International Journal of Transformation in English & Education
Vol. 2, Issue 1 - 2017

SILENT EXCELLENCE: A COMPARISON OF THE ACADEMIC ACHIEVEMENT LEVELS AND LEARNING STYLES OF HEARING IMPAIRED STUDENTS VERSUS THOSE WHO ARE NOT

ALIA R MUSTAFAA[*], TISHAUNA N MULLINGS[*], KEDISHA S POWELL[*], JASEN BILLINGS[*], PAUL A BOURNE[*]

ABSTRACT

INTRODUCTION: Hearing impairment often prevents the normal development of spoken language and limits intellectual development and educational achievement preventing participation in wider society.

OBJECTIVE: This survey design study investigates the learning styles of hearing impaired and hearing students to establish whether or not their learning styles have affected how well they perform academically.

METHODS: The VARK inventory was used to collect data on learning styles and the students' last report used to assess academic achievement. Convenient sampling was used to select the twenty one (21) hearing impaired subjects and eighteen (18) hearing subjects. The data was stored, retrieved and analyze using the Statistical Packages for the Social Sciences for Windows, Version 24.0. A p value of 5% was used to determine statistical significance. An independent sample t-test was used to analyze the difference in academic achievement between both groups of students.

FINDINGS: The results (t_{33}=-2.39, $p<0.05$) suggests that there is a significant difference between the groups. A significant difference was also found between the learning styles of the students. There is also a significant difference in how they learn. This study eradicated pervasive beliefs that deaf perform lower than their hearing counterparts because of their disability to hear.

CONCLUSION: Though it was not by a large margin, the deaf had higher academic achievement levels. However, there are still implications for much improvement in the tailoring of their curriculum to facilitate their unique learning styles.

KEYWORDS: Academic Performance, Deaf Education, Learning Styles, Jamaica.

[*]Northern Caribbean University, Mandeville, Jamaica.
***Correspondence to*:** Mr. Paul Andrew Bourne, Northern Caribbean University, Mandeville, Jamaica, W.I.
E-mail Id: paul.bourne@ncu.edu.jm.

INTRODUCTION

Many studies suggest that the history of educating the hearing impaired dates back to the 19th Century (Howard, 1998; Levitt, 2007; Mills, 2011; Muhvic-Dimanovski & Socanac, 2009). Popular philosopher Aristotle believed that hearing impaired persons who did not speak the superior Greek language could not be civilized (Traynor, 2017). In addition, Christianity perpetuated the inhumane treatment of the hearing impaired on the premise that they were believed to be punished by God. Deaf education has been in existence for a long while but there is need for improved methods of assessment and instruction. There are several difficulties faced by curricularists as it relates to developing a reasonable curriculum for the hearing impaired. There seems to be limited information available and little societal awareness of the struggles the deaf and hard of hearing face. Deaf educators need to undergo intricate training in order to be effective (Becker and Jauregui, 1981; Brice and Strauss, 2016).

Hearing impairment often prevents the normal development of spoken language, limits intellectual development and educational achievement, and prevents participation in the larger community in the most severe cases. Over the years the character and potential of the hearing impaired has been somewhat ignored. In Jamaica, in particular, there seems not to be a vast number of programmes specifically design to facilitate learning and the exposition of talent and ability. The Jamaica Cultural Development Commission (JCDC) has made some effort in helping hearing impaired students across the island to show off their dancing abilities through their annual Deaf Dance Competition.

If the academic performance level of hearing impaired students can be improved, it would facilitate them being better appreciated and integrated into the wider society..

Roth (1991) tells us that there has been little information available for the formation of curriculum for the deaf therefore, research of this nature is important in add to the knowledge to develop such and raising the awareness that proper care needs to be taken in developing teaching strategies for deaf students. Some teachers of the deaf in Jamaica are not specifically trained in deaf education, therefore there might be challenges in understanding and thereby properly teaching the hearing impaired to suit their specific needs and their learning styles. A study on their level of academic achievement will give an idea as to where they are at in terms of performance giving the deaf educators a better sense of direction as to how to cater for the needs of these students. As a result the current study investigates the learning styles of hearing impaired and hearing students to establish whether or not their learning styles have affected how well they perform academically.

The limitations of the study included the researchers' general inability to communicate with the hearing impaired. This was circumvented by obtaining the assistance of qualified sign language persons. Additionally, the Hearing Hearts Institute (for the hearing impaired) had significantly fewer students in each class than the Listen Me High School. Therefore, we had to modify our sampling procedures in order to obtain a smaller sample of hearing students. The resulting smaller population cannot be used to generalize across the Jamaican population.

In attempt to compare the academic achievement of both groups the students' last report was used which seem to imply that a fair homogeneous comparison was not done

because of differences in grading systems. If a standardized test such as the Hiskey-Nebraska Test of Aptitude (H-NTLA) or the Weschler Intelligence Scale for children was used then the researcher would have a better standard against which to compare as the literature proposes that these scales were developed for normal hearing subjects however are recommended for the evaluation of hearing impaired. (Vernon, 1976).The objective of this study is evaluate the learning styles of hearing impaired and hearing students to establish whether or not their learning styles have affected how well they perform academically.

LITERATURE REVIEW

The American Medical Association's Complete Medical Encyclopedia has defined define hearing as "the ability to perceive and identify sound" and has further stated that all sources of sound send vibrations or sound waves through the air" (p. 634). The ability to hear is an intricately delicate one; therefore, anything that interferes with the hearing apparatus can contribute to hearing loss. The term "hearing impairment" refers to the condition of being hard of hearing or having no hearing. There are different types of hearing impairment: Conductive - caused by diseases or obstructions in the outer or middle ear that usually affect all frequencies of hearing. According to the Complete Medical Encyclopedia, it "includes impairment to the hearing caused by interference with the structures and mechanisms that conduct sound waves from the external environment to the fluid in the inner ear".

This type of hearing loss can be corrected using medical treatments or procedures including surgery. Hearing aids generally help persons with a conductive hearing loss; Sensor neural- results from damage to the inner ear. This loss can range from mild to profound and often affects certain frequencies more than others. Sounds are often distorted, even with a hearing aid; Mixed- occurs in both the inner and outer or middle ear, and Central - results from damage to the central nervous system.

According to Beavers (2008), "About 20 percent of the world's population has an hearing disability…this large incidence of hearing loss is permanent and attributed to a number of causes-genetic, illness and or trauma during pregnancy, delivery or after birth; high fevers; certain prescription drugs; loud sounds and the aging process". Beavers (2008) has also stated that "decreased sensitivity has a major impact on communication in both children and adults. The severity of the communication process depends on the degree of hearing impairment and the brain's ability to process sounds it receives". It is interesting to note that many students who are hearing impaired, though intelligent, have been set back in the past by failure to receive appropriate academic instruction. Jacobs (1980) has stated "many bright and capable youngsters were labeled failures- and after living in a climate of failures, they inevitably became failures in everything else. Thus, incalculable damage was done not only to their self-image but also to their capabilities for optimum achievement". From these findings it can be seen that the effects of hearing loss far reaching and profound.

Understanding the state of deafness is the first step toward developing programs to help the hearing impaired. The fundamental point that relates to deafness and learning is that deafness is not a learning disability although it may appear to be so. "Many deaf students who are functioning within the expectation of typical language acquisition and academic development of a deaf population appear to have a learning disability when measured by diagnostic protocols designed for a hearing population" (Roth, p.393). Therefore, diagnostic protocols for the hearing population should not be used for the deaf as it seems to nullify their

intelligence and therefore gives a false representation of theories academic achievement level (Hausknecht& McKee, 1978).

McAnally, Rose, and Quigley (2007) have stated that "countless reports over the past 80 years indicate that deaf and hard of hearing children typically read at levels significantly below those of their hearing peers" (p. 4). One of the obvious reasons for this is that many deaf and hard of hearing students do not have a mastery of the language before they begin learning to read. This leads to the issue of the relationship between language and cognition. Reading is both a language process and a cognitive process. Several theories exist which attempt to explain the relationship between these processes. The language-dominant position ranges from the nativist hypothesis that "children have an innate propensity toward the development of language" to the theory of linguistic determination which proposes that "there is a one-to-one relationship between language and cognition and that cognition is dependent on language" (McAnally et al, 2007, p.4-5). In other words, the language dominant position has a bias towards the view that language skills determine how well an individual is able to learn.

The cognitive-dominant position is comprised of constructivist hypotheses that can be grouped as either strongly or weakly cognitive-dominant. This position is primarily based on the idea that learning, including the learning of language, is dependent on cognition. The strong cognitive-dominant hypothesis asserts that "cognition provides the foundation for language development and that cognition can adequately account for children's ability to learn language" (McAnally et al., 2007, p. 5). The weaker position is that "although cognition is necessary for language development to occur, cognition alone cannot account for children's ability to learn language" (McAnally et al., 2007, p. 5). The correlational position (or hypothesis) proposes that "there is a strong and fairly equal relationship between language and cognition" (McAnally et al., 2007, p. 5). Observations of infants in the Piagetian sensorimotor stage, have led to conclusions that "the development of language is first influenced by cognition, and later, cognition is influenced by linguistic structures" (McAnally et al., 2007, p. 6). None of the hypotheses are fully supported by research. Therefore, the relationship between language and cognition is not fully understood, and there is need for further research. However, the current view seems to be in favor of the language dominant position. McAnally et al. (2007) report that "early access to language is essential for normal cognitive development and academic success in both deaf and hearing children" (p. 6-7).

Hearing impaired individuals are not less intelligent that hearing individuals. McAnally et al. (2007) report that "the current view is that the range of intelligence for hearing and deaf individuals is similar. However, it is clear that hearing impaired students have poor vocabularies compared to their hearing counterparts' (p. 27). Similarly, the syntactic and inference skills of deaf and hard of hearing students are poor. Their comprehension of figurative language is also poor. McAnally et al. (2007) attribute the lower performance levels of hearing impaired students to underdeveloped language ability. Unlike most deaf and hard of hearing children, by the time hearing children are taught to read, they have developed a good vocabulary, schemata that allows for organizing and referencing information, and a range of language skills that includes inference and the interpretation of figurative language.

There are concerns about the methods used to evaluate the intellectual capabilities of hearing impaired persons. It is generally the case that individuals who are born deaf or hard of hearing find it to difficult to articulate or

manipulate language as do their counterparts who are not hearing impaired. It has been found that the vocabulary of test items and the syntactical structure, item format and the modes of delivery of test instructions have an impact on the student's ability to comprehend just what is given to them. This difficulty in developing language also affects their reading ability hence it has a negative effect on their academic development. Furthermore, research has suffered from its emphasis on written and spoken language production in hearing impaired students, as opposed to the syntactical structures and vocabulary which these students that are hearing impaired can comprehend accurately.

Much importance is usually placed on the literacy skills of the deaf, however numeracy skills are also of utmost important for everyday living and also other technical procedures in various fields. Focus should be placed on boththe numeracy and literacy skills of the deaf. The Using researchers from the Institute of Education in London, BBC (1999) makes inferences about the deaf students' numeracy skills that:

It is estimated that deaf children are three and a half years behind hearing children in numeracy skills. Researchers at the Institute of Education in London believe one of the reasons is that they miss out on much non-direct learning. This includes games which help teach children numeracy skills and general background conversation, for example, about shopping and the value of money. Hearing children may find out how numbers work through incidental learning in everyday life. Deaf children have fewer opportunities to pick up on environmental conversation so miss out on crucial bits of experience which is vital for mathematics.

Researchers have recommended the following strategies for testing hearing impaired students: Test items should be confined to vocabulary level appropriate for hearing impaired students; Test administrators should also avoid complex and compound sentences; Test administrators should minimize complex negation formations and items in which the correct answer is a negative answer; Test administrators should be aware that fill-in-the-blanks and short answer items are easier to understand rather than multiple choice or matching questions or items, and Test administrators should try to use visual aids and avoid narrative descriptions that might make it rather difficult for hearing impaired students to comprehend what it is that they should do on a test. (Hausknecht& McKee, 1978).

It has been the challenge of many researchers to understand the learning process of hearing impaired students. Watson (1986) has stated that "the apparent lack of success in helping hearing impaired students realize their full potential in language and academics may be due to the fact that the problems in these areas have not been adequately delineated. Little is known about how hearing impaired children acquire language or the manner in which they learn to read". This indicates the need for further research into how hearing impaired persons acquire knowledge.

Despite the problem of acquiring information on how these students learn, some researchers have tried to add to the existing pool of limited knowledge. They have tried to measure these students intelligence by giving them performance and non-verbal tests. Examples of typical performance test items include puzzles, block designs, and visual instructions. There are also non-verbal intelligence studies on the hearing impaired.

Examples of non-verbal IQ measures are the Hiskey- Nebraska Test of learning Aptitude (H-NTLA) and the performance scales as the Wechsler Intelligence scale for children. The

Wechsler scales contain a minimum of five verbal and five nonverbal subsets. The scores are calculated for the individual subtests. The Wechsler tests are recognized as adequately standardized. These scales were developed for use with normal hearing subjects; the performance scales are frequently used in the evaluation of hearing impaired individuals and are recommended for this purpose (Vernon, 1976).

The development of methods to educate the deaf has been a work in progress for several decades. Unfortunately, the work was unfruitful because the deaf were not made an integral part of the process. Jacobs (1980) has stated that "initial efforts to educate the deaf and the methods used were determined by people who by virtue of their hearing had only vicarious experience with deafness. That the deaf were not consulted should be understood and appreciated; they were for the most part uneducated recipients of compassion and charity."

Perhaps lessons can be learned from developments is educating the visually impaired. A study was conducted which compared the academic achievement by sighted versus visually impaired students at Polish universities. In Poland, the children who are visually impaired receive an education that is comparable to their sighted peers (Klinkosz, Sekowski, & Bramling, 2006). An individual who is visually impaired but not hearing impaired can learn language by hearing. Perhaps this accounts for the success of the visually impaired students in Poland. If this is so, it could also be taken as an indication that language development is important for learning. Meister (1998) interviewed students with motor, visual or auditory impairments at 15 German universities with a view to discovering factors affecting their achievements during their course of study. It was found that depending on the severity of the impairment, these students required two to five times as much time to learn the syllabus and to prepare and revise lectures than their peers without impairments. This extra effort on the students required them to request more breaks and have less time for leisure activities (Klinkosz, Sekowski, & Bramling, 2006). These findings include hearing impaired students and suggest that it is possible for hearing impaired students to do well academically.

It should be noted that there are several differences in the curriculum that hearing impaired students are exposed to in comparison to that which students who are non-hearing impaired are exposed to. Curricularists speak about the informal curriculum. For example, on its website, the Jedburgh Grammar Schoolrefers to "the informal curriculum which consists of activities such as sport, concerts". Hearing impaired students benefit from this to a lesser extent than hearing students because the impairment prevents them from immersing themselves totally in everyday life due to their handicap.

The formal curriculum taught to the over 555 hearing impaired students in Jamaica is to a reasonable extent different from that which is taught to regular students. According to The Gleaner (1996), "the third goal of the Caribbean Christian Centre for the Deaf (CCCD) is to prepare the children for adult life through vocational training. In Conjunction with HEART, these children are given extensive training in cosmetology, food preparation, Garment Construction, Housekeeping, woodwork and Building Construction…computer science." Though several high schools offer these subjects to regular students, the deaf students are at a disadvantage as they have limited exposure to other areas of educational training such as the sciences.

Some methods have been developed to reduce the disadvantage that hearing impaired

individuals face. Communication systems are often used to benefit people who are deaf. These systems, generally taught to deaf children in special schools and classes, encourage the combined use of certain methods of communication that are suitable to children or adults who cannot hear. One such method is cued speech.

According to an article in The Star (1980), "cued speech was first introduced in America in 1967 by DR. R. Orin Cornett…Since then it has grown from strength to strength and now more than 700 people are capable of using the method, including teachers, therapists, parents and the deaf themselves". The Jamaica Association for the Deaf tries to minimize the disadvantages faced by hearing impaired individuals by aiming to provide "hearing impaired students with stimulation which approximates as closely as possible, those experiences derived naturally by their hearing counterparts."

In Jamaica more needs to be done in terms of providing special education. According to Knight (1989) "special education involves the teaching of special children or adults-that is, individuals with various disabilities who because of their disability, cannot profit by regular education or who cannot attend regular school…special children may be physically disabled, mentally retarded, learning disabled, blind, hearing impaired, speech/language disabled, or autistic".

To provide good special education is costly and a considerable amount of money needs to be spent. Due to Jamaica's economic conditions these hearing impaired students are not afforded all they need to succeed. It is also possible that the government does not give enough priority to special education. According to the Planning Institute of Jamaica (2005) from the $37.1 billion budgeted for education a total of $351.3 million was expended on special education programmes for the economic year 2004/5.

There are only a few institutions in Jamaica geared specifically to educating the hearing impaired. Two such institutions are the Caribbean Christian Centre for the Deaf (CCCD) and St. Christopher's school. Garrick(1988) has stated that " as an institution St. Christopher's problems are two-fold: for one thing the hearing impaired children have to struggle with not only their physical limitations, but suffer most from the little understanding shown by the society whose attitude of rejection and shame of impairment may cause an almost irreparable loss of self-esteem".

Therefore, our society needs to be kinder and far more interested in the success well-being of hearing impaired persons. The literature has provided a comprehensive insight on the phenomenon of deaf education, aid in contextualizing the current work as it relates to objective, method, instrumentation, and framing how to interpret the finding of this research.

METHODS AND MATERIALS

This study employs an objectivistic epistemology, which explains its usage of survey research methodology, statistical tools (such as frequencies, bivariate analyses, and other analyses in the statistical packages for the social Sciences, SPSS, for Windows, Version 24), and section that dealt with the definition of terms. This section of the work outlines the research design, terms used in this study, population and sample, and the instrumentation.

RESEARCH DESIGN

A survey research design study is used to compare two or more groups on one variable. In the study at hand, academic achievement level and learning styles were the variable being

tested among two groups of students, one hearing impaired and the other hearing. The study was also quantitative because the researchers were working with known variables that were analyzed statistically, and used as the basis for conclusions arrived at by deductive analysis.

CONCEPTUALIZATION

Hearing Impaired in this study is used to mean deaf or hard of hearing.

Sensori-neuralhearing loss is also called perceptive hearing loss. The possible source of this type of hearing loss includes problems in the inner ear, problems that with the nerve that transmits impulse from the inner ear to the brain and problems in the brains functioning

Learning is acquiring knowledge or developing the ability to perform new behaviours. The scientific study of learning focuses on behaviour, specifically on how behaviours change because of learning. **American Sign Language (ASL)** is a communication system that teaches the hearing impaired person how to make gestures to convey words. These hand gestures are further differentiated and enhanced by facial expression and body posturing.

PSEUDO NAMES

- Listen me High School- Pseudo Name for hearing school
- Hearing Impaired Institute- Pseudo name for impaired school

OPERATIONALIZATION OF VARIABLES

- Academic achievement was measured using grades attained from the students' last report at both schools.
- The learning style variable was made operational using the VARK learning styles inventory.

POPULATION AND SAMPLING

The population that the sample of hearing impaired students was taken from is all hearing impaired students in grade 11 at the Hearing Hearts Institute. The population that was used for the sample of hearing students was all students in grade 11 at the Listen Me High School who are doing the subject Information Technology. For a populationsize100 <N < 500, the recommended minimum sample size is 50% of the population. Due to the fact that we have used purposive sampling the sample comprised of all the students in grade 11 from both schools who did a combination of information technology/computer, English language and mathematics.

INSTRUMENT OF DATA COLLECTION

The instrument that was used to garner information as it pertains to the learning styles of our subjects for this research is a standardized test known as the VARK which was formulated by Neil Fleming , the acronym VARK stands for visual , aural, read\write and kinesthetic sensory modalities that are used for learning information. The VARK consists of 16 questions that seek to determine one's learning preference or preferences.

The visual dimension looks at the depiction of information in maps, spider diagrams, charts, graphs that people use to represent what could have been presented in words. The other dimension is the Aural looks at the preference for information that is heard or spoken. Individuals with this as their main preference learn best from lectures, group discussion, radio, email, and web chat.

The third dimension which is the read/write dimension looks at the preference for information displayed as words. This preference is for information displayed as words. This preference emphasis text- based

input and output, reading and writing in all its forms, especially report, essays and assignments.

The fourth dimension which is the kinesthetic preference looks at the perceptual preference related to the use of experience and practice. People with this as a strong preference learn from the experience of doing something and they value their own background of experience and less so the experiences of others.

The VARK is also multimodal which caters to those individuals that don't have a single preference for any of the dimensions on the VARK inventory. There are seldom instances where one mode is used or is sufficient hence a four part VARK profile. Individuals who do not have a standout score with one preference score well above other scores are referred to as multimodal hence individuals can be for instance visual/ aural or any other paired dimension of the VARK.

As it relates to the validity and the reliability of the VARK the reliability estimates were 0.85, 0.82, 0.84 and 0.77 for the Visual, Aural, Read/Write and Kinesthetic respectively. (Flemming, 1992)

DATA COLLECTION

Permission to collect data was obtained from administrators and teachers at the schools targeted. The students were informed about the study and the principals were asked to sign informed consent forms before the test was conducted. The process was undertaken by the researchers completing this research.

Administration of the tests was done on the same day for all students at each school. The duration of each test, including time for instructions to be explained to the students, was a half an hour. The duration of the study was one semester, which was three months.

DATA ANALYSIS

The data was collected using data sheets at each school to match student's identification with grades received from the administrators of the schools. By using the data sheets each student's calculated learning style was then matched with their grades. This data was then entered into software, previously known as statistical package for the social sciences (SPSS) now known as predictive analytic software (PASW), for processing.

The statistical techniques used for comparing the two samples in our study werethe independent samples t-test, which allowed for the comparison of both groups on academic achievement and the analysis of learning styles was done using a two way chi-square. A p value less than or equal to 5% (0.05) was used to determine the level of significance for this paper.

FINDINGS

Statistical analysis of the data obtained from the respondents supplied results which mostly disproved the different research hypotheses.

RESEARCH OBJECTIVE 1

To compare the academic achievement levels of hearing impaired students and their hearing counterparts.

Null Hypothesis 1: There is no difference in the academic achievement levels of hearing and hearing impaired students

In order to arrive at an average to reflect the academic achievement levels of hearing and hearing impaired students the average of the three subjects mentioned in the methodology was calculated. The group of hearing students registered a mean of 56.89(SD=8.38); while the group of hearing impaired students had a mean of 65.67 (SD=14.19) (see table 1).

Table 1.showing mean and standard deviation of the averages of hearing and hearing impaired students

Hearing Status of Students	Mean	Std. Deviation
hearing	56.8889	8.37987
hearing impaired	65.6667	14.19272

An Independent sample t-test was used to analyze the significance of the difference observed in academic achievement between both groups of students, t (33)=-2.39, p<.05 .These results suggest that there is a significant difference in the academic performance between the two groups. The null hypothesis which suggests that there is no difference in the academic achievement of hearing and hearing impaired students has been rejected.

Further analysis was performed to compare the student's performance in specific subject areas. The means were taken for mathematics revealing that hearing students have a mean of 53.89 and hearing impaired students having a mean of 63.24. An independent sample t-test suggests that there is no significant difference between the performances of the groups the results were t(37)=-1.776. Similarly, the means for English was taken, showing that hearing students had a mean of 57.22 while hearing impaired students had a mean of 72.38 with as results these results of an independent sample t-test, t (29)=-3.32, p<.01.

Correspondingly, the means were again taken for the groups, this time for Information Technology/computer; hearing students had a mean of 59.39, while hearing impaired students had a mean of 56.32. There was found to be no significant difference between the performances of both groups.t (26.79) =.667. See table 2. See also figure 1 for a graphical display of the above mentioned results. Table 2.showing means, t scores and significance for students when compared on Mathematics, English and Information technology/computer.

Table 2.Showing means and significance for both groups when compared on three subjects

Hearing Status	Mathematics			English			Information technology/computer		
	Mean	t	P	mean	t	p	mean	t	p
Hearing Students	53.8889	-1.727	.099	57.2222	-3.320	.002	59.3889	.667	.511
Hearing-impaired students	63.2381			72.3810			56.3158		

RESEARCH OBJECTIVE 2

To explore the learning styles of the hearing impaired and identify if there is a distinction between their learning styles and those of hearing students.

A chi square analysis was conducted to measure the difference between the expected frequency and observed frequency in the learning styles. The following are the results $x^2(7) =17.271$, p<.05. This suggests that there is a significant difference between the observed and expected frequencies of the learning styles.

Based on the responses given on the VARK a total of ten combinations of learning styles were developed to represent the learners in the population. 7.7 % of the sample was visual and 10.3% was aural, with all of these being hearing students. 38.5 % of the sample was "read-write" learners; of this percentage 33.3 %

were hearing impaired students. This accounts for 13 of the 21 hearing impaired students in the sample. 25.6% of the sample was kinesthetic with equal percentage of hearing and hearing impaired students. One hearing student was visual kinesthetic, one hearing impaired student was "visual/read-write". A total of 7.7% of students learned best "Aural/read-write" with one student of these 3 being hearing impaired. The final 5.1% of students were "read-write/kinesthetic" with equal percentage of this category being hearing and hearing impaired. See table 3 for these results. Please refer to the appendix for cross tabulation outlining all the percentages relating to learning styles in both groups.

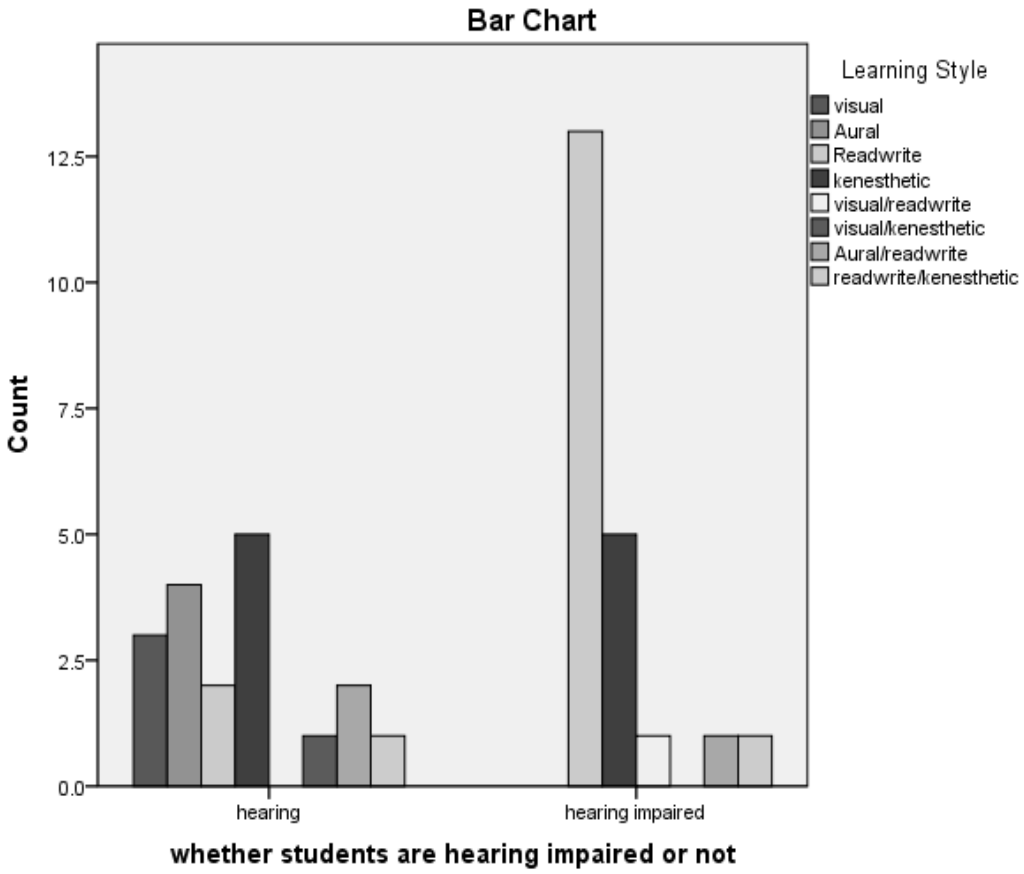

Figure 1.Composing bar graph of learning styles by hearing impaired status

The null hypothesis which states that there is no difference between the learning styles of hearing students and hearing impaired students is rejected.

RESEARCH OBJECTIVE 3

To determine if the learning styles are related to academic achievement.

A Point Biserial correlation was used to measure the relationship between academic achievement using average grade and learning styles. The results were r_b= .791, p<.05. This suggests that there is a significant moderately strong positive correlation between learning styles and average grade. Further analysis was done using a spearman's rank correlation to investigate the relationship between each subject and learning styles. The results suggested that there is no significant relationship between any of the subjects used and any given learning style. The null hypothesis which states that there is no relationship between academic achievement and learning style has been rejected.

RESEARCH OBJECTIVE 4

To investigate if there is a difference between the academic achievement of males and females from each group.

An independent samples t-test was used to compare the academic achievement of hearing impaired males and females. The average score for females was 72.444 while that of males was 60.583. t (19)=-2.039, p=.056. This suggests that there is no significant difference between the academic achievement of hearing impaired males and females. We have failed to reject the null hypothesis which states that there is no difference between the academic achievement of hearing impaired males and females.

Another independent samples t-test was used to analyze the difference between the academic achievement levels of hearing males and females. The average for males was 59.714 while that of females was 55.090. t (16)=1.152, p>.05. We have failed to reject the null hypothesis which suggests that there is no difference between the academic achievement of hearing males and females.

DISCUSSION AND CONCLUSION

The results revealed a significant difference between the academic achievement and learning styles between the hearing and hearing impaired, though not the hypothesized difference. Deaf students according to the findings performed better than hearing students. A t-test result revealed a significant difference t(33)=-2.39, p<.05 between the groups with the hearing impaired having a higher mean (65.67).According to the reviewed literature hearing students generally out-perform hearing impaired students.(Roth, 1991).However, these results could possibly have been obtained due to differences in the grading procedures employed by each institution. The possibility lies that the school from which the hearing sample was chosen receive students with lower Grade Six Achievement test (GSAT) scores hence they may be lower overall academic performers.

On the other hand, the researchers believe this study adds value to the fact that there is a pervasive expectation of the deaf to perform lower that needs to be eradicated because they can actually perform very well academically. A moving away from this type of thinking may very well be the road to improvement in the learning ability of deaf students. The literature correspondingly revealed that society's behavior to deaf students may cause lowered self-esteem (Garrick, 1988). This lowered self-esteem may cause lowered performance in school therefore, there needs to be some sensitization of the population at large and specifically the family and close associates of the deaf as to the value of respecting and appreciating that are human beings with the capacity to learn and do well if properly taught by professionals who understand the learning styles and cognition of the deaf. Smith (2008) carefully noted that, "teachers who have high standards have students who succeed because they expect them to do well. Tothem, deafness is not seen as an excuse for poor performance or behavior. This isespecially true for teachers who are Deaf themselves". The possibility lies that the teachers of the subjects in this study expected a high performance of them resulting in fairly good academic performance. Evidence exists that children who are deaf are a stigmatized group and can be affected by negative expectations of teachers.(Smith, 2008).

Literature reviewed had revealed that countless reports over the past 80 years have indicated that deaf and hard of hearing students usually reads at levels significantly below their peers. (McAnally, Rose, and Quigley, 2007). The results of this study deviated from this consistent trend where deaf student had a

higher mean average in English that their hearing peers. This result is rather intriguing because as aforementioned most researchers, based on knowledge from research, hold the view that the synaptic and inference skills of the deaf are poor (McAnally et al., 2007). Generally deaf students figurative language is poor since their impairment does not allow them a chance a good vocabulary poor schemata that allows for organizing and referencing information and a range of language.

Significant difference in performance was found in only one of the three subject areas; English, with the deaf students being the higher performers. While the difference was not significant hearing students had a higher mean than the deaf students for Information Technology while the hearing impaired had a higher mean for English and Mathematics. This higher performance in English must be interpreted with caution because understanding of English may differ among both groups. For hearing students, usually the primary language (used with friends and at home) is patois; therefore learning grammatical rules for proper English may become more difficult. It is hardly likely that deaf students would have a challenge in distinguishing between patois and Standard English since they cannot hear and communicate primarily through sign language. Though being able to hear seem to be more beneficial for language acquisition, it has its cons where persons have to unlearn some incorrect rules that have been inherently learnt. "The development of language is first influenced by cognition, and later, cognition is influenced by linguistic structures" (McAnally et al., 2007; p. 6). It would appear that the deaf would have more difficulty in language development as it relates to linguistic structure since they would not be able to hear and form schemata allowing for the organization and referencing of information mentally. Though the hearing has thing advantage, they are more likely to be faced with the disadvantages of unlearning so information they might have reference incorrectly in their minds. Correspondingly, McAnally et al. (2007) does accept that the ranges of intelligence for hearing and deaf individuals are similar.

It is pertinent to observe the performance in mathematics revealed in this present study since it gives great insight on competence of the deaf in numeracy. There was no significance difference found in the performance in math among both groups but the higher mean recorded was for the hearing impaired. Tere zinha Nunes (1999) makes inferences about the deaf students' numeracy skills where he states that "it is estimated that deaf children are three and a half years behind hearing children in numeracy skills. Researchers at the Institute of Education in London believe one of the reasons is that they miss out on much non-direct learning. Hearing children may find out how numbers work through incidental learning in everyday life. Deaf children have fewer opportunities to pick up on environmental conversation so miss out on crucial bits of experience which is vital for mathematics.

Smith (2008) also presents some arguments on performance in specific subject areas. "Low expectations have been found across topic areas in deaf education such as writing and reading and mathematics". The deaf students did perform better in mathematics by a small margin according to the means attained for each group in the present study; hearing (53.89) and hearing impaired (63.24) but the t-test scores suggested that there was not a significant difference in their performance. This once again gives insight that the deaf has the ability to transcend the lower expectations in the minds of many and perform on the same level or higher than their hearing counterparts. Smith (2008) continued to say that some

teachers giving deaf students simplified instruction, and repetitious work of low complexity and that lowered curriculum content is a consequence of the low expectations teachers have of their students. The students in the present study may have undergone similar teaching procedures where there curricula is simplified.

The kinesthetic learning style accounted for the greatest percentage overall (12.5%) for the hearing impaired students and the read-write learning style was the greatest overall (33.3%) for hearing impaired students. This may be due to the fact that the teacher to pupil ratio at the hearing impaired school is smaller allowing more one to one interaction in reading and writing activities, allowing some students to develop an affinity for learning in this manner. Reports over the last 80 suggests that the deaf read at lower levels that their hearing peers (McAnally, Rose, and Quigley, 2007), however this study revealed that the deaf are mostly read-write learners who also perform notably better in English. Additionally, the environment in which they live where they board on campus gives them longer school hours than the hearing school which may give the deaf an advantageous edge. Additionally, they have less computers at the hearing impaired school and more access to computers at hearing school where they have more than one computer labs. Furthermore, it would be more likely for the hearing students to be kinesthetic since they purposely choose to study information technology which is a practical course. All students in the deaf sample have to do information technology at their school as a requirement and not a choice.

Though the findings reveal that the hearing impaired has higher academic achievement level, it is oddly interesting to note that among the hearing impaired, there were no predominantly visual learners since the main mode of communication for the deaf is sign language which is a visual language. However, much logic may be garnered from this finding, while one may say that they look at the signs so they should be visual, the primary cognitive task may still be reading, because the movements of the hands are like letters in a book. So, while the visual facet must come into play because people must see in order to read, the primary style may still not be visual instead it is quite likely reading as revealed in this study. Ker Than (2010) postulates that, “deaf people with enhanced vision can thank the idle brain cells for their heightened sense which is vision. The brain is very efficient and it’s not going to let this huge territory that is the auditory cortex and all the processing that it has got to waste. So it makes sense that other senses will come in and colonize”. Therefore, it would make sense for them to be visual learners. The study’s revelation contradicts the idea that deaf people should most likely be predominantly visual. However, the finding that they are read-write appears accurate because reading does naturally takes in visual stimulation.

Correspondingly, persons who could hear in the past may read lips because they can make the connection between the movement of the lips and what sound those movements would be associated with. There is a cognitive process involved in comprehending what word is said and the read matches the shape of the mouth with the actual word said. It was no surprise that the findings revealed that there was no aural learners among the hearing impaired, interestingly though there was found one aural kinesthetic learner. This gives implications that this person may not be severely deaf (there are different severities of deafness) are may have not been born deaf.

This significance level however is very near to the region of rejection and therefore further research should be done to assess the difference between the academic achievement

of hearing impaired males and females. In concluding, even though the deaf students performed better that the hearing students it was not by a large margin therefore there are still implications for great improvement in the tailoring of their curriculum to facilitate their unique learning styles.

RECOMMENDATIONS

There are many complex and interrelated issues that needs to be addressed in order to facilitate a change in attitudes and expectations for the academic achievement of deaf children. To catalyze the perception of lower performance among the deaf requires a system wide commitment across the interdependent layers of community, schools, and institutions of higher education to encourage positive outlook on their performance levels. Therefore, measures should be put in place at the government level to ensure that families of deaf individuals take the time and care they get access proper education as well as to eradicate the expectation of lower performance that often actually lead to low achievement levels.

Many bright youngsters were labeled failures, (Jacobs, 1980) and seem to have become failures at everything causing inability to function at their optimum level. Lowered expectations of the deaf in academic achievement often leads to actual low performance levels. This reveals that many students regardless of their learning style are unable to perform at their optimum level because of the climate of failure they live in. Though, the hard of hearing students are performing better than the others according to the finding, they may not be performing at their optimum levels because the lectures do not adequately cater to their preferred learning style or some other reason. McAnallyetal (2007) confirms that “early access to language is essential for normal cognitive development and academic success in both deaf and hearing children” (p. 6-7). It is therefore recommendable that the parents of the deaf ensure that their children are exposed to language by seeking to attain training so they are able to communicate with their children. They have a further responsibility to ensure their children access formal education as early as necessary. Furthermore, it is necessary to follow up with the school and pay close attention to the child’s academic achievement by checking the child’s grades and remaining active and in close contact with school teacher.

This study actually proved that deaf students have the potential to become creative and productive citizens therefore meticulous care must be taken in educating the deaf and not a mere diminutive regard. Therefore, in addition to an opportunity to access proper education, skills training programmes are important in ensuring that their abilities and creative though does not go to wait. After accessing the necessary education and training the deaf often have difficulty integrating into the work place where most individuals are usually hearing individuals who are not likely to know sign language. Therefore workplace integration programmes are necessary to ensure that they are able to make a good transition from school to work and be able to attain a livelihood. By extension policies for people with disabilities in the workplace must be formed and duly enforced.

Designers of curricula for both hearing impaired and hearing students should take the time and care to ensure that the needs of students with varying learning styles are met. The finding revealed that there was a significant moderate positive correlation between academic achievement and learning style (r_b= .791, $p<.05$), as a result efforts to test each students learning style is important as to better position teaching strategies for their benefit. Researchers and deaf educators may also

collaborate and developed simple lessons and strategies to educate the deaf specifically as to accelerate learning. Deaf educators can additionally use technological means by collaborating with specialists in these fields to develop games which can help teach deaf children numeracy skills and general background conversation, for example, about shopping and the value of money. This way they will not miss out on the learning opportunities many hearing persons benefit from.

IMPLICATIONS FOR FURTHER STUDY

- It is recommendable that wider study be done involving the comparison of different groups, one from a low performing student population and one from a high performing population, along with the hearing impaired. Then a researcher might be able to see if the students' academic history as evidenced by GSAT passes has a bearing on the differences presently discovered in academic performance at the secondary school level.
- More in-depth research as to the type of achievement test appropriate for both hearing and hearing impaired learners.
- A study on how deaf people actually learn would be absolutely relevant in resolving issues face by researchers in evaluating them as well as those who teach them.

REFERENCES

[1]. Ashton-Smith, D. (1996, November 23). The Caribbean Christian fellowship for the Deaf: Part 1.

[2]. BBC. (1999, September 7). Education: Deaf children helped to beat numeracy gap. Retrieved from http://news.bbc.co.uk/2/hi/uk_news/education/441074.stm, accessed on July 28, 2017.

[3]. Becker and Jauregui, J. (1981). The Invisible Isolation of Deaf Women: Its Effect on Social Awareness," The Journal of Sociology & Social Welfare, 8(2), Article 4, 249-262.

[4]. Brice, P. J., & Strauss, G. (2016). Deaf adolescents in a hearing world: a review of factors affecting psychosocial adaptation. *Adolescent Health, Medicine and Therapeutics*, *7*, 67–76. *The Gleaner.*

[5]. Fleming, N.D. & Mills, C. (1992).*Not Another Inventory, Rather a Catalyst for Reflection*. To Improve the Academy, 11, 137-155.

[6]. Garrick, C. (1988, March 19). St. Christopher's School. *The Gleaner.*

[7]. Hausknecht, M.A., McKee, B.G. (1978). Classroom assessment techniques for hearing impaired students: A literature review. *Education Resources Information Center*. Retrieved from http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp.

[8]. Jacobs, L.M. (1980).*A deaf adult speaks out*. Washington, DC: Gaullaudet College Press.

[9]. Jedburgh Grammar School. Curriculum. Retrieved from http://jedburghgs.co.uk/curriculum.

[10]. Klinkosz, W., Sekowski, A., Bramling, M.(2006). Academic achievement and personality in university students who are visually impaired. *Journal of Visual Impairment& Blindness*. 100, 666-675.

[11]. Knight, S. (1996, November 23). Special Education. *The Gleaner*.

[12]. McAnally, P.L., Rose, S., Quigley, S.P. (2009). *Reading Practices with Deaf Learners*. Austin, TX: PRO-ED.

[13]. Muhvic-Dimanovski, V., &&Socanac, L. (2009). Linguistics: Encyclopedia of life support systems. New York: UNESCO.

[14]. Planning Institute of Jamaica. (2006). *Economic and Social Survey Jamaica 2005.*Kingston, Jamaica: Author.

[15]. Roth, V. (1991). Students with learning disabilities and hearing impairment:

Issues for the secondary and post secondary teacher. *Journal of Learning Disabilities*, 24.

[16]. Smith, D. H. (2008). Giving the spoon back: Higher teacher expectations of achievement for students who are deaf. *The Qualitative Report*, 13(4), 657-694. Retrieved from http://www.nova.edu/ssss/QR/QR13-4/smith.pdf.

[17]. Than, Ker (2010). Why deaf have enhanced vision. *National Geography. com*. Retrieved from: national geographic http: news national geographic.com

[18]. Traynor, B. (2017) Hearing health and technology matters. Retrieved from http://hearinghealthmatters.org/hearinginternational/2013/the-pope-and-deafness/. Accessed July 3, 2017.

[19]. The Gleaner. (1996, November 23). The Caribbean Christian Centre for the Deaf. *The Gleaner.*

[20]. The Gleaner.(2001, May).The disabled hearing impaired. *The Gleaner.*

[21]. The Observer.(1995, July).A helping hand for education. *The Observer.*

[22]. The Star. (1980, May 26). The cues that put words into David's mouth. *The Star.*

[23]. Howard, A. (1998). Hearing Aids: Smaller and Smarter. New York Times, November 26, 1998.

[24]. Mills, M. (2011). Hearing Aids and the History of Electronics Miniaturization. IEEE Annals of the History of Computing 33.2, 24-44.

[25]. Levitt, H. (2007). Digital hearing aids: wheel barrows to ear inserts. ASHA Leader 12(17), 28-30.

APPENDIX I

SURVEY INSTRUMENT

Hearing Hearts represents the use of a pseudo name to protect the identity of the school and its students.

Survey Number : _____

Reported Grade :_____

Student Identification : _____

THE VARK QUESTIONNNAIRE

How Do I Learn Best?

Choose the answer which best explains your preference and circle the letter(s) next to it.

Please circle more than one if a single answer does not match your perception.

Leave blank any question that does not apply.

1. I like websites that have:

   a. Things I can click on and do.
   b. Audio channels for music, chat and discussion.
   c. Interesting information and articles in print.
   d. Interesting design and visual effects.

2. You are not sure whether a word should be spelled 'dependent' or 'dependant'. I would:

   a. See the words in my mind and choose by how they look.
   b. Hear them in my mind or out loud.
   c. Find them in the dictionary.
   d. Write both words on paper and choose one.

3. You want to plan a surprise party for a friend. I would:

   a. Invite friends and just let it happen.
   b. Imagine the party happening.
   c. Make lists of what to do and what to buy for the party.
   d. Talk about it on the phone or text others.

4. You are going to make something special for your family. I would:

a. Make something I have made before.
b. Talk it over with my friends.
c. Look for ideas and plans in books and magazines.
d. Find written instructions to make it.

5. You have been selected as a tutor or a leader for a holiday program. This is interesting for your friends. I would:

a. Describe the activities I will be doing in the program.
b. Show them the map of where it will be held and photos about it.
c. Start practising the activities I will be doing in the program.
d. Show them the list of activities in the program.

6. You are about to buy a new digital camera or mobile phone. Other than price, what would most influence your decision?

a. Trying it.
b. Reading the details about its features.
c. It is the latest design and looks good.
d. The salesperson telling me about it.

7. Remember when you learned how to play a new computer or board game. I learned best by:

a. Watching others do it first.
b. Listening to somebody explaining it and asking questions.
c. Clues from the diagrams in the instructions.
d. Reading the instructions.

8. After reading a play you need to do a project. Would you prefer to:?

a. Write about the play.
b. Act out a scene from the play.
c. Draw or sketch something that happened in the play.
d. Read a speech from the play.

9. You are about to hook up your parent's new computer. I would:

a. Read the instructions that came with it.
b. Phone, text or email a friend and ask how to do it.
c. Unpack the box and start putting the pieces together.
d. Follow the diagrams that show how it is done.

10. You need to give directions to go to a house nearby. I would:

a. Walk with them.
b. Draw a map on a piece of paper or get a map online.
c. Write down the directions as a list.
d. Tell them the directions.

11. You have a problem with your knee. Would you prefer that the doctor:

    a. Showed you a diagram of what was wrong.
    b. Gave you an article or brochure that explained knee injuries.
    c. Described to you what was wrong.
    d. Demonstrated what was wrong using a model of a knee.

12. A new movie has arrived in town. What would most influence your decision to go (or not go)?

    a. You hear friends talking about it.
    b. You read what others say about it online or in a magazine.
    c. You see a preview of it.
    d. It is similar to others you have liked.

13. Do you prefer a teacher who likes to use:

    a. Demonstrations, models or practical sessions.
    b. Class discussions, online discussion, online chat and guest speakers.
    c. A textbook and plenty of handouts.
    d. An overview diagram, charts, labelled diagrams and maps.

14. You are learning to take photos with your new digital camera or mobile phone. I would like to have:

    a. Examples of good and poor photos and how to improve them.
    b. Clear written instructions with lists and bullet points.
    c. A chance to ask questions and talk about the camera's features.
    d. Diagrams showing the camera and how to use it.

15. You want some feedback about an event, competition or test. I would like to have feedback:

    a. That used examples of what I have done.
    b. From somebody who discussed it with me.
    c. That used a written description or table of my results.
    d. That used graphs showing what I achieved.

16. You have to present your ideas to your class. I would:

    a. Make diagrams or get graphs to help explain my ideas.
    b. Write a few key words and practice what to say again an again.
    c. Write out my speech and learn it by reading it again and again.
    d. Gather examples and stories to make it real and practical.

APPENDIX II

INTERPRETATION OF SURVEY INSTRUMENT

THE VARK QUESTIONNAIRE SCORING CHART

Use the following scoring chart to find the VARK category that each of your answers corresponds to. Circle the letters that correspond to your answers e.g. If you answered b and c for question 3, circle V and R in the question 3 row.

Question a category b category c category d category 3 K V R A

SCORING CHART

Question **a** category **b** category **c** category **d** category

1. K A R V
2. V A R K
3. K V R A
4. K A V R
5. A V K R
6. K R V A
7. K A V R
8. R K A V
9. R A K V
10. K V R A
11. V R A K
12. A R V K
13. K A R V
14. K R A V
15. K A R V
16. V A R K

CALCULATING YOUR SCORES

Count the number of each of the VARK letters you have circled to get your score for each VARK category.

- Total number of **V**s circled =
- Total number of **A**s circled =
- Total number of **R**s circled =
- Total number of **K**s circled =

CALCULATING YOUR PREFERENCES

Use the VARK spreadsheet (which can be purchased from the www.vark-learn.com web site) to work out your VARK learning preferences.

