



An Examination into the Validity of Secondary School Entrance Scores in Predicting the Academic Success of Secondary Aged Students

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The Barbados Secondary School Entrance Examination (BSSEE) is used to allocate students to secondary schools in Barbados. However, this means of allocation has always been contentious. Therefore the aim of this study was to establish the predictive validity of the BSSEE in relation to the Caribbean Secondary Education Certificate (CSEC). Academic achievement was measured using students' performances on the BSSEE and CSEC. The sample included 252 students across Barbados (130 males, 122 females). The results showed that the BSSEE accounted for 29% of the variance for this sample. Additionally, the means of female students were higher on both the BSSEE and CSEC, but only a statistically significant difference was obtained on the BSSEE. The BSSEE should be used in conjunction with other assessment scores as a fairer means to allocate students. Furthermore, the BSSEE should be used as a diagnostic tool for remediation.

Keywords: academic achievement; Barbados Secondary School Entrance Examination; Caribbean Examination Council; Caribbean Secondary Education Certificate; common entrance; high stakes exams; regression

High academic success, for many, provides an opportunity to improve one's social status; hence, high academic achievement is seen as one of the most important outputs of school. This focus on academic output over content could be misleading; for many, the ultimate purpose of education is to foster democratic citizens who can critically assess policy implications and make informed decisions for the betterment of a society (Nussbaum, 2010). Nevertheless, parents and students consider high academic success to be paramount, and therefore it is not surprising to see that differential attainment and predictive validity is at the center of discussions around academic outcomes and is usually at the forefront of academic debates.

A clearly documented disparity is the difference in achievement outcomes for both males and females (Hall, 2013a). Focus has been in various subject areas (Reis & McCoach, 2000); however, Mathematics and English Language are often highlighted. According to the 2004 National Reading Assessment, measured by the U.S.

Department of Education, the achievement gap between males and females, while are slight in 4th grade, left boys 14 points behind their female counterparts during 12th grade (approximately 17 years old) (Perie, Moran, & Lutkus, 2005). Interestingly, girls typically have better grades in Math classes, but tend to score below average on standardized Math tests (Dee, 2007). National Assessment for Educational Progress (NAEP) testing reveals that achievement gaps are practically non-existent at young ages, but that a significant disparity is apparent as students get older (Dee, 2007).

In the United Kingdom, a report from the Bow Group, a think-tank linked to the Conservatives, suggested an urgent call to action to address the falling academic performance of males. The report stated that nearly 90,000 males did not receive a single good GCSE (equivalent to CSEC) in 2006. Additionally, Skidmore (2008) states that boys are four times more likely than girls to be excluded from school permanently.

Interestingly, in Nigeria the observed trend was that many more girls than boys were being left out of the education system. Strong emphasis was being placed on the need for countries in the African Region to identify an effective strategic intervention that will enhance the improvement of girls' participation (Forum for Women Educationalists [FAWE], 2001). In countries where enrolment is high, the trend has been that the participation and performance of girls lagged behind that of boys and thus been aggravated by high repetition rate, high dropout rate, and low retention rate (John, 2011).

Reid (2011) stated that the data provided by the Caribbean Examinations Council (CXC), showed an inverse relationship between student registration and performance in Jamaica. In addition to the students who fail the examination, there are a significant number of students who register for, but do not sit the examinations. Barrett, pro-registrar of the CXC, attributes this poor performance to the amount of money that is allocated to education by government, stating that if monetary allocations are low, the results will be similar (Francis, 2006). "However, despite the fact that Barbados spends three times as much per student as Jamaica, the performance of Barbadian students at CXC is not proportionately higher than that of Jamaican students in these examinations" (Vision 2030 Jamaica National Development Plan, 2009, p. 14).

To pursue the point further, in Trinidad and Tobago, results revealed that for the 2002-2007 period that there was a decline in passing English rates, down to 52.8% in 2007 from 64.4% in 2002. A similar trend was observed in Mathematics for a similar period. Pass rates ranged from a high of 51.1% in 2002 to 41.2% in 2005. These results might suggest there is a struggle for some students to master basic literacy and numeracy skills.

Urgent action is needed to eliminate the poor performance of both males and females, especially when a significant amount of a country's budget is spent on education. In the United States, some 1.13 Trillion is spent on education annually (United States Department of Education, 2011) and previously approximately 21% of the Barbados' budget was spent on education in Barbados (Roberts, 2002). In fact, former Governor of the Central Bank of Barbados stated that between 1966 and 2000 successive Governments spent US\$15 billion on the cost of education which he calls "a remarkable investment for such a small state" (Alleyne, 2006). This investment in education begs the question of whether established models require modification to ensure a higher return on investment.

In light of the above, whether or not past performance can predict future performance has been another highly debated issue, again with sex differences being considered. This debate has realized the modification and transformation of many assessment models worldwide. In Barbados, this is the most current

debate surrounding academic achievement. In fact, quite recently, the Caribbean Examination Council (CXC) stated that it was waiting on the Government of Barbados to make a decision on whether the Barbados Secondary School Entrance Examination (BSSEE) would be replaced by the Caribbean Primary Exit Assessment (CPEA) – a CXC developed test (Carter, 2013). The exam, which is already in place in other Caribbean islands, is said to have a wider scope than the BSSEE and examines student performance over a period of three years (Carter, 2013).

While the only qualification to be accepted into and attend primary school in Barbados is that students must be approximately four (4) years of age, students who are eleven plus (11+) have to complete the compulsory BSSEE which is used as a means to allocate students to secondary schools. The student is examined in Language Arts, Mathematics, and has to write an essay. The test is prepared by the Ministry of Education in Barbados in conjunction with a consulting authority. Exemptions are permitted in special circumstances; however, all students between the ages of nine plus and twelve plus, whether attending public or private schools, are required to write the examination.

The BSSEE is usually administered annually between the months of May and June. On the basis of scores obtained on the exam, coupled with school choice, students are awarded places at one of the 22 secondary schools. They are allowed to select any of these schools in order of preference, as long as zoning requirements are met. The students are also given the opportunity to select two schools outside of their zones. The award of places at a particular school is restricted by the number of places available.

In addition to the student's choice of public secondary schools, they may choose to select a bursary to attend an Assisted Private School. There is a lone senior school where remedial and vocational programs are provided. Students whose performance on the BSSEE falls below the threshold, which would make them ineligible for a placement at a secondary school, are placed there. Typically, students who perform well and receive high grades on the exam are allocated to older secondary schools, and students who get lower grades are allocated to newer secondary schools.

Historically, this method of allocation causes much debate. Secondary schools in Barbados are well known based on an unofficial ranking. The result of this ostensible stratification has caused some disparity among the 'social academic class'. Before 1950, some schools were known as first grade and second grade schools. It is believed that the origin of this divide has its genesis in that classification. These schools were shortly after called grammar schools, were considered the *older* secondary schools, were looked upon as academic in nature and were revered. On the other hand, modern secondary

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schools or *newer* secondary schools, which were seen as vocational and sought to accommodate the 'underachievers', did not carry the same prestige as the older secondary schools. Disparities between the two groups are constantly being highlighted. In fact, it could be argued that the BSSEE, although it did not create, perpetuated a system of academic inequality.

At the secondary stage (11+ to 16+) students are prepared for their adult roles and concomitant responsibility as productive citizens in society.¹ They are introduced to the national curriculum for the first three (3) years and the CXC curriculum for the final two (2) years of study. The curriculum at this level comprises Agricultural Science, Biology, Chemistry, Entrepreneurial and Business Studies, Foreign Languages, Geography, History, Home Management, Information Technology, Integrated Science, Mechanical Drawing, Physical Education, Physics, and Technical and Vocational Education. At the end of Fifth form (14+) students sit the Caribbean Examination Council examinations – CSEC – at the Technical and General proficiency levels. From September 2001, students at Sixth form level schools were allowed to read for the Caribbean Advance Proficiency Examination (CAPE).

Tertiary level education is regarded as post-secondary education and is shared across four major institutions, namely, Erdiston Teachers' College, the Samuel Jackman Prescod Polytechnic, the Barbados Community College, and the University of the West Indies.

This purpose of this study was to examine the long standing policy of the compulsory, one-off examination that serves as the basis to allocate students to secondary schools. If the predictability of the BSSEE is known, this study could significantly inform policy. In other words, it may confirm or discount the view that performance on the BSSEE indicates how students will perform in secondary school at the CSEC. This study also explored sex differences in academic outcomes. Accordingly, this study sought to answer the following questions:

1. Are there statistically significant relationships between BSSEE and CSEC within a sample of secondary aged students in Barbados
2. Are there statistically significant relationships between BSSEE and CSEC for male and female subsamples?

3. Are there statistically significant sex differences between BSSEE and CSEC?
4. What is the predictive validity of the BSSEE in relation to CSEC in a sample of secondary aged students in Barbados?

In this study, Fifth form (Grades 11-12) was the only form selected from the selected secondary schools. Academic achievement was measured by scores obtained at CSEC Mathematics and English A, it was necessary to select a sample of students who would write these exams soon thereafter. This grade level was the most contiguous, making it easy to obtain a standardized measure of academic outcomes.

Research has shown that causal logic is not the most useful way to view the relationship between past academic performance and future academic outcomes, as there could be several intervening variables which may affect future academic outcomes. Interestingly, Horn (2003) found that increased performance on high stakes test scores does not equate to increased learning. Additionally, Marchant, Paulson, and Shunk (2006) stated that schools with high-stakes testing policies in place had a lower proportion of students reaching *proficient* than did schools without these types of policies in place.

Nevertheless, there is much research to suggest that previous performance is a strong predictor of academic achievement. In a study which examined how home and motivational factors affected high school boys' and girls' Math and Science achievement, researchers found that the best predictor of achievement was previous achievement (Koutsoulis & Campbell, 2001). Not surprising, Sackett, Kuncel, Arneson, Cooper, and Waters (2009) stated that scores on admission tests were indeed predictive of academic performance, as indexed by grades. These findings clearly show that past performance is usually a good predictor of academic success. Noteworthy however, is the fact that while Obioma and Salau (2007) have shown that high stakes examinations were statistically significant in their sample, of greater importance is the fact that there were not of much practical importance in predicting the achievement of students.

Method

Participants

Two hundred and fifty-two students (252) students were surveyed. The selected participants were all in the last year of their five year program. As a result, the students were all preparing for the CSEC in their respective schools. The sample selected represents student enrolments from all eleven Parishes of Barbados and consisted of students from both rural and urban areas.

Within the sample were 130 males and 122 females. The age range of the sample was narrow between 15 to 17 years. The mean age was 15.45 ($M = 15.45$, $SD = .50$). Seventy of the adolescents were 15-year olds, 174 of

¹ For a more comprehensive overview of the Barbados education system, see the International Bureau of Education: http://www.ibe.unesco.org/Countries/WDE/2006/LATIN_AMERICA_and_the_CARIBBEAN/Barbados/Barbados.pdf

the adolescents were 16-year olds, which is the typical age for students preparing for CSEC in the Barbadian education system, and eight of the adolescents were 17-year olds. The difference in age is due to students who were born in late August or early September, the school year begins in September. The difference could also be accounted for by students repeating a year at primary school because of the system of flexible transfer.

Design

The study employed a mixed design approach and can be viewed as partly ex post facto and partly longitudinal. The study could be considered ex post facto since the first set of data was of students who completed the BSSEE in 2005. These students were then located within varying secondary schools and the data representing their performance on the CSEC were subsequently obtained. This exam was taken five years after BSSEE and therefore satisfies the longitudinal component of the study. Descriptive statistics for all variables were computed on the overall sample and inferential statistics such as *t*-tests were employed to determine whether sex differences obtained were statistically significant. Pearson product moment correlations were used to determine the level of the relationship that existed between variables. The tests of significance were analyzed using the 0.05 probability level, the *p* value usually selected in educational research (Leacock, Warrican, & Rose, 2009). Linear stepwise regression analysis was used to assess the predictability of the independent variable (past performance, BSSEE) to the dependent variable (future performance, CSEC).

Procedures

A list was provided by the Ministry of Education and Human Resource Development of students who completed the BSSEE in 2005. Using data randomizing software, a sample of students was selected. This method was chosen because it allowed the researcher to have a sample that represented students from varying ability groupings. It also ensured a proportionate selection across all schools. In fact, this method realized the selection of twenty-two (22) public secondary schools. However, only fifteen (15) of these schools allowed access at the time that the study was being conducted.

There are six (6) scores that are produced when a student completes all of the components of the BSSEE. These six scores represent: a raw score for Mathematics, a raw score for English Language, a converted score for Mathematics, a converted score for English Language, a cumulative score of both Mathematics and English scores, and a letter indicating the grade the student obtained on the composition writing question. The cumulative score of both Mathematics and English scores was used as the overall performance score on the BSSEE to indicate academic achievement. Future academic achievement was measured by computing the grades received on the English Language and Mathematics CSEC. In the English

examination, students are graded on their understanding and expression. The rubric that defines the Mathematics grade includes knowledge, comprehension, and reasoning. Students taking this exam could receive grades ranging from 1 through to 6, with 1 indicating the best grade a student can receive and 6 indicating the lowest grade a student can receive. The scores were reverse coded and computed to reflect one academic achievement score.

Results

Research Question 1

A Pearson product-moment correlation coefficient was computed to assess the relationship between BSSEE and CSEC. There was a positive correlation between the two variables, $r = 0.54$, $n = 252$, $p < 0.0005$. The results are presented in Table 1. The data is also represented by a scatterplot in Figure 1.

Table 1
Table displaying the Correlation between BSSEE and CSEC

		Total BSSEE Score	Academic Outcomes (CSEC)
Total BSSEE Score	Pearson Correlation	1	.54**
	Sig. (2-tailed)		.000
	N	252	252
Academic Outcome (CSEC)	Pearson Correlation	.54**	1
	Sig. (2-tailed)	.000	
	N	252	252

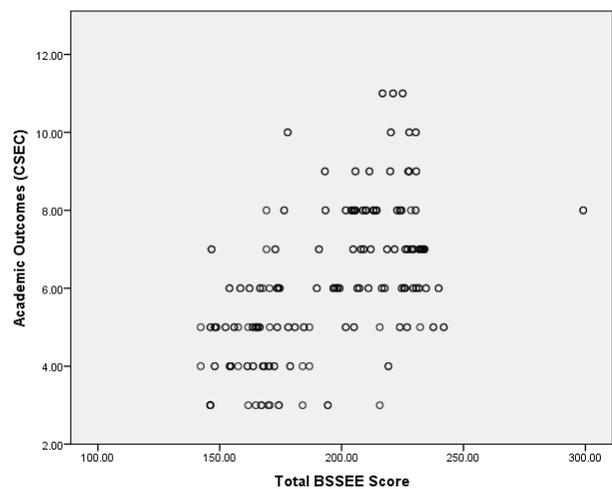


Figure 1. A scatterplot showing the relationship between achievement measures as measured by the Caribbean Secondary Education Certificate (CSEC) and the Barbados Secondary School Entrance Examination (BSSEE).

Research Question 2

Pearson product-moment correlation coefficients were computed to assess the relationship between BSSEE and CSEC for both males and females. There was a positive correlation between the two variables for both males ($r = .58, p = <.0005$) and females ($r = .48, p = <.0005$), with males obtaining a higher coefficient than females. The results are presented in Table 2. Figures 2 and 3 present the scatterplots of the correlations of the outcome variables for both males and females respectively.

Table 2
Table displaying the Correlation between BSSEE and CSEC for males and females

Student's Gender	Total BSSEE Score	Academic Outcomes (CSEC)	Total BSSEE Score	Academic Outcomes (CSEC)
Male	Total BSSEE Score	Pearson Corr.	1	.58**
		Sig. (2-tailed)		.000
		N	130	130
	Academic Outcomes (CSEC)	Pearson Corr.	.58**	1
		Sig. (2-tailed)	.000	
		N	130	130
Female	Total BSSEE Score	Pearson Corr.	1	.48**
		Sig. (2-tailed)		.000
		N	122	122
	Academic Outcomes (CSEC)	Pearson Corr.	.48**	1
		Sig. (2-tailed)	.000	
		N	122	122

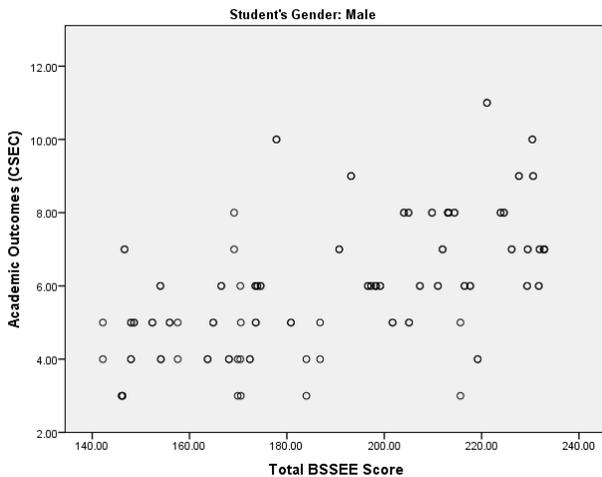


Figure 2. A scatterplot showing the relationship between achievement measures as measured by the Caribbean Secondary Education Certificate (CSEC) and the Barbados Secondary School Entrance Examination (BSSEE) for males.

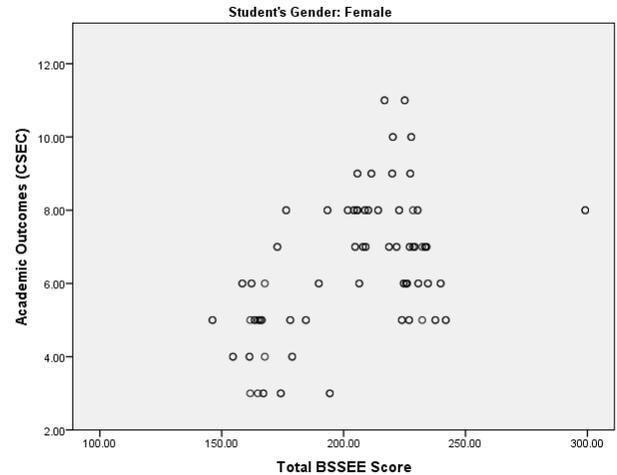


Figure 3. A scatterplot showing the relationship between achievement measures as measured by the Caribbean Secondary Education Certificate (CSEC) and the Barbados Secondary School Entrance Examination (BSSEE) for females.

Research Question 3

The data were further analyzed to determine whether there were any statistically significant differences in relation to sex. The *t*-test for independent samples was employed. A significant difference was found between males and females ($t = 3.63, df = 250, p < .0005$) on the BSSEE. Females obtained a higher mean score on this exam than did males. No significant differences were observed between the two groups on the CSEC examination ($t = 1.96, df = 250, p = .052$). The means and standard deviations for the two subsamples and for the two academic outcome measures were analyzed and are presented in Table 3.

Table 3
The means and standard deviation for males ($N = 130$) and females ($N = 122$) on the BSSEE and Academic Outcomes

	Males		Females	
	M	SD.	M	SD.
Total BSSEE Score	191.77	28.49	204.98	29.27
Academic Outcome	6.12	1.82	6.58	1.91

Research Question 4

When the data were entered for regression analysis, all of the models tested proved to be a good fit. For the entire sample BSSEE was able to account for 29% of the variance in relation to CSEC ($F(1, 250) = 102.43, t = 10.121, \beta = .539$) and the model was statistically significant $p < .0005$. For the male subsample, BSSEE accounted for 33% of the variance ($F(1, 128) = 65.32, t$

=8.082, $\beta = .581$); the model proved to be statistically significant $p < .0005$. For the female subset, 22% of the variance was accounted for ($F(1, 120) = 35.40, t = 5.949, \beta = .477$), the model was statistically significant $p < .0005$. Table 4 presents the summary of the results for the entire sample, and for males and females. Figures 4, 5, and 6 present the scatterplots of the regression results of the outcome variables for the entire sample, and for males and females respectively

Regression Equation. $\hat{y} = b_0 + b_1X$, where \hat{y} is the predicted outcome, b_0 is the intercept, b_1 is the gradient of the line and x is the predictor variable. Therefore academic achievement as measured by CSEC can be predicted by the intercept (BSSEE, b_0) + the gradient (CSEC, b_1) X the predictor (X, score received on CSEC).

Table 4
Summary of regression analyses

Grouping	R Square	Adjusted R Square	β	t	p -value
Total Grouping	.29	.29	.54	10.12	.000
Males	.34	.33	.58	8.08	.000
Females	.23	.22	.48	5.95	.000

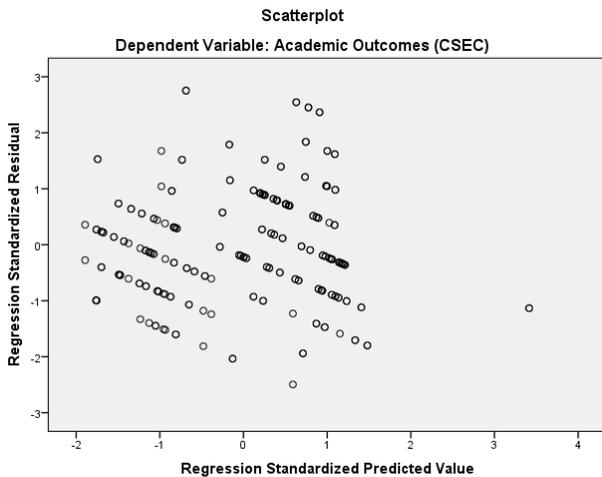


Figure 4. A scatterplot of the regression analysis of achievement measures as measured by the Caribbean Secondary Education Certificate (CSEC) and the Barbados Secondary School Entrance Examination (BSSEE).

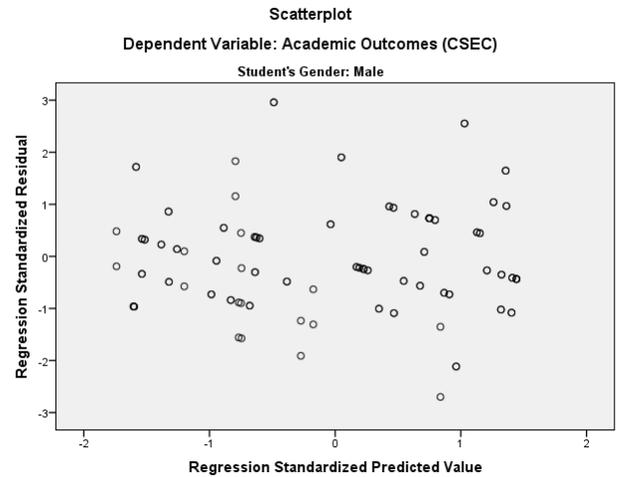


Figure 5. A scatterplot of the regression analysis of achievement measures as measured by the Caribbean Secondary Education Certificate (CSEC) and the Barbados Secondary School Entrance Examination (BSSEE) for males.

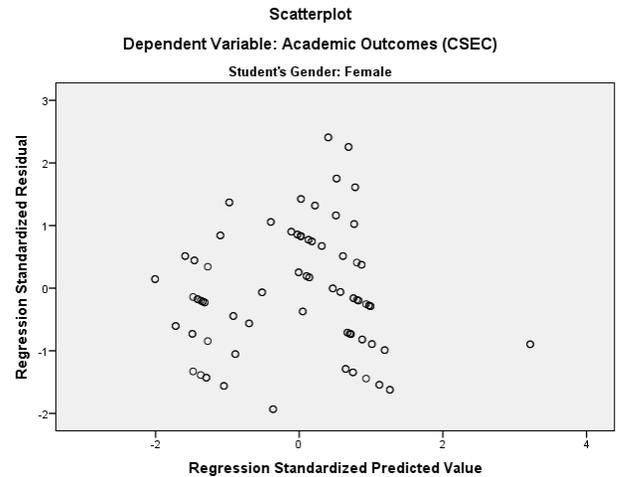


Figure 6. A scatterplot of the regression analysis of achievement measures as measured by the Caribbean Secondary Education Certificate (CSEC) and the Barbados Secondary School Entrance Examination (BSSEE) females.

Discussion and Conclusion

Over the years, there have been debates about the fairness of the BSSEE, with overtones suggesting that this one-shot examination was partial, and disadvantaged many students. Therefore this scope of work was important and necessary. The present findings show that the scores obtained by the entire sample on the BSSEE are positively related to grades obtained at CSEC, with a large percentage of variance being accounted for. The

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results were similar in both male and female subsamples, with a stronger correlation being observed for females. The work of Koutsoulis and Campbell (2001) and Sackett et al. (2009) support these results, as the findings presented in those studies showed that there was a relationship between past performance and future performance.

The present findings also revealed that mean scores were higher for females on both examinations; however, a significant mean difference was only observed on the BSSSE. Performance on the BSSEE usually identifies a trend where females' performance is superior to their male counterparts. Arguably, it could be due to the type socialization which takes place in the home as well as the school that accounts for this disparity. Another view is that girls receive more positive academic feedback which in turn affects student performance. Interestingly, Gunderson, Ramirez, Levine, and Beilock (2011) state that generally "boys and girls receive the same overall amount of positive and negative feedback about the intellectual quality of their work," but that girls receive "more positive feedback about their non-intellectual performance, which tended to make girls devalue positive feedback about their intellectual performance more than boys" (p. 159).

The competitive nature of the BSSEE and girls predisposition to be academically motivated could be important factors worth exploring. Girls appear to be more academically motivated, both intrinsically and extrinsically, and therefore strive for high academic achievement as is evidence by their grades in tandem with motivational measures (Hall, 2013b). The scores obtained on this examination, to a large extent, dictates which school a student will be allocated to. More importantly, whether that student will attend an older or newer secondary school, or put differently, a school that is perceived to be based on high academic merit or one that is perceived to have as its basis – a program structured around technical and vocational subject matters. Despite the above, the most comprehensive of reviews of the research in the area of academic gender differences have shown very few true differences between math and verbal abilities between males and females (Halpern, 2000). This is also reflected in the results of this study.

Although some researchers argue that there is no relationship between high stakes examinations (Amrein & Berliner, 2002), the findings of this study put the long standing argument about the predictive validity of the BSSEE to rest and are very significant in that way. The results of this study suggest that the BSSEE could reasonably predict how students will perform at CSEC, accounting for almost 30% of the variance. Whether these findings overwhelmingly support a position to keep to the examination is a matter of interpretation. However, it does not change the fact that allocation to secondary schools based on a one-off examination does not give everyone

taking the exam a fair chance to receive maximum results. There are many factors that could prevent exceptional students from performing their best on the day in question, e.g. illness, test anxiety, etc. (New York State Examination Department, 2004; Wu, Hughes, & Knok, 2010).

In a meta-synthesis of over 800 meta-analytic studies, Hattie (2012) found that prior achievement was a significant contributor to future performance. Prior achievement, according to Hattie, falls under the contributory student factor 'background'. It was ranked 14th among predictors of academic achievement, and it was revealed that it was not only a significant predictor of academic achievement, but that it had a large effect size. Importantly, it was not the only predictor or the highest predictor of academic achievement.

Debatably, the BSSEE is currently the best means of allocating students to secondary schools, especially in a 'ranked environment'. This view is supported by Mason (1989) who also conducted research using BSSEE data. More support is provided by the New York State Examination Department (2004) who reported that higher levels of academic achievement are obtained on high stakes examinations. However, serious considerations must be made about other fair and viable means of allocating students to secondary schools (Neill, 1997). True to the principles that undergird testing and measurement, continuous assessment or multi-modal assessment may be seen as fairer in the eyes of many. In 2001, the Ministry of Education and Human Resource Development outlined an action plan to allocate students to secondary schools using the BSSEE and other performances assessed by end of term tests. The only issue is that these exams may not be created with the same level of standardization as the BSSEE. It seems that where the proposed initiative set out to right what many saw as an 'injustice', could present a standardization challenge, a challenge that could be mitigated by the implementation of the proposed CPEA.

Moreover, educators need to take into account how boys learn and process information. The results of the BSSEE revealed that females scored higher on the exam than did males. Females are usually better at retaining facts (Hall, 2013a), while males usually are better able to understand concepts when the underlying processes have been explained, as has been shown in STEM subjects. Some researchers suggest that girls are better at verbal tasks and tasks which require the recollection of facts, while males may be better at mathematically and science based subjects (Bromfield, Clarke, & Lynch, 2001). Taking into account the learning strategies of both males and females, and designing instruction to accommodate these varying learning strategies is important if best results in terms of academic performance are to be obtained for both genders.

In addition to the above, teachers should use students' performance on the BSSEE as a diagnostic tool for remediation. This examination could be used more strategically, not simply to place students, but to identify the deficiencies that students possess at this stage. This knowledge should be employed to inform the development of remedial programs for students who perform poorly on the exam. Thereby, reinforcing their early academic foundation and better preparing them to engage secondary learning with the requisite skills. This approach is likely to produce excellent results, especially for students who enter secondary school without being fully prepared for that level of academic rigor and therefore are lost by the wayside.

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