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GENDER DIFFERENCE IN ACADEMIC PERFORMANCE AMONG LEARNERS IN BASIC DESIGN AND TECHNOLOGY SEWING: A CASE STUDY OF ASHANTI-MAMPONG MUNICIPALITY

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Abstract

A crucial part of the curriculum is Basic Design and Technology (BDT), which gives students practical knowledge in a variety of areas, including sewing. It is essential for encouraging students' creativity and invention while preparing them for professions in design and technology-related fields in the future. In numerous educational settings around the world, gender inequalities in academic achievement have been a topic of curiosity and concern. Designing successful educational practices and guaranteeing fair chances for all students require an understanding of these variances. In the Ashanti-Mampong Municipality, this case study seeks to identify the gender differences in academic performance among BDT sewing students. A descriptive survey that combines qualitative and quantitative methodologies was employed in the study. Various sampling techniques (stratified, purposive, and plain random) were used to determine the population and sample size. The researcher employed questionnaires, sewing proficiency exams, interviews, and a checklist for observing classes to obtain data. This aided in establishing the link between practical-based learning and its effect on students' academic progress. The majority of teachers employ practical-based teaching and learning techniques less frequently than the other teaching strategies mentioned in this thesis, according to the findings.

Keywords: *Basic Design Technology, Teachers Pedagogy, Education, Vocational and Technical Education*, Gender difference, Academic Performance

Introduction

Irin and Ahin (2020) claim that there is evidence to support the notion that factors like gender, the institution students attended, how they chose a specialisation, and the dad's educational background are all significant in boosting students' academic achievement in Turkey. In a survey of College of Education students, Abubakar and Adegboyega (2012) found a link between gender and academic success in mathematics. Although Aransi (2017, p. 23) found that

gender and class size had minimal effect on academic success, the curriculum of secondary schools, such as those that teach science, art, or business, had an impact on secondary school students' academic results. This was especially true in the English language.

Literature Review

The Brong-Ahafo Region of Ghana's pre-service teachers' performance in mathematics varies by gender (Naa et al., 2018). The study included 100 pre-service instructors as its sample. The 50 boys and 50 ladies that make up the 100 pre-service instructors were simply chosen from the second-year form. The study was a descriptive survey, and the pre-service teachers' real exam results for their proficiency in mathematics were gathered from the public College of Education and analysed using the t-test in SPSS. Pre-service teachers were tested on how well they performed, and the results showed that there was a considerable difference in how well they performed. The mean of the scores earned by the female pre-service teachers was marginally higher than that of their male counterparts, but the standard deviation was marginally lower. It was clear that female students achieved at a higher level than according to research by Tahir and Farooqi from 2002, which looked at all the instructional techniques. In terms of computer and information literacy, female students did better than male students, according to research by Gebhardt (n.d.). Quantifying potential gender variations in ICT use and skill sets was the goal of a small-scale meta-analysis conducted by Qazi et al. in 2022. A tiny, positive, but not statistically significant effect size in favour of boys was found using a random-effects model ($g = 0.17$, 95% CI [0.01, 0.36]). Goni et al. (2015) examine the relationship between gender and academic achievement among students in Borno State's educational institutions.

The population of this study consists of all of the NCE students from the three NCE-awarding schools in the state that were hand-picked for the study. the strategy used by Krejcie and Morgan A sample selection method was used to select the 322 participants, and proportionate techniques were used to select 136 students from among 210 NCE III students at Umar Ibn Ibrahim College of Education, Science, and Technology in Bama and 186 students from among 351 NCE III students at Kashim Ibrahim College of Education in Maiduguri. The Students' Academic Performance Aptitude Test (SAPAT), which had a r value of 0.62, was used by the researchers. Using a t-test, the study's hypothesis was evaluated. The results revealed no statistically significant gender disparities in academic performance at the educational institutions in Borno State, and the null hypothesis was accepted. The argument made was that the state should expand its annual scholarship programme to aid students in their academic endeavours because male students don't have enough pocket money. This study aims to shed light on how gender affects students' aptitude for and interest in fundamental technologies.

Males do better than girls on exams with more multiple-choice questions, according to a recent study (Griselda, 2020), and standardised tests (used, for example, in many university admission processes) primarily or largely comprise of these questions. But when grades are used instead of benchmark tests, girls usually benefit from them. According to Voyer and Voyer's meta-analysis from 2014, women frequently perform better than men in terms of academic performance in mathematics.

Due to this finding, Lyons et al. (2022) came to the conclusion that while low-stakes measures, such as grades, tend to favour female students, high-stakes measures, such as entrance tests, tend to close the gender gap. According to Gallagher and Kaufman (2005), despite the fact that there are no disparities in the classroom, girls typically do worse than boys on standardised mathematics tests. In conclusion, it seems that, among many other things, the gender gap varies significantly across cultures and nations, depends on how achievement is measured, and may vary based on the mathematical subject. Based on specific mathematical abilities, gender differences in mathematics show that males perform better than girls on word problems in middle school, high school, and college.

Males perform better on activities requiring logic, problem-solving, and visual-spatial abilities, whereas females do better on tasks requiring the immediate application of classroom knowledge (Byrnes, 2005; Benattabou et al., 2021). Students tend to perform better on verbal tasks when they are feminine than when they are male, according to studies by Halpern (Halpern, 1997; Hull et al. 2020).

In co-educational classrooms, female students performed better when learning mathematics with more tangible objects and manipulatives, whereas male students typically perform better when calculations are demonstrated using a chalkboard (Hyde et al., 2019; Sax, 2005). Other researchers have also found gender differences in learning. In a recent study, Kolawole (2007) examined how gender differences in math proficiency affect group learning. Male students perform better than female students in According to Kolawole's analysis, mathematics Male students do better in a typical classroom context, but female students perform better in a group learning environment, claims Joiner (1999). However, there are a variety of gender differences that can affect how well male and female students learn and perform in the classroom. In spite of male students' seeming confidence in their mathematical skills, numerous studies have shown that female students are not numerically less proficient than male students (Finch et al., 2022; Mao et al., 2021).

Why girls are underrepresented in a variety of industries has been the subject of numerous theories. Women are underrepresented in science, according to various studies, because they lack the analytical and spatial thinking skills required for science's abstract reasoning. New evidence, however, refutes this assertion and shows that a woman's aptitude does not influence whether or not she chooses to pursue a career in science. Girls and boys perform equally well if the learning environment is fair and encouraging (Bradford et al., 2021; Campbell et al., 2002).

According to some experts, girls performed better, but in other research, boys outperformed girls. Okwo and Otunba (2007) estimate that gender accounts for 13.39% of all influencing factors on accomplishment (Singh & Dutt, 2022). Boys outperform girls in arithmetic and other science subjects, according to Aremu (1999) and Noah, (2019). While other researchers found no difference in how well boys and girls did, Toh (1993) found that girls outperformed boys in a few other academic categories on a few tests of the brain (Bizimana et al., 2021). According to Collis (1991), secondary school policies that require mathematics as a prerequisite or co-requirement for computer work always favour more participation from men. It might be deemed a man's domain if there is just one computing lab. If computer resources are concentrated on the mathematics, science, and technology curricula, many girls lack access to computers. Boys did better on the physics essay test than girls, according to a 2007 study by Okwo and Otunba. On students' success on the physics essay test, gender and cognitive style had a significant impact. Regarding general arithmetic prowess, ability for numbers, mathematical calculation, concepts, and problem-solving, Hedges and Nowell (1995) discovered extremely few or no gender differences. As had previously been the case, female enrollment in math and science courses was equal to or nearly equal to that of male enrollment in 2000. When it came to taking scientific classes and doing better on the National Assessment of Educational Progress (NAEP), there weren't many differences between boys and girls in the United States of America (USA) (Parker et al., 2020; Coley, 2001). According to Soboyejo (2007), there were no discernible disparities in the knowledge of infectious diseases between male and female students. One of the many alleged school factors for gender inequality includes subject scheduling, evaluation procedures, instructor expectations and behaviour, peer pressure, unequal funding, and stereotyped texts, to name just a few imbalances (Okonkwo, 2017).

The attitudes and practices of instructors have gotten a lot of attention. Mathematical, physical, and technical craft teachers were those that supported equal opportunity programmes the least, according to Pratt (1985). According to Spear (1985), many professors of science agreed with the justifications for traditional roles for women. The GIST study team in the UK observed science instructors seeking to grab guys' interest by implying that science was "masculine" and emphasising its dangers. Raimi and Adeoye's 2002 study on gender differences among college students as drivers of performance in integrated science found that male and female college students perform significantly differently in terms of their science achievement. However, the outcomes showed that males outperformed females in terms of integrated science performance scores compared to their female counterparts.

Furthermore, Raimi and Adeoye's (2002) study discovered a significant disparity between male and female students' opinions towards integrated science, with the former being more avorable. Men may have performed better on integrated science achievement assessments as a result of this. The findings of prior research by Raimi and Oduwaye (1997), who identified a similar distinction between males and females, are compatible with this one (Kristiani, 2020). This information tends to support the concern of scholars like Oyedeji (1996) that science in African contexts seems to carry a masculine stigma. Some interventions to improve females' attitudes towards science and their academic

performance were effective, while others were not. For instance, when teachers paired attempts to boost pupils' engagement with an inquiry technique, the gap between males and girls was reduced, and engaging activities such as proper laboratory procedures, problem-solving, scientific writing, mastery learning, and extra research were encouraged (Jaina & Siradjuddin, 2022). The only situation where a physics intervention employing a modified physics curriculum led to improved achievement for both boys and girls was in the context of part-time, single-sex instruction. A chemistry teaching strategy that included a visual representation of matter led to improvements in girls' attitudes and performance (Adesoji, 2008; Dai et al., 2020).

To find out whether there are any gender disparities in how well BDT sewing students do, numerous studies have been conducted. Nevertheless, the majority of this research has focused on science and mathematics. The performance of BDT sewing students by gender was the subject of very few, if any, critical studies.

Methods

A crucial part of the curriculum is Basic Design and Technology (BDT), which gives students practical knowledge in a variety of areas, including sewing. It is essential for encouraging students' creativity and invention while preparing them for professions in design and technology-related fields in the future. A descriptive survey that combines qualitative and quantitative methodologies was employed in the study. Various sampling techniques (stratified, purposive, and plain random) were used to determine the population and sample size. The researcher employed questionnaires, sewing proficiency exams, interviews, and a checklist for observing classes to obtain data. This aided in establishing the link between practical-based learning and its effect on students' academic progress. The majority of teachers employ practical-based teaching and learning techniques less frequently than the other teaching strategies mentioned in this thesis, according to the findings.

Results and Discussion

Gender Difference in Performance Among Learners in Achievement Test

To determine the effect practical-based teaching techniques have on the performance of BDT sewing students, achievement assessments were administered. To determine whether there was a gender gap in student performance on the achievement test, the outcomes of the numerous tests that were administered were compared by gender. The accomplishment test was divided into objective test, subjective test, and practical test categories, while the gender categories were male and female. The first test, a pre-test, was given when the lecture approach was employed, and the second test, a post-test, was given after the students had been taught utilising practical-based teaching methods. Descriptive analysis of the mean and standard deviation was used to analyse the data. Higher mean score was deemed to be high performance while lower mean scores were deemed to be low performance. The outcome of the various tests was compared based on the gender of the students and the results of the comparison is presented in table 4.1.

Table 4.1: Test Result comparison on Gender basis

Type of Test	Mean	SD
Objective Test		
Pre-test (Male)	1.88	1.150
Pre-test (Female)	1.73	0.920
Post-test (Male)	4.16	0.736
Post-test (Female)	3.79	0.934
Subjective Test (Content Knowledge)		

Pre-test (Male)	0.48	0.828
Pre-test (Female)	0.59	0.946
Post-test (Male)	7.11	1.582
Post-test (Female)	7.53	2.189
Practical Test		
Pre-test (Male)	1.05	1.126
Pre-test (Female)	1.07	0.600
Post-test (Male)	8.31	1.636
Post-test (Female)	6.87	1.975

Source: Field Data

As could be seen, male students performed better on the objective test than female students did on both the pre-test and the post-test. This suggested that the mean of the respondents' responses regarding the variable that male students perform better than female students on the basic technology practical, with a mean of 2.6562, was closer to the scale's expected response. Additionally, 58.2% of respondents indicated agreement, and 23.7%, with a mean value of 1.8763, strongly agreed that female students perform poorly because their parents discourage them. The majority of respondents disagreed with the statement (male students perform better than female students in BDT sewing), as demonstrated by the mean score of 2.2143. In the subjective test, female outperformed the male students in both pre-test and post-test and in the practical test, female performed better than male in the pre-test with small margin while male outperformed the female with higher margin in the post-test of the practical test. All these are revealed by the means of the various tests in table 4.1. The outcome of this study agrees with Abubakar and Adegboyega (2012) who found a link between gender and academic success among College of Education students. A determinant such as gender has been demonstrated to be important in increasing students' academic achievements according to Irin and Ahin (2020). Additionally, a study by Goni et al. (2015) indicated that female students fared better than male students. They proposed that the state government enhance the annual scholarship because male students don't have enough pocket money to support their academic activities.

These findings in this study are consistent with the findings of Abubakar and Adegboyega, (2012) who shown that males tend to outperform females in standardized tests. However, this discovery is contrary to the views of

headteachers who reported that the male learners lack the interest in BDT sewing subjects as opposed to Sadler and Sadler (1994) where male students were seen to have outperformed their female counterparts. On the flip side, both before and after the test, female students did better on the subjective test than their male counterparts. This finding is important and requires a second look at the policymaking level of the Ghana education service. Another set of authors that supported the findings of this research is Irin and Ahin (2020) who noted that females tend to outperform males in tests that require more creativity and critical thinking, which is the case of the BDT sewing subject Furthermore, because the mesosystem is made up of links between microsystems, ecological theory has had a significant influence on this discovery (Bronfenbrenner, 1995). Pupils and parents, two of the school's microsystems, interact and dynamically interact to form a mesosystem (Johnson, 2008). The things that are beyond the control of the developing person are included in the exosystem, which is a reflection of the greater social system. A school's exosystem may include structures like local laws, the economy, district requirements, and local calamities (Johnson, 2008). The overall pattern of values, belief systems, lifestyles, opportunities, norms, and resources that characterises a culture, subculture, or large social environment is known as the macrosystem (Bronfenbrenner, 1995). The national environment, as well as the local community's cultural, political, social, and economic environments, are all examples of a single school's macrosystem (Johnson, 2008). The chronosystem represents a time-based element that affects how all levels of ecological systems function, although it is not one of the four system layers in and of itself.

The observation that female students outperformed the male counterparts in pre-test but not the post-test implies that male students may benefit more from practical-based teaching methods than female learners if they are given proper attention and practical-based support. The study has revealed important and interesting findings that have implications for the design of teaching and learning activities, as well as for the assessment of student learning especially in BDT sewing and related subjects in the Junior Secondary Schools.

Table 4. 2: Gender difference in students' performance by Teachers

Item	Strongly Agree *n*(%)	Agree *n*(%)	Neutral *n*(%)	Disagree *n*(%)	Strongly Disagree *n*(%)
Male learners perform better than female learners	-	1(10)	5(50)	2(20)	1(10)

Female learners perform better than male learners.	3(30)	4(40)	2(20)	1(10)	-

Source: Field Data

Male learners performing better than female learners in BDT sewing received a neutral response from 50% of respondents, 20% of respondents disagreed, 10% of respondents agreed and strongly disagreed, and none of the respondents strongly agreed. It can be seen that nearly half of the respondents, or 40%, agreed that female students perform better than male students, 30% strongly agreed, 20% responded neutrally, 10% disagreed, and none strongly disagreed that female students perform better than male students. Table 4.2 provides evidence for this.

These results are rather unexpected given that a large body of evidence implies that men often perform better than women in STEM fields like physics and math (Sadker & Sadker, 1994; Kyei et al., 2011). The findings of this study, however, imply that this might not hold true for BDT stitching. The gender preconceptions frequently associated with STEM fields do not apply to BDT stitching, which could be one explanation for these findings (Sadker & Sadker, 1994). Another hypothesis is that female students would benefit more from the teaching strategies and resources used in BDT sewing (Else-Quest et al., 2010).

Whatever the reason, the study's findings imply that it is not necessary to assume that male students will perform better than female students when learning BDT stitching. The findings of this study really suggest that female students may perform better in this topic, which has a number of consequences for theory, practice, and future research. The findings of this study challenge the conventional belief that men perform better than women in STEM fields from a theoretical standpoint. Hence, gender stereotypes that are often associated with STEM subjects may not be precise (Cheryan et al., 2017). In terms of practice, teachers should not make assumptions about the performance of students based on their gender but rather focus their energy and expertise on providing all students with the same opportunities to succeed. It can also be asserted from the above that the individual has an impact on the microsystem, and the microsystem has an impact on the individual. If a single school is chosen as the research unit and this theory is applied to organisational growth, the school's microsystem would consist of children, parents, and family members, the administration, the teachers, and the local community (Johnson, 2008).

Given the differences in opinion arising from the research paradigm, there is the need for further research is to explore extensively the circumstances for the gender differences in students' performance in BDT sewing and STEM subjects.

This study has the tendency of contributing to the body of knowledge striving to identify factors that hinder to these differences and develop interventions that can help to close the gender gap (National Academies of Sciences, Engineering, and Medicine, 2018). However, inferences to a larger population is limited due to (i) The total quantity of samples obtained for the current study, and (ii) the fact the study was conducted in a single setting which may not be generalisable to other settings as in the STEM subjects.

Conclusion

The study also found that males outperformed females in the subjective test in both the pre-test and post-test; females outperformed males in the objective test in both the pre-test and post-test; and that in the practical test, females outperformed males in the pre-test by a small margin but by a larger margin in the post-test. In conclusion, gender does not significantly influence BDT sewing.

Lastly, with the challenges teachers face in implementing practical-based teaching in BDT sewing among junior high schools in Mampong-Ashanti Municipality of Ghana, it can be established that teachers did not use teaching and learning resources, had inadequate content knowledge, only used the lecture method, had their lessons not structured, and had inadequate practical skills. It was also realized that, few teachers had less interaction with the students, inadequate presentation, less knowledge in methods of teaching. Lack of teaching and learning materials, inadequate resource personnel for BDT sewing, a lack of parents' support, and inadequate time allotted to BDT sewing were key challenges faced by teachers when implementing practical-based teaching methods for instructing learners in BDT sewing. If TLRs and in-service/workshops are provided for teachers, performance in BDT sewing can be improved. Also, training of teachers to teach sewing only, motivation for BDT Sewing teachers, and a review of the BDT Sewing curriculum can help improve the teaching of practical courses in the curriculum, such as BDT sewing.

Recommendation

1. Gender and BDT Sewing Performance: According to the study, gender has no appreciable impact on BDT sewing performance. To guarantee equal opportunities and results for all students, it is crucial to keep an eye out for and rectify any potential gender-based discrepancies.
2. sAllocate Sufficient Time: Ensure that an adequate amount of time is allocated to BDT sewing in the curriculum to allow for effective teaching and learning.
3. Teacher Training and Motivation: Offer training programs for teachers specific to sewing instruction. Additionally, motivate BDT Sewing teachers through recognition and incentives to improve their commitment and performance.
4. Curriculum Review: Consider reviewing the BDT Sewing curriculum to ensure its alignment with current educational needs and industry standards.

5. Professional Development: Provide opportunities for in-service workshops and continuous professional development (CPD) for teachers to enhance their teaching skills and stay updated on best practices in BDT sewing education.

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