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Gender debate is not worthy in the 21st century classroom: Evidence-based outcomes from psychological abilities in students

Inuusah Mahama[1,*], Veronica Esinam Eggley[1], Rabbi Abu-Sadat[2], Benjamin Abass Ayimbire[3]

[1] *Department of Counselling Psychology, University of Education, P.O. Box 25 Winneba, Ghana*

[2] *Department of Special Education, University of Education, P.O. Box 25 Winneba, Ghana*

[3] *Department of Education and Psychology, University of Cape Coast, P.O. Box 5007 Cape Coast, Ghana*

*** Corresponding author:** Inuusah Mahama, imahama@uew.edu.gh

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ABSTRACT: The debate about differences in intellectual abilities is far from over. This debate has astronomically drifted from academic success to mental possessions. In this regard, the current study examined curiosity, creativity, and academic motivation in students for possible differences in terms of gender. A total of 568 high school students were surveyed using a cross-sectional design. The data were gathered using adapted curiosity, creativity, and academic motivation scales to test for possible differences. Male and female students had similar abilities in curious, creative, and motivated potentials, according to the test MANOVA results [F (3,549) = 0.718, p > 0.610; Wilks' Lambda = 0.993, partial eta squared = 0.007]. This could be the result of similar opportunities presented to both male and female students in their academic journey. Therefore, educational policies on gender parity should be developed to help tone down unnecessary comparisons and mental competition between male and female students in the areas of curiosity, creativity, and academic motivation.

KEYWORDS: gender; curiosity; creativity; academic motivation; high school

1. Introduction

Traditional societies have consistently asserted that male and female gender differences exist. This description has always drawn the attention of many people from all walks of life. In part, males are different from females, especially in terms of biological segregation[1], while in the other part, the differences are debatable, especially when they have to do with personal abilities and social functions[2]. Scholars have become more interested in gender differences in the last decade[3,4]. According to Anggraini et al.[3], studies in education have consistently compared learning abilities between male and female students. In some of these studies, gender differences in intelligence were found between male and female students[5–7]. Aside from intelligence, there are other mental abilities, including curiosity, creativity, motivation, and learning outcomes, where the male and female difference debate is rife[8–12].

Curiosity is one of the important innate potentials of living organisms. Curiosity is normative in human development, and all human creatures possess a bit of curiosity for exploring their environment and seeking knowledge when the need arises. In their view, Kashdan et al.[13] defined curiosity as the urge to seek information and experiences for one's personal reasons based on one's personal drive or personalised process (self-directed behaviour). According to Kashdan et al.[14,15], curiosity is an integral

human incentive that predicts knowledge acquisition, learning, and the fulfilment of life's demands. Likewise, Brod and Breitwieser[16] and Shah et al.[17] indicate that curiosity stimulates learning and memory in students. There have been a series of arguments concerning differences in curiosity between male and female students in educational literature. For example, Engelhard and Monsaas[18] surveyed 150 students concerning their differences in curiosity level and gender. They found that male and female students were not different in their curiosity levels. In a similar vein, Abakpa et al.[19] explored levels of scientific curiosity using a random sample of 104 students. They found no significant differences in science curiosity levels between male and female students. To buttress the insignificant differences in curiosity between male and female students, recent studies conducted by Hartini et al.[20] and Suhirman et al.[21] found no differences in the levels of curiosity based on gender. Contrarily, Turan et al.[22] investigated levels of curiosity among 532 randomly selected college students in Turkey. The study revealed that female students had higher levels of curiosity than male students did. In support of this, Jaen and Baccay[23] explored the levels of curiosity, motivation, attitude, gender, and mathematics performance among 321 10th-grade students. The study revealed that female students were more curious than their male counterparts.

While the debate over gender differences in curious abilities rages on, it is clear that the evidence presented is inconclusive. On one end, no differences are found, while on the other end, differences are found between male and female students. This alludes to the fact that curiosity is multidirectional, multidimensional, and diverse among learners. The display of curious abilities among students is asynchronous, albeit normative[14,24–26]. Despite the normative nature of curious abilities among students, differences sometimes occur between male and female students, and such differences could be attributed to contextual and situational differences, affective and aptitude differences, investigative/methodological and sample size disparities, etcetera[27–31].

While curiosity is noted to be an important part of human learning, creativity has also become an indispensable component of the 21st-century classroom and the economic fortunes of nations[32]. Creativity is a 21st-century skill that allows students to see their innate potential in the context of building a globally efficient and effective economy[33–35]. Creativity is an individual's ability to come up with novel ideas and products that are applicable in specific or diverse areas that are needed. Plucker et al.[36] defined creativity as the ability, process, and environment in which people generate new and useful ideas. According to Puryear and Lamb[37], there is no definite definition for creativity because several fields, including education, psychology, neuroscience, and business, have different ways of approaching it but with similar outcomes.

This implies that there is variance in the definition of creativity, as some scholars have specific phrases and words (e.g., novel, unique, tenable, useful, new, etc.) they use in describing it[38–42]. According to the current study, it is about the applicability of creativity in education. According to Patston et al.[40], creativity "has come to be seen as a general core competency underlying all learning". "As a result, creativity is gradually moving away from being regarded as a fringe topic or a luxury in curricula and towards being regarded as a key capability that should be fostered in all subject areas"[40]. The significance of encouraging creative thinking among students has been the subject of several empirical studies. Students can learn to thrive in environments where they are not expected to know the answer, where they are encouraged to try out a variety of approaches, where they are encouraged to embrace the discomfort of uncertainty as a source of innovation, and where they are praised for using their imagination rather than relying on their memorization of facts[43]. There is evidence to suggest that students who engage in creative activities also perform better in other areas of their education[44].

Undoubtedly, creativity has been accorded its value in the educational terrain. Nevertheless, there are persistent comparisons between male and female students in terms of their creative potential or abilities. Conspicuously, students with high intellectual ability differ in mental functioning as compared with their age normative group[8]. A study comparing adolescent creative output in Mexico and Lithuania found that females outperformed males in the visual-spatial category of creativity but that males outperformed females in the inventive category of creativity[45]. Additionally, Fellmann and Widmann[46] discovered that females outperformed males on measures of creativity. As Zahed et al.[47] found, creatively gifted male students particularly shine in the realm of originality compared to females. A recent study concluded that females are more creative than males; however, no significant differences were found between male and female students in terms of the other components of creativity[48]. Jackson et al.[49] and Pastor and David[50] all came to the same conclusion that there were no differences in gender. In a similar vein, Permatasari et al.[51] found that male and female students did not have differences in the ability to use mathematical creativity. Because of these dissimilarities, no firm conclusions can be drawn about the relationship between male and female students in terms of creativity. In this regard, it is not incorrect to state that the debate over whether male or female students have more knowledge of creativity than either sex is never-ending. In instances where differences are found, they are diverse and depend on the maturity, intellectual, and developmental levels of the students[52–54].

Creative ideas bring joy and motivate people to engage in ventures that are more productive. Motivation is goal-directed behaviour. Motivation can be ignited and manifested in several ways[55,56]. Aside from this, the genesis and the extent to which it ignited and manifested among students are diverse, and the diversity takes into consideration the gender of students. In this regard, the existing literature indicates gender differences in motivation in some cases but not in others. For instance, in a recent study, Kuśnierz et al.[57] examined the motivational abilities of 424 randomly sampled Ukrainian and Polish students. The study revealed female students had higher motivational levels than their male counterparts. The study revealed that the gender effect on motivation was low and that no significant differences were found between males and females. In a similar vein, Rodriguez et al.[58] studied the mathematical motivation of 897 students and found that male students had higher mathematical motivation than female students. In another study, Mawson and Bodnar[59] investigated potential gender differences in academic motivation among students. The study revealed that female students had higher levels of academic motivation than male students. Contrarily, in a meta-analytical approach, Turhan[12] scoped the literature on gender differences in academic motivation. Similarly, Lesperance et al.[60] discovered no significant differences between male and female students in meta-analytical research. In profiling the motivational levels of students, Ajlouni et al.[61] found that female students possessed higher motivational abilities than their male counterparts.

Based on the inconclusive nature of the literature on gender differences in curiosity, creativity, and motivation, it may appear pathological to pride one gender over the other in terms of creative abilities. Again, it is psychologically and academically unhealthy for differences to be assumed between male and female students who appear to be exposed to similar learning situations at the same time. Given a common platform, both males and females can exhibit psychological abilities in a similar fashion.

2. The current study

The gender debate in abilities is inescapable in as much as biological differences exist between males and females in most parts of the world. The debate breeds misunderstanding and impairs success for both

sexes in this obvious and unavoidable situation[62]. In Ghana, tradition has made it normative to believe and abide by the fact that the male gender is superior to the female gender in almost all aspects of human interaction[63–65]. This practice has moved from communities to the teaching and learning environment and appears to breed envy and uncomfortable arguments among stakeholders in the educational landscape. The researchers assume that male and female students are not different in their abilities, provided they are given equal opportunities in the learning situation. Again, with similar chronological ages, both male and female students are expected to show similar learning potential and mental activities. To refute or confirm gender difference conspiracies, we examined curiosity, creativity, and motivation among high school students who were exposed to similar learning situations. Based on this, the following hypothesis was tested:

H0: There will be no significant gender differences in (a) curiosity, (b) creativity, or (c) motivation among students.

3. Materials and methods

Using a cross-sectional survey design, we examined 568 (male = 323; female = 329) students from 25 senior high schools in the Central Region of Ghana. The students were entirely adolescents (early, middle, and late), with an average of 16.80 ± 0.98. Eligibility was tied to the availability of any two students who happened to be in class at the time of data collection. The Ethical Review Board, College of Education, University of Cape Coast (CES-ERB/UCC-EDU/V4/20-09) approved the study.

We adapted three sets of latent scales on curiosity, creativity, and academic motivation. With the curiosity scale, 5-Dimensions of Curiosity Revised (5DCR; 25 items) of Kashdan et al.[13] was used. The scale had five sub-scales with sample statements like, "I view challenging situations as an opportunity to grow and learn; I cannot handle the stress that comes from entering uncertain situations". The scale yielded a total reliability coefficient of 0.78. With the creativity scale, Kaufman's[66] Domains of Creativity Scale (K-DOCS; 50 items) was used. The creativity scale is multi-dimensional, with five dimensions and sample statements like "helping other people cope with a difficult situation; solving math puzzles". The scale yielded a total reliability coefficient of 0.88. With the academic motivation scale, academic motivation scale (AMS-28) of Vallerand et al.[67] was used. The scale had seven dimensions with sample statements like, "I experience pleasure and satisfaction while learning new things; I really like going to school". The scale produced a composite reliability coefficient of 0.85. We collected quantitative data using the adapted scale. The data were entered into the statistical package for service solution version 26 (SPSS v26). Using the trimmed mean procedures, the data was screened and cleaned for any potential outliers. Specifically, multivariate analysis of variance (MANOVA) was used to test the hypothesis because the constructs were three with two categorical determinants (male and female).

4. Results

To avoid statistical errors, test assumptions using descriptive statistics. These included the skewness of the data, the kurtosis data, and the means and standard deviations of the variables used in the study. **Table 1** presents the results.

Table 1 displays the skewness of the data for a variety of custom rule values (+1 to −1) and kurtosis custom rule values (+1 to −1). When the skewness and kurtosis statistics were used to look at curiosity, the results were −0.255 and −0.098. It was decided that the data were leptokurtic because they had a left-skewed distribution with a negative kurtosis. A negative kurtosis means that the distribution does not

Table 1. Descriptive statistics for all the scales.

Measures	*N*	Min.	Max.	Mean	*SD*	Skewness		Kurtosis	
	Stat.	Stat.	Stat.	Stat.	Stat.	Stat.	Std. E	Stat.	Std. E
Curiosity total	568	51.00	90.00	71.54	7.30	−0.255	0.103	−0.098	0.205
Creativity total	568	92.00	200.00	143.75	16.50	0.209	0.103	0.438	0.205
Motivation total	568	51.00	112.00	86.31	9.11	−0.654	0.103	0.483	0.205

peak and has lighter tails. This showed that most answers or situations lie above the normal curve's median value (the mean and median are less than the mode). In terms of creativity, it yielded a skewness statistic of 0.209 and a kurtosis statistic of 0.438. When kurtosis returned a positive value, it meant that the creative distribution was right-skewed. This is called platykurtic kurtosis, and it means that the distribution has a peak and thick tails. This indicated that most situations lie below the normal curve's median value (the mean and median are greater than the mode). Concerning motivation, it yielded a skewness statistic of 0.654 and a kurtosis statistic of 0.483. Because kurtosis was positive, we knew the data was leptokurtic, which means it was left-skewed (negative kurtosis means the distribution has lighter tails than the normal distribution). This showed that most answers or situations lie above the normal curve's median value (the mean and median are less than the mode). Specifically, it yielded a skewness statistic of −0.080 and a kurtosis statistic of −0.443. This indicated that the data was leptokurtic, meaning that the distribution was skewed to the left and the kurtosis was negative. This showed that most situations lie above the normal curve's median value (the mean and median are less than the mode). This analysis found a skewness of 0.373 and a kurtosis of 0.361 when applied to the field of integrated science. Since the kurtosis was positive and the skewness was left, we could conclude that the distribution was platykurtic. This showed that responses and occurrences are skewed to the right of the normal curve's median (the mean and median are less than the mode). A skewness value of zero indicates a perfectly symmetrical distribution, so it can be inferred from the data that the distribution was fairly close to symmetrical[68].

H0: There will be no significant gender differences in (a) curiosity, (b) creativity, or (c) motivation among students.

Before running the MANOVA test, the following assumptions were met: adequacy of sample size, normality, outliers, homogeneity of variance-covariance, and Levene's Test of equality of variance. The Box Test of Equality of Covariance value of 0.88 was used for equality of covariance matrices, and the result shows that homogeneity of variance-covariance matrices was met[69]. Again, Levene's Test of Equality of Error Variance was used to look for non-significant variables, and none of them were significant (e.g., curiosity = 0.310, creativity = 0.185, and motivation = 0.190)[70]. For possible differences, **Table 2** presents the descriptive results.

Table 2 shows the descriptive results of the study variables, which indicated that there were not many differences between male and female students' mean scores of curious abilities, creativity, and academic motivation, as differences were less than 2 scale points according to Pallant[70]. For instance, in curiosity, male respondents (M = 71.86, SD = 7.10) were not different from female respondents (M = 71.09, SD = 7.47); in creativity, male respondents (M = 143.70, SD = 15.99) were not different from female respondents (M = 143.64, SD = 14.55); in motivation, male respondents (M = 86.60, SD = 8.80) were not different from female respondents (M = 86.50, SD = 8.29). The results imply significant differences were not observed between male and female students in terms of curiosity, creativity, and

academic motivation. However, the descriptive results are not enough to confirm that there are no statistically significant differences in the mean scores between male and female respondents, hence the need to examine the multivariate tests in **Table 3**.

Table 2. Descriptive statistics.

Variables	**Gender**	**Mean**	***SD***	***N***
Curiosity	Male	71.86	7.10	267
	Female	71.09	7.47	286
	Total	71.46	7.29	553
Creativity	Male	143.70	15.10	267
	Female	143.64	14.55	286
	Total	143.67	15.25	553
Motivation	Male	86.60	8.80	267
	Female	86.50	8.29	286
	Total	86.55	8.53	553

Table 3. Multivariate tests.

Effect		**Value**	***F***	**Hypothesis *df***	**Error *df***	***Sig.***	***PES***
Intercept	Pillai's trace	0.996	2,6287.72	3	549	0.000	0.996
	Wilks' lambda	0.004	2,6287.72	3	549	0.000	0.996
	Hotelling's trace	240.29	2,6287.72	3	549	0.000	0.996
	Roy's largest root	240.29	2,6287.72	3	549	0.000	0.996
Gender	Pillai's trace	0.007	0.718	3	549	0.610	0.007
	Wilks' lambda	0.993	0.718	3	549	0.610	0.007
	Hotelling's trace	0.007	0.718	3	549	0.610	0.007
	Roy's largest root	0.007	0.718	3	549	0.610	0.007

Bonferroni adjusted significant value at 0.017.

The multivariate test results are shown in **Table 3**, and they compare male and female students for traits like curiosity, creativity, and academic motivation. In this test, the Wilks' Lambda results showed no statistically significant difference in gender, F (3,549) = 0.718, $p > 0.610$; Wilks' Lambda = 0.993, partial eta squared = 0.007 at the Bonferroni-adjusted alpha level of 0.017 (0.05/3 = 0.017). This suggests that there is no correlation between students' gender and their levels of curiosity, creativity, and motivation in the classroom.

5. Discussion

We tested for potential differences in curiosity, creativity, and academic motivation. The study revealed that male students were not different from female students in their curious behaviours, creative potentials, and academically motivated behaviours. The revelation implies that students possessed similar abilities in curiosity, creativity, and academic motivation. The revelation supports the assumption that boys and girls can have equal abilities if society gives them equal opportunities. Besides, the study assumed that curiosity, creativity, and motivation would be similar for male and female students because they attend similar schools, are taught by similar teachers, and are exposed to similar school opportunities. For this reason, the issue of gender differences in curiosity, creativity, motivation, and

academic performance in core mathematics and integrated science among students does not hold. Even if differences do occur, it is possible that aptitude could be a reason. Students with similar abilities may approach situations differently and work differently within the situation, resulting in variation in their situational outputs.

The findings of the current study disprove previous research that claimed there were gender differences in students' levels of interest, creativity, and academic motivation. For instance, contrary to the findings of Narayanan et al.[71], the current study did not find that female students had higher levels of intrinsic motivation than their male counterparts. However, this study's findings are consistent with those of Yau et al.[72], who concluded that the lack of a significant difference between the sexes was due to the fact that male and female students were equally motivated and that the same teaching methods were used in the education system. More importantly, the results of the current study contradict the findings of Narayanan et al.[71], who found that female students were more intrinsically motivated to learn than male students. These findings corroborate those of Singh[73], who also observed no discernible gender gap in levels of curiosity. Results from this study contradict those from Jaen and Baccay[23], who found that female students were more inquisitive than male students. Results from the current study are at odds with those from a previous study by Eren and Coskun[74]. These researchers discovered that male students had greater creative abilities than female students. Results from the current study also contradict those from Okere and Ndeke[75] and Zhao et al.[76], who found that male students performed better on creativity tests than their female counterparts. Furthermore, the results of the current study are inconsistent with those of Kamonjo and Wachanga[77], who also discovered that girls demonstrated a higher level of creativity than boys and that a greater proportion of boys possessed lower levels of creativity than girls.

6. Conclusion and recommendation

Students in high school displayed similar inquisitive, creative, and motivated behaviours. This might be the case if both male and female students attend the same schools, have the same teachers, and have access to the same opportunities. As a result, biological segregation of students is accepted, but psychological or mental ability differences based on gender debate are irrelevant because they offer nothing to scholarship other than unnecessary and frivolous debate among scholars and gender advocates. Therefore, it is recommended that the Ghana Education Service, in collaboration with the Ministry of Education, non-governmental organisations (NGOs), and gender advocates, come up with educational policies that will help tone down unnecessary comparisons and mental competition between male and female students in the areas of curiosity, creativity, and academic motivation. Given similar opportunities and time, both male and female students will be on equal footing, hence the disregard for differences in their abilities.

Implications of gender debate and the psychological abilities of students with disabilities

Our study findings reveal no difference in the curious behaviours, creative potentials, and academically motivated behaviours in a gendered discourse. It is important to appreciate that students with disabilities and special educational needs form an integral part of a 21st century classroom, and as such, it is crucial to ensure they are represented if the gender debate is to be made holistic and inclusive. The study assumption that boys and girls can have equal abilities if society gives them equal opportunities may not necessarily be the same for girls and boys with disabilities due to the feminization of disability—that boys with disabilities have more opportunities across the life cycle in comparison to girls with disabilities, especially in psychological domains such as curiosity, creativity, motivation, and academically motivated behaviours, regardless of the same opportunities presented to them. Again, we

report the issue of gender differences in the aforementioned psychological abilities in core mathematics and integrated science as non-existent. This is relevant for students with disabilities. This is because their functional limitations create little to no room for the understudied abilities with respect to core mathematics, integrated science, and English for those with hearing impairments. Nonetheless, much more effort is needed by special educators and school psychologists to identify gaps in the psychological abilities of students with disabilities and put in place measures to bring them to redress. Empowering students with disabilities to express their curiosity, creativity, and other abilities could be a promising way to ensure a more holistic gendered discourse in a 21st-century classroom.

Author contributions

IM conceptualized the study; VEE wrote the methodology; software was provided by IM; validation was done by IM, VEE, RAS and BAA; formal analysis was done by IM and BAA; the investigation was done by VEE and RAS; resources were provided by IM, VEE, RAS, and BAA; data curation was done by IM; writing—original draft preparation was done by IM, VEE, RAS and BAA; writing—review and editing was done by VEE and RAS; visualization was done by IM; supervision was done by IM; project administration was done by BAA; funding acquisition was done by BAA. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

We have no conflicting interest in as much as this study is concerned.

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