EDUCATION POLICY | RESEARCH ARTICLE

Are caning and learning friends or foes in Ghanaian secondary schools?
Florence Christianah Awoniyi

Abstract: A total of 3,342 eleventh graders from 10 public Senior High Schools were engaged in an investigation of the nature of motivation for the learning of mathematics in the Cape Coast Metropolis of Ghana. The Likert survey revealed both intrinsic and extrinsic motivation, while in the interview students mainly provided extrinsic motivation explanations. Although motivation and caning seems a contradiction in terms, unfortunately, it is a style of motivation experienced by some students in the context of this study. Specifically, the interviewed students mentioned fear of corporal punishment as the most important demotivating issue and high stake national examination results remain the impetus for the learning of mathematics in Ghana. The respondents bemoaned the effects of corporal punishment upon their learning of mathematics and its implications for their capacity to benefit from school were expressed.

Subjects: Secondary Education; Theories of Learning; Teachers & Teacher Education; Classroom Practice; Continuing Professional Development; Education Policy & Politics; Educational Psychology

Keywords: motivation; mathematics; corporal punishment; secondary school

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PUBLIC STATEMENT INTEREST
The old adage “spare the rod and spoil the child” reflects what was an almost universal belief in the use of corporal punishment of children. This paper researches the various consequences of maintaining the policy of caning in particular on the teaching and learning of mathematics in secondary schools, though its findings could well apply to other subjects in all schools in most countries. Motivation for learning, both positive and negative, is explored and tabulated in detail. The results indicate that teachers should be encouraged to reflect on their own models and styles of teaching and disciplining classes. In order to get the best academic results from pupils and also to ensure their learning is of personal benefit to themselves as well as the economic future of the country, the use of the cane needs to be assessed. This paper provides serious research findings that cannot be ignored.
1. Introduction

1.1. Motivation

Motivation has been conceptualised by Middleton et al. (2016, p. 18) as “the reason we engage in any pursuit, mathematical or otherwise”. It has to do with the individual assessing the task at hand to determine its benefits to self. According to Anderson and Kriesler (2018), the perception of the individual of the task enables him/her to take further action in favour or against the task. To take action in favour of the task means planning to follow a course of action that will produce the desired results. Disengagement from the task is a direct or an indirect way of the individual saying the task is of no benefit to him/her. In agreement with Hannula (2006) and Reeve (2009), motivation can be seen as the inclination to do certain things and avoid doing some others. Thus, it has to do with the why of behaviour. Little wonder that Hannula (2015) indicates that motivation directs behaviour. The core quality of motivation to move people into action can be traced to its Latin root of the word, “movere”, which means to move or be moved (Ryan et al., 2010).

Motivation research has several theoretical approaches and use of terminology is sometimes confusing (Middleton et al., 2016). Different researchers have investigated motivation differently. In their articles, Deci and Ryan (1985) and Ryan and Deci (2000a), indicate that some researchers have treated motivation as a singular construct despite the fact that people are moved to act by very different types of factors, with highly varied experiences and consequences. Although some authors have classified motivation into intrinsic and extrinsic subscales, Walter and Hart (2009) have demonstrated that in the mathematics classroom specifically, the separation of motivation into two extremes is insufficient. Over time, the initial distinction made between intrinsic and extrinsic motivation as adaptive and mal-adaptive drives, respectively, turned out to be less compelling than originally expected (Matthews et al., 2013). Their position was corroborated by Cerasoli et al. (2014) when they indicated that with respect to performance, extrinsic and intrinsic motivation are not necessarily antagonistic. Hence, they suggested that the two are best considered simultaneously.

However, some researchers have broadened their investigations to include various sub-constructs of motivation (e.g., Deci & Ryan, 1985; Lim & Chapman, 2014). While some focus on either intrinsic motivation as the most important (e.g., Deci & Ryan, 2000a) or emphasize extrinsic motivation (Reiss, 2005; Wigfield & Eccles, 2000), some others focus on a combination of both intrinsic and extrinsic motivation (Lepper et al., 2005).

According to TIMSS (Mullis et al., 2012), grade eight students in Ghana are both intrinsically and extrinsically motivated in mathematics. Their average score for liking learning mathematics (intrinsic motivation) is one of the highest in the study and their average score for utility value of mathematics is higher than any other participating country. Be that as it may, Ghanaian

| Year | Percentages of passes (A₁ to C₂) |
|------|---------------------------------|
| 2012 | 49.90                           |
| 2013 | 36.80                           |
| 2014 | 32.60                           |
| 2015 | 25.04                           |
| 2016 | 32.83                           |
| 2017 | 42.73                           |
| 2018 | 38.33                           |

Source: WASSCE (2012); West Africa Examination Council (2013, 2014, 2015, 2016, 2017, 2018).
students are not doing well in mathematics. Observations and reports from examining bodies revealed that a high percentage of grade twelfth students continue to perform poorly in mathematics national examinations. For example, their performances followed a downward movement from 2012 to 2015, went up a bit in 2016 and 2017, and came down again in 2018. Table 1 depicts the percentages of passes (where passes means A1 to C6) recorded and their respective years.

If the Ghanaian students “like” and “value” mathematics to the extent that was reported by Mullis et al. (2012), why is this not culminating into good performances for the students? Thus, the current study aims to explore in more detail the nature of student motivation in Ghana, targeting at secondary level.

Deci and Ryan (1985) classified motivation into three major categories: intrinsic, extrinsic, and amotivation but further divided extrinsic motivation into four sub-constructs: (i) external regulation, (ii) introjection, (iii) identification, (iv) integrated regulation motivation. Studies have reported that each sub-construct measures distinct aspects of motivation and exist on a continuum, according to the level of control that individuals have over their actions (e.g., Deci & Ryan, 2000a). When students take up challenges simply because it interests them or because they think it is good or enjoyable, their motivation is said to be intrinsic. That is, intrinsic is at work when behaviour is directed by the activity itself rather than environmental incentives or physiological drives. It is a truism that students could take up challenges or do some things simply because it interests them or because they think it is good or enjoyable. Their interest is not in what they will get out of it, but because of pure satisfaction and pleasure experienced in the activity. This is what is called intrinsic motivation. Ryan and Deci (2000a, p. 56) define intrinsic motivation as “the doing of an activity for its inherent satisfaction rather than for some separable consequence”. Intrinsic motivation has been linked to individual interest, enjoyment and liking by some researchers (e.g., Gaspard et al., 2015).

There are three types of intrinsic motivation postulated by Vallerand et al. (1989): intrinsic to know, intrinsic to accomplish and intrinsic to experience stimulation. Intrinsic “to know” is the act of performing an activity for the pleasure and the satisfaction that one experiences while learning, exploring or trying to understand something new. Intrinsic “to accomplish” is the fact of engaging in an activity for the pleasure and satisfaction experienced when one attempts to accomplish or create something. Intrinsic “to experience stimulation” is operative when one engages in activity in order to experience stimulating sensations such as sensory pleasure, aesthetic experiences, as well as fun and excitement derived from ones engagement in the activity.

In a nutshell, when intrinsically motivated, a person is moved to act for the fun or challenge entailed rather than because of external products, pressures or reward. However, these three subtypes of intrinsic motivation are not differentiated on the self-determination continuum. Several researchers who had conducted studies on the Academic Motivation Scale (Cokley, 2000; Cokley et al. 2001; Fairchild et al., 2005; Vallerand & Bissonnette, 1992) had suggested the need to collapse the three intrinsic motivation sub-constructs (intrinsic motivation to accomplish, to know, and to stimulate) to form an overall intrinsic motivation construct. According to Fairchild et al. (2005), the intrinsic motivation factors were highly correlated, thus they questioned the distinctiveness of these factors. In addition, Liu et al. (2009) are of the opinion that the distinction could be observed mainly in adults.

However, extrinsic motivation is the force behind doing something for some consequence separate from the immediate action (Wigfield & Cambria, 2010). It is driven by external forces such as rewards, punishments, praises and approval by peers, which can end in the absence of a reward or a gift. External regulation is performed because of external demand or possible reward (Deci & Ryan, 1985). Individuals would only take action in order to obtain a reward or avoid punishment and not just for fun. The individual participates in activity out of consideration for the present or future benefits or because there is strong external coercion. Extrinsic motivation that is driven by introjected regulation is driven by ego, and it is meant to maintain self-esteem or pride or to avoid guilt (Deci & Ryan, 1985).
Furthermore, Deci and Ryan (1985) describe regulation through identification as involving consciously valuing a goal or regulation so that the said action is accepted as personally important and strongly associated with the student’s personal goals. The student makes the benefit of the object his/her own, understands its rationale and experiences a sense of self-determination in acting in line with it. They (i.e. Deci & Ryan, 1985) define integrated regulation as that which occurs when regulations are fully assimilated with self so they are included in a person’s self-evaluations and beliefs on personal needs. Because of this, integrated motivations, according to them, share qualities with intrinsic motivation but are still classified as extrinsic because the goals that are to be achieved are for reasons extrinsic to the self, rather than the inherent enjoyment or interest in the task. Due to very high correlations between integrated regulation, and its two adjacent subscales (i.e. identification and intrinsic motivation), integrated regulation is excluded from the Academic Motivation Scale (Lim & Chapman, 2014). In addition, the authors of the Academic Motivation Scale found no reason to measure integrated regulation as a separate subscale (Wang et al., 2009) since it is observed mainly in adults (Liu et al., 2009).

Amotivated is defined as lacking sense of purpose and expectation of reward or of the possibility of changing the course of events (Vallerand & Bissonnette, 1992). According to them, amotivated individual is said to experience feelings of incompetence and expectancies of uncontrollability. Amotivated behaviours are neither intrinsically nor extrinsically motivated. Since they are non-motivated, their participation in the activity will eventually cease. This made Deci and Ryan (1985) conjectured that amotivation can be seen in many ways as similar to learned helplessness.

In view of the review so far, it is apparent that there are different categorizations of motivation, some researchers classified it into two, three, five, six or even eight sub-constructs. The variations could be due to the fact that some of the sub-constructs could be collapsed. For example, external regulation and identification sub-constructs could be collapsed. Both sets of items refer to aspirations about the future, and results from past studies on the Academic Motivation Scale show that they are closely related (Cokley, 2000; Fairchild et al., 2005; Smith et al., 2010; Vallerand et al., 1993). In the same vein, identified regulation and integrated regulation seem to have academic effects more like those of intrinsic motivation (Ratelle et al., 2007) hence could be collapsed to produce one sub-construct. Nevertheless, Deci and Ryan (1985) categorization was adopted in this study.

1.2. Corporal punishment
Some countries, including New Zealand, Australia, the United Kingdom and some states in the United States have recognised the deleterious effects of corporal punishment and thus have abolished it (Agbenyega, 2006). Unfortunately, corporal punishment in the form of the use of physical force with the intention of causing a child to experience pain so as to correct their misbehaviour continues to occur in schools throughout the world, both in countries where it is legal and countries where it is banned, leading to estimates that millions of children are subject to legalized assault at their schools (Covell & Becker, 2011; Morrow & Singh, 2014). Consequently, there is national and international concern about the effects of corporal punishment upon children and its implications for their capacity to benefit from school (Ogando Portela & Pells, 2015).

Children in India, Republic of Korea, South Africa, Sudan, Swaziland, the United States, and Zambia have reported being subject to corporal punishment for a range of behaviours, including not doing their homework, coming late to class, bringing cell phones to school, running in the hallway, sleeping in class, answering questions incorrectly, having an unacceptable appearance, using bad language, writing in a text book, failing to pay school fees, making noise in class, and being absent (Gershoff, 2017). Surprisingly, three industrialized countries are outliers that continue to allow school corporal punishment: Australia, the Republic of South Korea, and the United States. In the United States, corporal punishment is allowed in 19 states. Examples of laws permitting school corporal punishment:

United States, Mississippi, 37–11.57. (2)
Corporal punishment administered in a reasonable manner, or any reasonable action to maintain control and discipline of students taken by a teacher, assistant teacher, principal or assistant principal acting within the scope of his employment or function and in accordance with any state or federal laws or rules or regulations of the State Board of Education or the local school board, does not constitute negligence or child abuse. (Gershoff, 2017, p. 227)

In the African context, it was acceptable in the homes as well as in the schools during the earliest days of formal education to use a cane. Christian sayings of “Whoever spares the rod hates their children but the one who loves their children is careful to discipline them” (Proverbs 13:24), was taken to mean an approval of the practice. The cane has been a symbol of correction in Ghana for a very long time, such that many people see it as the only form of correction. Corporal punishment is lawful in the home. This is due to the fact that cane was linked to old Ghanaian traditions and customs that aimed at reducing rule-breaking behaviours among children (Boakye, 2013; Kyei-Gyamfi, 2011). Hence, cane has been the sanction in instances of minor breaches of school and home rules.

However, in recognition of Article 19 of the UN Convention on the Rights of the Child, many African countries including Ghana have put in place policies that either prohibit or regulate the use of physical discipline against children in school (Ministry of Education, 2008). Article 13(2) of the Children's Act (1998) agrees with the concept of “justifiable” and “reasonable” physical correction of a child. Consequently, caning is restricted to be a punishment for severe cases of breaking school rules and it should be supervised and approved by the school principal. According to Rush and Lazarus (2018), the Education Act (1961) and the Ghana Education Code for second cycle school provides for up to six strokes by a head teacher (principal) or person authorised by the head teacher. Therefore, in principle, Ghana Education Code is against the routine use of cane on the students but in practice, it seems teachers have not been brought to book for going contrary to the regulations.

1.3. Statement of the problem
Despite the regulation of the use of physical discipline against children in school, teachers still use a cane routinely in schools all across the country because they believe that without it their schools will experience reduced academic standards (Agbenyega, 2006). Thus, according to Kyei-Gyamfi (2011) children live in constant fear in Ghana. Although Ghana, along with Ireland, Fiji, Jamaica, Korea, Lebanon, and Senegal prohibits the corporal punishment of children with a specific recommendation to remove caning as a form of discipline from the teacher’s handbook (Freeman, 2010), the report of 9 June 2015 Committee on the Rights of the Child/Ghana/CO/3-5 observed that corporal punishment was being widely practiced in society. It was accepted as a form of discipline in keeping with Children’s Act (1998) acceptance for a degree of reasonable and justifiable punishment.

1.4. Purpose of the study
Caning as an external coercion in this study is used to “motivate” students to learn. Although motivation and caning seems a contradiction in terms, unfortunately, it is a style of motivation experienced by some students in the context of this study. It means teachers externally regulate the learning of mathematics by using a cane on the students and students responding to mathematics to avoid being caned by their teachers. Obviously, caning directs their behaviour. However, considering a situation where some students are being beaten for them to learn in the 21st century, what is the nature of motivation in such a circumstance? Thus, the study investigated in more detail the nature of student motivation in Ghana, targeting secondary level.

1.5. Significance of the study
Caning as a form of corporal punishment is physically painful, potentially injurious, and emotionally humiliating for students. In addition, there is no evidence that caning promotes the learning of mathematics in any classroom, rather, there are studies whose findings indicate that students who were caned while learning scored lower in mathematics. Therefore, this study is poised to help both practitioners and researchers in education to understand how students think, feel and are
motivated, thereby providing information which could help to improve the learning of mathematics. This could be made possible by making the teaching and learning of mathematics fun, meaningful and inspiring, and by avoiding those practices that promote fear in students.

1.5.1. Coding
Senior high school or secondary schools are used interchangeably because they mean the same thing in Ghanian context. Headteacher and principal also mean the same thing. For the coding, STA means “student 3 from school A”, TrH means “teacher 2 from school H” and Sch D means “school D”.

2. Methodology

2.1. Population, sample and sampling technique
With the approval of the school headteachers, the study was conducted in 10 schools in a metropolitan area in Ghana. These schools are mutually exclusive and collectively exhaustive. The metropolis is made up of 5 high performing schools, 2 average performing schools and 3 extremely poor performing schools. The 5 high performing schools originally belonged to the missionaries before government took over the schools. The population comprises 6,317 eleventh graders. From this population, intact classes with altogether 3,342 students were randomly selected to participate in the study. Quantitative data were received from 2,575 students representing 77% of the sample. Moreover, 240 students participated in the focus group interviews. Majority of the sampled students, about 88% were between the ages of 16 to 18 years, out of which 54% were male while 46% were female. The Ghanaian educational system offers different programmes in secondary school and they were represented in the study in the following proportions: Science (34%), General Arts (28%), Business (15%), Home Economics (12%), Visual Arts (8%) and Technical (3%).

2.2. Research design
Sequential explanatory design (Hollstein, 2014) was used. According to Teddlie and Tashakkori (2006), the design permits quantitative method to feed into the design of the qualitative method. Thus, it is for this reason of complementarity and triangulation that mixed method approach was adopted in this study. The qualitative method provided meaning and understanding to the statistical results generated by the quantitative method.

2.3. Research instruments
The research instruments used for the study were questionnaire and interview guide. The self-constructed students’ focus group interview guide contained five items. The Academic Motivation Scale (AMS) questionnaire by Lim and Chapman (2014) originally contained 21 items. Because words and phrases have different meanings in the contexts in which they are used, the adaptation was necessary to suit the respondents. Thus, the instrument was adapted to the Ghanaian context: new items were added and the language was made simpler to understand. For example, an item such as: “I can’t see why I study mathematics and frankly, I couldn’t care less” was changed to “I can’t see why I should study mathematics”. Special effort was made to preserve the questionnaire’s underlying constructs, for example, the ultimate goal of every graduate of secondary school in Ghana is either to proceed to tertiary level or learn a trade. Ghana senior high school students do not think of a better salary after senior high because they do not stand the chance of being gainfully employed, rather they think of securing admission to a tertiary institution, preferably, university admission. Hence they learn mathematics for a better grade at the national examination for university or vocational schools admission.

Thus, the item “Because without a good grade in mathematics, I will not be able to find a high-paying job later on” was changed to “I am doing my best in mathematics so that I can have the best grade in the national examination”. The final instrument had 35 close-ended items (Likert scale: ‘1’ for “strongly disagree”, ‘2’ for “disagree”, ‘3’ for “neutral”, ‘4’ for “agree” and ‘5’ for
“strongly agree”). All these instruments were reviewed by four senior colleagues (comprising of two experts each in mathematics education, and mathematics and statistics) and then pilot-tested. The administration of the questionnaire took place between January and April 2016, and interviews were conducted in June 2016.

3. Results and discussion

3.1. Survey results and discussion

A principal component analysis was conducted on the 35 items (KMO =.953, Bartlett tests = 35,549.013) and five factors had eigenvalues over Kaiser’s criterion of 1 and in combination explained 51.53% of the variance. The subscales were named after they have been found to bundle together. The scree plot showed inflexions that would justify retaining the five factors: “amotivation” subscale (14 items, α = .841), “identified regulation” subscale (11 items, α = .885), “introjection regulation” subscale (5 items, α = .763), “external regulation” subscale (3 items, α = .666) and “intrinsic” subscale (3 items, α = .661). An item “I am doing my best in mathematics so that I can have the best grade at the national examination”, factored in 3 places (external, identified and intrinsic) but was retained for external and identified subscales based on interview explanations and literature review.

Samples of items, eigenvalues and percentage variance explained are presented in Tables 2 and 3, while the scree plot is presented in Figure 1.

| Table 2. Samples of items in each category |
| Scale Name                  | Sample item                                                                 |
|-----------------------------|------------------------------------------------------------------------------|
| Amotivation                 | I don't see how mathematics is of value to me.                               |
| External regulation’        | I am doing my best in mathematics so that I can have the best grade at WASCE. |
| Introjection regulation     | I am studying mathematics because I want to show to others (e.g., teachers, family, and friends) that I can do mathematics. |
| Identified regulation’      | I am studying mathematics because I think that mathematics will help me better prepare for my future career. |
| Intrinsic                   | I am studying mathematics because I want to feel the personal satisfaction of understanding mathematics. |

| Table 3. Total variance explained of motivation |
| Component | Initial Eigenvalues | Extraction sums of squared loadings |
|-----------|---------------------|-----------------------------------|
|           | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1         | 10.382 | 29.662 | 29.662 | 10.382 | 29.662 | 29.662 |
| 2         | 3.412 | 9.749 | 39.412 | 3.412 | 9.749 | 39.412 |
| 3         | 1.979 | 5.654 | 45.066 | 1.979 | 5.654 | 45.066 |
| 4         | 1.186 | 3.388 | 48.453 | 1.186 | 3.388 | 48.453 |
| 5         | 1.076 | 3.076 | 51.529 | 1.076 | 3.076 | 51.529 |
| 6         | .973 | 2.780 | 54.309 |       |       |        |
| 7         | .867 | 2.477 | 56.786 |       |       |        |


Table 3 presents the eigenvalues and percentage variance explained for motivation from the students’ survey.

For the amotivation scale, the majority of the respondents (92%) strongly disagreed with the opinion that it is a waste of time studying mathematics, while as many as 89% strongly disagreed that mathematics will not be important for the rest of their lives and about 76% claimed that mathematics is useful to them. This seemed to indicate that the students are generally motivated to learn mathematics. However, with about 52% of respondents in strong agreement to the idea that they were studying mathematics because it is a compulsory subject in senior high school, connotes amotivation. They lack the intent to study mathematics and would be pleased to discard of it at any opportune time.

For the external regulation subscale, about 70% of the respondents believed they would need a firm mastery of mathematics in the future, while as many as 58% planned to major in a mathematics-related programme at university and 95% agreed that they were learning mathematics in order to get a best grade in the national examination ($M = 4.58$, $SD = 0.74$). This suggests that students seemed to be guided by external regulation as well as identified regulation motivations since they favoured items from both sub-constructs. This suggests an overlap between the two thematic areas.

For the introjected regulation subscale, as many as 54% of respondents revealed that they are studying mathematics because doing well in mathematics makes them feel important. Similarly, 58% of respondents agreed that they work very hard in mathematics because they want to be respected as intelligent students. A majority of the respondents portrayed great feelings of self-importance and ability as the main reasons for studying mathematics ($M = 3.4$, $SD = 1.3$).

For the identified regulation subscale, it was observed that 91% of respondents claimed that they were studying mathematics because they believe it will improve their work competence in future. It was also observed that 83% of respondents strongly agreed that they were studying mathematics because what they learnt in mathematics now would be useful for the course of their choices in the university. Almost all the respondents in this study are learning mathematics.
because of its future usefulness (M = 4.2, SD = 0.7). They are studying mathematics because it identified with their personal goals. This is good news because students seem to agree that mathematics is useful for their future career and daily lives.

On the intrinsic motivation subscale, as many as 56% of respondents agreed that they were studying mathematics for the pleasure that they experienced when they were able to solve questions. A majority (75%) of the respondents agreed that they were studying mathematics because they want to feel the personal satisfaction of understanding mathematics and 66% of respondents indicated that they were studying mathematics for the pleasure that they experienced when they learnt how things in life worked because of mathematics. In other words, respondents claimed a full sense of volition and choice in studying mathematics (M = 3.8, SD = 0.8).

The percentages of the students that identified with intrinsic motivation items and those that opted for extrinsic motivation items suggest an overlapping between the two motivational orientations. For example, having as many as 75% of respondents agreeing that they were studying mathematics because they want to feel the personal satisfaction of understanding mathematics, connotes intrinsic motivation. On the other hand, having 95% agreed that they were learning mathematics in order to get a best grade in the national examination suggests extrinsic motivation. For these to be occurring at the same time, in the same study (on the same instrument) seems to suggest that for these students intrinsic and extrinsic motivation are mostly independent constructs. That is, the two may coexist in some of the students.

The findings of the survey which suggested students to be intrinsically and extrinsically motivated necessitated the need for the interviews with the view to understanding the students’ choice of both sub-con structs. Thus, students who made a choice of both sub-con structs were shortlisted and 240 of them were interviewed. The interview also provided the students with opportunity to express their views regarding the manner in which their teachers motivate them through the use of caning.

### 3.2. Interview results and discussion

Interview is a flexible tool for data collection as it enables multi-sensory channels: verbal, non-verbal, spoken and heard, to be used (Cohen et al., 2005). Semi-structured focus group interview was used to ensure that the interview session was controlled while still giving space for spontaneity.

The interviews with 10 to 14 students at a time were conducted (20 groups in all) to provide causes of effects that were apparent from the survey. The following were the interview questions: (1) What do you understand by motivation in relation to the learning of mathematics? (2) Why are you studying mathematics? (3) How are you motivated to learn mathematics? (4) What can prevent you from studying mathematics? (5) What can motivate you to study mathematics better? The data collected in response to these questions were analysed qualitatively using common themes.

#### 3.2.1. Interview question one: what do you understand by motivation in relation to the learning of mathematics?

The interview data revealed that about 50% of the students understood motivation as being supported, 21% as being encouraged and 8% as being appreciated. It was evidence that a majority of the students sought for motivation from sources that were external to self. For instance,

StI₆ claimed: ‘I am learning math because I want good grade or mark, nothing else matters to me . . .’

StH₂ stated: “I just must do well in mathematics to make my parents proud . . .”

In both cases, the students imposed their own rewards or constraints in order to protect their ego. Likewise, some of the students were not motivated. For example,
StG, declared: ‘the day I complete my final exam would be the day I bid farewell to math, give me three or four reading subjects in place of math, I would gladly accept, …’

StE stated: “I don’t want to learn math in its entirety, but I am being forced. It’s not funny”.

This group of students seemed to lack intent to learn mathematics.

3.2.2. Interview question two: why are you studying mathematics?
The responses of the students to the reasons behind their learning of mathematics is presented in Table 4

The reasons given by the students were all within the domain of extrinsic motivation, with the exception of about 2% who explained they learn mathematics in order to “improve their thinking ability”. There are many studies pointing to the fact that extrinsic rewards undermine intrinsic motivation (e.g., Deci et al., 1999). In the same vein, there are studies questioning the validity of those studies and the conclusions drawn from them (e.g., Reiss, 2005). Some studies also conjecture that these effects do not lead to the same results in all individuals but that they vary depending on motivational orientation (e.g., Bateman & Crant, 2003). Extrinsic motivation is also necessary in the educational setting as argued by Reeve et al. (2004). In fact, Silverstein (2010) also argued that people with motivational impairments are more likely to experience motivational benefits from external motivation, in the form of rewards rather than acquiring detrimental effects on their already low levels of motivation. In addition, Lemos and Verissimo (2014) conjecture that for unpleasant and unappealing academic activities, extrinsic motivation, rather than detrimental, might represent a strategic process to support learning.

However, if the stimulation to learn mathematics depends on external incentives rather than the inherent enjoyment or interest in the task, its continuity may not be guaranteed. For example, in the interview

StA, stated: ‘I have no option than to learn math for me to gain admission … although I would not like to study mathematics related programme in my life again’.

Interview Question Three: How are you motivated to learn mathematics?

About 67% of the students claimed that the only way their teacher is motivating them is through the use of caning while about 5% of students affirmed that some teachers gave money as a reward to encourage them to learn mathematics. Moreover, fear of caning was the most frequently mentioned demotivating factor (58%) (Table 3). During one of the interviews, while probing to determine the level of commitment of students to mathematics, students were asked

| Table 4. Reasons behind the learning of mathematics by the students |
|--------------------------|------------------|
| Reason | Percentage (%) |
| Mathematics is a compulsory subject. | 38 |
| Paves the way for admission into higher institutions. | 33 |
| Flexibility of mathematics to branch into other fields. | 17 |
| Running businesses in future. | 4 |
| Utilitarian usage. | 4 |
| Future aspirations. | 2 |
| To improve their thinking ability. | 2 |
x what they will do when answering a mathematics question that proves difficult to them in an assignment. The following are some of their responses:

StB1: “… in times of difficulty where there happened to be no hope in gaining understanding to answering the questions, I copied from friends to avoid being caned”

StB2: “Sometimes I search in some textbooks for understanding or just to follow the steps whether I understand it or not”

StE1: “… I stay away from school until the submission date is over to avoid being caned or punished severely … ”

The responses from StB1 and StB2 confirmed the fact that corporal punishment may interfere with children’s learning. Children may avoid or dislike school because it is a place where they are in constant fear of being physically harmed by their teachers (Gershoff, 2017).

**Interview Question Four: What can prevent you from studying mathematics?**

The respondents provided various causes of demotivation to their learning of mathematics. These are presented in Table 5.

The detrimental effect of caning on students’ learning cannot be over-emphasized. About 58% of the interviewees expressed their distaste for the cane. Sadly, the researcher witnessed, a teacher caned some students for failing to do their assignment and made them lie down on the floor in front of the classroom. Although this was addressed immediately, with a promise from the teacher never to repeat such abhorrence practice, it nevertheless provided the evidence to the fact that routine use of cane in some schools persists.

As many as 54% mentioned lack of encouragement from their teachers as a demotivating factor despite the fact that the role of a mathematics teacher is to spark the interests of students and excite them about mathematics and its usefulness in our world (Brahier, 2011). The inability of

| Item                                           | Frequency | Percentage |
|------------------------------------------------|-----------|------------|
| Fear of the cane                               | 140       | 58         |
| Lack of attention/encouragement from math teachers | 130       | 54         |
| Not knowing usefulness of each of the topics   | 120       | 50         |
| Teachers rushing through topics                | 85        | 35         |
| Negative attitude of math teachers to the weak students | 80        | 33         |
| Overloaded syllabus and time factor            | 80        | 33         |
| Procrastination/not seeking for help from friends | 60        | 25         |
| Laziness/complacency by the students           | 40        | 17         |
| Over-ambition of parents/guardians/teachers    | 40        | 17         |
| Continuous failure/fear of failing behind      | 40        | 17         |
| Unfriendly learning environment                 | 30        | 13         |
some teachers to play this role may jeopardize the individual and national development that is associated with the learning of mathematics. Not knowing the usefulness of each of the topics in the syllabus was indicated by 50% as one of the demotivating factors. Ordinarily, people attach much importance to activities and practices which they see to be relevant to their lives and critical to their survival (Anderson & Kriesler, 2018). If students see mathematics as sensible, useful, and worthwhile, they would be inclined to put in their best to achieve success in the subject. In other words, those students did not see the relevance of mathematics to their future careers and as such were not committed to the learning of the subject. Several studies have established that students’ attitudes are affected by the personal applicability, or lack thereof, of mathematics to their lives and possible future careers and student commitment or productive disposition to a task is determined by his/her perception of the task’s relevance to self (Elliott et al., 2001; Malmivuori, 2006).

3.2.3. Interview question five: what can motivate you to study mathematics better?
As many as 75% and 50% of the interviewees indicated that tertiary admission and support from teachers, respectively, are their preferred method of motivation among others, while about, 54% of the interviewees pleaded for the abolition of the use of canes. For example,

StF₂ begged: ‘… our teachers should stop the use of the cane on us so that we can relax to learn mathematics well … ’

StB₁ pleaded: ‘my teacher should mark my work and indicate what I did wrong, instead of marking only my answer … my efforts should count …’

StJ₂ complained: ‘… I live far from school and always reach home late … but I always try to do my assignment … he caned me all the time for failing to submit my work or for receiving bad grades’

The sharing of the students (StF₂ and StJ₂) corroborates the findings by (Ogando Portela & Pells, 2015) that being beaten by teachers was the most important reason for not liking school by the students. Nonetheless, proponents of corporal punishment argue that it is an effective and non-harmful means of instilling discipline, respect and obedience into children. For example, such individuals are likely to maintain that StJ₂ always does her assignment for fear of being caned.

In addition, some of the students’ explanations during the interview were opposite to their earlier position on the Likert scale. For example, 50 students from different schools have this or its variation to say:

Learning math brings joy if you succeed but pains if you don’t. There is a great joy within me whenever I succeeded in solving a question in math. It’s awesome that I could understand how certain formulae were put together to solve questions in word problem. Unfortunately, my teacher wouldn’t acknowledge me because I always score less than half of the total marks.

The aforementioned students’ responses to the items on intrinsic motivation seemed to be based on relief from the pain of failure whenever they succeeded rather than the joy of learning mathematics for its inherent satisfaction and the expectations of some of the students for acknowledgement render it instrumental. Thus, this is a call to researchers to be cautious when designing instruments for data collection.

4. Conclusion
This study serves as a warning to researchers not to rely too heavily on one measure alone when conducting research. Methodological triangulation and use of mixed methods in this study managed to clarify initially confusing survey results. It could be said in a way that the students in this study did not fall into one or the other category of motivation. The Likert
survey suggested the students to be both extrinsically and intrinsically motivated but in the interview, they were mainly providing extrinsic motivation explanations. In addition, it seems the negative aspect of extrinsic motivation, that is, the use of caning, was largely determining their learning of mathematics.

The data also revealed that the importance of the national examination cannot be overemphasized. It is a high stake examination and as such, students were focusing on producing satisfying results.

Secondly, many of the students felt they did not get enough feedback from their teachers. Paying attention only to the correct answers provided by the students cannot be enough to correct students’ errors, neither can it be sufficient to entice students to learn, rather it may discourage them from making further efforts which they think may not be rewarded.

Thirdly, even though there are restrictions regarding the use of cane in Ghanaian schools, some teachers are terrorizing their students with apparent impunity. The researcher was a witness to many such illegal acts which were immediately addressed by talking with the teachers who promised to change the practice. Fear of caning seems to be the most important factor influencing student motivation.

Corporal punishment seems to create problems in schools as it creates an atmosphere of fear. Apart from feelings of humiliation that can be heightened when children are punished in front of the class, caning is physically painful, potentially injurious, and emotionally humiliating for children. Agbenyega (2006) and Gershoff (2017) suggest that this might lead to truancy and dropping out, and without important skills, a person is in danger of social segregation or becoming an outcast. Thus, this research paper indicates that the use of caning would seem to be a recipe for disaster.

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**References**
Agbenyega, J. S. (2006). Corporal punishment in the schools of Ghana: Does inclusive education suffer? The Australian Educational Researcher, 33(3), 107–122. https://doi.org/10.1007/BF0321684
Anderson, J., & Kriesler, A. (2018). Making maths matter: Engaging students from low socio-economic schools through social justice contexts. In E. Bergqvist, C. M. Österholm, Granberg, & L. Sumpter (Eds.), 42nd conference of the international group for the psychology of mathematics education (Vol.2, pp. 35–42). Umea, Sweden: PME.
Boteman, T. S., & Crant, J. M. (2003). Revisiting intrinsic and extrinsic motivation. Paper presented at the meeting of the academy of management, Seattle, WA.
Boakye, K. E. (2013). Correlates and predictors of juvenile delinquency in Ghana. International Journal of Comparative and Applied Criminal Justice, 37(4), 257–278. https://doi.org/10.1080/01924036.2013.792149
Brahier, D. J. (2011). Motivation and disposition: The hidden curriculum. In D. J. Brahier & W. R. Speer (Eds.), Motivation and disposition: Pathways to learning, 73rd yearbook of the National Council of Teachers of Mathematics (pp. 1–12). NCTM.
Cerasoli, C. P., Nicklin, J. M., & Ford, M. T. (2016). Intrinsic motivation and extrinsic incentives jointly predict performance: A 40-year meta-analysis. Psychological Bulletin, Advance Online Publication, 1–30. https://doi.org/10.33375/00356611
Cohen, I., Manion, I., & Morrison, K. (2005). Research methods in education (5th ed.). London, UK: Routledge Falmer.
Cokley, K. O. (2000). Examining the validity of the academic motivation scale by comparing scale construction to self-determination theory. Psychological Reports, 86(2), 560–564. https://doi.org/10.2466/P.R.08.2.560-564
Cokley, K. O., Bernard, N., Cunningham, D., & Motoike, J. (2001). A psychometric investigation of the Academic motivation scale using a United States sample. Measurement and Evaluation in Counseling and Development, 34(2), 109–119. doi:10.1080/07481756.2001.12069027
Covell, K., & Becker, J. (2011). Five Years on: A global update on violence against children, report for the NGO advisory council for follow-up to the UN Secretary-General’s Study on violence against Children. United Nations.
Deci, E., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation.
Psychological Bulletin, 125(6), 627–668. https://doi.org/10.1037/0033-2909.125.6.627
Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. Plenum.
Deci, E. L., & Ryan, R. M. (2000a). The “what” and “why” of goal pursuits: Human needs and the self-determination of behaviour. Psychological Inquiry, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
Elliott, B., Oty, K., McArthur, J., & Clark, B. (2001). The effect of an interdisciplinary algebra/science course on students’ problem solving skills, critical thinking skills and attitudes toward mathematics. International Journal of Mathematical Education in Science & Technology, 32(6), 811–816. https://doi.org/10.1080/00207390110053784
Fairchild, A. J., Horst, S. J., Finney, S. J., & Barron, K. E. (2004). Evaluating existing and new validity evidence for the academic motivation scale. Contemporary Educational Psychology, 30(3), 331–358. https://doi.org/10.1016/j.cedpsych.2004.11.001
Freeman, M. D. A. (2010). Upholding the dignity and best interests of children: International law and the corporal punishment of children. Law and Contemporary Problems, 73(122), 211–251
Gaspard, H., Dicke, A.-L., Flunger, B., Schreier, B., & Hafner, I. (2015). More value through greater differentiation: Gender differences in value beliefs about math. Journal of Educational Psychology, 107(3), 653–677. https://doi.org/10.1037/edu0000003
Gershoff, E. T. (2017). School corporal punishment in global perspective: Prevalence, outcomes, and efforts at intervention. Psychology, Health & Medicine, 22(51), 224–239. https://doi.org/10.1080/13548506.2016.1271955
Hannula, S. M. (2006). Motivation in mathematics: Goals reflected in emotions. Educational Studies in Mathematics, 63(2), 165–178. https://doi.org/10.1007/s10649-005-9019-8
Hannula, S. M. (2015). Emotions in problem solving. In J. S. Cho (Ed.), Selected regular lectures from the 12th international congress on mathematical education (pp. 269–288). Cham: Springer International Publishing.
Holstein, B. (2014). Mixed methods social networks research: An introduction. In S. Dominguez & B. Holstein (Eds.), Mixed Methods Social Networks Research: Design and Applications, 1, 3–35.
International Labour Organisation. (1998). Act of the parliament of the Republic of Ghana entitled “the children’s Act, 1998”. Retrieved from http://www.ilo.org/dyn/natlex/docs/WEBTEXT/S6216/65194/ESGHA01.htm.
Kyei-Gyamfi, S. (2013). Corporal punishment in Ghana. In K. K. Anne, D. L. Agbényiga, & N. A. Apt (Eds.), Children’s rights in Ghana: Reality or rhetoric? (pp. 77–98). Lexington Books.
Lemos, M. S., & Verissimo, L. (2014). The relationships between intrinsic motivation, extrinsic motivation, and achievement, along elementary school. Procedia - Social and Behavioral Sciences, 112, 930–938. https://doi.org/10.1016/j.sbspro.2014.01.1251
Lepper, M. R., Corpus, J. H., & Iyengar, S. S. (2005). Intrinsic and extrinsic motivational orientations in the classroom: Age differences and academic correlates. Journal of Educational Psychology, 97(2), 184–196. https://doi.org/10.1037/0022-0663.97.2.184
Lim, S. Y., & Chapman, E. (2014). Adapting the academic motivation scale for use in pre-tertiary mathematics classrooms. Mathematics Education Research Journal, 27(3), 331–357. https://doi.org/10.1007/s13394-014-0140-9
Liu, W. C., Wang, C. K. J., Tan, O. S., Kohn, C., & Ee, J. (2009). A self-determination approach to understanding students’ motivation in project work. Learning and Individual Differences, 19(1), 139–145. https://doi.org/10.1016/j.lindif.2008.07.002
Malmivuo, M. (2008). Affect and self-regulation. Educational Studies in Mathematics, 63(2), 149–164. https://doi.org/10.1007/s10649-006-9022-8
Mathews, A. R., Hoessler, C., Jonker, L., & Stockley, D. (2013). Academic motivation in calculus. Canadian Journal of Science, Mathematics and Technology Education, 13(1), 1–17. https://doi.org/10.1080/14926156.2013.758328
Middleton, J. A., Jansen, A., & Goldin, G. A. (2016). Motivation. In G. Kaiser (Ed.), Attitudes, beliefs, motivations and differentiation: An overview of the field and future directions. ICME-13 Topical Surveys (pp. 17–23). Springer Open.
Ministry of Education. (2008). Teachers’ code of conduct: Rules of professional conduct for teachers in Ghana. Ghana Education Service.
Morrow, Van, & Singh, R. (2014). Corporal punishment in schools in Andhra Pradesh, India: Children’s and parents’ views. Young lives.
Mullis, I. V. S., Martin, M. O., Foy, P., & Arora, A. (2012). TIMSS 2011 international results in mathematics. TIMSS & PIRLS International Study Center, Boston College.
Ogando Portela, M. J., & Pells, K. (2015). Corporal punishment in schools: Longitudinal evidence from Ethiopia, India, Peru, and Viet Nam. Innocenti Discussion Paper No. 2015-02. Florence: UNICEF Office of Research. https://www.unicef-irc.org/publications/series/221.
Ratelle, C. F., Guay, F., Vallerand, R. J., Larose, S., & Sen-ecal, C. (2007). Autonomous, controlled, and amotivated types of academic motivation: A person-oriented analysis. Journal of Educational Psychology, 99(4), 734–746.
Reeve, J., Deci, E. L., & Ryan, R. M. (2004). Self-determination theory: A dialectical framework for understanding the socio-cultural influences on student motivation. In D. McInerney & S. V. Etten (Eds.), Research on socio-cultural influences on motivation and learning: Big theories revisited (Vol. 4, pp. 31–59). Information Age.
Reeve, J. (2009). Understanding motivation and emotion. John Wiley & Sons, Inc.
Reiss, S. (2005). Extrinsic and intrinsic motivation at 30: Unresolved scientific issues. The Behavior Analyst, 28(1), 1–14. https://doi.org/10.1080/07068410008601000086177
Rush, M., & Lazarus, S. I. (2018). ‘Troubling’ chastisement: A comparative historical analysis of child punishment in Ghana and Ireland. Sociological Research Online, 23(1), 177–196. https://doi.org/10.1177/1360780417749250
Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary Educational Psychology, 25(1), 54–67. https://doi.org/10.1006/ceps.1999.1020
Ryan, R. M., Lynch, M. F., Vansteenkiste, M., & Deci, E. L. (2010). Motivation and autonomy in counseling, psychotherapy, and behavior change: A look at theory and practice. The Counseling Psychologist, 39(2), 193–260. https://doi.org/10.1177/001100001036759313
Silverstein, S. M. (2010). Bridging the gap between extrinsic and intrinsic motivation in the cognitive remediation of schizophrenia. Schizophrenia Bulletin,
Awoniyi, Cogent Education (2020), 8: 1862031
https://doi.org/10.1080/2331186X.2020.1862031

36(5), 949–956. https://doi.org/10.1093/schbul/sbp160

Smith, K. J., Davy, J. A., & Rosenberg, D. L. (2010). An examination of the validity of the academic motivation scale with a United States business student sample. Psychological Reports, 106(2), 323–341. https://doi.org/10.2466/pr0.106.2.323-341

Teddie, C., & Tashakkori, A. (2006). A general typology of research designs featuring mixed methods. Research in the Schools, 13, 2–28.

Vallerand, R. J., & Bissonnette, R. (1992). Intrinsic, extrinsic and amotivational styles as predictors of behavior: A prospective study. Journal of Personality, 60(3), 599–620.

Vallerand, R. J., Blais, M. R., Brière, N. M., & Pelletier, L. G. (1989). Construction and validation of the Échelle de motivation en Education (EME). Canadian Journal of Behavioural Sciences, 21(3), 323–349. https://doi.org/10.1037/h0079855

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Sen ‘ecal, C., & Valli’eres, E. F. (1993). On the assessment of intrinsic, extrinsic, and amotivation in education: Evidence on the concurrent and construct validity of the academic motivation scale. Educational and Psychological Measurement, 53(1), 159–172. https://doi.org/10.1177/0013164493053001018

Walter, J. G., & Hart, J. (2009). Understanding the complexities of student motivations in mathematics learning. Journal of Mathematical Behavior, 28(2–3), 162–170. https://doi.org/10.1016/j.jmathb.2009.07.001

Wang, J. C. K., Hagger, M., & Liu, W. C. (2009). A cross-cultural validation of perceived locus of causality scale in physical education context. Research Quarterly for Exercise and Sport, 80(2), 313–325. https://doi.org/10.1080/02701367.2009.1059956

WASSCE. (2012). General resume of chief examiners’ reports. Accra, Ghana. West Africa Examination Council.

West Africa Examination Council. (2013). General resume of chief examiners’ reports.

West Africa Examination Council. (2014). General resume of chief examiners’ reports.

West Africa Examination Council. (2015). General resume of chief examiners’ reports.

West Africa Examination Council. (2016). General resume of chief examiners’ reports.

West Africa Examination Council. (2017). General resume of chief examiners’ reports.

West Africa Examination Council. (2018). General resume of chief examiners’ reports.

Wigfield, A., & Cambria, J. (2010). Students’ achievement values, goal orientations, and interest: Definitions, development, and relations to achievement outcomes. Developmental Review, 30(1), 1–35. https://doi.org/10.1016/j.dr.2009.12.001

Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. Contemporary Educational Psychology, 25(1), 68–81. https://doi.org/10.1006/ceps.1999.1015