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Context and Impact of Repetition Courses in Mathematics on Feeling of Competence of Middle School Students in this Subject

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Abstract: ***As early as middle school, because of real or supposed learning difficulties in mathematics, many students fear them. They even have an aversion to it. As a consequence, bad grades in this subject are recurrent. In an attempt to improve or to see more clearly, many students do not hesitate to call upon teachers of this subject or other subjects for rehearsal classes. In what context do these classes take place? Do they really help to improve the students' feeling of competence in mathematics? To answer these questions, a total of 515 pupils in the 9th grade are mobilized to answer a sociodemographic questionnaire and a scale of feelings of competence in mathematics. The data collected are processed using SPSS 21.0 software with the calculation of percentages to describe the context and Student's t to check the relationship between the variables involved. In the end, the results show that, firstly, mathematics rehearsal classes are provided in the majority of cases by the subject teachers, at the students' homes, on Wednesday afternoons and weekends; secondly, their impact on the feeling of competence in mathematics is proven.***

Keywords: Rehearsal classes; feeling of competence; mathematics; teachers; students

1. Introduction

The Togolese school system, with its emphasis on mathematics, has made mathematics a fundamental learning activity from primary school onwards (Bawa and Atsu, 2018). While in primary school, they seem concrete, from the first cycle of secondary school onwards, mathematics is very abstract with the introduction of unknowns. From 6th grade to 3rd grade, they become more complex to the point of appearing disgusting to pupils who do not understand them. Many of these students develop a weak feeling of competence in the subject.

The concept of self-efficacy is presented through Bandura's social cognitive theory (1989 in Ruph, 1997) as the set of judgments that people make about their ability to organize and perform the actions required to achieve a given type of performance. It strongly influences their choices, the efforts they make and their perseverance in the face of challenges (Ruph, 1997).

Bandura's (1989) theory of feeling of competence is based on the idea that this sense is a function of "a belief system acquired over the course of an individual's development and life history" (Ruph, 1997; p.11). This system would be established according to four components (Bawa, 2018; Moumoula, Bawa and Koutou, 2019): 1) Experiences of mastery. When an individual achieves success, it allows belief in his or her skills. Conversely, failure damages this belief; 2) vicarious experiences: Seeing people similar to oneself succeed through sustained effort increases belief in one's ability to succeed and vice versa. 3) Social persuasion: People who have been verbally persuaded that they have the ability to master a given activity are more likely to mobilize and sustain an effort than if they doubt themselves; 4) Physiological and emotional states. A person's mood also affects their feeling of competence (De Visscher, 2013; Ruph, 1997).

Several authors see the feeling of competence as one of the modalities of the self-concept, a determining factor in the sense that it allows a student, in a school context, to evaluate his or her abilities with regard to learning and to commit accordingly (Bawa, 2018; Gaudreau, 2013; Gurtner et al., 2001; Moumoula et al., 2019). Masson and Fenouillet (2013) breaks it down into two dimensions: feelings of general or academic competence and feelings of disciplinary competence. The latter correspond to the different disciplines or subjects taught, such as French and mathematics, and make this concept a multidimensional one. The feeling of being competent to learn in any subject has a profound influence on the feelings, thoughts, and behaviours of individuals in learning situations (Ruph, 1997). According to Bandura (1995) reported by Ruph (1997), it is equivalent to the feeling of being able to control the situation and achieve the desired goal, largely determines motivation and cognitive engagement in a learning or problem-solving activity, effort and perseverance in the face of difficulties, emotional and affective reactions, and learning outcomes.

In this study, we retain the feeling of competence in mathematics because it was most evoked in the reasons for choosing repetition courses during the pre-survey in the following terms: "I'm bad at mathematics", "I don't really understand the explanations of mathematics in class", "to make up for my difficulties in mathematics", "mathematics is not for me", "I'm stupid in mathematics because I'm worthless". All of these statements suggest that these students "feel that they are incompetent, without ability or talent, 'useless', even 'stupid' (De Visscher, 2013) in mathematics. Even in France, "many students say they are useless in mathematics and think that nothing can overcome these difficulties of understanding and application" (Lebrun, 2017, p. 15). In fact, this subject is probably the most anxiety-provoking, or in other words, the practice of mathematics is the one that generates the most anxiety among students compared to other subjects (Lebrun, 2017). Students who are uncomfortable with mathematics feel

tensions that are sometimes difficult to bear, which leads them to little involvement in mathematical activity. These discomforts occur in mathematical problem-solving situations and are a reminder of difficult moments experienced with respect to mathematics. Fear, on the other hand, is more intense and leads to avoidance; it creates unbearable tensions (Lafortune and Fennema, 2002). In the end, he experiences a feeling of total incompetence that "only precise and sustained interventions can reduce his fears" (Lafortune and Fennema, 2002, p. 10). It is precisely in this context that mathematics rehearsal classes, which remain the only way to support students (Kabore, 2008).

Repetition courses, also known as tutoring, academic support, tutoring or tutorials, and cognitive coaching (Houessou, 2014), are defined as courses provided in the form of personalized, paid supervision that focuses strictly on solving the problems that the pupil faces during classroom learning (Kabore, 2008). It is in fact a form of "socio-pedagogical strategies to ensure school success [...]" (Yabouriand al., 2010; p.10) for which parents mobilize enormous resources. In reality, it is a variant of the pedagogical support traditionally provided to pupils during learning, especially when they are experiencing difficulties (Yabouri et al., 2010). These authors identify four forms of pedagogical support: home rehearsal classes, rehearsal classes at school outside working hours, maintenance classes or holiday courses, and supervised study. This study examines the first two forms of pedagogical support.

Repetition sessions, whether at home or at school, in their pedagogical dimension, are therefore similar here to remediation and, in their social dimension, to preceptorship (Houessou, 2014). Their intrinsic aim is firstly to provide practical or methodological support for pupils in their school exercises outside formal classes and, secondly, to analyze the causes of the differential difficulties they often experience in the different learning processes (Yao, 2014).

All in all, it is undeniable that their parents call on their children's mathematics rehearsal classes in the expectation of dealing with the learning difficulties or problems that these children experience in this subject. In a national environment of a legal vacuum, i.e. where there is no law describing the legal framework for rehearsal classes at home or at school, it is important to ask the essential questions:

- What is the context (place, time and status of the tutor) in which rehearsal classes take place?
- Is there an impact of these repetition classes on the feeling of mathematical competence?

In the following section, a methodological arsenal is put in place to answer each of these questions.

2. Method

2.1 Study setting and population

The study focused on students from junior high school to middle school level. The collège comprises two cycles, namely; the observation cycle (sixth, fifth) and the orientation cycle (fourth and third). The third class is chosen for the fundamental reason that the students in this class are in examination class. They have the obligation to work well in all the subjects taught if they want to succeed at the end of the year and move on to the second year of secondary school. In addition, all subjects are given equal weight. For the occasion, two colleges in Lomé have been mobilised, one public (Collèged'EnseignementGénéral de Doumassé) and one private (CollègeKouvahey). The population of pupils in the third year of secondary school in the two collèges is 723.

2.2 Sample

Our greatest intention was to take into account all the students in the ninth grade. Unfortunately, on the day of data collection, not all students wanted to participate in the survey. Most of them were in a hurry to return home since it was time to leave. Therefore, it was the students who were available and willing to volunteer to answer the items on all of our measurement instruments. In total, the survey involved a total of 515 students with the following characteristics:

Table 1: Breakdown by gender of students

Gender	Frequency	% of students
Male	267	51,80
Female	247	48,00
Missing system	1	0,20
Total	515	100

Table 1 shows that just over half of the students in our sample are 51.80% boys. Girls make up 48%.

Table 2: Age distribution

Age	Frequency	% of students
> 12 years	267	51,80
12-14 years old	247	48,00
15-18 years old	1	0,20
< 18 years old	515	100

There are more pupils under 12 years of age (51.80%) than their slightly older counterparts, i.e. 48% for pupils aged between 12 and 14, and 0.2% for pupils aged between 15 and 18.

Table 3: Distribution by social origin

Social origin	Frequency	% of students
Lower origin	339	65,8
Average origin	93	18,1
Superior origin	82	15,9
Missing system	1	99,80
Total	515	0,20

More than half of our subjects are of lower social origin (339 or 65.80%). Students of average social origin represent 18.1%. Finally, those of higher social origin number 82 or 15.9%.

Table 4: Breakdown according to whether or not they benefit from repetition courses in mathematics

Do you benefit from courses for math tutoring?	Frequency	% of students
Yes	211	41,00
No	302	58,60
Missing System	2	0,4
Total	515	100

The number of students who do not benefit from repetition classes in mathematics is much higher (58.60%) than those who do (41%).

2.3 Measuring instruments

Two different measuring instruments were used in this study. On the one hand, a socio-demographic questionnaire was used to collect the characteristics of the participants relating to their gender, age, social origin and the context of the rehearsal courses in relation to the place, time and authors of the rehearsal courses. On the other hand, the "Feeling of competence in mathematics" subscale of the Multidimensional Motivation and Academic Learning Scale (EMMAS) of Ntamakiliro et al. (2000) and used by Leclerc et al. (2010) to apprehend "the feeling of competence, moderator of the link between IQ and academic performance in mathematics" among 928 Montreal students. This subscale is composed of five items (α = 0.70) whose responses are spread over a seven-point Likert-type response scale ranging from 1 (Never or Not at All or Strongly Disagree) to 7 (Very Often or Strongly or Strongly Agree). Examples of items:

- I have difficulty with mathematics;
- I think I am good at math.

2.4 Method of data analysis

The quantitative method using statistical tests to compare average scores was used. In this case, it is the analysis of variance ANOVA: calculation of Student's t to compare two averages of two samples. This test makes it possible to show the significance of the differences between two samples considered and to rule on the existence of a relationship between the variables in question.

3. Results

In this section it is up to answer the two questions asked previously: what is the context (the place, time and status of the repeater) in which the rehearsal classes take place? And what is the impact of these rehearsal classes on the sense of mathematical competence?

3.1 What is the context in which repetition classes take place?

3.1.1 The location of the mathematics rehearsal classes

Table 5: Breakdown by location of the mathematics rehearsal course

Where does the tutoring take place?	Frequency	% of students
In the school	73	34,60
At home	138	65,40
Total	211	100

Of the pupils who claim to benefit from rehearsal classes, 65.40% consider that they do them at home. In 34.60% of cases, rehearsal classes are held on the school premises.

3.1.2. The timing of repetition classes in mathematics

Table 6: Breakdown by time of repetition courses in mathematics

When are the rehearsal classes?	Frequency	% of students
During the weekend	75	35,55
Wednesday afternoon	25	11,85
Weekends and Wednesday afternoons	96	45,50
Daily	15	7,10
Total	211	100

Rehearsal classes take place much more on weekends and Wednesday afternoons in 45.50% of cases. The students who do their rehearsal classes at the weekend are 75 or 35.55%. Wednesday afternoons are the time chosen by 11.85% of the students. Finally, only 7.10% of the students declare that they do their rehearsal classes every day of the week.

3.1.3. The status of the person in charge of the rehearsal classes in mathematics

Table 7: Distribution according to the status of the person in charge of the mathematics rehearsal course

Status of the rehearsal instructor	Frequency	% of students
Teacher	123	58,29
Student	82	38,86
Other officials	6	2,85
Total	211	100

In the majority of cases, repetition classes in mathematics are given by teachers of this subject (58.29%). Students account for 38.86% of the lecturers in these courses. Only 2.85% are taught by other civil servants.

3.2 Is there an impact of rehearsal courses on the feeling of competence in mathematics?

Table 8: ANOVA: Sense of competence in mathematics and whether or not students benefit from repetition courses in mathematics

Do you benefit from a course for math tutoring?		Frequency	Mean	Standard Deviation
Feeling of competence in Mathematics	Yes	211	24,33	5,01
	No	302	21,56	5,80
Total		513	22,95	5,41

From Table 8, it is clear that students who receive mathematics rehearsal classes have a higher average score of feeling competent in mathematics than students who do not receive such classes. Respectively, these average scores are 24.33 and 21.56. Comparing the two scores, the difference is very significant ($t_{511} = 5.26$; $p < 0.000$). Thus, there is a clear relationship between repetition classes and the feeling of mathematical competence.

4. Discussion

The objective of this study is to answer the following questions: What is the context (place, time and status of the tutor) in which rehearsal classes are held? Is there an impact of these rehearsal classes on the feeling of mathematical proficiency?

With respect to the context in which the repetition classes take place, data collected from 515 students in the ninth grade described the context in which the repetition classes take place. Indeed, the results show that the majority of repetition classes in mathematics take place in the students' homes. Yabouri et al (2010) made the same observation, confirming the private nature of these classes. This is what makes it difficult to legislate these pedagogical strategies. Also, these classes take place on Wednesdays and weekends. Using rest periods or even every day for some students to attend these classes indicates the state of anxiety in which these students are (Lafortune and Fennema, 2002). Anxiety in mathematics can be defined as "an emotional state characterized by worry, uneasiness, and fear that can prevent one from doing mathematics" (Lafortune&Fennema, 2002 in Lebrun, 2017; p. 15). Finally, we have noted that it is mathematics teachers who are called upon for rehearsal classes both at home and at school. Is it not the remunerative nature of these courses (Kabore, 2008) that pushes these teachers to make more money? Above all, in the private sector, where the salary barely reaches the guaranteed interprofessional minimum wage (SMIG), there is reason to do so.

To the second question concerning the impact of mathematics repetition courses on the feeling of competence in this subject, we noted that it is the pupils who benefit from mathematics repetition courses who have a strong feeling of competence in this subject. This proves the existence of a link between these two variables. However, Cosnefroy (2007) finds a positive and strong correlation between students' feeling of competence in mathematics and their interest in this subject. If rehearsal classes make students' feeling of competence in mathematics strong, it is because, in turn, these classes have an impact on student motivation. This feeling is seen as a lever for motivation (Burkhardt, 2017). According to the socio-cognitive approach, "motivation in the school context is a dynamic state that has its origins in the perception that a student has of himself and his environment and that encourages him to choose an activity, to engage in it and to persevere in its accomplishment in order to reach a goal" (Viau, 2009, p. 22 in Jahiji, 2016). There is therefore no learning without motivation and no motivation without learning (Viau, 2003). In addition, the feeling of self-efficacy plays a mediating role in the motivational dynamic between activity and perseverance as well as activity and cognitive engagement in the task (Viau, 1994). According to Bandura (2007 in Jahiji, 2016; p. 11), the feeling of self-efficacy has a direct influence on the level of mastery of school subjects, and therefore of learning. A high feeling of self-efficacy leads students to better regulation of learning because it makes it easier to abandon erroneous strategies and select the most effective ones. In this way, pupils who have developed "a certain cognitive elasticity" (Puozzo Capron, 2010 in Jahiji, 2016; p. 11) will invest in the pursuit of the goals they have set themselves by making the necessary effort to overcome any obstacles (Bandura, 2007). "The feeling of self-efficacy acts as an enzyme that creates a virtuous circle that enables a positive and effective approach to learning in schools" (Bruni, 2011, in Jahiji, 2016; p. 11). As a result, pupils who benefit from repetition classes persevere in the face of the mathematical difficulties they encounter, the amount of positive energy invested in the effort or negative emotional reactions, particularly those related to stress and anxiety, increases.

5. Conclusion

The aim of this study is twofold: to describe the context in which repetition courses in mathematics take place in Togo and to verify whether there is a relationship between repetition courses in mathematics and the feeling of competence in this subject. At the end of this report, we believe that this objective has been achieved. Indeed, we found not only that the pupils who benefit from the repetition courses in mathematics have a strong feeling of competence in this subject, but also that these repetition courses are mostly carried out by the teachers, at the pupils' homes on Wednesday afternoons and weekends. The fact that there are only two schools can be mentioned as a limitation of this study. It would limit any generalization. But it must be recognized that our results provide sufficient information in the Togolese scientific literature on the importance of repetition courses in mathematics on the feeling of competence of the pupils. In view of this importance, it is urgent to define a legal framework for the holding of this rehearsal course.

Finally, Leclerc et al (2010) show that there are positive correlations between the feeling of competence and academic performance in mathematics and science. Therefore, in the Togolese context, it is important to see whether pupils who benefit from repetition classes and who have a strong feeling of competence in this subject also obtain the best marks in this subject. This is a possible perspective for future research.

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