

Evaluating the Effectiveness of an Emulation Initiative on Pupils' Performances in the School District of Bacongo in Brazzaville-Congo

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Abstract: This research focuses on school emulation and pupil achievement. It aims at evaluating the effectiveness of an emulation system put in place, in Congo-Brazzaville, by teachers for the sake of boosting pupils' motivation and awakening in them the interest for learning. Within a class, this pedagogical initiative consists in clustering pupils according to their academic performances in order to design a level groups-based classroom layout. Pupils are usually clustered into three homogeneous groups, namely 'good' also named as the 'right away', the 'medium' group and the 'weak' group pejoratively designated as the 'never'. This cross-sectional and descriptive study was carried out in a public primary school in the school district of Bacongo in Brazzaville, Congo. The effectiveness of this pedagogical initiative is assessed on the basis of a statistical analysis of a corpus of trimestral average marks of 309 pupils from CP1, CP2 and CM1 classes. The major findings show that this pedagogical initiative has counterproductive effects on learning. Indeed, the school performances have not changed significantly. The trend in school results is rather generally downward as school evaluations are conducted. In addition, it appears that: (i) the probability for a pupil to remain in his group is very high; (ii) pupils in the 'weak' group have a low probability of transitioning to the 'medium' or 'good' groups. This fact should allow education professionals to consider more effective approaches to boost learners' motivation.

Keywords: School emulation, school performance, motivation, transition, pedagogical device.

1. INTRODUCTION

Scientific references indicate that motivation is an essential factor for success, perseverance in an activity and in all spheres of human activity. The education sector is no exception. Indeed, in the school context, many research studies have shown that a high level of motivation suggests a higher probability of success. On the other hand, a lack of motivation can lead to failure or dropping out of school (A. Wigfield et al., 2002; R. Viau, 2007; C. Ratelle, et al., 2007...).

Hence, how to generate listening and maintain interest through pupil concentration, during school teaching/learning? How can we help them mobilize their cognitive capacity to learn effectively and progress in their studies? These questions are always at the heart of the concerns of education professionals. T. Gordon (2003), interested in this issue, showed in his study that most parents and teachers believe that children learn more efficiently if there is an external constraint or motivation imposed on them. Several forms of stress can be exerted on the pupil. Research has shown that school emulation is the most widely used in primary school. (C. Couture et al., 2013; K. F. Hoffmann et al., 2009; L.A. Rawlings, 2007, R. Vienneau, 2011). By the way, in the study by Fortin et al. (2016), more than 76.6% of teachers use emulation in their teaching practices. It should be recalled that the practice of emulation took shape in the old pedagogy. She assumed that, in order to learn, each pupil should take as model the best pupils in their class. Nowadays, there are various types of emulations: posting of the names of the best pupils on an honors roll, awards ceremony for the best pupils, verbal recognition or encouragement by the teacher or peers...

In the Congolese educational context, especially in primary school, emulation has a very large audience. Almost all teachers use emulation. They often set up a special arrangement whereby pupils are grouped and placed in their classrooms according to their results in the trimestral evaluations. Accordingly, learners fall into three groups: the first is made of good pupils that is called the group of the *'right away'*. The medium pupils fall in the second group known as that of the *'not ready'*. Finally, the weakest pupils constitute the group of the *'never'*. In addition, it should be noted that the configuration of the classroom space changes according to the results of the pupils at the different evaluations. Two possible phenomena can be observed: either the student stays in his or her group, or he or she transitions to other groups during the next assessments.

Despite the omnipresence and almost hegemony of the practice of emulation in the Congolese educational context, it must be noted that performance indicators from international evaluation reports show that: *"The education system has a low internal efficiency, characterized by high rates of repetition and drop-out at primary levels, resulting in a relatively low completion rate."* (PASEC, 2014, p. 6). It is in this context that the research topic entitled "Evaluation of the effectiveness of an emulation system on the academic performance of pupils in the school district of Bacongo in Brazzaville" has been built-in.

In order to analyze and interpret the effects of the emulation system on pupils' academic learning, this research work has drawn on learning theories, specifically behaviorism and socioconstructivism. Behaviorism postulates that behaviors respond to environmental stimuli (J. Archambault et al., 2009). In this study, the grouping and placement of students according to their skills represents a reinforcer that can either positively or negatively alter students' behavior in learning situations. The socioconstructivist theory considers motivation as a construction of the human being through the history of his experiences. This is largely the result of interaction with other social actors. In this vein, L.S. Vygotsky (1978), speaking of school learning, believes that mental processes are shaped by the practical and contextual activities in which they are implemented. What effect does the emulation system have on academic performance? In light of these theories reviewed, we can ask ourselves what impact the competitive school context may have on students' academic performance.

It is true that this topic has been the subject of significant research. However, in the Congolese educational context, it is superficially addressed. Therefore, it is important to investigate the legitimacy and the educational and pedagogical value of this system. Also, the results of this study could inspire actors to define efficient motivation strategies.

This research paper, apart from the introduction and the conclusion, is structured in four parts: problematization of the study (Section 1), methodology (section 2), and results and discussion (Section 3).

1.1. Problematization

The scientific literature on emulation, reward and academic achievement has shown that these two strategies are effective tools in managing difficult and motivational behaviors of pupils (E.G. Car et al., 1994; G. Sugai et al., 2000...). On the other hand, T. Gordon (ibid) showed that rewards are not only ineffective, but also corrosive, in that they "eat up" the motivation that is a real factor in the achievement of competence and self-esteem. In addition, they destroy the pupil's spontaneity, pleasure, and desire to collaborate and feel useful. According to the same author, the lack of reward can reinforce school inequalities since awards are generally reserved for the brightest pupils. As a result, other pupils experience the absence of rewards such as punishment and may stop making efforts. That's why Toraille et al., (Sine datum) wrote that: *"It happens that the game of emulation in a class is limited to a few pupils, to those who have a chance to succeed. The others willingly settle down in a kind of acceptance resigned to their situation, in a school fatalism that gradually destroys all enthusiasm and enthusiasm"*. For his part, M. Montessori (2010) believes that rewards are the enslavement of the spirit. She overstates the case by pointing out that at school, rewards can breed envy and vanity, rather than elevation.

The analysis of the research work cited above shows controversial points of view. This dichotomy feeds doubt about the relevance of the practice of emulation to school learning.

Thus, on the basis of the above facts, our research, which focuses on the problem of the effectiveness of the emulation system, from the point of view of pupils' academic performance. It proposes to answer the following main question: Does this school emulation system improve pupils' academic performance?

The subsidiary questions that arise from this are:

- What are the effects of this system on pupils' academic performance?
- What is the level of difficulty a pupil in the 'weak' group must overcome in transiting to the 'good pupils' group?
- What is the probability for a pupil to stay in his/her group or to transit to another group?

The theoretical argumentation directed our research towards the following main assumption: does this school emulation system not improve pupils' academic performance?

In congruence with the specific research questions, we assume that:

- This emulation device is not positively related to pupils' academic performance;
- It is very difficult for a student from the 'weak' group to be able to migrate to the 'good' group;
- In this highly competitive educational context, it is very likely that a student will stay in a given group, and unlikely that he or she will transfer to other groups.

This research aims at evaluating the effectiveness of the emulation system on pupils' academic performance. More specifically:

- To describe the progress of pupils' academic performance during the three annual evaluations;
- To assess the level of difficulty for a pupil in transitioning to other groups;
- To determine the probability for a pupil to remain in his/her group or to migrate to another group.

The answers to these research questions require methodological precautions that are explained in the next section.

2. METHODOLOGY

Being a cross-sectional and descriptive research type, this study was carried out in Brazzaville, in a public primary school in the school district of Bacongo. This choice is due to the fact that the constitution of classes by level of competence is a more or less avowed pedagogical policy of this school.

2.1. Sampled Participants

The study involved all pupils in this school, an estimated target population of 1,367 pupils. To select the sample of participants, we used the reasoned sampling technique. This selection was based on one criterion, including participation in the three quarterly evaluations of the 2019-2020 school year. For this purpose, a sample of 309 pupils was formed. Pupils came from classes of CP1, CP2, and CM1, corresponding to the first two and the penultimate year of the primary cycle. Table 1, hereafter, gives the sample distribution by pedagogical level.

Table1. *Sample Distribution by Classroom*

Classroom	CP1-A	CP1-B	CP2	CM1-A	CM1-B	Total
Number of pupils	44	35	61	81	88	309

Source: *field survey, Y. Bakingu Bakibangu. et al. 2021.*

2.2. Data Collection Instrument

Data were collected from a document review. Precisely, a corpus of quarterly averaged marks of these pupils was compiled and analyzed.

2.3. Data Analysis Method

For each class, pupil averaged marks were partitioned into three homogeneous groups corresponding to good, medium and weak groups. To do this, an automatic classification technique was used. The automatic classification consisted in creating these groups from algorithms involving data only and not the subjectivity of the experimenter. An unsupervised learning method (the k-Means algorithm) was used under the Matlab software. The principle of this method is summarized as follows: given the points (averages of pupils in our case) and an integer k , the problem is to divide the points into k groups, often called clusters, in order to minimize a certain function. We consider the distance of a point to the average of the points of its cluster. The function to be minimized is the sum of the squares of these distances. The only specification given to the algorithm is the number of groups (3) to conform to the practice of teachers. Once the classification was completed, the transitions of pupils from one cluster (group) to the other were identified and then counted in order to define empirical transition probabilities (number of transitions/number of pupils in the group). The transitions, averaged over the year, then made it possible to build directed graphs whose nodes are groups of pupils (good, medium, weak). The existence of an edge of a node A to a node B means that transitions have been made from group A to group B. The weighting of the edge corresponds to the previously calculated empirical probability of transition. Another marker to be evaluated is that related to the difficulty of transiting to a higher level group. We assess the difference in averages between the last of the top group and the elements of the interest group. Therefore, the minimum average gap between the weak and the medium is obtained by making the difference between the lowest average of the middle group of pupils and the average of the scores of all pupils in the weak group of pupils. This marker is then averaged over the three evaluations of the year.

3. RESULTS

The results of the analyses intended to verify the hypotheses are presented in three subsections: analysis of the evolution of school performance, analysis of the minimum deviation from the upper-level groups, analysis of the probability of remaining in a given group or transiting to another group

3.1. Analyse de l'évolution des Rendements Scolaires

On average, Figures 1, 2 and 3 show the variation in pupil achievement over the three assessments.

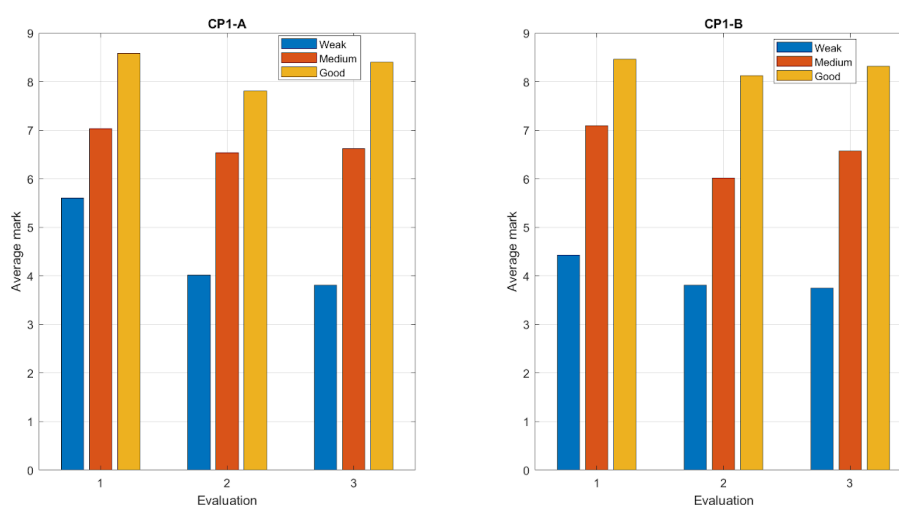


Figure1. Average mark by level group at CPI

Between the first and subsequent assessments, there was a significant drop in the average mark of the weak group in both classes. The second (2) and third (3) evaluations are of a comparable level. For the group of good pupils, there were no significant variations over the three assessments.

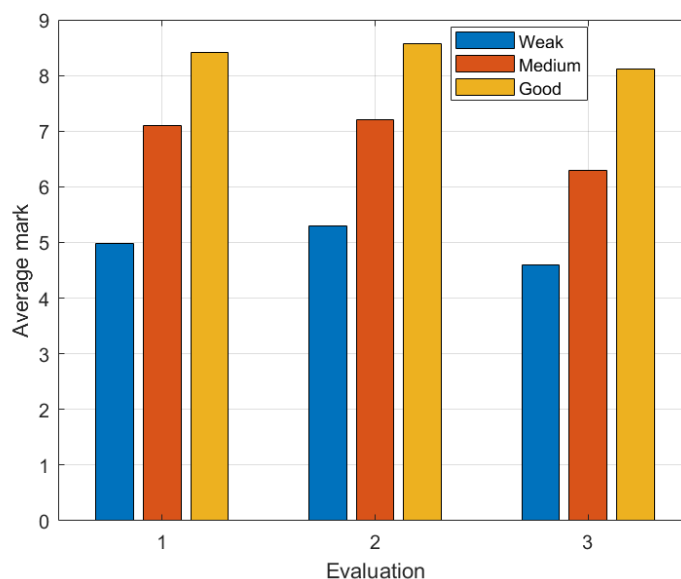


Figure2. Average mark by level group at CP2

Reading data from Fig 2 shows a decrease for the Weak and Medium groups between the first and the last evaluations. This decrease is more pronounced for the Medium group. Performance of good pupils is in average constant.

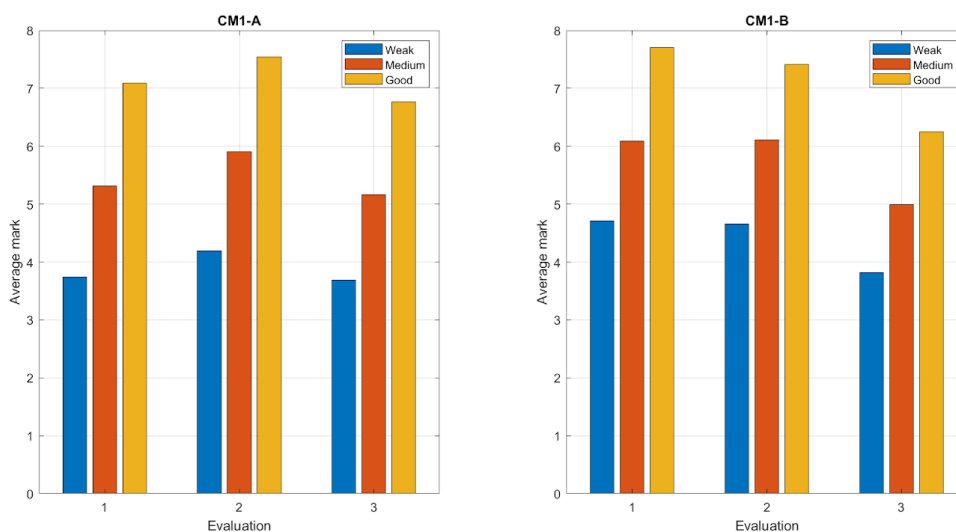


Figure3. Average mark by Level Group at CM1

For both classes of CM1, there are two different dynamics. In CM1-A, for all groups, there is growth and then a decline towards a lower level of results at the end of the year. In CM1-B, the overall trend is towards decreasing over time.

These results suggest that regardless of the educational level evaluated, it is found that the educational system did not produce positive effects. Indeed, there has been no significant improvement in pupil achievements. The trend is rather downwards overall over the three quarterly evaluations, except for the good pupils in CP1 which almost maintain their performance.

3.2. Analysis of Minimum Deviation from Higher Level Groups

This analysis aims at assessing the minimum average gap between the groups of weak and medium pupils, medium and good pupils, and weak and good pupils. This gap expresses the difficulty a pupil has in transiting to the higher level group. We have assumed that the larger the gap, the more difficult it will be for the pupil to transition to a higher level group.

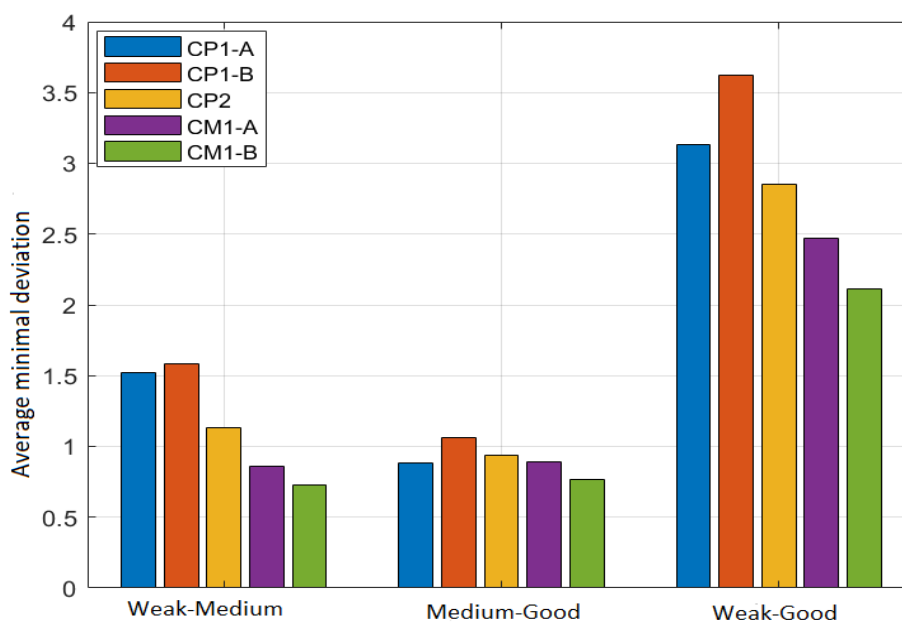


Figure4. Average Minimum Deviation

The analysis of this figure shows that the minimum gap is greater between the weak and the good; it is more than 2 points of average whatever the teaching class. Between the weak and the means, the gap is at least one point for the pedagogical classes at the beginning of the cycle (CP1 and CP2). It narrows for CM1, becoming comparable to the gap between the medium and the good pupils. It can therefore be expected that the probability of transition from the ‘weak’ group to the ‘good’ group be significantly low compared to the transition from the ‘weak’ to the ‘medium’ group. We can also observe that the minimum gap, for weak-medium and weak—good, pupils decreases with the teaching class. The higher the pedagogical level the lower the gap. This may be due to a downward leveling rather than the other way around.

3.3. Analysis of a Pupil’s Likelihood of Maintaining or Transiting

Figures 5, 6 and 7 show the weighted graphs of transitions between the different level groups in a classroom.

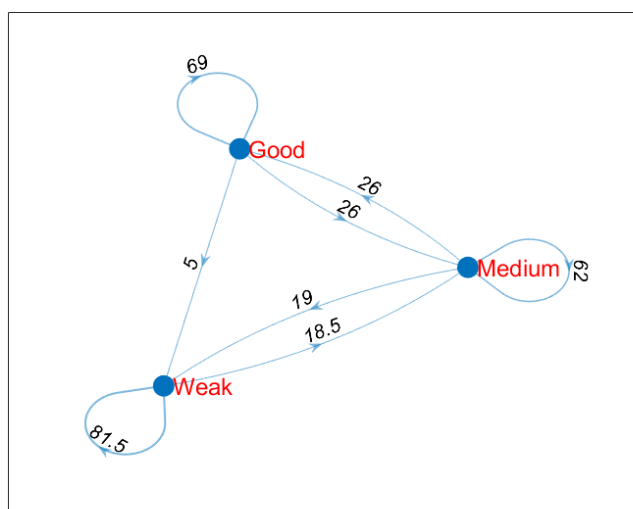


Figure5. CP1 level weighted transition graph between groups

According to the CP1 transition graph, the probability of a pupil remaining in a given group is very high. Indeed, it is 81.5% for the weak pupils, 62% for the average pupils and 69% for the good pupils. The positive transitions observed reveal that 18.5% of students from the weak group transition to the medium group and 26% of medium students transition to the good group. However, the risk of downgrading is not zero. It is respectively 5% for good pupils to the group of weak pupils and 12% for average pupils to the group of weak pupils and 26% for good pupils to the group of average pupils.

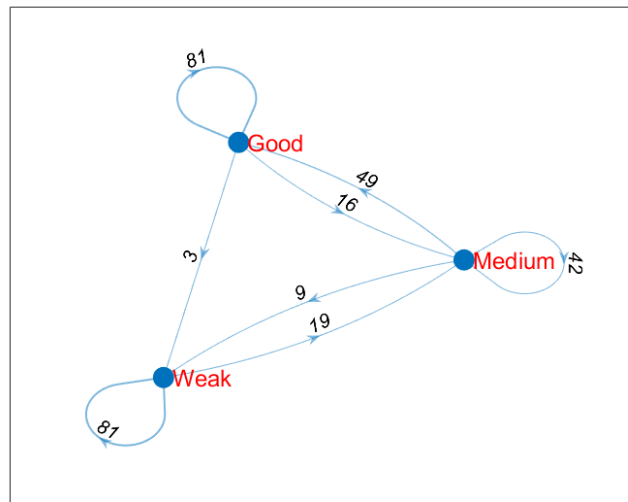


Figure6. CP2 level weighted transition graph between groups

The data shown in Figure 6 first shows that the probability of a pupil staying in a given group is very high for poor or weak pupils and good pupils, at 81%. Then, the transitions from average pupils to good or better pupils are more significant (49%), than from weak to medium (19%). Finally, the risk for a good pupil to go down to the weak group is 3%. It is of 9% from medium to weak and of 16% from good to medium.

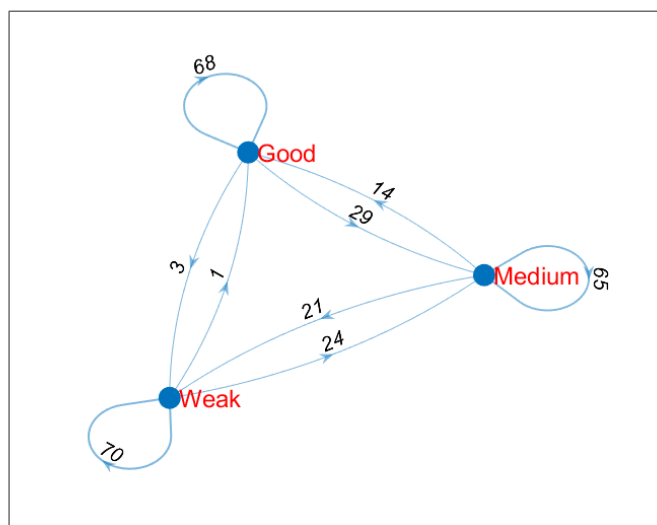


Figure7. CM1 level weighted transition graph between groups

From Figure 7, on can note that the probability for a pupil to stay in his level group is high (68% for good, 65% for medium and 70% for weak). Transitions to better groups are low. Indeed, weak pupils

have almost no chance of transiting to the group of good pupils (1%) while their probability transition to medium pupils is 24%. The probability of demotion of good pupils is respectively 3% to the group of weak pupils and 29% to the group of medium ones while it is of 21% from the medium group to the weak one.

From these three graphs (Figures 5, 6 and 7), the following conclusions can be drawn:

- Regardless of the teaching class, it is almost impossible for a weak pupil to migrate to the group of good pupils.
- In early school classes, the progression of weak pupils towards the middle level is less significant (18.5% in CP1 and 19% in CP2) than at the end of the cycle (24% in CM1). These results suggest that at the beginning of the cycle, the emulation system does not contribute to the improvement of the results of the weakest.
- In CM1, the proportion of transitions from good pupils to the middle class is higher (29%) than the reverse (14%). In other words, the educational attainment of many good pupils is declining. This supports the assumption of a downward levelling that we have mentioned above.

4. DISCUSSION

The aim of this research was to evaluate the effectiveness of the emulation scheme on pupil achievement. On an operational level, it was a question of describing the progress of pupils' academic performance, assessing the level of difficulty to be overcome for a weak pupil to migrate to the group of good pupils and determine the likelihood of a pupil staying in a given group or transiting to other groups.

In this section, we highlight two relevant findings from the study. The first result relates to the impact of the emulation scheme on pupils' academic performance. The analyses and interpretations of the data from the literature study showed that this scheme does not have a positive impact on pupils' academic performance. Indeed, the academic performance of these pupils has not progressed significantly over the course of the evaluations. On the contrary, the overall trend has been a decline in results over the three evaluations (Figures 1, 2 and 3). The second interesting and relevant finding relates to the probability that a pupil will remain in his or her group or move to other groups. Analysis of the results shows that there is a high probability for a pupil to remain in a given group (Figures 5, 6 and 7). However, there is a low probability that a pupil will improve their academic performance to change groups (positive transition). It is weaker for a good pupil to demote (negative transition).

Based on these results, we find that emulation, as practiced in our education system, is not productive. To explain these results, several hypotheses are plausible.

The first explanation relates to the organization of the learning space. We believe that the organization of the class into homogeneous groups has not been effective in the success of the learnings. It did not facilitate mutual assistance and collaboration between the different categories of pupils. Yet, I. Plante (2012), speaking about student cooperation, indicated that it is an incentive for effort to complete academic tasks. The author also showed that pupils who work in a cooperative setting devote more time to tasks than pupils who learn competitively or individually. P. Merieu (2004, p.117), focusing on the negative effects of homogeneous groups, writes: *"We learn nothing from the same: we are strengthened in our certainties, we admire ourselves as Narcissus in the mirror of the other [...] every pupil needs to be considered in his difference and grouped with others."*

Similarly, Piaget and Vygotsk's psychological perspectives both support the idea that interactions are more beneficial when the topics involved present different skills. In other words, you learn easily with someone who has a higher intellectual level.

The second explanation relates to the climate prevailing in this learning space. To our understanding, this scheme has accentuated in pupils the spirit of competition to the detriment of cooperation. Thus, this competitive classroom climate was not conducive to the progress of pupils in the weak group. This finding corroborates that of S. Woollcombe (2015) who found in her study that competition, even in its most playful form, is not appropriate for all the pupils within a class. Especially for those

pupils who fear being "exposed". He believes that opting for competition favors some pupils at the expense of other pupils. Similarly, P. Sarrazin (2006) and N. Leroy et al., (2013), have shown that a pupil seeking to learn and progress will be more motivated in a climate of mastery than in a climate of competition.

The third explanation concerns the affect of the pupil's psychological sphere. The low performance recorded would be attributed to the categorization of pupils into homogeneous groups. In this context, each pupil is linked to a label, ('the immediate', 'the little ready' and 'the never'). , this type of referent, under the play of interaction, can affect the pupil's psychological balance and lead to a disinvestment in school work. This result is identical to that of A. Florin et al (2007) and R. Viau (op. cit.). Indeed, these authors have shown a causal relationship between self-esteem and academic performance. They also noted that self-esteem directly affects the degree of involvement of the pupil in school tasks. Similarly, D. Martinot, (2005) also emphasized the value of good self-esteem in successful learning. Indeed, according to the author, a positive conception of oneself makes it possible to believe in one's abilities, to review one's objectives upwards and to increase motivation and perseverance in the face of difficult school tasks.

However, the good pupils probably had a satisfying school experience, with praise and encouragement. This, in our opinion, caused these students to focus on demonstrating their skills. This probably explains the high percentage of retention in their group (69%, 81% and 68%). These results are in line with those of M. Montessori, (op. cit), who showed that emulation is likely to generate envy and vanity, instead of elevation.

Finally, the fourth explanation can be linked to the lack of knowledge of the principles of the system of emulation by Congolese teachers, in this case the pedagogy of proximity and the personalization of learning. We assume that the constant low performance observed with weak pupils is due to poor teacher management. A teacher in an overcrowded class, probably working with pupils participating in the course by asking questions or answering questions (right away and ready to go), while 'never' or 'no' are left behind. This hypothesis is similar to the results of studies by Archambault et al., (op. cit.), which found that more than 40% of teachers consider having a low or moderate level of knowledge about the basic principles of using an emulation system.

5. CONCLUSION

The aim of this research was to evaluate the effectiveness of an emulation system on the educational performance of primary school pupils. This system consists of grouping the pupils in the class according to their academic performance. To answer the research questions, a literature review of a corpus of quarterly averages of 309 pupils was conducted. The results of the various analyses have shown that this scheme is inefficient. In fact, the school performance of pupils has not changed significantly, the trend has been generally downward as the evaluations have been carried out. Based on these results, can we still find an interest in maintaining this kind of practice?

We do not dare to take the risk of establishing a causal relationship between this system and the facts that were observed, and we believe instead that a consideration should be given to psychological aspects such as the experience of labelling by these pupils, the analysis of the relationship between the weak pupil and the teacher on the one hand, and between the weak pupil and his/her peers on the other.

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