

## The need for teacher training for Middle School and High School teachers in Madagascar

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**Summary:** Based on our own lived teaching, studies of errors made by high school and high school students in Madagascar through mathematical writing activities have shown that secondary school teachers require enormous stimulation. On this subject, in this paper we try to propose "How mathematics should be taught", and "the common point between the pedagogy of mathematics in French and that of French in a scientific class" in view of the effectiveness of the educator and to leave learners 'on-loving towards this matter.

**Key Words:** Teacher's characteristics, Learner's characteristics, Mathematical Writing, Error Analysis.

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### I- INTRODUCTION

The psychology of education concerns research and theories likely to better understand the activity of the student and the interactions between it and his school environment from the teacher to the institution itself (Marie-Laure & Davezac-Duhem, 2010), (Karen Francois & Jean Paul Van Bendegem, 2007), (Keith Devlin, 2012). In fact, there are many possible ways to provide education. It requires a huge initial and ongoing training for its guarantee. This is a reason why UNESCO has launched a qualitative challenge of trainer, educator, teacher, etc. (UNESCO, 2011). Writing and mathematical communication is the foundation for a better future for learners in society (Alma Harris and Daniel Muijs, 2005). Several authors have already announced that the writing of mathematics is a very tedious task and therefore requires an immense effort to the designer, (EduSCOL, 2009), (Kolette E. & Albert IC, 1993), (S. Maury, 1994), (Jules Payot, 1913), (G. Polya, 1965), (Cabassut Richard, 2005), (Gerard Dumont, 2004), (Stéphane Enrich, 1990). It requires a good trainer and / or a good teacher to make effective the knowledge and/or skills acquired by learners. Understanding mathematics remains well beyond the ability to do calculations, the ability to build reasoning to find solutions to a given problem, (Kevin Houston, 2009), (UNESCO, 2011). All teachers must have and / or know the ways and / or methods of transferring the real skills that learners need to be assigned so that they never stumble in life. In the field of solving exercises, more specifically on the modes of answering mathematical questions and many others, copying the question is not acceptable as a mathematical skill. In this paper, we will analyze the origin of several mistakes often made by middle school and high school students in order to give some guidelines that may be necessary for learners.

### II- TASKS OF TEACHERS FACING HIS LEARNERS

One of the most important duties of a teacher is to help his learners in difficulty and to make his subject love. This duty is not easy. It requires time, practice, dedication, and good principles (G. Polya, 1965). The learner must acquire the widest possible experience of personal work. But if he remains alone in his problem, without any help, or with insufficient help, he can make absolutely no progress.

On the other hand, if the teacher helps too much, he has nothing left to do. The teacher must help him, neither too much nor too little, so as to leave him a reasonable part of the work. If the means of the learner are limited, the teacher must at least keep the illusion that he is providing a personal work; to do this, he must help it in a discreet way, without imposing on him (G. Polya, 1965), (Stéphane Enrich, 1990). The best is to help the learner in a natural way. The teacher must put himself in his place, examine his particular case, and try to understand what is going on in his mind, ask a question or indicate a stage of reasoning that might have come to the mind of the learner himself: question, recommendations, and intellectual operation. By trying to help the learner in an effective and natural way, but without imposing himself on him, the teacher is led to ask the same questions all the time, to constantly indicate the same stages of reasoning. Thus, in innumerable problems, we must ask the question such as: "What is the unknown? ". We can vary the vocabulary, ask the same question in a different way: "what do we ask for? What do you want to find? What are you supposed to look for?. The purpose of these questions is to force the learner to focus on the unknown. Sometimes, we obtain the same result

in a more natural way by suggesting to look at the unknown. Question and suggestion are aimed at the same goal: they tend to provoke the same intellectual operation. It should be remembered that a teacher must have styles of paternalistic and democratic leadership (UNESCO, 2011).

### III- MATHEMATICAL WRITING

The essential tool for building valid reasoning is writing the problem resolution. Mathematics is a discourse consisting of logically arranged propositions. Subsequently, the objectives of mathematical writing are:

- Master the architecture of reasoning;
- Master the logical links articulating the reasoning;
- Advance the right arguments;
- Justify the delicate passages.

Writing mathematics then involves putting one's speech in writing so that it can be read and understood by another person (Mr Wambst & Y. Genzmer, 2008), (André Totohasina, 2011). It is a question of describing as precisely as possible the reasoning followed by the maximum justifications. In addition, writing is purely an exercise in writing. It differs in particular from what can be written when taking class notes or when doing a course on the board or the oral and writing mix. Even if we use mathematical notations in the text, we will avoid using too much abbreviation and we will associate to make sentences. Finally, one is not allowed, under pretext of mathematics, to malmenerate the grammar and the spelling of the language in which one expresses. Developing a good writing also means writing as precisely as possible the reasoning followed by maximizing the implications or the equalities. A good student copy should contain only the necessary arguments, without redundancy or useless sentences. Moreover, the writing is purely an exercise of writing; everyone is aware that a real specialist has the ability to design a technical object, and can embrace several areas at once. But skills do not come alone; they require prior training before they are actually acquired and valued. The courses are in the field of Education and Education. Finally, one is not allowed, under pretext of the course of mathematics, to malmenerate the grammar and the orthography of the language in which one expresses oneself.

#### ➤ Why write well?

The purpose of a copy is to be read! We must therefore comply with the conventions of notation, and verify that the reasoning does not contain any ambiguity to structure his thinking. Writing well helps clarify your ideas and makes it easier to find the logical solution to a problem. To apply well to writing requires intellectual rigor, which is also required in literary disciplines to avoid errors (James T. Kinard & Alex Kozulin, 2008). Writing well also requires you to be rigorous and therefore to identify the difficulties or traps hidden in a question. And so to earn points in competitions! If you write well: you will avoid the pitfalls; you will have all the points to the questions answered ... But in addition: you will have a bonus and the corrector will be more indulgent in the face of certain errors (Wayne A. Wickelgren, 995).

### IV- DIFFERENT TYPES OF LEARNER ERRORS

We did a sampling for the analysis of the mistakes made by the learners. The sample totals 409 learners of whom: 61 belong to the 6<sup>th</sup> Grade, 52 - the 7<sup>th</sup> Grade, 43 the 8<sup>th</sup> Grade, 52 the 9<sup>th</sup> Grade, 87 the 10<sup>th</sup> Grade, 55 the 11<sup>th</sup> Grade, and 66 learners of the 12<sup>th</sup> grade. We took samples of control errors presented in the Appendix. The possession of the collected data leads us to make some remarks and to make some recommendations in the field of Education in Madagascar.

In the work of the teacher, the organization of an examination on a topic already treated, and this examination must be corrected appropriately and not wrongly and through. Indeed, and this is frequently seen in Madagascar, several teachers are tolerant in the assessment of learners' copy sheets, that is, they tend to assign inappropriate marks to the work done by the learners. Therefore, this habit gives the learner a false self-assessment and even a bad impression in the society where he lives. Let us leave this aside and see more closely the mathematical domain. For example, here is an analysis of the copy sheets of learners of the 4<sup>th</sup> class). The question was asked as follows: "Solve the equation obtained". Note that this equation is of the form:  $2x + 7 = 3$ . A student answered this way as we see figure 1.

"Solve the equation obtained"

$$\begin{aligned}2x + 7 &= 3 \\2x &= 3 - 7 \\2x &= -4 \\x &= -4/2 = -2 \\x &= -4\end{aligned}$$

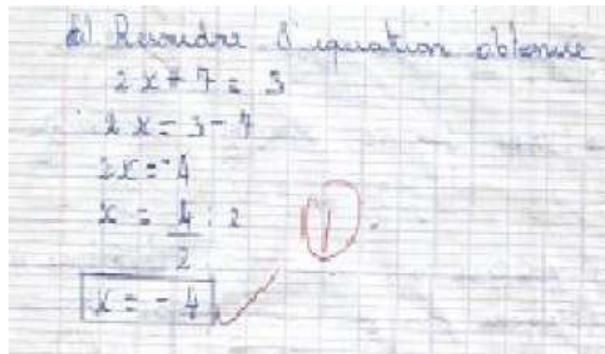


Figure 1. - Error committed by a 4th grade student

Here is another question:

1) Calculate the sum of the following vectors

a)  $\vec{AB} + \vec{CD} + \vec{BC}$

b)  $\vec{EF} + \vec{GE} + \vec{FG}$

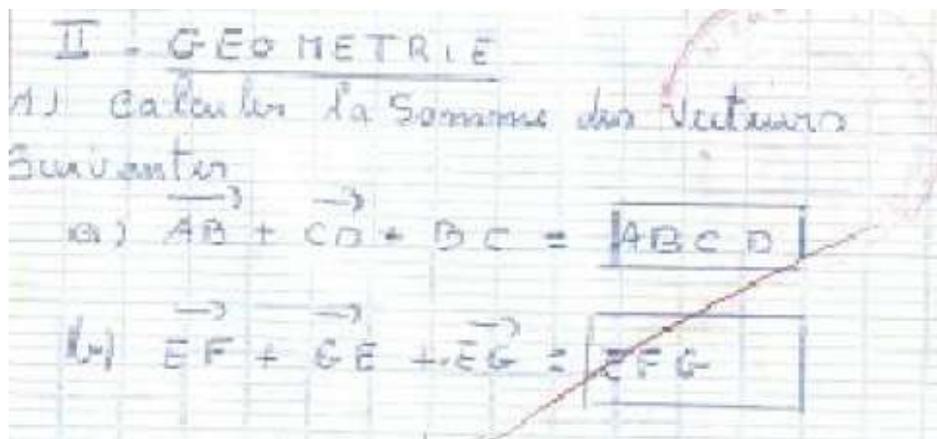


Figure 2. - Error committed by a 4<sup>th</sup> grade student

As we see, still in this class, a learner responded by writing:

1) Calculate the sum of the following vectors.

a)  $\vec{AB} + \vec{CD} + \vec{BC} = \vec{AB} + \vec{BC} + \vec{CD} = \vec{AC} + \vec{CD} = \vec{AD}$

b)  $\vec{EF} + \vec{GE} + \vec{FG} = \vec{EF} + \vec{FG} + \vec{GE} = \vec{EG} + \vec{GE} = \vec{EE} = \vec{O}$

And these learners got the maximum score scale as we see in Figure 2 mistakes made by 4th grade learners. Without saying the opposite on the right of a corrector in the field of correction, but still, several comments appear here obvious and feasible. It is practically impossible to collect all similar mistakes made by teachers throughout Madagascar, especially about learners who take the questions squarely or respond to them wrongly and through, but still accepted by the teacher. The analysis of such an error leads to the character of certain professors who easily admit the obviously false answers and defend their acceptance. The source may be the lack of pedagogical competence. It is incumbent upon everyone to answer this question: do these teachers really ignore the false answer? The excuse here lies in the following fact: "the learner has gotten the right grade, which makes him think that what he wrote is indisputably fair". The learner goes on to higher class with a false and erroneous intellectual baggage, which affects his whole life and will leave a certain problem for the teacher who will welcome him. The analysis that we carried out at the level of college, especially in the classes from the 6<sup>th</sup> Grade to the 8<sup>th</sup> Grade, even in the 9<sup>th</sup> Grade, shows an immense number of teachers having this character, that is to say if the someone is asked to calculate 2 + 2, and the person has answered 4, so that person gets the

maximum score regardless of the nature of the way to obtain the answer: such an assessment approach It's not about it. Indeed, without pretending to be a jurist, we say that the way to answer questions also has its rules which are worth observing (Wayne A. Wickelgren, 1995), (Andrew Noyes, 2007), (James T. Kinard & Alex Kozulin, 2008). The possible reasons are various.

Primo: At the College and Middle Schools level of Madagascar, there are several private schools with a number of learners exceeding one thousand. In fact, the overstaffing of the present in a class makes the checks very difficult for each learner.

Secondly: As we have already said, at the level of public institutions, thousands of teachers paid by Parents' Associations occupy these positions. In the absence of a good job structure, many teachers in these institutions are not even holders of the Baccalaureate, that is to say academically are not able to perform such a function. This statement is shared at the level of all disciplines. In addition, these teachers have no initial pedagogical training, with the number approaching 43% of all teachers. Of those who hold a bachelor's degree, master's degree, or even a Master, many teach subjects that fall outside their respective specialty. This is due to unemployment and the lack of specialized teachers required, especially in public institutions.

Let us not forget for us teachers and / or learners that an error means a deviation or a distorted representation of knowledge or know-how. It is then a question of an adequation of the competence and the performance of the learner; while mistakes occur when the user and / or learner is unable to put their skills to work, as it might be the case for a native speaker. Several attitudes are possible in the face of the learner's mistakes, for example: mistakes and errors are proof of the failure of learning, mistakes and errors are proof of the inefficiency of teaching, mistakes and mistakes are proof of the willingness of the learner to communicate despite the risks, errors are inevitable.

Faults are inevitable in any use of a language, including by native speakers. The measures to be taken, considering the errors and errors of the learner, can be:

- corrected immediately by the teacher;
- systematically encouraged to make them disappear;
- taken and corrected when it does not interfere with the communication;
- corrected, but also analyzed and explained in a timely manner;
- ignored, but systematic errors must disappear;
- corrected and interfere with communication;
- accepted as "transitory language" and ignored.

## **V- THE NEED FOR OBSERVATION OF ERRORS**

Findings or observations or analyzes of learner errors, and by oneself, may lead teachers or learners' minds to:

- plan teaching and learning on a collective or individual basis;
- setting up a course or developing materials;
- evaluate teaching and learning, for example: students are essentially evaluated on their mistakes and mistakes in carrying out a proposed task; if this is not the case, we must find all the success criteria implemented; the degrees of errors and faults are part of the scale criteria for the exercises to be proposed. It is a question here of putting in the head of the teacher the relative importance of errors and mistakes in pronunciation, syntax, spelling, usage, vocabulary, socio-cultural content, morphology, etc.

### **5.1. The different types of student characters**

We see that, and we also find that what we call "error" is only "a truth that is not adaptable to the true". On how to correct them, we would tentatively ask the following question: "Does a learner make a mistake if he adopts this habit of spreading the false knowledge he has acquired in the society in which he lives?". Our answer is no, we are waiting for yours. Indeed, he received training on the subject in question, and he obtained a full score. To get the full score means to the candidate that he has done just everywhere.

Here is another error with this form (see E3 errors made by students in 6th grade):

Subject: Let  $x$  be a natural integer such that  $-1 < x < 5$ .

Give all the values of  $x$ .

The learner answered this way:

Let  $x$  be a natural integer such that  $-1 < x < 5$ .

Give all the values of  $x$ .

$$x = 2 - 4.$$

Here is another one (see E2 mistakes made by 6th grade students).

Store the decimal numbers in ascending order:

$$5.5; 3.82; 4; 5.55.$$

One student responded as follows.

Store the decimal numbers in ascending order:

5.5; 3.82; 4; 5.55

$5.55 > 5.5 > 3.82 > 4$ .

Considering these five different types of errors classifies students' characters in a class into three categories.

- There are very curious and passionate students: these are the students who made the first two errors (solving the equation  $2x + 7 = 3$  and the sum of the vectors). Indeed, all the mistakes made by the students come from the teacher.
- Some students say, curious, but who misuse their intelligence: they use it for other purposes and not for the purpose of their training. In this category comes the student who has solved the problem on the search for  $x$  such that  $-1 < x < 5$ .
- There are students who need deep and detailed explanations to grab what they need. For example, the student who made the decimal place ranking belongs to this group; indeed, it is clear that he began to find himself in the right direction at first, but a confusion came to meet him towards the end.

Each educator must know at least these three characters, because in all cases he is the only one authorized to remedy them. In short, a good education requires a good teacher (John Mason et al., 2010). It is for this reason that UNESCO has launched the qualitative challenge of teachers. Note that these three characters all require a good trainer, that is to say a good teacher. A question arises: "What kind of person can be called a good educator?". This answer may be needed: perhaps a good educator is a person who has a great challenge in the following areas: Education, Teaching, Pedagogy, Psychology, Didactics, Training Manual, Sense of Leadership, Character, Competence, Commitment, Trainer Profile, Training of Trainers, Youth Training, Charisma etc. In general, we can say that all these characters translate more or less bad natures of formation, these natures being thus staggered. In all circumstances, André Totohasina has already posed in (André Totohasina, 2011) the problematic "How to fight against the didactic obstacle?".

It's not related to the fact that he's a scientist. It is likely the education system that would favor this somewhat catastrophic situation, it seems to us. A possible, if not decisive, cause would be the abolition of Second Cycle Pedagogical Centers or the famous CPIICs (BEPC + 2 years), place of training for the profession of primary school teacher preparing the CAE diploma (certificate of aptitude for teaching). , the sixties and seventies. During this time, everyone wanted to send their children to a public institution versus a private institution, and not the reverse as is happening now. Public primary schools (PPEs) were very homogenous in pedagogical terms, regardless of their geographical position in each district and throughout the Big Island. How to find this effectiveness of such an educational system in Madagascar?

### 5.2. Comments on mistakes made by learners

The analysis of these four errors shows their many common points, namely: the unconsciousness of the need for punctuations " , " , " : " , " ; " and " ." etc., and the non-respect of the recommendations of good writing manuals such as the introduction of everything we talk about, the introduction of a variable, the donation of a name to an object for the sake of cohesion, the highlighting logical articulators, the announcement of what we do, the citation of a definition or theorem, the naivety of classical notations etc. We also see the various errors mentioned above. Absence of the use of transitional articulators and / or logical deduction or argumentation such as: gold, therefore, like, because, as a result, it follows that, hence, etc.. A correct correctness expected the four questions mentioned above, for example (David Pimm, 1995):

1 - "Resolve in (R for example) the equation obtained. "

Let S (for example) be the set of solution obtained.

So,  $2x + 7 = 3 \Leftrightarrow 2x = 3 - 7$   
 $\Leftrightarrow 2x = -4$   
 $\Leftrightarrow x = -4/2$   
 $\Leftrightarrow x = 2$ .

So  $S = \{2\}$ .

In general, the equation or inequation resolution requires equivalence reasoning, otherwise the implications are sufficient but remain to be avoided in all these classes.

2 - Let  $x$  be a natural integer such that  $-1 < x < 5$ .

Let's give all the values of  $x$ .

$x = \{0; 1; 2; 3; 4\}$ .

3 - Let's put the decimal numbers in increasing order: 5.5; 3.82; 4; 5.55.

$5.55 > 5.5 > 4 > 3.82$ .

4) Let's calculate the sum of the following vectors.

- a)  $\overline{AB} + \overline{CD} + \overline{BC} = \overline{AB} + \overline{BC} + \overline{CD} = \overline{AC} + \overline{CD}$ , according to Chasles's relation;
- b)  $\overline{AB} + \overline{BC} = \overline{AC}$ . D'où,  $\overline{AC} + \overline{CD} = \overline{AD}$ .
- c) Using the same reasoning as before we have:

$$\overline{EF} + \overline{GE} + \overline{FG} = \overline{EF} + \overline{FG} + \overline{GE} = \overline{EG} + \overline{GE} = \overline{EE} = \vec{0}$$

Certainly, the purpose of a copy is to be read! But still, in accordance with the objectives of good writing, we must agree to the conventions of notation, and verify that the reasoning does not contain any ambiguity. Therefore, to write well always requires to be rigorous, and thus to detect the difficulties or pitfalls concealed in a question in order to gain points to the contests! If you write well: you will avoid the pitfalls; you will have all the points to the questions answered and after, you will have a bonus and the corrector will be more indulgent face some errors. Finally, in order to write well, it takes time and practice. If you do not start right now trying to write well, it's not the day of the contest that you'll get there. Moreover, training to write well allows to acquire automatisms and thus to answer a question faster, with all the required details.

In order to answer the question asked by André Totohasina, as a recommendation, if we refer only to middle and high school levels, we teach different disciplines, but we are specifically limited to the mathematical discipline, especially on the analysis. Learners' drafting errors in problem solving and math exercises at their levels (W. Gary Martin et al., 2009). We report many guidelines that can improve writing, guidelines that can attract learners to the mathematical discipline. Firstly, we will invite fellow teachers to have ideas on the use of punctuations, conjunctions, relative pronouns, etc. Such an act does not in any way imply that teachers ignore the rules of their use. Rather, several teachers are not demanding on their job and, as a result often noted, they even tend not to control them! In this sense, we have taken the responsibility to awaken everyone in the field of Education on the importance of using these "tools" in the rules of the art for all disciplines. A reminder and an invitation to act are made according to the indications mentioned for the following reason: punctuations are obligatory because they make clear and precise reasoning, and clear and precise reasoning will certainly give learners that taste for doing mathematics. Secondly, as the deepening of what has been announced in (André Totohasina, 2011), the official languages of education in Madagascar are French and Malagasy, French being the dominant language. It is therefore logical to state that teachers of the Malagasy and French languages (in particular) and the mathematical discipline must pedagogically demonstrate good collaboration; this does not mean that the math teacher should not have a pedagogical relationship with teachers in other disciplines. Indeed, according to the surveys that we conducted at the level of colleges and high schools, we find, in general, that the collaboration between these teachers is virtually non-existent. The remark is generalized throughout Madagascar. But on the other hand, the surveys carried out in the French Middle Schools of Madagascar let us see this: the meetings on the didactic of mathematics where the French and mathematics teachers participate are frequent. This is an example that deserves to be followed.

## VI- CONCLUSION

In Madagascar, Mathematics is one of the basic subjects of education from the primary level. Most of the teachers in public primary schools in Madagascar are FRAM teachers and as such have hardly received any teacher training. Surveys of students and teachers have shown a great difficulty in assimilating the academic knowledge mobilized by the subject "Mathematics" on the part of pupils and a major handicap as regards the transmission of knowledge on the part of teachers. One of the factors, if not the main one, of this blockage is the academic level of the teachers. They possess only fragmentary notions of the knowledge they must teach. This module is designed to strengthen the academic level of primary school teachers on the subject "Mathematics". The surveys carried out among the teachers made it possible to identify the knowledge to be reinforced in this module. Also, the teacher training structure does not meet the needs. There is certainly the Regional Center of Pedagogical Training Institute (RCPTI), but these are only intended for Elementary Schools and Middle Schools. In addition, many of the trainers at these centers did not receive any prior teacher training; which certainly influences the quality of training given to students. We will want to introduce continuous training from kindergarten to university. In other words, the long journey Kindergarten-University must be constituted to form a solid and solid educational whole. The discontinuity in the training will thus be automatically eliminated, because, in this case, said training is governed by the same pedagogy and the same didactic disciplines. This is not currently the case in Madagascar where there is a deep gap between Primary and High School on one side, and between the Middle Schools and the University on the other side. A unique pedagogy can then flourish and develop freely, and the education of learners in any discipline, whether literary or scientific, will certainly be more fruitful and therefore better! A concrete example that deserves to be followed in the best possible time is seen in France: the existence of RIMA (Research Institutes on Mathematics Education) which publish in journals the results of research on the teaching of mathematical disciplines from kindergarten to higher education institutions. The University Institute of Teacher Training or (UITT) within the Francophonie is

another example to quote and copy: a unique body that ensures the training of teachers of all levels. We, the few researchers who devote their lives to the development of pedagogy, will want to propose the creation of a research institute on the teaching of scientific disciplines in its entirety, instead of being limited to mathematical disciplines. Teachers of literary disciplines are urged to follow the same path. The recommendations made in the form of projects will be addressed to decision-makers in the country.

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