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The Influence of Social Factors on Learning Difficulties in Mathematics: Testing the Anthropo-Didactic Approach

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Abstract: The aim of this research is to increase knowledge about learning difficulties in mathematics. A literature review of the learning difficulties in mathematics researches of the last thirty years shows the emergence of two major interpretative perspectives. In the first perspective, the difficulties are studied in terms of the learners' cognitive characteristics. This perspective highlights the need to develop interventions adapted to the specific characteristics of the student in difficulty. In the second perspective, learning difficulties are interpreted as the result of interactions between the student and the school system. This perspective considers teaching from the point of view of creating favourable conditions for learning through didactic interventions that take into account both the knowledge of the student and the mathematics tasks. During the last few decades, there have been many debates between the proponents of the first perspective and those of the second perspective. It is within this conflict that a third interpretative perspective emerged from the European work on the difficulties of learning in mathematics. This perspective based on an anthropo-didactic approach, adopts a dual theoretical anchoring (anthropological and didactic) to identify a whole class of explanatory phenomenon of difficulties that could not be cleared in one or other of the frameworks when taken alone. More specifically, this framework makes it possible to articulate sociological considerations, such as educational and didactic inequalities as well as the study of the student-teacher relationship. However, this perspective is relatively unknown to researchers and practitioners working in Quebec. In this context, the object of this research is to validate the anthropo-didactic approach as to the interpretation of learning difficulties in mathematics of elementary school children.

Keywords: Anthropo-Didactic Approach, Learning Difficulties, Mathematics, Elementary School

1. Introduction

This research fits into a rich line of work on the difficulties of mathematical learning [1], [2], [3], [4]. The study aims to question the fundamental source of these difficulties. More specifically, its main objective is to test an innovative approach in order to interpret the learning difficulties in mathematics of elementary students.

This project is an extension of a research realised in 2014 by Rajotte, Giroux & Voyer [5]. The results of this research which was essentially aimed at testing two interpretative perspectives on learning difficulties in mathematics (one from the cognitive sciences and the other from the didactic of mathematics), have highlighted the importance of investing in the sociological perspective of education in order to explain the academic difficulties of students. This perspective, based on an anthropo-didactic approach, considers the need to adopt an anthropological point of view to deal with cultural variables (traditions, social values and institutional influences) in the interpretation of students' difficulties in mathematics [6]. In this regard, although students' difficulties are interpreted differently in the administrative regions of Quebec, the percentage of students

in difficulty varies between 1.5% and 22.1% within these regions [7]. However, this new interpretative perspective is under documented by researchers. In this context, the object of this research is to test the anthropo-didactic approach in order to interpret the learning difficulties in mathematics of Quebec elementary students.

More specifically, this project focuses on two specific objectives:

1) to establish the influence of the socio-economic level of the students, the sociodemographic profile of the parents and the academic performance in mathematics on the assessment of a diagnosis related to an adaptation or learning difficulty;

2) to document the cultural variables likely to influence the professionals involved in the assignment of a diagnosis related to an adaptation or learning difficulty.

2. Problematic

2.1. Context

In the wake of the work of the Commission des États généraux sur l'éducation, in the late 1990s, the Quebec Ministry of Education (MEQ) took on a major challenge to make education Turn of success [8], [9], [10], [11]. Essentially, through this aim, the various actors in the education system must implement concerted actions that make it possible to move from access to the greatest number to the success of the majority [12].

In order to meet the challenge, specific actions targeting students with either handicap, social maladjustments or learning difficulties (SHSMLD) have been proposed by the government in order to support the success of this group of students recognized as the most at risk of academic failure [13]. In 2017, the need to intervene specifically with the SHSMLD is still relevant. The dropout rate for this group of students (46.8%) is nearly three times higher than the ones of the other students (16.2%) [14]. In order to prevent the academic difficulties of these students, special attention must be paid to the teaching and learning of mathematics. This is justified by the fact that contemporary society requires numeracy skills that go beyond the mastery of a set of technical skills [15].

With the intention of promoting the success of this student population, the MEQ published a framework to support teachers' intervention in the implementation of institutional education policies for students with learning difficulties, [20]. To this end, teachers are now being asked to adapt their pedagogical interventions to the characteristics and needs of the SHSMLD [16], [17]. In concrete terms, in the field of mathematics, this request results in the implementation of interventions that are distinct and adapted to the necessity of individual students with special needs (e.g. either because they are disabled [hearing, visual or organic impairment], have dyspraxia [developmental coordination disorder (DCD)], have to cope with developmental dyscalculia [DD], diagnosed with attention deficit disorder [ADHD], or on the autism spectrum) [18]. This logic of adaptation emerged from the explanatory framework of cognitive sciences [19], [20]. On the other hand, as mentioned by Giroux [21], the application of this recommendation is difficult because teachers have little support (practical and theoretical support) and didactic material to make these adaptations according to the different profiles of the SHSMLD. Moreover, in the last few years, research on learning difficulties in mathematics with an explanatory framework in the cognitive sciences has yielded little empirical results [22].

In this context, in order to interpret learning difficulties in mathematics, a new sociological perspective emerged from the work carried out at the Laboratory Culture, Education and Society (LACES) of the University of Bordeaux. This perspective, which is based on an anthropo-didactic approach to the interpretation of learning difficulties, is increasingly documented by European researchers [23], [24], [25], [26], [27]. On this subject, since 2007, the anthropo-didactic approach has been the subject of five international congresses that were held in Europe [28]. On the other hand, this perspective, which examines the teacher-student relationship from a double theoretical framework (anthropological and didactic) [29], [30], is relatively unknown in the Quebec school system. Consequently, before disseminating the modalities of the anthropo-didactic approach to teachers working in Quebec, it is important to test this approach empirically within the Quebec school system.

2.2. Problematic

In the field of mathematics, several scientific writings reveal two distinct perspectives on the problematic of learners with learning difficulties [31]. The first perspective, as shown in Figure 1, focuses primarily on identifying and describing student-specific dysfunctions, while the second perspective focuses on the functioning of the didactic system and the phenomenon that characterize the relationships between student production, the actual teaching situation and the specificity of knowledge.

Scientific works adopting an explanatory framework relating to the fields of developmental psychology, neuropsychology and cognitive sciences are linked to the first perspective. Proponents of this approach see learning disabilities innate to the student, directly linked to the functional and cognitive characteristics of the learner. By adopting this point of view, the students are perceived as a participant for whom such personal characteristics can be measured through standardized assessment tools. According to this perspective, the role of the teacher is to help the students overcome their difficulties through remedial interventions aimed at modifying their cognitive processes.

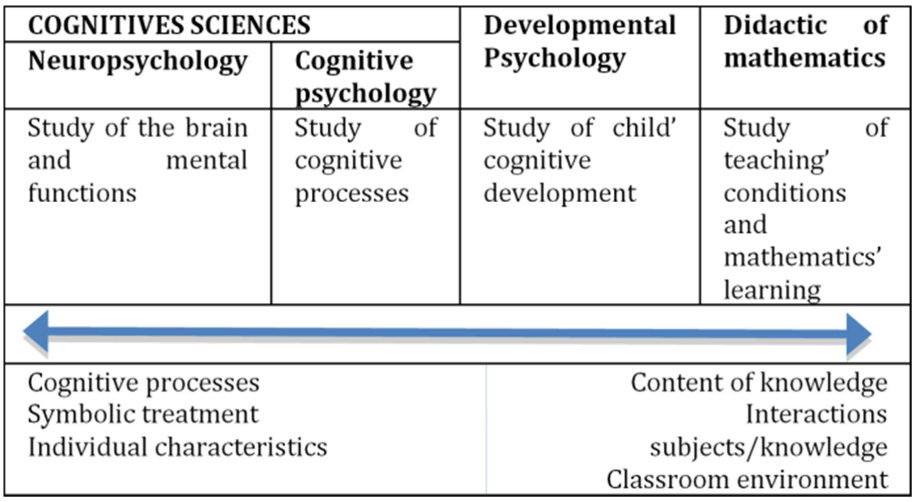

Figure 1. *Organization of the fields studying difficulties in mathematics.*

On the other hand, works adopting an explanatory framework relating to the didactics of mathematics belong to the second interpretative perspective. In this perspective, learning difficulties are interpreted as the result of the students' interaction with the school system in which they evolve [32]. Consequently, teaching is considered from the point of view of setting favourable conditions for learning through didactic interventions that take into account both the mathematical knowledge of the pupil and the specificity of knowledge.

The evolution of legislation and policies specific to special education tend to position the orientation of the ministry, in the first perspective, on the difficulties of students in mathematics. This position emerges from the Policy on Special Education of Quebec, which aims to reframe the main thrusts of educational reform with regard to the special needs and characteristics of the SHSMLD. This policy includes a ministerial injunction for teachers to adapt their teaching to the characteristics and needs of students.

Moreover, it is pertinent to question the founding of the ministerial injunction concerning the adaptation of education to the characteristics specific to learners. Indeed, in the last few years, research having adopted an explanatory framework specific to the cognitive sciences has obtained few empirical results. On the other hand, biases are also attributed to the perspective of didactics which means that, although the work resulting from this second perspective has made it possible to document the particularities of the teaching given to the SHSMLD, research in mathematical didactics mainly calls for the implementation of in-depth analyses. As such it is difficult to generalize results to large populations of students.

Following this observation, Giroux mentions that the problem of failure and academic difficulties is so complex that it calls for analysis tools from the social sciences in order to tackle it. Consequently, the sociological explanatory theses of academic failure formulated 35 years ago, [33] must be considered. These theses, which adopt a theoretical, anthropological and didactic anchor, make it possible to identify a whole class of phenomenon that could not have been seen only in one or the other framework taken in isolation. If several empirical results emerged from European research based on this perspective [34], the sociological perspective was supplanted by cognitive sciences in most of Quebec research on academic difficulties. In this context, the need to test the sociological perspective within the Quebec school system is crucial.

2.3. Theoretical Framework

The anthropo-didactic approach, which comes from the sociological perspective concerning the interpretation of learning difficulties, is situated at the crossroads of two theoretical fields: 1) the didactic field, which studies the phenomena of education, considers the central role played by the structure of mathematical knowledge as well as the modalities of teaching and learning [35], [36]; 2) the anthropologic field, which focuses its study on the cultural dimension of the different educational contexts within a particular consideration of the cultural background that is part of the process of socialization of an individual throughout his development, [37]. This cultural background is tainted by the "knowledge and beliefs" [38] that the teachers have of their students, their job, their teaching to the students with difficulties in mathematics. Unconsciously, it influences the act of teaching.

Concerning the interpretation of the learning difficulties of the SHSMLD, this approach considers three dimensions: 1) didactic, in accordance with the knowledge that the pedagogue is required to teach content from the school curriculum; 2) institutional, which refers to the behaviors and customs of the culture that characterize the students and the teacher; 3) pedagogical, which consists of implementing a differentiated pedagogy enabling the success of the greatest number of students.

Based on the theories of Bourdieu [39], this perspective relates school inequalities and social inequalities by highlighting the mechanisms by which the school institution acts as a system of social reproduction of inequalities [40]. The thesis advanced by the proponents of this perspective is

that the school institution transforms the social ranking of students into school rankings or, in other words, transforms the differences of social classes into differences of intelligence. Over the generations, this mechanism would lead the upper classes to preserve their privileged status.

3. Methodology

To conduct this study, a correlational research design is used. With this research design, variables are studied and analyzed without being manipulated or controlled experimentally. The researcher observes variables, measures their values without any intervention and establishes the level of relationship between each of the variables using the correlation coefficient. In this type of research design, variables that are not manipulated are studied. More specifically, they are observed and measured without being experimentally manipulated by the presence of another (independent) variable that could influence the one studied.

3.1. Participants

In order to constitute the sample of the research, a probabilistic sampling technique of stratified random type is used [41], [42]. Schools from five school boards were identified. Within these schools, 61 Grade 4 and Grade 6 classes were approached. All the school boards are part of the rural regional of Abitibi-Témiscamingue (province of Quebec, Canada). 750 students from different socioeconomic backgrounds took part in the research.

3.2. Measurements and Instruments

In order to operationalize the research methodology, different variables are considered. Therefore, ten variables that were more likely to influence are examined:

1) the students' performance in problem solving;

2) the teachers' perception of the students' performance in problem solving;

3) the teachers' perception on students' dropping out risk.

These variables are the following and are presented in three categories: 1) those relatives to the students; 2) those relatives to the parents; 3) those relatives to the teachers.

Variables relatives to the parents

Sociodemographic profile of parents The sociodemographic profile (age [from 26 to 67], gender [female or male], annual income [9 categories: from fewer than 10 000$/year to more than 180 000$/year], the highest degree of education [8 categories: high school not completed, high school, college, bachelor, master, doctorate, post-doctorate, other], marital status [5 categories: married, common-law partner, single, widow, others, maternal language and ethnicity] of parents are established through various indicators from a questionnaire developed by the research team.

Decile ranks of the low-income cut-off line indicator (LICO) This variable is "based on the percentage of families living under the low-income cut-off line [43] – as calculated by the MEQ. This indicator alone can lead to misinterpretations. Indeed, the MEESR developed the SEEI to provide a holistic understanding of the data's emergence and the impact that they have on the academic success. The LICO is established by referring to the most recent version of the MEQ deprivation indexes.

Socioeconomic environmental indicators (SEEI) This indicator, also from the MEQ, is based on "the mother's schooling (accounting for two thirds of the weight of the indicator) and the proportion of parents who did not work the previous year (accounting for one third), with no weighting for family income". The SEEI is established by referring to the most recent version of the MEQ deprivation indexes.

Variables relatives to the students

Sociodemographic profile of students (school grades [4th or 6th grade], belonging class [61 classes possible], family ranking [oldest, middle child, youngest, only child], month of birth) [January through December]. The sociodemographic profile of the students is established through various indicators from a questionnaire developed by the research team.

Intrinsic motivation As mentioned earlier, the student's intrinsic motivation variable was evaluated using the *Primary school motivation scale* of Vallerand, Blais, Brière, Sénécal and Vallières (Cronbach's alpha α=0.80). This instrument is composed of 12 items and the participants rate themselves on a Likert scale ranging from 1 (almost never for this reason) to 5 (almost always for this reason). It measures four components of motivation: 1) amotivation, which consists of a lack of motivation, 2) intrinsic motivation, which refers to doing an activity for the satisfaction and pleasure that one derives from it; 3) identified extrinsic motivation, which consists in the regulation of behaviour by the free choice of an individual who identifies the reason for his / her choice; the consequence is external and not related to pleasure and satisfaction; 4) extrinsic motivation introjected, which consists in the regulation of behaviour by internalized control sources by the individual; these sources of control exerting pressure on that person [44].

Individualizes service plan intervention (IP) plan and special measures In Quebec schools, special measures can be put in place to help SHSMLD. This plan is developed with the learner, his parents and school members concerned. Ministry of education defines the IP as "an instrument used to coordinate and integrate services provided to a young person by staff members from different institutions. It addresses the person's needs in all the areas of intervention. It is established in cooperation with the young person and the parents, and includes the following elements: 1. A shared understanding of the young person's abilities and needs, based on a general needs evaluation; 2. A ranking of the needs; 3. The overall objective, based on the situation, and the indicators of the results expected; 4. Intervention strategies to be implemented to achieve genuine coordination of the principal services; 5. The anticipated duration of the services and the date on which the plan will be reviewed; 6. The name of the person in charge of coordination, drafting

and evaluation of the plan" (MELS, 2014: 46).

Students types classification The classification used was done by referring to the different categories of SMSMLD. Students identified as having a MSMLD must have been accurately diagnosed at the time of data collection. There are ten categories: 1) no diagnosis; 2) attention deficit hyperactivity disorder (ADHD) hyperactive type; 3) ADHAD inattentive type; 4) ADHD combination type; 5) Autistic spectrum disorder (ASD); 6) physical or motor handicap; 7) learning difficulties (dyslexia, dyscalculia, dysphasia); 8) adaptive difficulties implying behavioural disorder; 9) other; 10) wish not to answer this question.

Performance in mathematical problems solving The performance in problem solving was assessed using the Pearson Francophone Performance Test (TSF). Version A of the test was administered to students in Grade 4, while a B version of the test was dispensed to Grade 6 students. In total, 20 problem statements were administered to students. Then a result on a scale from 0.00 to 5.00 was calculated. Here are two examples of this type of problem, one for the 4^{th} grade students, and the other for the 6^{th} graders:

1. Jasmine catches two fishes. The first one has a length of 18 cm. The second fish is 35 cm longer than the first one. How long is the second fish?
2. 16 pumpkins cost 64$. I want to buy 18 pumpkins. What is the cost of 18 pumpkins?

Variables relatives to the teachers

Perception of student's mathematical performance in problem solving Teachers' perception of the student's mathematical performance in problem solving was established through a questionnaire developed by the research team. Teachers were asked to assess students' performance in problem solving. They used the following scale: 1) substantially better than expected; 2) better than expected; 3) meet expectations; 4) less than expected; 5) significantly below expectations.

Perception of problem of student's risk of dropping out

Teachers' perception of student's risk of dropping out of school was established through a questionnaire developed by the research team. Teachers were asked to assess students' risk of dropping out using the following scale: 1) none; 2) low; 3) average; 4) high; 5) very high.

3.3. Analyses

Data's analyses were conducted through SPSS version 23. In order to meet the objectives of the research, regression analyses were performed. In order to relieve gradually the importance of the influence of a group of variables of another, stepwise regression analyses were specifically conduced.

4. Results

To test the influence of the variables relatives to the students, to their parents and the teachers on students' performance in problem solving, on the teachers' perception of students' performance in problem solving and on the teacher's perception on student's dropping out risk, regression analyses were performed. The results of these tests are reported in different tables in this section. First, some descriptive results are presented.

4.1. Descriptive Results

The sample of the study is composed of 750 students and 750 parents. Students are coming from five different school boards of Abitibi-Témiscamingue: CSRN (N=296), CSLT (N=86), CSH (N=104), CSDLA (N=22) and CSOB (N=242). Within the schools of these schoolboards, Grade 4 and Grade 6 classes had been approached. Table 1 shows our effectives by Schoolboards and by grades, 4^{th} or 6^{th}.

Table 1. *Participants by Schoolboards and by classes.*

Schoolboards		*Effectives*
CSRN	4^{th} grade	163
	6^{th} grade	133
	Total	296
CSLT	4^{th} grade	46
	6^{th} grade	40
	Total	86
CSH	4^{th} grade	60
	6^{th} grade	44
	Total	104
CSDLA	4^{th} grade	13
	6^{th} grade	9
	Total	22
CSOB	4^{th} grade	134
	6^{th} grade	108
	Total	242

Variables relatives to the parents

Sociodemographic profile of parents The sociodemographic profile is diverse (age [from 26 to 67], gender [female:73.7% and male: 18.7%, missing data: 7.7%], annual income [9 categories: from fewer than 10 000$/year to more than 180 000$/year], highest degree of education [8 categories: high school not completed: 5.7%, high school: 30%, college: 27.7%, bachelor: 21.5%, master: 5.6%, doctorate: 1.3%, post-doctorate: 0.8%, other: 0%, missing data: 7.3%], marital status [5 categories: married: 29.1%, common-law partner: 48.4%, singles: 15.1%, widow:0.1%, other: 0.1%, missing data: 7.2%) and was established through various indicators from a questionnaire developed by the research team.

Decile ranks of the low-income cut-off line indicator (LICO) and Socioeconomic environmental indicator (SEEI) In addition to the schoolboard of origin, the SEEI and the LICO are considered as stratification variable in the sample [45]. 500 learners come from a lower socioeconomic background (levels 8, 9 and 10 of the SEEI), 185 come from a moderate socioeconomic background (levels 4, 5, 6 and 7 of the SEEI), and 65 from a well-off background (levels 1, 2 and 3 of the SEEI). As for the LICO' distribution of the participants, Table 2 shows that 345 participants are on the higher end (levels 1, 2 and 3), 347 participants are on the middle end (levels 4, 5 and 6), and 129 (levels 6, 7 and 8) are on the lower end.

Table 2. *LICO participants' distribution.*

LICO	Effectives
1.00	140
2.00	73
3.00	132
4.00	69
5.00	207
6.00	71
7.00	31
8.00	27
Total	750

Variables relatives to the students

Sociodemographic profile of the students The sociodemographic profile of the students is the following: school grades' (4^{th} grade [n=416] or 6^{th} grade [n=334]), belonging class (61 classes have participated to the research), family rank (oldest [n=286], middle-child [n=241], youngest [n=178], only child [n=44]) and month of birth (January [n=-48], February [n=48], March [n=66], April [n=61], May [n=93], June [n=54], July [n=64], August [n=72], September [n=68], October [n=54], November [n=59], December [n=58]: students born in July, August and September are usually a little younger than their peers).

Intrinsic motivation Students' intrinsic motivation variable was evaluated using the *Primary school motivation scale* of Vallerand, Blais, Brière, Sénécal and Vallières (Cronbach's alpha α=0.80). Table 3 shows the minimum and maximum values for the four components of motivation measured on Likert scale which ranges from 1 (almost never for this reason) to 5 (almost always for this reason). It also shows the average of each component: 1) amotivation= 1.5348; 2) intrinsic motivation= 2.8959; 3) identified extrinsic motivation= 3.3338; 4) extrinsic motivation introjected= 2.5646.

Table 3. *Intrinsic motivation.*

	Minimum	Maximum	Average	Et
Amotivation	1.00	4.00	1.5348	.70877
Intrinsic motivation	1.00	4.00	2.8959	.74783
Identified extrinsic motivation	1.00	4.00	3.3338	.59770
Extrinsic motivation introjected	1.00	4.67	2.5646	.94221

Individualizes service plan intervention (IP) plan and special measures In this research, 191 students have a PI which represents almost a quarter of the students. From these students having a PI, 116 have special measures including adaptive measures or modification measures.

Students types classification From our sample n=750, 696 students were categorized in ten categories as shown in Table 5: 1) no diagnosis (n=473); 2) attention deficit hyperactivity disorder (ADHD) hyperactive type (n=40); 3) ADHAD inattentive type (n=81); 4) ADHD combination type (n=43); 5) Autistic spectrum disorder (ASD) (n=7); 6) physical or motor handicap (n=7); 7) learning difficulties (dyslexia, dyscalculia, dysphasia) (n=24); 8) adaptive difficulties implying behavioural disorder (n=0); 9) other (14); 10) wish not to answer this question (n=7).

Table 4. *Students types classification.*

Effective	
No diagnosis	473
Attention deficit hyperactivity disorder (ADHD) hyperactivity type	40
ADHD inattentive type	81
ADHD combination type	43
Autistic spectrum disorder (ASD)	7
Physical or motor handicap	7
learning difficulties (dyslexia, dyscalculia, dysphasia)	24
Other	14
Wish not to answer the question	7
Total	696
Missing	54
Total	750

Performance in mathematical problem solving

The results of the performance in mathematical problem solving are shown in Table 5. As it shows, the average for the 750 students assessed is 4.0429 (e.t. 1.0808).

Table 5. *Performance in problem solving.*

	N	Minimum	Maximum	Mean	Std Dev.
mean RP	749	1.00	5.00	4.0429	1.08080

4.2. Regression Analyses

4.2.1. Variables

As mentioned in the *Measurement and instruments sections*, different variables were considered to operationalize this research. First, some variables are related to the parents: educational level, annual incomes, ethnic origin, first language, marital status, and their involvement or not to the individualize education plan. Second, some variables are related to the students: birth rankings, month of birth, performance in problem solving, academic motivation and their perception of teaching practices (such as competition, individualized teaching, control level and student independency). Finally, some variables are related to the teachers: their perception of students' performance in problem solving and their perception of students' dropping out risk.

4.2.2. Regression Analyses

The first analyses that were conducted directly linked to the research question – which variables have the most impact on performance in problem solving? The regression analyses were conducted by using the stepwise entry method.

Table 6. *Results of Regression Analysis for the Evaluation of the variance of the student' performance in problem solving.*

Models summary				
Models selected	**R**	**R^2**	**R^2 adjusted**	**Standard error of estimate**
1	0.230[a]	0.053	0.045	1.121176
2	0.296[b]	0.087	0.071	1.19483
3	0.358[c]	0.128	0.105	1.17302

a Predictors: (Constant), Marital Status

b Predictors: (Constant), Marital status, Annual family income

c Predictors: (Constant), Marital status, Annual family income, intrinsic motivation

The third model, as shown in Table 6, was retained. This model, the strongest one, explained merely 10.5% of the variance of the student' performance in problem solving. Three variables emerge as having an impact on the problem solving performance (see Table 7): 1) marital status, explaining 4.5% of the variance; 2) intrinsic motivation, explaining 3.4% of the variance; 3) annual family income, explaining 2.6% of the variance. This model is the strongest one when all sociable values are taking into account to explain the performance in solving written problems. Thus, few social variables can explain, in these preliminary results, the students' performance in problem solving. More analyses are needed to push, furthermore, the links' comprehension between theses variables through the eye of the anthropo-didactic approach.

Table 7. *Regression model retained (Entry method: step by step) – Performance in Problem solving.*

Performance in problem solving Total: 10.5% of the variance is explained.	
Marital status	4.5%
Intrinsic motivation	3.4%
Annual family income	2.6%

Table 8. *Results of Regression Analysis for the Evaluation of the variance of the teacher's perception on students' performance in problem solving.*

Models summary				
Models selected	**R**	**R^2**	**R^2 adjusted**	**Standard error of estimate**
1	0.601[a]	0.362	0.356	12.35286
2	0.682[b]	0.466	0.456	11.35209
3	0.722[c]	0.522	0.509	10.78707
4	0.743[d]	0.552	0.535	10.49527
5	0.759[e]	0.577	0.577	10.24272
6	0.774[f]	0.599	0.576	10.01876
7	0.789[g]	0.622	0.597	9.76690
8	0.802[h]	0.643	0.615	9.54669
9	0.810[i]	0.657	0.627	9.40346

a Predictors: (Constant), SEEI
b Predictors: (Constant), SEEI, LICO
c Predictors: (Constant), SEEI, LICO, Individualized service plan
d Predictors: (constant), SEEI, LICO, Individualized service plan, School grade
e Predictors: (Constant), SEEI, LICO, Individualized service plan, School grade, belonging class
f Predictors: (Constant), SEEI, LICO, Individualized service plan, School grade, belonging class, family ranking
g Predictors: (Constant), SEEI, LICO, Individualized service plan, School grade, belonging class, family ranking, Individualized service plan-special measure
h Predictors: (Constant), SEEI, LICO, Individualized service plan, School grade, belonging class, family ranking, Individualized service plan-special measure, month of birth
i Predictors: (Constant), SEEI, LICO, Individualized service plan, School grade, belonging class, family ranking, Individualized service plan-special measure, month of birth, student gender

However, the situation is quite different when we considered the perception/appreciation of the teachers on their students' performance in problem solving. When we took the same variables (social ones) and we did a regression analysis taking into account the perception of the teacher on their students' performance in problem solving, social values as the LICO and the SEEI could explain up to 45.6% of the variance (see Table 9 for the Models summary and Table 9 for the details of the model retained). As the strongest one, the eighth model was retained (see Table 8). SEEI and LICO constitute significant elements in the interpretation of students' mathematics difficulties perceived by the teacher.

In addition, it is important to note that more than 7% of this perception of teachers is due to the fact that the student has or not an intervention plan (IP) and / or that it benefits from a special measure registered to the PI. Admittedly, it is notable that more than 45% of the variance in the teacher's perception of mathematical difficulties is explained by the SEEI and the LICO.

Table 9. *Regression model retained (Entry method: step by step) – Teacher's perception on students' performance in problem solving.*

Teacher's perception on student's performance in problem solving Total: 62.7% of the variance is explained	
SEEI	35.6%
LICO	10.0%
Individualized service plan	5.3%
School grade	2.6%
Belonging class	2.2%
Family ranking	1.9%
Individualized service plan, special measure	2.1%
Month of birth	1.8%

Some similar results are obtained from the regression analysis of the teacher perception on their students' dropping out risk. Table 10 shows the summary of the models.

Table 10. *Results of Regression Analysis for the Evaluation of the variance of the teacher's perception on their students' dropping out risk.*

Models summary				
Models selected	**R**	**R^2**	**R^2 adjusted**	**Standard error of estimate**
1	0.591[a]	0.350	0.344	12.83624
2	0.686[b]	0.470	0.460	11.64249
3	0.722[c]	0.522	0.508	11.11373
4	0.744[d]	0.553	0.536	10.79233
5	0.764e	0.583	0.563	10.47298
6	0.787[f]	0.619	0.597	10.05456

a Predictors: (Constant), SEEI
b Predictors: (Constant), SEEI, belonging class
c Predictors: (Constant), SEEI, belonging class, Individualized service plan
d Predictors: (Constant), SEEI, belonging class, Individualized service plan, Individualizes service plan-special measure
e Predictors: (Constant), SEEI, belonging class, Individualized service plan, Individualizes service plan-special measure, family ranking
f Predictors: (Constant), SEEI, belonging class, Individualized service plan, Individualizes service plan-special measure, family ranking, birth month

As the strongest one, the sixth model was retained (see Table 11). The variance is explained by up to 34.4% by the SEEI. There is an interesting fact, which concerns the belonging class. In this regression model retained, up to 11.6% can be explained by belonging class. This can probably be attributed to the teacher effect.

Table 11. *Regression model retained (Entry method: step by step) – Perception of the teacher on the drop out risk of their students.*

Perception of the teacher on the drop out risk of their students. Total: 59.7% of the variance is explained	
SEEI	34.4%
Belonging class	11.6%
Individualize intervention plan	4.8%
Individualize intervention plan – special measures	2.8%
Family ranking	2.7%
Month of birth	3.4%

5. Conclusion

These analyses show that social variables explain merely the students' performance in solving written problem. However, these social variables (SEEI, LICO, etc.) can explain the variance of the perception of the teacher on their students' difficulties in mathematics.

Evidence suggests that many sociodemographic factors may alter teachers' perceptions of students' difficulties in mathematics. Admittedly, it is notable that more than 45% of the variance in the teacher's perception of mathematical difficulties (see Table 10) is explained by the SEEI and the LICO. For the initial training of Quebec teachers, these results are very evocative. In fact, they suggest that social factors, external to the student, greatly influence teachers' perceptions of students' potential in mathematics. In addition, the role of these factors is greatly diminished when we look at the performance students achieve following the completion of a written questionnaire.

The analyses bring us to think that a new competency could truly emerge from the research; a one based on the perception of the teacher on his students, through their social background. A competence based on the social status and background of the students; a competency based directly on an anthropo-didactic approach. The analyses suggest that the social values have a major impact on the teacher's perception, way more than on the performance of their students.

Trough rigorous and reflexive analyses, we believe that every teacher – through his professionalism and commitment – is able to be fair in this teaching interventions. The desire in line with the school environment's reality seeking "polyvalent teachers able to intervene at different levels with students with different needs" [46].

In addition, this impartiality could contribute to contradicts the French sociologist, Pierre Bourdieu, who affirms that the school constitutes an inequality reproduction's system by transforming students' social ranking into school ranking by offering different treatment for students from wealthy backgrounds.

These conclusions are drawn from the quantitative component of a research project aimed at testing the anthropo-didactic approach. A qualitative component is currently in progress. The ongoing interviews with the teachers, resource teachers, educational consultant and psychologists, will allow us to understand more deeply these variances in order to detect how these elements modulate the perception of the teachers, and therefore could explain students' difficulties in mathematics.

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