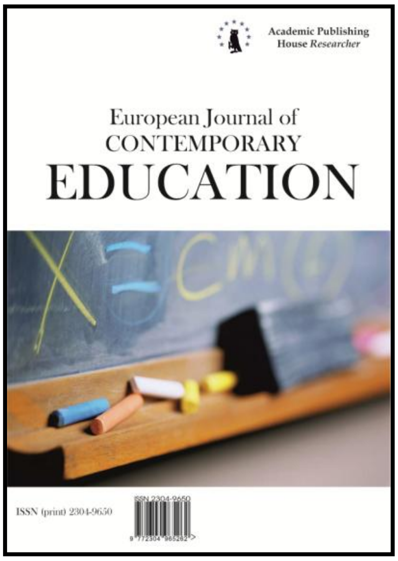
Published in the Slovak Republic
European Journal of Contemporary Education
ISSN 2304-9650
E-ISSN 2305-6746
2017, 6(2): 240-253
DOI: 10.13187/ejced.2017.2.240
www.ejournal1.com



Mathematics Test, Numerical Task and Mathematics Course as Determinants of Anxiety toward Math on College Students

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Abstract

The aim of this study was to determine the variables that explain the anxiety towards mathematics in college students. For this purpose, we used the scale RMARS that integrate 25 items. The sample is non-probabilistic by convenience and the questionnaire was applied to 100 student's enrollment in the *Instituto Tecnológico de Veracruz* (ITVER). Exploratory factorial analysis with component extraction was used for data measurement. The internal consistency of the test was α=0.911. The Bartlett's test of Sphericity with KMO (0.857), chi-square test X^2 with 276 *df* (1404.084) and significance p < 0.000 as well as the values of MSA tending to 1, show a significant result that allow us reject null hypothesis Ho. The percentage of the 65.62% variance is explained by five components. The result shows that anxiety in the ITVER students is explained by a five factors model and not by the tridimensional model as stated by Richardson y Suinn.

Keywords: mathematics test anxiety, mathematics course anxiety, numerical task anxiety.

State of the Literature

Knowledge and information on mathematics are essential to developing skills of students.

In the literature has been documented the redesign of the RMARS scale by Alexander and Martray (1989) that integrates 25 items, which is derived from the 98 elements of the seminal scale of Richardson and Suinn (1972), which integrates three factors or dimensions oriented to math tasks, math courses and math exams.

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Contribution to the Literature

- The main finding shows that anxiety in students is explained by a five-factor model and not by the three-dimensional model as indicated by Richardson and Suinn.
- The components obtained show that students generate anxiety when mathematics is associated with exams, mathematical problems to be solved, thinking about pre-test temporality, math books and listening to math topics.

1. Background

The topic of mathematics teaching process has become a regular theme in the academic speech; from the student´s performance that causes failure levels and desertion as consequence to the preparation of professors who teach economy and mathematics subjects, but it is even more alarming the hard data shed by PISA indicators.

The Organization for Economic Cooperation and Development (OECD) implements every three years since 1997 the Program for International Student Assessment (PISA) where member and non-member countries of the Organization participate, Mexico being one of the countries incorporated in 2000.

The PISA test evaluates the student´s competence in three specific subjects: Mathematics, Science and Reading. Each year in the application of the test, one of the subject is accentuated, an example of this is Mathematics in 2012, Reading in 2009 and Science in 2006, to mention a few. The assessed student´s age is around 15 years, which is the transition age between middle school level and high school.

But what is the aim of this test? or rather, what is sought by the educational systems of the 60 countries that participate? Regarding that matter, it is pointed out that the PISA test seeks to identify the competence level of the student in the above mentioned subjects and therefore, being able to develop educational policies that favor the acquirement of skills and competences that the student requires an that will be needed in the job context (local and international) where he/she will enter after the culmination of his/her studies.

1.1. Recent background

In the International Business Time web page on the "Education" section there is an article that stands out, written by Lluvia Gabriela (August 30th, 2012) and called "Mexico failed in Mathematics and Spanish: Enlace". This article refers to the Enlace test, which places 9 million students in a low range of Mathematics and Spanish scores, meaning that in Mexico, education got a low score on the subjects of Mathematics and Spanish in the last six years.

This is an alarming fact if we consider that Mathematics and Spanish language skills, as well as what derives from them, is closely linked to the daily life of every human being and if add to that fact that the scholar reaches a college level to study a professional career, as it is in this case our study subjects, then more than worrying we need to address the issue.

The exact fact is given by the National Evaluation of Academic Achievement in School Centers (Enlace for its acronym in Spanish), which points out that 75.5 % of the children and young students from Elementary and Middle schools have an insufficient score in the subjects of Mathematics and Spanish (9 million students).

In the specific case of mathematics, 67 % of Elementary school students attained insufficient results and 87.7 % of Middle school students are placed on a marginal level of mathematical skills insufficiency. However, the former Secretary of Public Education -at the end of president Calderon term- José Ángel Córdova Villalobos, referred in the presentation of these results that Mexico "is going in the right direction", despite the worrisome results.

But then again, the subject is open to debate and inside the college education institutions the following questions arise: how do new students arrive to college to study a career from the Economic-Administrative area? What level of competence does the student of an Economic-Administrative career have?, all this regarding mathematics competence and skills of the student. It must be reminded that because of the profile of the Economy-Management area, the careers include in their curricula subjects related to Mathematics, hence a justified query arises and because of that, it is sought to know if anxiety is present in the scholars that study Mathematics; therefore, the research question, objective and hypothesis are:

1.2. Question, objective and hypotheses.

Is there a set of variables that explain the anxiety towards Mathematics on college students?

1.3. Objective

The aim of this study was to identify the variables that explain the anxiety towards Mathematics that manifests on college students.

1.4. Hypotheses

Hi: There is a set of variables that explain the anxiety towards Mathematics that manifests on college students.

2. Literature review

Interest in mathematics anxiety started with the observations of mathematics teachers in the early 1950s. In 1957, Dreger and Aiken introduced *mathematics anxiety* as a new term to describe students' attitudinal difficulties with mathematics. They defined it as "the presence of a syndrome of emotional reactions to arithmetic and mathematics" (p. 344). Notwithstanding the difficulties in defining and measuring mathematics anxiety (Wood, 1988), several attempts have been made to assess it. Atkinson (1988) described three distinct periods in the measurement of mathematics anxiety. In the first period, most studies were merely the authors' opinions and did not employ any standardized mathematics anxiety measures. During this period, an awareness of anxiety about mathematics arose and mathematics anxiety was being defined (e.g., Gough, 1954).

Next, studies focused on the assessment of attitudes toward mathematics through surveys that included several variables such as state-trait anxiety, confidence, enjoyment, and misconceptions (e.g., Dutton & Blum, 1968). The third period saw the development of standardized mathematics anxiety instruments. Dreger and Aiken developed the first instrument, the Number Anxiety Scale, in 1957. Afterwards, more comprehensive scales such as the Mathematics Anxiety Rating Scale (Richardson & Suinn, 1972), the Fennema-Sherman Mathematics Attitudes Scales (Fennema & Sherman, 1976), the Anxiety Towards Mathematics Scale (Sandman, 1980), and the Mathematics Anxiety Questionnaire (Wigfield & Meece, 1988) were developed. Even though the Mathematics Anxiety Rating Scale (MARS; Richardson & Suinn, 1972) is one of the most extensively used mathematics anxiety instruments, Alexander and Martray (1989) reported two major shortcomings. The first is that it is a long assessment instrument (98 items), time-consuming to administer and to score. However, the Revised Mathematics Anxiety Rating Scale (RMARS; Alexander & Martray), developed from the original MARS, has only 25 items.

In a more recent attempt to develop an abbreviated version of the MARS, Suinn and Winston (2003) investigated the previous studies that attempted to shorten the original MARS (e.g., Levitt & Hutton, 1984; Rounds & Hendel, 1980; Plake & Parker, 1982; Alexander & Martray, 1989) and generated 30 items from Alexander and Cobb (1984), Alexander and Martray, and Rounds and Hendel. The rules Suinn and Winston used for inclusion were that an item should (a) be found as an important factor in at least two of the studies or (b) show the highest loading among factors in at least one of the studies. The 30 collected items were subjected to a principal components analysis with oblique rotation, and two factors that emerged accounted for 70.3 % of the total variability in the MARS items. Mathematics Test Anxiety accounted for 59.2 % of the variance, whereas Numerical Anxiety accounted for 11.1% of the variance.

Extensive research has been done on the MARS and its psychometric properties (e.g., Camp, 1992; Capraro, Capraro, & Henson, 2002; Dew, Galassi, & Galassi, 1984; Resnick, Viehe, & Segal, 1982; Richardson & Suinn, 1972; Rounds & Hendel, 1980; Strawderman, 1985; Suinn & Edwards, 1982). However, the second, and more important, shortcoming of the instrument is that the proposed underlying construct of the MARS is unidimensional (Richardson & Suinn, 1972; Suinn, Edie, Nicoletti, & Spinelli, 1972). Nonetheless, more recent studies have revealed that there may be more than one underlying construct in mathematics anxiety (e.g., Alexander & Cobb, 1984; Alexander & Martray, 1989; Brush, 1981; Ferguson, 1986; Plake & Parker, 1982; Resnick et al., 1982; Rounds & Hendel, 1980; Satake & Amato, 1995).

Ling (1982) investigated the validity of mathematics anxiety as a multidimensional construct and found six factors (i.e., Personal Effectiveness; Assertiveness; Math Anxiety; Outgoingness; Success; and Dogmatism) that accounted for 76% of the total variance. Bessant (1995) revealed that 43% of the variance in the MARS scores was explained by six factors: General Evaluation Anxiety, Everyday Numerical Anxiety, Passive Observation Anxiety, Performance Anxiety, Mathematics

Test Anxiety, and Problem-Solving Anxiety. Kazelskis (1998) investigated the factor structure of the three most widely used mathematics anxiety scales: the RMARS (Alexander & Martray, 1989), the Mathematics Anxiety Questionnaire (MAQ; Wigfield & Meece, 1988), and the Mathematics Anxiety Scale (MAS; Fennema & Sherman, 1976).

When an exploratory factor analysis, with a principal-axis component analysis and oblique rotation, was applied, the results revealed six dimensions of mathematics anxiety, which accounted for approximately 61% of the total variance. These six dimensions were Mathematics Test Anxiety, Numerical Anxiety, Mathematics Course Anxiety, Worry, Positive Affect toward Mathematics, and Negative Affect toward Mathematics. Kazelskis also pointed out that because "Numerical Anxiety appears to be distinct from the other dimensions... it could be argued that anxiety as a result of the manipulation of numbers is the *sine qua non* of mathematics anxiety" (p. 631).

The RMARS, on the other hand, is a mathematics anxiety instrument that assumes the multidimensionality of the construct. There are three subscales of the RMARS to measure the amount of mathematics anxiety that students usually experience. The Mathematics Test Anxiety subscale assesses student reactions to evaluative situations in mathematics. The Mathematics Course Anxiety subscale is designed to measure student reactions to being in a mathematics class. The Numerical Task Anxiety subscale measures anxiety due to basic math activities such as multiplication and division. Psychometric properties of the RMARS were investigated in a few studies. Initial construct validity of the instrument was obtained from a sample of 517 undergraduate students (Alexander & Martray, 1989).

A principal component factor analysis with squared multiple correlations as initial communality estimates and with a Varimax rotation of the 69-item-version MARS revealed three factors, Mathematics Test Anxiety, Mathematics Course Anxiety, and Numerical Test Anxiety, which accounted for 31% of the variance in the RMARS scores. In a more recent study, Bowd and Brady (2002) conducted principal components analysis followed by Varimax rotation on the results of 357 senior undergraduates in education and found three factors that accounted for 73 % of the variability in the RMARS scores. The three factors were named Mathematics Test Anxiety (11 items), Mathematics Course Anxiety (8 items), and Numerical Task Anxiety (4 items).

Initial concurrent validity of the instrument was tested by comparing it with the Fennema-Sherman Attitude Scale (1976), and negative relationships were found, which meant that students who had more favorable attitudes toward mathematics experienced less mathematics anxiety (Alexander & Martray, 1989). In addition, Moore, Alexander, Redfield, and Martray (1988) found high to moderate correlations between the RMARS and the MAS (Fennema & Sherman, 1976), the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), and the Test Anxiety Inventory (Spielberger, 1980).

Alexander and Martray (1989) also found that the RMARS discriminated between students who took geometry or algebra in high school and students who did not. Students who took an algebra course (F = 18.07, p < .001) and a geometry course (F = 25.60, p < .001) in high school experienced significantly less mathematics anxiety compared with students who did not take these courses, as measured with the RMARS. Moore et al. (1988) also revealed that the RMARS scores were significantly correlated with the American College Testing mathematics scores and mathematics course grades. Moderate-to-high-reliability evidence was found for the total and subscales of the RMARS. Initial internal consistency reliability coefficients of the RMARS subscales were .96 for the Mathematics Test Anxiety, .86 for the Numerical Task Anxiety, and .84 for the Math Course Anxiety (Alexander & Martray, 1989).

Because the psychometric properties of the RMARS have not been fully investigated, we set out to investigate the validity and reliability of the scale. Validity was investigated in terms of its construct and concurrent validity.

Individual RMARS items and three subscales were tested through a confirmatory factor analysis by means of structural equation modeling techniques. When the confirmatory factor analysis did not confirm the underlying factor structure of the RMARS, an exploratory factor analysis was used to discover which measured variables formed a common factor or factors. In addition, students 'perceived general and current mathematics anxiety levels were used to investigate the concurrent validity of the RMARS. Perceived general mathematics anxiety levels were assessed on a scale of 0 to 100, where the higher ratings indicated the higher levels of mathematics anxiety that students usually experience.

Similarly, perceived current mathematics anxiety levels were assessed on a scale of 0 to 100, where the higher ratings indicated the higher levels of mathematics anxiety that students were experiencing at the moment of administration. For the purpose of reliability, the consistency of the instrument's items was studied with internal consistency and split-half reliability coefficients.

From the analysis and discussion of literature that explain the phenomenon, we justify the theoretic cause model that follows from the subsequent construct.

3. Methods

This study is non-experimental since the independent variables are not manipulated and hence, the effects (dependent variables) will not be conditioned towards a determined result. It is transversal-cut considering that the recollection of data by the application of the instrument and its analysis and interpretation were made at a single time. The study is explanatory because it seeks to know the level of anxiety towards Mathematics in students from the Economic-Administrative area as from the model posed by Richardson and Suinn (1972), which has three factors: anxiety towards the evaluation of Mathematics, anxiety towards the course of Mathematics and numerical anxiety.

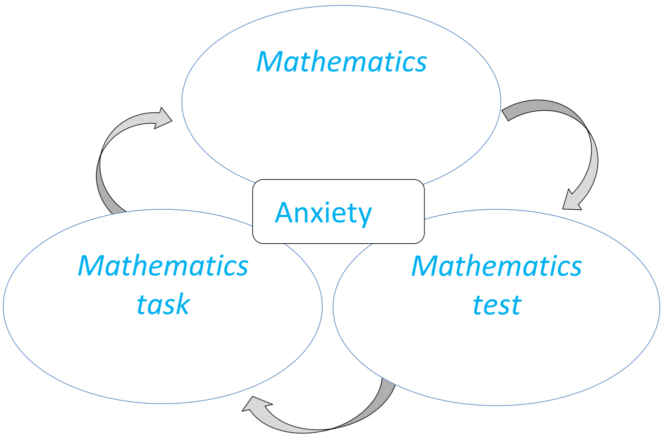

Fig. 1. Theoretical model of anxiety (Richardson and Suinn (1972) and modified by Alexander and Martray (1989).

3.1. Test

The used instrument was the Revised Mathematics Anxiety Rating Scale (RMARS) developed in the seminal work of Richardson and Suinn (1972) and later modified to 25 items by Alexander and Martray (1989). The scale consists of 3 factors: Math evaluation anxiety (15), numerical anxiety (5) and anxiety towards the course of Mathematics (5). The scale used is Likert-type, N=Nothing (1); L=Little (2); AGA= A Good Amount (3); VM= Very Much (4); TM=Too Much (5). Also, table 1 shows the integration of items by dimension.

Table 1. Factors in the RMARS scale of anxiety towards Mathematics.

Indicators	Definition	Codes/items
1-15	Anxiety towards mathematical tests	MATHTEST01 to 15
16-20	Numerical anxiety	MATHTASK16 to 20
21-25	Anxiety towards mathematical course	MATHCOURSE21 to 25

Source: taken from Alexander and Martray (1989), reduced version of the Richardson and Ruin scale (1972).

3.2. Participants

The population of this study is the students who are in a career of the Economic-Administrative area of the Institute that participates in this study, the requirement is that they are active in their institute at the time of applying the survey..

3.3. Sample size

It is a non-probabilistic sample since it was decided to carry out a census, meaning a non-probabilistic by convenience because the choosing of the sample do not depend on probability but on the causes related with the research characteristics, such as the criteria for the survey application, which is that they are registered and present at the time of the test application. With the former, key information can be obtained about the study subjects to later capture and analyse the data with the SPSS software v.16 (*Statistical Package for Social Science*).

3.4. Statistical procedure

For the evaluation and interpretation of data phase, we follow the procedure that has been carried out in some studies, García-Santillán, Venegas-Martínez, Escalera-Chávez and Córdova-Rangel, (2013); García-Santillán, Escalera-Chávez, Córdova-Rangel and López-Morales (2014); García-Santillán, Escalera-Chávez, Moreno-García and Santana-Villegas (2015), García-Santillán (2017) who used the exploratory factorial analysis with main components extraction.

Under the theoretical criteria that stablishes that the hypothesis are invariant: Null hypothesis: Ho = 0 showing that there is no correlation and Hi ≠ 0 that indicates that there is a correlation. Also the decision criterion for the rejection of Ho in all the cases is: Reject Ho if chi-square χ^2 calculated > chi-square χ^2 tables.

As a first step, the instrument is validated by Cronbach alpha and later, the pertinence of using factorial analysis for which the chi-square χ^2 test was applied, the Barttlet test of Sphericity with KMO (Kaiser-Meyer-Olkin), the determinant value to identify the correlations and the measures of sample adequacy by variable (MSA) with significance α =0.01; factorial charges of 0.70 and % of the explained variance.

4. Results

First, the internal consistency of the used instrument by Alexader and Martray (1989) was evaluated. For that, the reliability and internal consistency test Cronbach alpha (α) was used. This coefficient represents the square of the correlation coefficient that measures the consistency of the items through the average of all the correlations among all the items. The closer it is to 1, the better the reliability. The values (α) from 0.80 are considered very acceptable (Hair, Anderson, Tatham and Black, 1999).

To begin, Table 3 shows the Cronbach alpha values for the total of items of the scale “Revised Mathematics Anxiety Rating Scale”, as well as grouped for the three dimensions of anxiety: towards the tasks, towards the exams and towards the course.

Table 2. Reliability test

Concept	Cases	%	α
Valid cases	100	100.0	0.911 with 28 factors (25 items of the scale and the career profile, year and gender)
Excluded (a)	0	0.0	
Total	100	100.0	

a. Removal based on all the variables of the procedure.
Source: own

The results show a Cronbach alpha α of 0.911 for all the items, which is considered acceptable based on the theoretical criteria stated by Hair *et al*, (1999) and so it can be said that the scale reunites characteristics of internal consistency and reliability for the instrument validity.

4.1. Bartlett´s test of Sphericity

To determine if the factorial technique is suitable to explain the data, we obtained the values of Bartlett test of with Sphericity Kaiser (KMO) and the adjustment index X^2 *with df* and the value of α =0.01, as well as the measure of sample adequacy (MSA) and the determinant value to identify if there is correlation among the variables of the study. In this manner, table 3 shows the values of chi-square $X^2$with 276 *df* (1404.084), the KMO value is 0.857 and sig. < 0.00

Table 3. Bartlett test of Sphericity with Kaiser (KMO)

Measure of sample adequacy Kaiser-Meyer-Olkin.		0.857
Bartlett sphericity test	Approximate chi- square	1404.084
	df	276
	p.	0.000

Source: own

The values shown on table 3 support the use of the factorial analysis technique, also, according to the acceptance and rejection criteria of the hypothesis, we can reject the null hypothesis which states that the variables are not correlated, on the contrary, there is evidence that they do present correlation, hence Ho is rejected. Therefore, Table 4 (see in annex) show the correlation matrix with acceptable values (>0.5) between the dimensions implied in the calculus, as well as the MSA values which tend to 1.

For the specific case of the measure of sample adequacy by variable (MSA), on table 5 (see in annex) we can see the obtained values by the variables of the study, which present values that range from 0.759 (lower value of X_{16}) to 0.926 (higher value of X_{13}).

4.2. Components, communalities, eigenvalue and total variance matrix

Now that the use of the factorial technique has been justified, the evaluation of the factorial loadings of the grouped items is presented for the rotation and extraction of rotated components, under the criteria of eigenvalue > than 1, hence table 6 shows the obtained components, variance proportion, eigenvalue and total variance explained.

Table 6. Factors, communalities and variance

Variables	1	2	3	4	5	Communalities
X_4	.837					.727
X_3	.699					.651
X_2	.691					.599
X_1	.608					.602
X_{14}	.556					.730
X_{19}		.885				.867
X_{18}		.877				.859
X_{20}		.846				.816
X_{17}		.568				.524
X_8			.812			.815
X_9			.806			.683
X_{15}			.639			.616
X_{21}				.771		.726
X_{11}				.712		.680
X_5				.631		.661
X_{16}					.677	.661
X_{10}					.537	.540
X_{24}					.515	.662
Eigenvalue	9.450	2.354	1.444	1.389	1.112	
% Variance	39.377	9.808	6.015	5.788	4.634	
% Total Variance			65.62%			

Source: own

As we can see on Table 6 with the component extraction of the rotated components that are grouped by components, according to the criteria of the Eigenvalue higher than 1, five components were able to obtained, which are integrated as follows: the variables that compose component 1 are all related to the exams (39.37 % of its variance), the component 2 is integrated by the variables linked to the mathematical problems to solve (9.08 of its variance), component 3 incorporates the variables linked to the thought of temporality previous to exam (6.015 of the variance), component 4 integrates variables associated to mathematical textbooks (5.7 % of its variance) and finally, component 5 (1.1 % of its variance), which integrates variables related to the fact of listening about mathematics. All of the former explains 65.62 % of the total variance of the studied phenomenon.

5. Conclusion and Discussion

With the evidence attained by the analysis of main components, we were able to know that the RMARS scale of Richardson and Suinn (1972) do not present a tridimensional model, on the contrary, it presented pentadimensional behavior when applied in college students of the economic-administration area of the Veracruz Institute of Technology. Therefore, the resulting model of the five extracted components (called factors) and which explain the phenomenon of anxiety in college students, as shown on Figure 2.

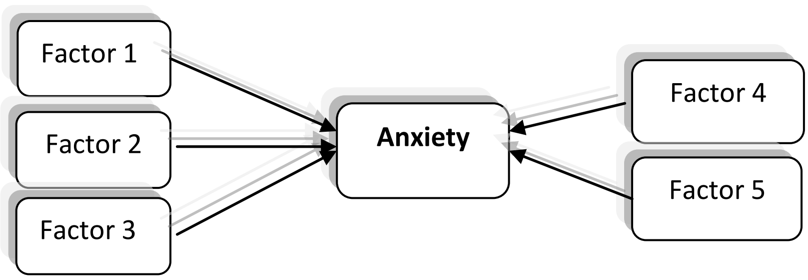

Fig. 2 Pentadimentional Model of anxiety

Where:

Component 1 "Anxiety during exams", Component 2 "Anxiety toward numerical cases" Component 3 "Anxiety for the exams", Component 4 "Anxiety toward math textbook", Component 5 "Anxiety toward alternative activities on math"

Also, it can be proved that some variables from the 25 items scale that was modified by Alexander and Martray (1989) did not present loading in some of the components, this items are: 6, 7, 12, 13, 22, 23 and 25 (see table 7).

Table 7. Items excluded

Item 6. Being given homework assignments of many difficult problems that are due the next class meeting
Item 7. Thinking about an upcoming math test 1 week before
Item 12. Receiving your final math grade in the mail
Item 13. Opening a math or stat book and seeing a page full of problems
Item 22. Watching a teacher work on an algebraic equation on the blackboard
Item 23. Signing up for a math course
Item 25. Walking into a math course

Source: take it of Alexander y Martray (1989)

As part of the important findings obtained, we could know that students are caused a great anxiety (39.27 %) by all that is related to exams, generally speaking, even quick tests. This fact constitutes a previous antecedent from which students can be oriented with didactic strategies that allow them to acquire skills needed to reduce anxiety and in a very specific way, when they present any mathematics exam.

It is clear that if strategies are carried out inside the teaching-learning process in this discipline, the performance of the student would be stimulated and it would certainly reduce the level of anxiety towards the solving of problems in daily life where mathematic aspects are involved or also, when students hear topics related to mathematics, the anxiety towards this subject would be reduced. But which would be the practical implications? To this effect it is convenient to discuss each of the attained components described in table 8.

Regarding Component 1 called "anxiety during exams", students show the highest level of anxiety when facing an evaluation of their knowledge, meaning, when an exam is applied. This anxiety presents from the time students start preparing for the test, whether to enter a college or in the midterms or final exams, even the quick tests applied automatically at the end of each subject.

For Component 2, called "anxiety towards numeric problems" students present a level of anxiety when facing a series of mathematical problems they must solve, whether they are multiplications or divisions. The fact of solving mathematical operations constitutes a trigger of anxiety in students.

In the case of component 3 called "anxiety towards exams", unlike component 1 where students present anxiety when in the process of an exam application, in component 3 the students generate anxiety by the simple fact of thinking that an exam will come shortly, meaning that he/she has not yet prepared nor he/she is solving exercises to practice, it is just the fact of thinking previously in the time when an exam will be applied, whether this is a day or an hour before.

For component 4 called "anxiety towards mathematics books" students generate anxiety when they must buy a mathematics book or when they asked for a book to a classmate, it is also the fact of collecting a mathematics book for reading or to make some difficult task that causes anxiety.

Finally, a fifth component called "anxiety towards complementing activities about mathematics" is when students are caused anxiety by alternatively or at least outside the classroom they are related to subjects about mathematics, for instance when they read a receipt after a purchase or when they realize they have to take a number of mathematic classes since it is a requirement of the career they are studying or when hearing another student explain some mathematical formulas.

Table 8. Components extracted

Component 1 "Anxiety during exams"	Component 2 "Anxiety toward numerical cases"	Component 3 "Anxiety for the exams"	Component 4 "Anxiety toward math textbook"	Component 5 "Anxiety toward alternative activities on math"
Item 4.- Taking an exam (final) in a math course (.837) ***Item 3.-*** Taking an exam (quiz) in a math course (.699) ***Item 2.-*** Taking the mathematics section of college entrance exam (.691)	***Item 19.-*** Being given a set of multiplication problems to solve (.885) ***Item 18.-*** Being given a set of subtraction problems to solve (.877) ***X20.-*** Being given a set of division problems to solve (.846) ***X17.-*** Being given a set of	***Item 8.-*** Thinking about an upcoming math test 1 day before (.812) ***Item 9.-*** Thinking about an upcoming math test 1 hour before (.806) ***Item 15.-*** Being give a "pop" quiz in a math class (.639)	***Item 21.-*** Buying a math textbook (.771) ***Item 11.-*** Picking up math textbook to begin a difficult reading assignment (.712) ***Item 5.-*** Picking up math textbook to begin working on a homework assignment (.631)	***Item 16.-*** Reading a cash register receipt after your purchase (.677) ***Item 10.-*** Realizing you have to take a certain number of math classes to fulfill requirements in your major (.537) ***Item 24.-*** Listening to another student explain a math formula (.515)

Item 1.- Studying for a math test (.608) ***Item 14.-*** Getting ready to study for a math test (.556)	numerical problems involving addition to solve on paper (.568)

Source: own

By means of final reflection we can say that regarding anxiety, like a feeling innate of human beings towards certain circumstances, causes an apparent obstacle in the student´s performance, meaning that being present can hinder the development of skills, in this case mathematical skills. In fact, this subject has been approached in several studies in Latin contexts, specifically in the Mexican context and in the southeast region of the country (García-Santillán et al., 2014, 2015).

The findings shown by the study could be the starting point to propose new didactic strategies that incorporate activities that help the development of numerical skills in the student and that encourage a significant learning more than learning by memory. This knowledge should be taken to the practical field where learning of the solving of daily life problems is contextualized in the own environment of the students. By developing skills to solve numerical problems, the student´s self-esteem would be increased, which would probably help to reduce the level of anxiety towards mathematic, which has been by decades one of the subjects avoided by students in their academic training.

It is clear that as didactic strategies are incorporated to the educational systems in Mexico, the aspects that cause anxiety towards mathematics can be reduced. To this effect it is important to consider that anxiety towards mathematics affects student´s groups and the educational institutions in their performance scores which are evaluated by other organizations.

Recommendation and futures works

The conclusion of this research coincides with the result provided by the Organization for Economic Co-operation and Development (OECD) from the PISA test 2015, where yet again the results do not favor the Mexican educational system. The Secretary of Public Education stated that although there has been a slight improvement in Mathematics, the desired results have not yet been achieved. Even the gap between the students of high and low socio-economic level has been reduced, which is evidence of equity in the Mexican education system (OECD, 2016).

It is clear that the educational reform proposed in the term of President Peña Nieto has not achieved the expected results, which shows stagnation in the Mexican education system, with serious problems regarding the student´s performance, according to Gabriela Ramos, cabinet director of the OECD. It is clear that this is not what Mexico wants, since the middle school student, whose mean age is among 15 years old, enters high school, which precedes college education. At this age, they are close to entering adulthood, when they start to take decisions related to money for instance. Therefore, the low performance in math and specifically financial mathematics can be an obstacle in their daily life.

Finally, the importance of continuing this line of research comes from the position of Mexico, which is number 59 of 71 evaluated countries. The score attained was: 416 points in Sciences, 423 in Reading and 408 in Mathematics, all of which are below the average of 500 points for the three subjects. Because of the former, further exploration is suggested in order to identify the factors that influence anxiety, attitude and behavior toward Mathematics, so that proposals of didactic strategies can be presented in order to redesign the contents of the study plans.

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Annexes

Table 4. Correlations matrix

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	X24
X1	**1.00**	0.51	0.43	0.47	0.34	0.40	0.41	0.49	0.28	0.41	0.21	0.30	0.42	0.58	0.44	0.24	0.25	0.28	0.29	0.32	0.12	0.28	0.42	0.38
X2		**1.00**	0.53	0.49	0.34	0.41	0.39	0.36	0.28	0.39	0.31	0.35	0.40	0.47	0.35	0.13	0.36	0.24	0.41	0.36	0.10	0.32	0.41	0.42
X3			**1.00**	0.64	0.32	0.47	0.45	0.32	0.31	0.25	0.42	0.44	0.44	0.48	0.38	0.03	0.40	0.31	0.32	0.27	0.30	0.23	0.32	0.30
X4				**1.00**	0.21	0.44	0.40	0.27	0.19	0.31	0.35	0.37	0.41	0.50	0.25	-0.05	0.28	0.26	0.28	0.20	0.15	0.27	0.38	0.33
X5					**1.00**	0.46	0.52	0.38	0.27	0.31	0.65	0.22	0.36	0.55	0.34	0.44	0.37	0.41	0.43	0.44	0.43	0.36	0.31	0.45
X6						**1.00**	0.53	0.43	0.29	0.44	0.43	0.26	0.45	0.64	0.51	0.21	0.42	0.45	0.35	0.38	0.23	0.46	0.38	0.44
X7							**1.00**	0.61	0.44	0.39	0.44	0.27	0.48	0.60	0.43	0.24	0.40	0.34	0.34	0.39	0.36	0.42	0.40	0.45
X8								**1.00**	0.65	0.43	0.24	0.30	0.38	0.49	0.58	0.20	0.31	0.18	0.22	0.30	0.24	0.33	0.22	0.35
X9									**1.00**	0.28	0.23	0.43	0.31	0.40	0.40	0.16	0.34	0.17	0.21	0.24	0.22	0.20	0.21	0.20
X10										**1.00**	0.37	0.17	0.35	0.40	0.20	0.31	0.36	0.27	0.32	0.31	0.03	0.33	0.37	0.40
X11											**1.00**	0.25	0.42	0.50	0.31	0.28	0.40	0.39	0.43	0.33	0.42	0.33	0.44	0.34
X12												**1.00**	0.54	0.44	0.42	-0.12	0.27	0.12	0.20	0.21	0.33	0.20	0.21	0.10
X13													**1.00**	0.62	0.48	0.16	0.40	0.29	0.36	0.35	0.35	0.39	0.33	0.37
X14														**1.00**	0.54	0.27	0.46	0.40	0.39	0.41	0.35	0.47	0.56	0.59
X15															**1.00**	0.10	0.33	0.21	0.23	0.30	0.44	0.36	0.32	0.22
X16																**1.00**	0.30	0.44	0.38	0.39	0.14	0.44	0.14	0.47
X17																	**1.00**	0.55	0.53	0.50	0.34	0.44	0.35	0.32
X18																		**1.00**	0.86	0.78	0.25	0.43	0.41	0.58
X19																			**1.00**	0.80	0.31	0.39	0.38	0.56
X20																				**1.00**	0.31	0.45	0.44	0.59
X21																					**1.00**	0.35	0.37	0.25
X22																						**1.00**	0.39	0.54
X23																							**1.00**	0.52
X24																								**1.00**

a Determinante = 1.73E-007

Table 5. Anti-image Matrix

		X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	X24
Covariance anti-image	X1	0.4130	-0.0730	-0.0420	-0.0870	-0.0450	0.0500	0.0290	-0.0830	0.0570	-0.0640	0.1040	0.0020	-0.0310	-0.0780	-0.0490	-0.0920	0.0670	-0.0250	0.0070	0.0020	0.0380	0.0360	-0.0860	0.0640
	X2		0.3970	-0.1050	-0.0300	-0.0470	-0.0460	-0.0030	0.0050	0.0060	0.0160	0.0250	-0.0510	0.0040	0.0410	-0.0300	-0.0070	-0.0680	0.1050	-0.0980	-0.0020	0.1370	-0.0300	-0.0870	-0.0600
	X3			0.3980	-0.1540	0.0260	-0.0380	-0.0490	0.0290	-0.0350	0.0340	-0.0650	-0.0500	0.0030	0.0220	-0.0280	0.0160	-0.0560	-0.0320	0.0280	0.0120	-0.0640	0.0770	0.0580	-0.0270
	X4				0.4230	0.0560	-0.0360	-0.0300	-0.0110	0.0400	-0.0070	-0.0500	-0.0360	0.0010	-0.0330	0.0730	0.0890	0.0130	-0.0030	-0.0130	0.0330	0.0160	-0.0560	-0.0080	-0.0160
	X5					0.3560	-0.0480	-0.0580	-0.0270	0.0350	0.0320	-0.1790	-0.0290	0.0630	-0.0530	0.0360	-0.0830	0.0070	0.0040	0.0050	-0.0410	-0.0920	0.0470	0.0800	-0.0140
	X6						0.3700	-0.0290	0.0110	-0.0040	-0.1160	0.0000	0.0640	-0.0140	-0.0770	-0.1050	0.0670	0.0170	-0.0790	0.0590	0.0060	0.0280	-0.0680	0.0500	0.0110
	X7							0.4120	-0.1150	-0.0220	-0.0050	-0.0020	0.0630	-0.0640	-0.0340	0.0460	0.0120	0.0050	-0.0070	0.0140	-0.0180	-0.0460	-0.0280	-0.0300	0.0110
	X8								0.2920	-0.1880	-0.0930	0.0220	0.0440	0.0100	0.0160	-0.1240	0.0490	0.0000	0.0090	0.0090	-0.0160	-0.0050	-0.0190	0.0820	-0.0530
	X9									0.4530	0.0320	-0.0090	-0.1520	0.0490	-0.0270	0.0260	-0.0870	-0.0560	0.0140	-0.0190	0.0100	0.0300	0.0500	-0.0560	0.0310
	X10										0.5170	-0.0830	-0.0480	-0.0320	0.0490	0.0760	-0.0870	-0.0910	0.0580	-0.0430	0.0010	0.1130	0.0130	-0.0930	-0.0350
	X11											0.3760	0.0240	-0.0590	-0.0150	-0.0130	-0.0340	0.0120	0.0030	-0.0370	0.0500	-0.0220	-0.0050	-0.1060	0.0570
	X12												0.4530	-0.1460	-0.0630	-0.0320	0.1220	0.0380	-0.0180	0.0190	-0.0370	-0.0810	-0.0510	0.0570	0.0580
	X13													0.4440	-0.0700	-0.0420	-0.0210	-0.0280	0.0260	-0.0250	-0.0090	-0.0220	-0.0160	0.0550	-0.0200
	X14														0.2440	-0.0440	-0.0070	-0.0640	0.0180	-0.0040	0.0270	0.0430	0.0150	-0.0740	-0.0990
	X15															0.3970	-0.0020	0.0120	0.0080	0.0010	-0.0280	-0.1100	-0.0370	-0.0260	0.0770
	X16																0.4610	-0.0190	-0.0500	0.0280	0.0020	-0.0090	-0.1400	0.1080	-0.0770
	X17																	0.4820	-0.0610	0.0050	-0.0230	-0.0690	-0.0850	0.0070	0.1140
	X18																		0.1420	-0.0990	-0.0370	0.0550	-0.0030	-0.0470	-0.0300
	X19																			0.1490	-0.0670	-0.0590	0.0180	0.0580	-0.0040
	X20																				0.2670	0.0140	-0.0190	-0.0540	-0.0440
	X21																					0.4800	-0.0650	-0.1300	-0.0290
	X22																						0.4960	-0.0230	-0.0800
	X23																							0.4090	-0.0660
	X24																								0.3200
Correlation	X1	**.859(a)**	-0.1800	-0.1040	-0.2080	-0.1170	0.1290	0.0710	-0.2390	0.1330	-0.1380	0.2640	0.0050	-0.0740	-0.2470	-0.1210	-0.2110	0.1490	-0.1010	0.0300	0.0070	0.0860	0.0790	-0.2080	0.1760
	X2		**.815(a)**	-0.2630	-0.0730	-0.1250	-0.1200	-0.0080	0.0160	0.0150	0.0350	0.0640	-0.1210	0.0100	0.1310	-0.0760	-0.0170	-0.1550	0.4430	-0.4010	-0.0050	0.3150	-0.0670	-0.2150	-0.1680
	X3			**.882(a)**	-0.3770	0.0690	-0.0980	-0.1210	0.0850	-0.0830	0.0760	-0.1690	-0.1180	0.0080	0.0720	-0.0710	0.0360	-0.1280	-0.1340	0.1140	0.0380	-0.1460	0.1720	0.1430	-0.0760
	X4				**.884(a)**	0.1440	-0.0910	-0.0720	-0.0320	0.0910	-0.0150	-0.1260	-0.0810	0.0020	-0.1020	0.1790	0.2010	0.0290	-0.0130	-0.0540	0.0990	0.0360	-0.1220	-0.0200	-0.0430
	X5					**.861(a)**	-0.1330	-0.1510	-0.0840	0.0870	0.0750	-0.4910	-0.0710	0.1580	-0.1810	0.0950	-0.2050	0.0180	0.0180	0.0200	-0.1340	-0.2230	0.1110	0.2090	-0.0420
	X6						**.879(a)**	-0.0740	0.0330	-0.0090	-0.2640	-0.0010	0.1560	-0.0340	-0.2560	-0.2730	0.1630	0.0390	-0.3470	0.2500	0.0180	0.0670	-0.1590	0.1280	0.0320
	X7							**.942(a)**	-0.3300	-0.0510	-0.0110	-0.0040	0.1450	-0.1500	-0.1070	0.1140	0.0270	0.0120	-0.0290	0.0570	-0.0550	-0.1020	-0.0630	-0.0730	0.0310
	X8								**.811(a)**	-0.5180	-0.2390	0.0670	0.1210	0.0290	0.0590	-0.3650	0.1350	0.0010	0.0450	0.0420	-0.0560	-0.0140	-0.0510	0.2370	-0.1720
	X9									**.803(a)**	0.0670	-0.0220	-0.3340	0.1100	-0.0820	0.0610	-0.1900	-0.1190	0.0540	-0.0750	0.0280	0.0640	0.1050	-0.1290	0.0820
	X10										**.838(a)**	-0.1890	-0.0980	-0.0660	0.1380	0.1680	-0.1780	-0.1810	0.2140	-0.1560	0.0040	0.2270	0.0260	-0.2020	-0.0870
	X11											**.852(a)**	0.0590	-0.1440	-0.0490	-0.0340	-0.0820	0.0280	0.0140	-0.1570	0.1570	-0.0520	-0.0120	-0.2700	0.1630
	X12												**.796(a)**	-0.3260	-0.1890	-0.0760	0.2670	0.0810	-0.0690	0.0740	-0.1050	-0.1730	-0.1080	0.1320	0.1530
	X13													**.926(a)**	-0.2120	-0.1010	-0.0460	-0.0610	0.1020	-0.0970	-0.0250	-0.0470	-0.0340	0.1280	-0.0540
	X14														**.904(a)**	-0.1400	-0.0200	-0.1860	0.0990	-0.0220	0.1080	0.1260	0.0420	-0.2330	-0.3540
	X15															**.868(a)**	-0.0040	0.0280	0.0340	0.0050	-0.0850	-0.2510	-0.0830	-0.0660	0.2160
	X16																**.759(a)**	-0.0400	-0.1950	0.1080	0.0070	-0.0180	-0.2920	0.2490	-0.2000
	X17																	**.906(a)**	-0.2340	0.0180	-0.0640	-0.1430	-0.1730	0.0160	0.2910
	X18																		**.779(a)**	-0.6830	-0.1890	0.2120	-0.0100	-0.1950	-0.1420
	X19																			**.802(a)**	-0.3370	-0.2210	0.0680	0.2340	-0.0180
	X20																				**.932(a)**	0.0400	-0.0530	-0.1640	-0.1490
	X21																					**.777(a)**	-0.1340	-0.2940	-0.0750
	X22																						**.911(a)**	-0.0510	-0.2000
	X23																							**.807(a)**	-0.1830
	X24																								**.873(a)**