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## Empirical Study on Financial Knowledge among High School Students in Veracruz

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### Abstract

The financial knowledge that young people have is fundamental to their financial decision making, to guarantee their future consumption and their well-being in retirement. The study focused on analyzing the knowledge that high school students have of income, money management, savings, investment, credit and spending, and comparing if there is a difference by gender. Data from 100 high school students from Boca del Río, Veracruz were obtained using test designed by Contreras-Rodríguez, et al. The analysis seeks to determine the structure of variables that explain the knowledge that Mexican high school students have of financial topics; in addition to verifying that the variables are correlated and that the data matrix is not an identity matrix. The results show that the instrument used has a relatively low Cronbach's alpha (0.597). It was verified that the data matrix did not constitute an identity matrix, which made the data analysis possible through factorial analysis with component extraction. The two extracted factors are explained by 67% of the total variance. The ANOVA tests and the values of the F statistic with gl and its significance (0.05), as well as the Levene statistic, showed that there is no gender difference. Based on the results, strengthening financial education of students is advisable to contribute to their future inclusion in the financial system.

**Keywords:** Finance, Gender, Knowledge, Mexico, Students, Youth.

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### 1. Introduction

According to the OECD/INFE [1], financial education is the process through which individuals acquire a better understanding of financial concepts and products, develop the necessary skills to make informed decisions, assess financial risks and opportunities, and improve their well-being.

There is worldwide evidence that individuals have little knowledge of financial terms [2, 3]. Based on this, different institutions, such as the United Nations (UN), have undertaken initiatives to improve financial knowledge among the population, especially the youth. One of them was the creation of the Child and Youth Finance International movement in

2012, backed by the United Nations Children's Fund (UNICEF), whose premise is that today's youth are future economic actors, who will make financial decisions and set the course for world economies.

The knowledge young people have in terms of income, money management, savings, investment, credit and spending is fundamental to their financial decision making, to guarantee their future consumption and their well-being in retirement. Villagómez [4] points out the importance of financially literate young people who are about to start college, since that is when they begin to relate to the financial world.

Young people who are in their last year of high school are not prepared to manage their finances when they graduate. High school programs focus on preparing them for college or developing skills that will allow them to get a job and an income. High school subjects do not prepare them for their future income and management of financial matters such as bank accounts, investments, credits, loans, mortgages, insurance and taxes Manton, et al. [5]. Scheresberg, et al. [6] identified that despite the economic crises of recent years, less than half of the young people born in the United States between 1980 and 2000 report having sufficient funds to cover their expenses for a period of three months in case of an unexpected event.

Regarding financial knowledge, there is a growing focus on gender. Bucher-Koenen, et al. [7] mention that evidence has shown that women have less financial knowledge than men and when asked about financial knowledge, they are more likely to answer that they do not know. Roy and Jain [8] reveals that women do not relate to financial issues and most of them do not consider it important because they do not know the recent financial innovations in the market and do not use financial services in an optimal way.

Since it is in their school years when most young people face decisions on spending, savings, credit cards and student loans for the first time, and at the same time they are investing in their human capital [9], the following questions arise: is there a variables structure that explains the knowledge Mexican high school students have in terms of income, money management, savings, investment, spending and credit? Does this knowledge differ according to gender?

The objective of the research is to identify if there is a variables structure that explains the knowledge Mexican students have in terms of income, money management, savings, investment, credit and spending and if this knowledge differs according to gender.

Next, the literature review and the research hypotheses are presented. Section three presents the methodology. Subsequently, the results of the research are shown. Then, section five presents the discussion of the results and finally, the conclusions.

## **2. Literature Review**

Several authors have studied financial knowledge among young people [6, 9-18] finding that, in general, the level of knowledge they have in financial matters is low.

Adequate knowledge in financial matters builds confidence in students and empowers them to be able to explore an unlimited number of business initiatives as graduates [19-21]. The intention to increase financial knowledge is linked to the long-term vision. Students who see money only for the gratification of immediate desires are less likely to make efforts to improve their financial education level. It is necessary to have higher financial goals and a positive attitude towards money to be ready to achieve a better financial education [22].

Chen and Volpe [10]; Mandell [11]; Lusardi, et al. [14]; Seyedian and Yi [16]; Lusardi and Mitchell [23]; Barboza, et al. [24], among others, have analyzed not only the level but also the gender differences among students in terms of financial knowledge. A study on financial education carried out in more than 140 countries shows that gender differences are present in all economies, from developing countries to advanced economies [25, 26]. Studies show that men outperform women in basic and sophisticated financial literacy. Even single men are more financially literate than single women who are in charge of their own finances [7]. These significant gaps also exist between young people and students [27].

Although this gender gap in financial literacy levels among the population has attracted increasing interest, not only from researchers but also from policymakers, the reasons for this difference are not yet fully understood. Among other causes, empirical evidence points to differences arising from specialization within the household, where men decide mainly on financial matters [23]. Other studies have documented that woman increase their financial knowledge mainly when it becomes necessary for them to do so. For example, their husbands' death or when social values in their country are low [28].

In economically underdeveloped countries, the gender gap is more pronounced, and rules and regulations favor men more than women. Longer life expectancies, shorter working lives, and rapid changes in financial markets have made women more vulnerable than men [29].

Based on the theoretical and empirical arguments presented, the following hypotheses are established:

*H1: There is a structure that explains the knowledge Mexican high school students have in terms of income, money management, savings, investment, spending and credit.*

*H2: There is a gender difference in the knowledge Mexican high school students have regarding income, money management, savings, investment, spending, and credit.*

## **3. Methodology**

This is a non-experimental design, descriptive, exploratory and correlational study, seeking to determine the structure of variables that explain the knowledge Mexican high school students have about financial topics, in addition to verifying that the variables are correlated and that the data matrix is not an identity matrix.

The participants were high school students from Tecmilenio University in Veracruz. These were fourth and sixth semester students, whose ages ranged between 16 and 19 years. The sample was non-probabilistic by self-determination and had the participation of 120 students who voluntarily agreed to collaborate in the research. The survey was applied online

during March 2020 owing to the Covid-19 health contingency and confinement experienced. The students received the instrument link from their teachers. Of the 120 surveys, 20 were eliminated because they were incorrectly completed.

The test designed by [Contreras-Rodríguez, et al. \[30\]](#) was used. This instrument was designed with the purpose of gathering information on knowledge of financial topics. It consists of two sections: the first one to obtain information about the personal profile of the respondent. The questions in this section allow the collection of information on the variables: age, gender, occupation, income, relationship and type of medical service. The second section is made up of fifteen questions to collect information on knowledge about money management, savings and investment, as well as spending and credit. Each question presents the student with a mini-case simulating a situation related to financial items they would face in real life. Once the surveys were completed and the information collected, the entire database was loaded into the statistical software SPSS v23.

A descriptive analysis of the demographic characteristics of the sample was performed with the data from the first section of the survey. Subsequently, the data matrix was analyzed using exploratory factor analysis to validate that it is not an identity matrix and finally, a one-factor ANOVA test was performed to determine if there was a gender difference.

#### 4. Results

The instrument showed an internal consistency and a Cronbach's alpha reliability of 0.597, which is relatively low, since it is desirable that it be greater than 0.7. The values obtained were cautiously taken to make the corresponding statistical inferences. The results of the participants' profile are presented in [Table 1](#). The sample was balanced in terms of gender, with the participation of 54% women and 46% men. 51% of the students who participated were between 17 and 19 years old and 49% between 14 and 16 years old. 96% are just students, and 4% also worked. The average income received by the 4% of the participants, who in addition to studying also worked, is 4,000 pesos per month. 51% have IMSS medical service and the relationship they have with the home owners is that of children (95%).

**Table 1.**  
Participants profile.

<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>	<b>% Accumulated</b>
<b>Gender</b>			
Men	46	46.0	46.0
Women	54	54.0	100.0
Total	100	100.0	
<b>Age</b>			
14 - 16	49	49.0	49.0
17 - 19	51	51.0	100.0
Total	100	100.0	
<b>Occupation</b>			
Student	96	96.0	96.0
Student and worker	4	4.0	100.0
Total	100	100.0	
<b>Income</b>			
3,000 – 4,999	4	4.0	4.0
Does not work	96	96.0	100.0
Total	100	100.0	
<b>Medical service</b>			
Popular security	6	6.0	6.0
IMSS	51	51.0	57.0
ISSSTE	15	15.0	72.0
Pemex medical service	10	10.0	82.0
Military or Naval medical service	10	10.0	92.0
Other	3	3.0	95.0
Without medical service	1	1.0	96.0
Does not know	4	4.0	100.0
Total	100	100.0	
<b>Family relationship</b>			
Son	95	95.0	95.0
Grandson	3	3.0	98.0
Other	2	2.0	100.0
Total	100	100.0	

To verify that the data matrix does not constitute an identity matrix, [Tables 2](#) and [3](#) show the correlation matrix and its determinant, the Bartlett sphericity test with Kaiser and the values of sample adequacy per variable (MSA), Chi2 and its statistical significance with the degrees of freedom.

**Table 2.**  
Correlation matrix.

Variables	Inc1	Inc2	Inc3	Inc4	Inc05	MM6	MM7	MM8	MM9	MM10	MM11
Income1	1.00	0.316	0.025	0.295	0.061	0.280	0.232	0.462	0.084	0.406	0.169
Income2		1.00	0.183	0.120	0.340	0.247	0.392	0.045	0.138	0.086	0.081
Income3			1.00	0.390	0.158	0.482	0.206	0.152	0.135	0.034	0.357
Income4				1.00	0.492	0.460	0.052	0.212	0.442	0.129	0.431
Income5					1.00	0.384	0.119	0.320	0.409	0.297	0.154
MM6						1.00	0.229	0.127	0.061	0.118	0.043
MM7							1.00	0.254	0.021	0.397	0.119
MM8								1.00	0.400	0.268	0.267
MM9									1.00	0.227	0.225
MM10										1.00	0.126
MM11											1.00

**Table 2.**  
Continued.

Variables	SI12	SI13	SI14	SI15	EC16	EC17	EC18	EC19	EC20	EC21	EC22
SI12	1.00	0.491	0.205	0.427	0.051	0.021	0.308	0.044	0.417	0.195	0.166
SI13		1.00	0.144	0.029	0.114	0.426	0.362	0.149	0.016	0.348	0.056
SI14			1.00	0.140	0.344	0.442	0.056	0.415	0.144	0.417	0.383
SI15				1.00	0.006	0.011	0.463	0.356	0.323	0.196	0.053
EC16					1.00	0.308	0.108	0.202	0.209	0.293	0.000
EC17						1.00	0.088	0.146	0.359	0.033	0.280
EC18							1.00	0.107	0.495	0.151	0.016
EC19								1.00	0.480	0.498	0.290
EC20									1.00	0.090	0.054
EC21										1.00	0.292
EC22											1.00

**Table 3.**  
Bartlett sphericity test with KMO.

KMO and Bartlett sphericity test		
Bartlett sphericity test	Kaiser-Meyer-Olkin measure of sampling adequacy	0.437
	Chi-square test approx	328.543
	gl	231
	Sig.	0.000

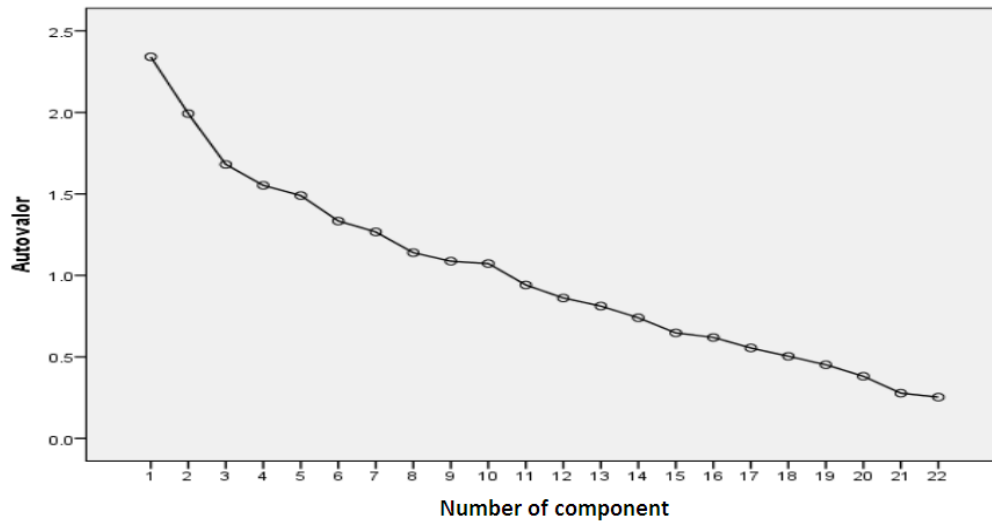
The correlation matrix is not an identity matrix. The values of the correlations show that there is a relationship between the variables, plus the determinant close to zero proves it. The Chi2 values 328.543 with 231 df and significance <0.5 support the factorization. However, the KMO value is very low, so the use of another statistical technique would have to be assessed. It is common that in the practice of hypothesis verification, the value of significance sets the guideline to reject or accept the null hypothesis. That said, the value of calculated Chi2 is greater than the Chi2 of tables, and following the decision criterion, the null hypothesis stating that the matrix constitutes an identity matrix is rejected.

Table 4 shows the total explained variance of the factors extracted by the criterion of factors > 1, and Figure 1 shows the sedimentation graph of the extracted components.

**Table 4.**  
Total variance explained.

Component	Extraction Sums of Squared Loadings		
	Total	% Variance	% Accumulated
1	2.341	10.641	10.641
2	1.993	9.059	19.700
3	1.681	7.639	27.340
4	1.552	7.055	34.395
5	1.490	6.773	41.168
6	1.334	6.063	47.231
7	1.267	5.757	52.988
8	1.139	5.178	58.166
9	1.087	4.942	63.108
10	1.073	4.878	67.985

The extraction of the 10 components provides 67.985% of the total explained variance, which is obtained from the criterion of factors > 1, which makes evident an acceptable explanation of the variance of the structure that underlies the explanation of students' knowledge about income, money management, saving and investing, spending and credit.



**Figure 1.**  
Sedimentation graph.

Table 5 shows the component matrix, where the ten components extracted under the factor extraction criterion and the indicators that comprise them are described.

**Table 5.**  
Component matrix <sup>a</sup>.

Items	Component									
	1	2	3	4	5	6	7	8	9	10
EC22	0.785									
EC16	0.617									
MM7	0.578									
MM9	-0.451									
MM10	-0.440					0.406				
SI13		0.622								
SI15		0.532						0.528		
Income3		0.501			-0.449					
Income5		0.482								-0.401
Income2			0.578							
MM8		0.463	-0.469							
EC19			0.420							
EC17			0.430	-0.683						
EC18				0.519						
SI14				0.423						
EC20					0.556				0.417	
Income1					-0.451					
MM11					0.440					
MM6						-0.469		0.468		
SI12						0.423				
EC21							0.627			0.427
Income4										

**Note:** Extraction method: principal component analysis.  
10 components extracted.

From the components extracted by the criterion of eigenvalues greater than 1, the indicators of each of the variables were grouped and a Varimax rotation was run to simplify the factorization, as shown in Table 6.

**Table 6.**  
Items corresponding to each one of the variables.

Income (INCOME\$)	Money management (MM)	Saving and investment (SI)	Credit and spending (EC)
Items 1 to 5	Items 6 to 11	Items 12 to 15	Items del 16 to 22

With this grouping criterion, the Varimax rotation was performed, which is shown in the rotated component matrix in Table 7.

**Table 7.**  
Rotated component matrix<sup>a</sup>.

Component matrix <sup>a</sup>			Rotated component matrix <sup>a</sup>		
	Component			Component	
	1	2		1	2
SI	0.737		SI	0.784	
MM	0.648		MM	0.737	
INCOME\$	0.577		INCOME\$		0.849
EC		0.823	EC		0.612
Extraction method: principal component analysis.			Extraction method: principal component analysis.		
			Rotation Method: Varimax with Kaiser normalization.		
<sup>a</sup> . 2 components extracted.			<sup>a</sup> . Rotation converged in 3 iterations.		

The matrix is reduced to two components in the Varimax rotation: on the one hand, saving and investment and money management, with acceptable factor loads. This could initially have an interesting meaning since saving and investment are necessarily associated with a reasoned decision to save money. Hence, it makes sense that the money management variable is found in this component. On the other hand, knowledge about the income variable is associated with the spending and credit variables and together they form the second component.

Finally, to identify if there is a gender difference, the indicators of each of the variables (INCOME\$, MM, SI and EC) were grouped. Therefore, the hypotheses establish: H0:  $\mu_1 = \mu_2 = \dots = \mu_k$  the population means are equal and H1: at least two population means are different  $\mu_1 \neq \mu_2 \neq \dots \neq \mu_k$ . For this, the ANOVA is calculated to compare each component and verify if the population means of each component in relation to gender are equal. The test statistic is F and the significance (p-value).

Table 8 describes the F values for each component and their significance, and Table 9 shows Levene's statistic for the variance homogeneity test. The decision criterion is if the calculated F is greater than F in the tables, the null hypothesis is rejected. The same case for the Levene statistic, if the significance is greater than 0.05 there is no evidence to reject the null hypothesis.

**Table 8.**  
ANOVA by components.

Variable	Root mean square			
	gl1=1	gl2=98	F	Sig.
INCOME\$	2.399	5.942	0.404	0.527
MM	2.895	4.558	0.635	0.427
SI	0.822	3.569	0.231	0.632
EC	0.362	10.884	0.033	0.856

The ANOVA values described in Table 8 on the square mean of the inter-groups and intra-groups with degrees of freedom  $gl_1 = 1$  and  $gl_2 = 98$ , respectively, as well as the values of the F statistic with their significance level  $>0.05$ , are evidence not to reject the hypothesis of equality of means, which leads us to think that there is no difference between the groups.

**Table 9.**  
Test of homogeneity of variances.

Variables	Levene's statistic	gl 1	gl 2	Sig
INCOME\$	0.143	1	98	0.707
MM	0.512	1	98	0.476
SI	1.267	1	98	0.263
EC	0.646	1	98	0.424

In addition, the Levene statistic values on equality of variances with the degrees of freedom and its statistical significance, the latter greater than 0.05 in the four components, are evidence not to reject the hypothesis of equality of variance, concluding that both populations (men and women) are equal [31].



## 5. Discussion

The results of the research show that the structure of variables analyzed explains the knowledge Mexican high school students have in terms of income, money management, savings and investment, spending and credit.

No gender differences were found among students in terms of their knowledge about financial issues, which contrasts with research such as that of Lührmann, et al. [27]; Lusardi and Mitchell [23] and Lusardi, et al. [26] who identified that men have more knowledge than women. In Filipiak and Walle [28] there was a gender difference: it is the woman who has more financial knowledge than the man, in a widowhood situation.

The result of this empirical study contrasts with Lusardi, Michaud and Mitchell [25], who found that in more than 140 countries the data on financial education have shown differences by gender. They also contrast with the results of Sholevar and Harris [29] who identified that the gender difference becomes more acute in underdeveloped countries than in developed ones.

## 6. Conclusions

Having financial knowledge is especially important for young people who are about to start their college studies and, therefore, make decisions about debt, credit, money management and budgeting. However, high school institutions in Mexico have not yet included subjects whose objective is personal finance education, which would be of great benefit to students who are just a few years away from starting their working life, starting to manage their equity and retirement savings.

Financial education empowers and allows both individuals and families to better manage their resources, which would help to have better long-term planning and provide a greater capacity to respond to any financial uncertainty situation that may arise.

For society, having individuals with a high financial education level would be of great economic benefit, since it contributes to their financial inclusion, and good individual financial decision-making helps the country to achieve its economic policy objectives.

The result of this empirical study in which there is no difference by gender in the financial knowledge that students have, could be a consequence of some course content that they might have studied recently and probably the teaching support that, in this sense, has favored them to improve their understanding of concepts such as the ones analyzed in this work.

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