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Energy-related financial literacy among university students

ALFABETIZACIÓN FINANCIERA RELACIONADA CON LA ENERGÍA ENTRE ESTUDIANTES UNIVERSITARIOS

Sergio Hernández-Mejía[1]
Universidad Cristóbal Colón

Elena Moreno-García[1*]
Universidad Cristóbal Colón

* Autora corresponsal.

1 Financial Literacy Research Center, Universidad Cristóbal Colón, Carretera Veracruz-El Tejar-Medellín No. 1946, Fracc. Del Predio Rústico Ex Hacienda La Boticaria, 94297, Boca del Río, Veracruz, MÉXICO.

Abstract

Purpose: To analyze energy and financial literacy among university students in Veracruz, Mexico and its impact on investment decisions regarding energy-efficient appliances.

Methodology: The data were obtained by applying a structured survey to a non-probability self-selected sample. A multiple regression model and a Probit model were employed to analyze data from 557 students.

Results: Financial and energy literacy, as well as students' area of knowledge, have a significant impact on their ability to make decisions about energy-efficient appliances.

Implications: Education on basic energy and on financial topics can improve students' decision-making ability regarding energy-efficient appliances. This enhances financial well-being and contributes to environmental conservation. Future research should analyze other variables, such as income level, work experience, and socialization on energy and financial practices.

Originality: This is the first study conducted in Latin America to examine energy investment literacy determinants. The results may contribute to the design of educational strategies to improve young people's energy investment decision-making.

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Resumen

Propósito: Analizar los conocimientos en energía y financieros de estudiantes universitarios de Veracruz, México y su incidencia en la toma de decisiones de inversión en aparatos energéticamente eficientes.

Metodología: Se aplicó una encuesta estructurada a partir de un muestro no probabilístico por autodeterminación. Para el análisis se utilizó un modelo Probit, útil para estimar la probabilidad de que una variable dependiente ocurra, y un modelo de regresión múltiple con datos de una muestra de 557 estudiantes.

Resultados: La alfabetización financiera y energética inciden significativamente en la capacidad de los estudiantes para tomar la mejor decisión de inversión en materia de eficiencia energética. El área de conocimiento es un determinante significativo de la alfabetización en inversión energética.

Implicaciones: La educación sobre temas básicos de energía y finanzas puede mejorar la capacidad para tomar decisiones de inversión en electrodomésticos energéticamente eficientes. Esto mejora el bienestar financiero y contribuye a la conservación del medio ambiente. Se sugiere para futuras investigaciones analizar otras variables como el nivel de ingresos, la experiencia laboral y la socialización de temas sobre energía y finanzas.

Originalidad: Los resultados de esta investigación son los primeros en América Latina sobre los determinantes de la alfabetización en inversión energética y podrían contribuir al diseño de estrategias educativas para mejorar la capacidad de toma de decisiones de los jóvenes.

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INTRODUCTION

This study aims to identify energy and financial literacy incidence in energy investment learning, as well as its determinants: age, gender and area of knowledge among university students from Veracruz, Mexico. The results will address a gap by generating evidence of a population that has not been studied. There is no literature that accounts for energy investment literacy among students in Mexico, or in any other population group in this country. If young people do not have adequate energy and financial literacy, they lack a key component for comfortable adult life, as contemporary society demands individual responsibility and informed consumer decision-making.

Population growth and a greater demand for energy increase per capita energy consumption (Aliyu et al, 2015), leading to a fossil fuel limited future and worsening environmental conditions (DeWaters & Powers, 2011). This implies that people and industries will have to make significant changes in the way they consume energy (Adams et al., 2022).

People should know how to optimize energy and based on knowledge, how to maintain a responsible and environmentally friendly attitude. To make the best energy investment decisions, people need to have information and knowledge related to energy and the skills to process that information. These skills are comparable to those needed to invest or plan for retirement (Blasch et al., 2018) and have been linked to financial literacy level. Kalmi et al. (2021) present this concept as energy investment literacy, based on people's ability to evaluate long-term investment decisions to achieve energy efficiency.

Appropriate energy efficiency investment decision-making requires an understanding of the types, sources, and uses of energy — what Ozili (2022) called energy literacy—, as well as the ability to process economic information to make the best financial decision. Lusardi and Mitchell (2014) defined this ability as financial literacy. Energy literacy has recently emerged as a research topic globally (Martins et al., 2020a). On the other hand, financial literacy has been widely studied, and research has been

conducted on different populations around the world to determine their levels of financial literacy. To a lesser extent, the influence of both financial and energy literacies on investment decisions in energy efficiency has been analyzed (Kalmi et al., 2021).

LITERATURE REVIEW

Financial and energy literacy are significant determinants of energy decision-making. The following sections show the relationship between these variables and how gender, age, and field of expertise can impact them.

Energy investment literacy

Some authors have measured people's ability to calculate and compare appliances lifetime costs (Blasch et al., 2018). That is, they measure the ability to make the best investment decision considering the cost of replacing an appliance with another that represents energy savings in the long term (Kalmi et al., 2021). Financial literacy is an important requirement to make the best decisions regarding energy optimization by choosing the appliance that gives the best cost-benefit ratio (Blasch et al., 2019). According to Brent and Ward (2018) financial literacy increases the possibility of correctly calculating the payback time for investment in more energy-efficient, and also more expensive, household appliances. Therefrom, the first research hypothesis is formulated.

H1. Energy investment literacy is significantly related to financial literacy.

The concept aims to determine what we should know about energy and to what extent (Castañeda-Garza et al., 2025). According to Hendinata et al. (2022) this knowledge is necessary to make the best investment decision in energy efficiency, considering the profitability achieved from potential energy savings. This implies that understanding energy empowers people to make wise decisions and to take responsible action regarding energy use. From this, the second hypothesis emerges.

H2. Energy investment literacy is significantly related to energy literacy.

In line with the research results on energy literacy, gender is also a determining variable in energy investment literacy (Kalmi et al., 2021). This gender difference is due to the different roles that men and women adopt at home; for example, women tend to consume more energy using household appliances (Tjørring, 2016). This influences their decisions related to investment in energy efficiency. Regarding age, Blasch et al. (2018) identified that the ability to relate concepts about energy and finance increase as people get older. In contrast, Filippini et al. (2020), identified that age was not a significant variable.

There is no evidence that the area of knowledge is a determinant in the energy efficiency investment decision-making process. However, there is evidence that the area of knowledge is a determinant in both energy and financial literacy. Therefore, we can assume that this variable is a determinant of energy investment literacy. Martins et al. (2021) identify that those who studied engineering, natural or environmental sciences have significantly higher knowledge levels on energy issues. Participants with professional training in social sciences and humanities have significantly lower knowledge levels on energy than those who studied health sciences. Regarding financial literacy, several studies have found that people who have studied business and finance have higher financial literacy levels (Yew et al., 2017). These results suggest that the students' area of knowledge is a determinant in their energy investment literacy. The above evidence gives rise to the third research hypothesis.

H3. Energy investment literacy is significantly related to students' gender, area of knowledge and age.

Financial literacy

Financial literacy, according to the OECD (2014), refers to the knowledge and understanding of financial concepts and risks, as well as the skills, motivation and confidence to apply such

knowledge to make effective decisions in a variety of financial contexts. Research shows that the sociodemographic characteristics of the population are determinants of financial literacy levels (Dewi, 2022). Regarding gender, results show that women have a lower financial literacy level than men (Bucher-Koenen et al., 2024 and Vaahtoniemi et al., 2023). In student populations, gender is also a determining variable of the financial literacy level with females also having the lowest level (Böhm et al., 2023).

Lusardi & Mitchell (2011) found an inverted U relationship between the age variable and financial literacy. They identified that financial literacy is low for people under 35 years old, increases to a maximum in the productive age and decreases in people over 65. These results are consistent with Vaahtoniemi et al. (2023). In contrast, Kim & Mountain (2019) identified that age is not related to the financial literacy level.

The area of knowledge is a determining variable in the financial literacy level of university students. Ameer & Khan (2020) identified that the financial literacy level differs depending on the area of knowledge and that those who study Business and Economics do have higher financial literacy levels. From the above, the fourth hypothesis of the research emerges.

H4. Financial literacy is significantly related to students' gender, area of knowledge and age.

Energy literacy

Blasch et al. (2019) define energy literacy as the knowledge that people have regarding energy topics, such as the price of energy and the energy consumption of different household appliances. Research has identified that, in student populations, gender has a significant relationship with energy literacy (Białynicki-Birula et al., 2022), as well as their area of knowledge (Cotton et al., 2015). Age has also been identified as a determining variable in students' energy literacy (Martins et al., 2020c). Vocational training is also an energy literacy determinant. Martins et al. (2021) identify that those who studied engineering, natural or environmental sciences have significantly higher knowledge levels on energy issues. Participants with professional training in social sciences and humanities have significantly lower knowledge levels on energy than those who studied health sciences. From the evidence on these determining variables in energy literacy, the fifth hypothesis of the research emerges.

H5. Energy literacy is significantly related to students' gender, area of knowledge and age.

METHODOLOGY

Data was obtained from a questionnaire applied in October 2022. The sample of population are students from a private university in the city of Veracruz, Mexico, enrolled in undergraduate programs (Business and Economics, Health Sciences, Engineering, and Humanities). The sampling method was self-determination. The total number of cases (557) are students enrolled during the August-December 2022 semester. Data collection was carried out through Google Forms digital platform, during class time, under a professor´s supervision.

The aim of this research is to analyze the impact of energy and financial literacy, together with sociodemographic characteristics, on a person's ability to identify the convenience of investing in an energy-efficient appliance. The analysis is carried out calculating the payback time of the difference in investment amounts between a conventional air conditioning system and an energy-saving one.

The survey included a question, adapted from Martins et al. (2020a) and Kalmi et al. (2021), that assesses a person's ability to choose between two air conditioning systems with different prices and different annual electricity costs. The question reads as follows: Consider two air conditioning systems. System A costs 1,500 USD and has an annual electricity expenditure of 400 USD. System B costs 3,500 USD and has an annual electricity expenditure of 200 USD. How long will it take to pay back the cost difference between the two systems, considering the annual electricity savings? Answer options: a) 1 to 5 years, b) 6 to 10 years, c) 11 to 15 years, d) I don't know). For the statistical analysis, the value of 1 is assigned to option b), considered the correct answer, and 0 to all other answers.

Energy investment literacy focuses on energy efficiency decision-making. Therefore, the dependent variable in this study, denoted as energy investment literacy is modeled as a dichotomous variable with a value of 1 if the respondent chose the correct answer and a 0 if the respondent chose the incorrect answer. Therefore, a dichotomous Probit model is used (Wooldridge, 2010). This model estimates the probability that a person can choose an efficient appliance, considering its cost, instead of a less efficient one, given a set of explanatory variables. The Probit estimate is based on the following equation: $P_I=P\ \ (y=1/X)$. The latent variable is defined $y_i^*=X_i\beta+\varepsilon_i$. The variable y^* is unobservable and y takes values of 0 or 1 according to the following rule:

$$y_i = \begin{cases} 1 \ \ if\ y_i^* > 0 \\ 0\ otherwise \end{cases}$$

The term X represent the independent variables. It is assumed that ε_i is distributed as a standard normal and therefore y_i^* as well. The partial effect of the independent variables on the probability of response, called the marginal effect, is calculated from $\frac{\partial p(x)}{\partial (x_j)} = g(B_0 + \boldsymbol{X\beta})B_j$.

The independent variables are the energy literacy index, the financial literacy index, gender, area of knowledge and age.

The research used the conceptual framework proposed by Blasch et al. (2019) to measure energy literacy. Four questions are used in this research: The first question is intended to determine whether the respondent knows the cost of 1 kilowatt-hour (kWh) of electricity in Mexico. The second is intended to find out whether he knows the technical characteristics that determine the cost of using household appliances. The third question is intended to determine if the student knows, according to the energy efficiency label, which appliance consumes less energy. The fourth question is intended to find out whether the respondent is aware of the potential savings derived from LED technology use. These four questions assess people's knowledge of energy. For each question, a value of 1 is assigned if the respondent chooses the correct answer, and 0 if he does not. Energy literacy is measured by an index ranging from 0 to 4, determined by the number of correct answers.

Three questions proposed by Lusardi & Mitchell (2011) measure financial literacy and assess the ability to calculate compound interest, knowledge of inflation, and the relationship between diversification and risk. A value of 1 is assigned if the respondent chooses the correct answer, and 0 if he does not. The financial literacy index is determined by the sum of correct answers to the questions on compound interest, inflation and diversification. The indicator takes integer values in the range of zero to three.

The questionnaire includes questions to find out the characteristics of the student (gender, age and area of knowledge). For the statistical procedure, a dichotomous variable is designed for gender (woman=1, man=0); a dichotomous variable for each area of knowledge (1 if the respondent belongs to the corresponding area and zero otherwise, and the base category is the humanities area) and a continuous variable for age.

For the correlational analysis of energy literacy and financial literacy with respect to the independent variables (gender, area of knowledge and age), Blasch et al. (2021) methodology is closely followed, and a multiple regression model is used. Descriptive numerical measures such as mean and standard deviation are calculated and different estimates are made according to the research hypotheses. Based on the estimate, the independent variables individual significance is evaluated using the P-value method, taking a significance level of 5% as a reference.

RESULTS

Of the total number of cases in the sample, most participants (55%) are women between 18 and 22 years old. The students' distribution in the sample, by area of knowledge, is as follows: 22% in Business and Economics, 29% in Humanities, 21% in Engineering and 28% in Health Sciences. Of these, 73% of the students indicated that they live in their family home, 10% are aware of the electricity costs of the home they live in since they are responsible for making the payment.

Figure 1 shows the proportion of correct answers. Of all the questions, the selected cohort seems to be better informed about the greater efficiency of LED (or incandescent) light bulbs.

Only 19% of respondents know the cost of 1 kilowatt-hour (kWh) of electricity in Mexico. Less than half, 46%, are aware of the variables that determine the amount of energy consumed by an appliance. About 10% of students know, according to the energy efficiency label, which appliance consumes the least amount of energy. Less than a third of respondents, 30%, were able to calculate the best investment in an appliance based on the energy savings it generates. Regarding financial literacy, 34%, 37%, and 24% of respondents answered the questions about compound interest, inflation and diversification correctly.

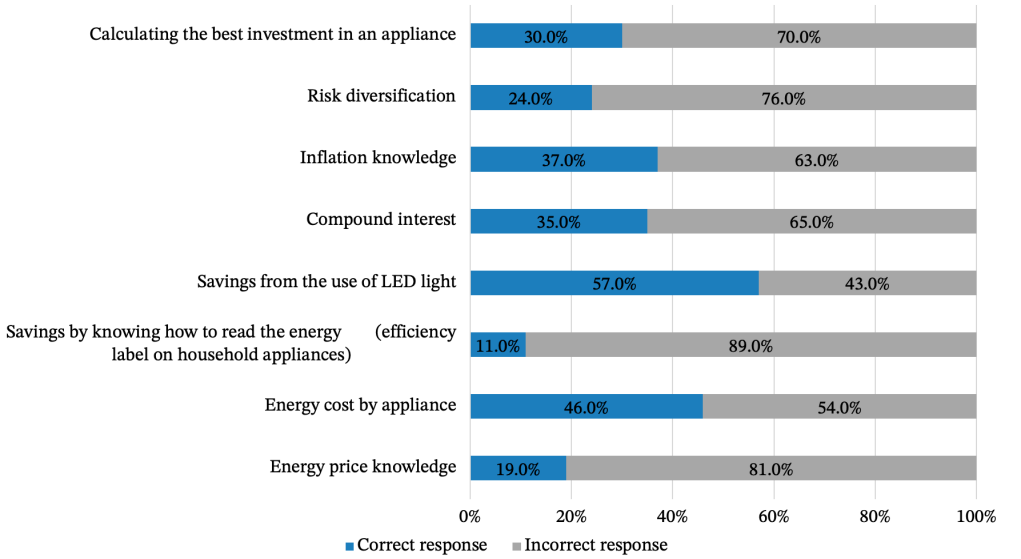

Figure 1. Energy-related financial literacy survey results (percentage of correct answers). Source: own elaboration.

The average of the energy investment literacy indicator is 0.30, equivalent to 30% of students who correctly answered the question on energy investment. The average energy literacy indicator is 1.32, indicating that, on average, university students didn't answer more than two questions correctly, out of the four, corresponding to energy literacy. The financial literacy estimated mean is 0.94, which means that university students answered one of three questions correctly.

Table 1 presents the target group percentage by gender, area of knowledge and age, who answered the questions to assess their knowledge about energy correctly, as well as the results of the mean difference test. In all questions, the percentage of men who had correct answers is higher than that of women. The results of the test show a significant difference between men and women (P-value <0.05).

Table 1 shows that the percentage of students from the Faculty of Humanities who gave correct answers to energy literacy questions was lower than that of other faculties. The results of the hypothesis test show mean difference by area of knowledge (P-value <0.05), except in the question on knowledge about energy price (P-value =0.07). Regarding the difference by age, the results of the hypothesis test show that there is no mean difference in any concept (P-value >0.05).

Table 1. Differences in energy literacy by gender, area of knowledge and age.

Target group	Price energy knowledge	Energy cost by appliance	Savings by knowing how to read the energy efficiency label	LED technology saving	Sample
All	19%	46%	118%	57%	557
Men	24%	52%	16%	64%	247
Women	15%	42%	7%	51%	310
	F=7.42 P-value=0.00	F=5.80 P-value=0.01	F=11.8 P-value=0.00	F=8.98 P-value=0.00	
Business and economics	20%	50%	18%	61%	121
Health sciences	19%	55%	10%	66%	154
Engineering	26%	52%	14%	60%	117
Humanities	13%	31%	5%	42%	165
	F=2.30 P-value=0.07	F=7.71 P-value=0.00	F=4.29 P-value=0.00	F=6.89 P-value=0.00	
Age 17	29%	38%	10%	52%	21
Age 18	21%	48%	10%	56%	193
Age 19	18%	51%	14%	56%	148
Age 20	19%	37%	9%	59%	113
Age 21	15%	46%	7%	59%	41
Age 22	13%	50%	21%	50%	24
Age 23	0%	46%	0%	45%	11
	F=0.80 P-value=0.62	F=1.00 P-value=0.44	F=1.51 P-value=0.13	F=0.51 P-value=0.88	

Note: The F-value is the result of the mean difference test. Source: Own elaboration.

Table 2 shows the results of the financial literacy indicator by gender, area of knowledge, and age, as well as the results of the test for difference in proportions. In this analysis, the size of each group varies, which could influence the test results, especially when grouping by age. The questions assessing students' financial literacy are multiple-choice questions with a single correct answer. According to our estimates, only 8% of the total sample chose the correct answer to the financial literacy questions.

In the gender comparison, a higher proportion of men answered each of the questions correctly. The results of the hypothesis test indicate a gender gap in financial literacy (P-value <0.05). Regarding financial literacy by area of knowledge, around 50% of the business and economics students answered the questions on multiple interest and inflation correctly, and the lowest percentage of correct answers was from Humanities students, around 20%. In the diversification question, less than 30% of the students from all areas of knowledge answered correctly. The test results show a significant difference in the financial literacy mean by area of knowledge (P-value <0.05). Regarding the difference in financial literacy by age, the results of the hypothesis test show that there is no average difference (P-value >0.05).

Table 2. Differences in financial literacy by gender, area of knowledge and age.

	Compound interest	Inflation	Diversification	Sample
All	34%	37%	24%	557
Men	42%	46%	30%	247
Women	28%	30%	19%	310
	F=11.65 P-value=0.00	F=15.64 P-value=0.00	F=8.51 P-value=0.00	
Business and economics	50%	49%	27%	121
Health Sciences	40%	42%	26%	154
Engineering	34%	40%	30%	117
Humanities	18%	21%	15%	165
	F=13.02 P-value=0.00	F=9.29 P-value=0.00	F=3.86 P-value=0.00	
Age 17	29%	48%	10%	21
Age 18	31%	30%	23%	193
Age 19	34%	40%	26%	148
Age 20	39%	43%	27%	113
Age 21	37%	37%	15%	41
Age 22	33%	38%	29%	24
Age 23	36%	27%	18%	11
	F=0.65 P-value=0.76	F=1.03 P-value=0.41	F=1.33 P-value=0.20	

Note: The F-value is the result of the mean difference test of respondents who chose the correct answer.
Source: own elaboration.

The results shown in tables 3 and 4 confirm that energy investment literacy is significantly related to financial literacy and energy literacy, and that students' area of knowledge significantly impact all three literacy variables. The results of the four models are presented in table 3. Models 1 and 2 are bivariate regressions between the energy investment literacy variable with the financial literacy index and the energy literacy index, respectively. Model 3 includes both indexes as independent variables, and model 4 also includes the students' sociodemographic characteristics. The results show a positive and significant relationship between financial literacy and energy literacy with the energy investment literacy variable.

The results of models 1 and 2 show that financial literacy and energy literacy, separately, are significant determinants of energy investment literacy. The marginal effect for financial literacy is 10%, and for energy literacy is 9%, with a P-value <0.01, indicating a strong positive association. These results confirm the research hypothesis H1 and H2. The results of model 3 show the combined effect of financial literacy and energy literacy on an individual's ability to calculate the payback time for investment in energy-efficient appliances. Although the individual effect of each variable is smaller compared to the results of the bivariate models, the effect of both variables is positive and significant (P-value <0.01).

Model 4 includes sociodemographic variables. The results show that the marginal effect of both variables, financial literacy and energy literacy, is smaller than in the other models, but the effect is positive and significant. The results show that the variable area of knowledge is a significant energy investment literacy determinant. The marginal effect corresponding to the Business and Economics programs (15%) is positive and significant (P -value <0.05), indicating that Business and Economics students are more likely than those in Humanities to possess the

skills to correctly perform a calculation to invest in a household appliance. The variables gender and age are not significant. The results partially support hypothesis H3.

Table 3. Energy investment literacy Probit regression (Marginal effects)

	Dependent variable: Energy investment literacy			
	Model 1	Model 2	Model 3	Model 4
Financial Literacy Index	0.10***		0.08***	0.07***
Energy literacy Index		0.09***	0.07***	0.06***
Gender (Ref=Male)				-0.01
Area of knowledge (Ref.=Humanities)				
Business and Economics				0.15**
Health Sciences				0.11*
Engineering				0.06
Age				-0.00
Observations number:	557	557	557	557
Dependent variable Mean	0.29	0.29	0.29	0.29
R-square Mc Fadden	0.04	0.03	0.06	0.07
Number of correctly predicted cases	385 (69.1%)	393 (70.6%)	383 (68.8%)	389 (69.8%)
F (beta'x)	0.34	0.34	0.34	0.33
Likelihood ratio test:	=30.52 [0.00]	=23.31 [0.00]	=42.15 [0.00]	=49.40 [0.00]

Notes: Ref.= reference variable. Standard errors in parentheses. *, **, ***: level of significance (<0.10, <0.05, <0.01, respectively). Source: own elaboration.

Table 4 shows the results of the multiple regression model of the correlational analysis of energy literacy and financial literacy with respect to the independent variables. For the variable financial literacy, gender and area of knowledge (P-value<0.01 for both variables) are significant determinants. The negative sign of the coefficient of the gender variable (-0.31) indicates that women obtained a lower average score on the indicator, which confirms the gender gap in the financial literacy measures. For the variable financial literacy, the area of knowledge is a significant determinant (P-value<0.01). The positive sign of the coefficient corresponding to the Business and Economics (0.64), Engineering (0.34) and Health Sciences (0.50) indicates that students obtained a higher average score, compared to the average score obtained by students from Humanities, which is the reference category. The results also show that students' financial literacy does not have a statistically significant relationship with students' age. Findings partially support the research hypothesis H4.

Table 4. Financial and energy literacy linear regression

	Financial literacy	Energy literacy
Constant	0.39 (0.52)	1.79*** (0.53)
Gender (Ref=male)	-0.31*** (0.08)	-0.31*** (0.08)
Area of knowledge (Ref.=Humanities)		
Business and Economics	0.64*** (0.11)	0.50*** (0.11)
Health Sciences	0.50*** (0.10)	0.52*** (0.10)
Engineering	0.34*** (0.12)	0.42*** (0.12)
Age	0.01 (0.02)	-0.03 (0.02)
Observations number	557	557
Dependent variable Mean	0.94	1.32
R-square	0.10	0.09
F (5,551)	13.24	11.65
P-value (F)	0.00	0.00

Notes: Ref.= reference variable. Standard errors in parentheses. *, **, ***: level of significance (<0.10, <0.05, <0.01, respectively). Source: own elaboration.

The results of the energy literacy regression show that the variables gender and area of knowledge are statistically significant (P-value<0.01 for both variables), but the variable age is not. The negative sign of the coefficient for the variable gender (-0.31) indicates that women scored lower on average on the energy literacy indicator, confirming the gender gap in energy knowledge. The area of knowledge is a significant determinant (P-value<0.01). The positive sign of the coefficient corresponding to the Business and Economics (0.50), Engineering (0.42) and Health Sciences (0.52) indicates that students obtained a higher average score in financial energy, compared to the average score obtained by students from Humanities, which is the reference category. Regarding age, older students compared to younger students, on average, have lower energy literacy level. The result partially supports the research hypothesis H5.

DISCUSSION

The results are the first to be obtained in a Latin American context and show that basic energy and financial knowledge positively impact energy investment decisions among young university students. This means that energy and financial knowledge improve the decision to invest in an energy-efficient household appliance that is also the best financial option. These results support hypothesis 1 and 2 and are consistent with with the results of Blasch et al. (2019) and Brent & Ward (2018), who found that energy investment literacy is significantly related to financial literacy. The results also coincide with Hendinata et al. (2022) in that they highlight the necessity of energy knowledge for making optimal investment decisions in energy efficiency.

The results also show that students' area of knowledge is an essential factor of energy investment literacy and that students from Business and Finance programs are more likely to make optimal investment decisions. According to Filippini et al. (2020), age doesn´t impact students' energy investment literacy, and unlike Kalmi et al. (2021), there is no gender gap in the ability to calculate the best investment decision in energy efficiency. These results partially support the third hypothesis.

Analyzing the sociodemographic determinants of the financial and energy literacy reveals that women scored lower than men on average in both finance and energy. Financial literacy's gender gap is widely demonstrated, and the results are consistent with those of Bucher-Koenen et al. (2024) and Vaahtoniemi et al. (2023). The gender gap on energy knowledge coincides with the findings of Białynicki-Birula et al. (2022).

The area of knowledge is another significant determinant of energy and financial literacy, and Humanities students, under study, have the lowest financial literacy level. This result is consistent with those of Ameer & Khan (2020). Students from the Faculty of Humanities also obtained the lowest result in the energy literacy questions as Martins et al. (2021) reported. Most research has identified age as a significant determinant of the financial and energy literacy level. However, the results obtained in this research agree with those of Kim & Mountain (2019) in that they didn't find a statistically significant relationship. Our results contrast with those of Martins et al. (2020c) who found age as a determining variable in students' energy literacy. One possible explanation is that those authors analyzed a wider age range of participants. The results partially support the fourth and fifth research hypothesis.

The average score of the energy literacy indicator was 1.32 points, lower than the value of 2.45 reported by Boogen et al. (2021). This result shows the limited knowledge that undergraduates have about the operating cost of household appliances, consistent with the results reported by Blasch et al. (2021) and Filippini et al. (2020), and could be associated with the poor energy education acquired in their basic education (Castañeda-Garza & Valerio-Ureña, 2023).

We found that university students are aware of the energy saving potential associated with the use of LED technology bulbs compared to conventional bulbs. This result coincides with Blasch et al. (2021) and Filippini et al. (2020). This is probably a result of the growing promotion of LED technology bulbs (Filippini et al., 2020). Our results show evidence of low financial literacy level among university students in line with Ramos-Hernández et al. (2020).

CONCLUSION

The results of this research achieve the objective of identifying the impact of energy and financial literacy on energy investment by demonstrating the importance of these two variables as key factors in household energy consumption and investment decision making. Therefore, it is essential to know whether individuals, especially young people, have the knowledge and skills to make optimal energy consumption choices, considering that they will be the next generation making financial, economic and political decisions.

The results of this research are the first conducted in Mexico and could contribute to the design of educational strategies aimed at improving and young people's energy literacy and developing their financial skills, especially among women and those studying Humanities degrees, who obtained the lowest results.

Future research should be conducted to assess financial and energy literacy, taking into account other sociodemographic determinants, such as living in rural areas, education and income level, and labor conditions.

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Authors' contributions:

Conceptualization: SHM and EMG; Data Curation and Formal Analysis: SHM; Research: EMG; Methodology: All; Project Management: EMG; Supervision: EMG; Validation: SHM; Visualization: All; Writing - Original Draft: SHM; Writing - Review and Editing: EMG.

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