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Financial literacy and sustainable consumer behavior

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Abstract: A more sustainable society and economy also implies a more sustainable behavior in the consumption of financial products. A possible change in focus can come from the demand side, so that more sustainable consumption of financial products have to go hand to hand with financial literacy. However, financial literacy, potential favoring of this sustainable behavior, is far from reaching an international consensus about its definition, object and scope.

Two objectives are analyzed; the different interpretations of financial literacy in the academic literature, as well as its evolution and how, in what context and with what other concepts the term is used in social networks. Scientometric techniques and content analysis have been used to carry out a systematic review of literature and also NLP to analyze the comments on Social Networks.

Critical moments are identified in the definition of financial literacy. Also ten sentiments are analyzed in social networks in wich positivity, trust, and anticipation predominate. Greater attention to this issue is necessary both from the private initiative and from public policies, so that financial literacy is an effective tool for a more sustainable behavior by consumers. Finally, a new definition is proposed based on our findings.

Keywords: Financial Literacy, Financial Behaviour, Consumer Behavior, Sustainable Consumer Behavior, Social Media, Natural Language Processing, Social Network

1. Introduction

Financial education favors a more sustainable behavior in the consumption of financial products and leads to a more sustainable economy and society. It is evident that not all financial products present in the markets today exhibit characteristics of sustainability. For this reason, a change of approach, from the supply side, through the consolidation of sustainable finances and, from the demand side, through more sustainable behavior of consumers is, in this sense, where financial literacy plays a prominent role [1].

Both academic and economic policy makers show increasing interest in financial education because of its importance in making sustainable economic and financial decisions that will improve future well-being [2]. The current approach to "financial education" must include attitudes, values, and beliefs that enable informed financial decisions [3]. However, although "financial education" favors a more sustainable behaviour, it is still far, at least from an academic point of view, from reaching an international consensus on its definition, object, and scope.

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When we analyze the issue of financial culture, we find one of its first complexities, that which derives from the absence of a universally accepted, conceptual definition [4] [5]. This also makes it difficult to measure financial knowledge [6], given its qualitative nature [7], and makes it difficult to implement programs and initiatives that promote financial education [8]. Consensus on a definition will lead to finding common measurable indicators that allow assessing financial literacy and understanding its educational impact.

In an attempt to limit and homogenize the concept of the phrase "financial education", this research has a double objective. On the one hand, it aims to analyze the disparate interpretations that academic literature has made of financial education, as well as interpret the evolution that it has undergone over time and its academic estatus at the present time. On the other hand, it seeks to evaluate how and in what context and with what other concepts the term is used in social networks through the use of social listening on Twitter, one of the most popular and widespread social networks today and characterized by impulse and spontaneity [9].

What is new in this article is the combination of the academic approach combined with a more informal approach on the use of the concept of financial education in social networks, in order to analyze different perspectives based on the different sources used. In addition, analysis of sentiments allows us to analyze tweets not only based on their content and nature, but also by applying a subjectivity that allows us to determine the emotional tone behind the analyzed terms. This is important because financial decisions are not based solely on logic and knowledge, but are influenced by emotions, personal values, and social pressure [10,11].

Based on the significant growth in academic contribution on the study of financial education and the growing interest in social networks, we consider the following research naritives: (H1) The conversation threads that consider financial literacy are important for individuals. (H2) Conversations that promote financial literacy at an early age predominate. (H3) Positive feelings and trust prevail in social media posts referring to financial education. (H4) The information obtained from different approaches provides a new opportunity to define financial education.

The rest of the article presents the following structure: After the introduction, the second section compiles a review of the existing literature on the study of financial education; the third section identifies the source used to extract the Twitter data and the methodology applied to the tweets; In the fourth section, the empirical analysis of the results obtained is carried out and in the last section, the results are discussed, the conclusions of the study are presented and future lines of research are proposed.

2. Literature Review and Research Hypotheses

"Financial education" proffers different interpretations and this is clearly reflected in the large number of definitions used in the literature. For some authors it is a broad concept, encompassing understanding of the economy and how individual decisions are affected by economic circumstances, behaviour, and financial skills. For others, it focuses strictly on basic money management [12].

John Adams, politician and second president of the United States, was one of the first people to express the importance and need for financial education. In a letter to Thomas Jefferson, written in 1787, he stated: "All the perplexities, confusion, and distress in America arises not from deficits in the Constitution or Confederation, nor from want of honor or virtue, so much as from downright ignorance of the nature of coin, credit and circulation".

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We have to wait almost 200 years to find theoretical arguments relating to financial education again. We can therefore say that the concept of financial education has recently been consolidated. In the second half of the 20th century, the first relevant studies were carried out, with students from schools and universities, related to the knowledge of efficient money management [13,14]. Both studies reflect the lack of financial literacy on the part of students and They highlight the lack of knowledge in different areas related to everyday money management such as credit cards, insurance and personal loans, as well as in financial management in general [14]. In the last decade of the 20th century, financial education began to acquire importance, largely motivated by the decreasing savings rates that had been observed in American households since the beginning of the previous decade [15].

One of the first definitions presented on financial education defines it as "the ability to make informed judgments and make effective decisions about the use and management of money." [16] It highlights two dimensions in this definition, the first refers to financial knowledge and the second to the ability to use the financial knowledge acquired in an appropriate way to make informed decisions. [17] We consider that this interpretation of the concept is very reductionist, since it is practically limited to the nature of money.

In the following years, several publications almost exclusively conflate the concepts of financial education and financial knowledge [18-21] in such a way that they are presented almost as synonyms. Certain studies [22] find a positive relationship between financial knowledge and making more financially responsible decisions. Although financial literacy and financial education are related, empirical evidence shows that financial knowledge, by itself, is not sufficient for making informed financial decisions [23].

Over the years the relevance of financial education has grown and studies on the subject appear to show, the absence of a consensual definition of the concept. This lack of definition does not contribute to raising levels of financial literacy [24]. In this sense, the author proposes that individuals, in order to make sense of the financial information they receive and achieve the desired results, must have a base combination of skills and technologies, resources and contextual knowledge.

Gradually, the idea that financial education goes one step beyond mere financial knowledge is solidifying. For this reason, from the first years of this century, new concepts appear that should be included in the definition. One of the most important additions is to consider financial behavior as a fundamental variable. Evidence of this is the 2002 award of the Nobel Prize in Economics to psychologist Daniel Kahneman and economist Vernon L. Smith for their work on behavioral economics [25]. Their work considered that previous research on financial knowledge reveals a problem as more financial knowledge does not necessarily translate to better financial behaviour [26].

Financial education is a complex concept and therefore difficult to define [27]. For this reason, this author incorporates two new dimensions, apart from behaviour, there are experience and competence. She proposes that there is a positive relationship between these variables and efficient financial management. In 2005, the Organisation for Economic Co-operation and Development (OECD) tried to clarify and integrate the subjective term "Financial well-being" into the definition based on the fundamental features that appeared in the definitions listed above. This term has been the subject of multidisciplinary study and refers to individual perception on the maintenance of a standard of living and financial freedom, both in the present and in the future [28].

Other definitions, much more instrumental, relate mathematical ability of arithmetic and basic calculus with the understanding of financial terms [29-31]. These studies display a positive correlation between mathematical ability and financial literacy. A certain mathematical calculation ability is necessary to understand, for example,

interest capitalization, the difference between nominal and real values, and to be able to adequately diversify risk and debt. Other authors used the concept of financial arithmetic as a combination of financial literacy and financial ability [32]. In contrast, for other studies, financial literacy and numeracy are two separate competencies [33] and there is no direct correlation between numerical skills and better financial decision making [34].

In the definitions referred to above, a temporal dimension almost never appears, and it is necessary to introduce this variable [35]. An estimate of future financial well-being depends on financial behavior in the present [36]. In addition, it should be noted that the individual perception of financial well-being can be dynamic, given the different personal and work situations that may arise throughout life [28,36].

In 2009, financial education had gained visibility as a result of the economic and financial crisis unleashed in 2008, caused mainly by the over-indebtedness of a large part of the population due to the acquisition of complex, high-risk products. That is why numerous and important studies on the subject begin to appear, questioning whether, with higher levels of financial education on the part of individuals, the magnitude of the crisis could have been reduced, and looking for indicators that would help to measure this literacy. Support for financial education grew as the crisis became not only a temporary moment of economic difficulties but a state of "permanent economic emergency" [37]. From the perspective of behavioral economics, the two implications that this moment in financial education has stand out. On the one hand, it points out that individuals do not always behave rationally, as conventional economics had considered, and, on the other hand, that the environment in which financial decisions are made is not always perfect [38]. Decisions will be more informed if individuals are presented with information in a simpler way [39]. It is worth dwelling on this last point, since the origin of the economic and financial crisis of 2008 is fundamentally in the excess of spending and indebtedness, when many people acquired mortgages and complex assets above their ability to pay and, later, alleged that they had bought these financial products without having had clear and concise information about them and without having financial knowledge.

When addressing the issue, in this context of economic and financial crisis, [20,40,41] they clearly determined that financial education was not conceptually defined at all. This caused that, on occasions, the definition was deduced by the context or based on how the author measured financial competence. Proof of this is that, in their research, different definitions that had been formulated previously by various authors are collected. In addition, this diversity in defining financial education also causes a disparity in the methods used to measure it, which makes it difficult to find a more homogeneous model that allows the financial education indicators to be measured in a predictable and repeatable way.

In an international study [42] financial education is considered as a combination of knowledge, attitude and behavior. In their contribution to the attempt to clarify the concept they define it as "a combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions and, ultimately, achieve individual financial well-being." Numerous subsequent investigations analyze this contribution and, in this way, highlight that what is remarkable about this interpretation is that financial education is not an objective but a means to achieve and maintain financial well-being [43]. Other research emphasizes the inclusion of financial attitude, such as the desire to save in the long term, and financial behavior, such as preparing a family budget [44].

Financial education to date has been fundamentally based, as previously stated, on studies that focus on the more objective aspects of the concept, that is, on real financial knowledge, normally measured through academic tests and not perceived [8]. Allgood and Walstad [5] incorporate this subjective dimension by

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assessing the importance of individuals' self-perception, that is, what people think they know about financial matters. The combined study of real and perceived financial knowledge obtains more conclusive results on how financial knowledge is related to behavior [45] This new dimension is also relevant for Xiao and Cheng, introducing in the binomial education and financial behavior the perceived financial capacity and trust [46]. Other prominent authors have defended, how our perceptions, and how different options are presented to us, affect our decision-making. For example, in matters such as retirement and savings plans, these "pushes" and the "architecture of decisions" are presented as a more effective alternative to financial education and much less expensive [47].

Currently, most studies are based on the OECD definition (2014): “Knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life ”. Following this interpretation, some studies show financial education as a dynamic combination of knowledge and skills, behavior, and attitude [48-50] and incorporate other factors such as sociodemographic characteristics and financial training.

In recent years, given the multidimensional nature of the subject, many authors propose a multidisciplinary vision, showing that financial education affects a wide range of financial behaviors [51]. Thus, a direct relationship has been empirically demonstrated between better financial education and decision-making that lead to financial behaviours that have allowed a greater accumulation of wealth in households [52], resulting in more adequate retirement planning [53] , stock market participation [54], increased savings rates [55], more efficient mortgage management [56], transition to adulthood for young people [57], financial inclusion [58,59] and had an overall benifical effect on financial well-being [28].

The study of financial education continues to be in vogue and in this sense, it is studied in the work related to the scientometric review of the investigations that are being carried out in relation to the concept under study in this article [60,61]. In both cases, the research methodology has managed to map scientific knowledge to know the development and evolution of scientific production followed by authors, faculties, countries, scientific journals and the choice of topics, terms, and trends in relation to the study of financial literacy.

In 2020, the OECD simplifies and summarizes the concept of financial education compared to those expressed in 2005 and 2014 and defines it as a “combination of awareness, knowledge, skills, attitudes and behaviours necessary to make good financial decisions and, ultimately, to achieve individual financial well-being”. The evolution of the concept and its significance is shown in the diagram (Figure 1).

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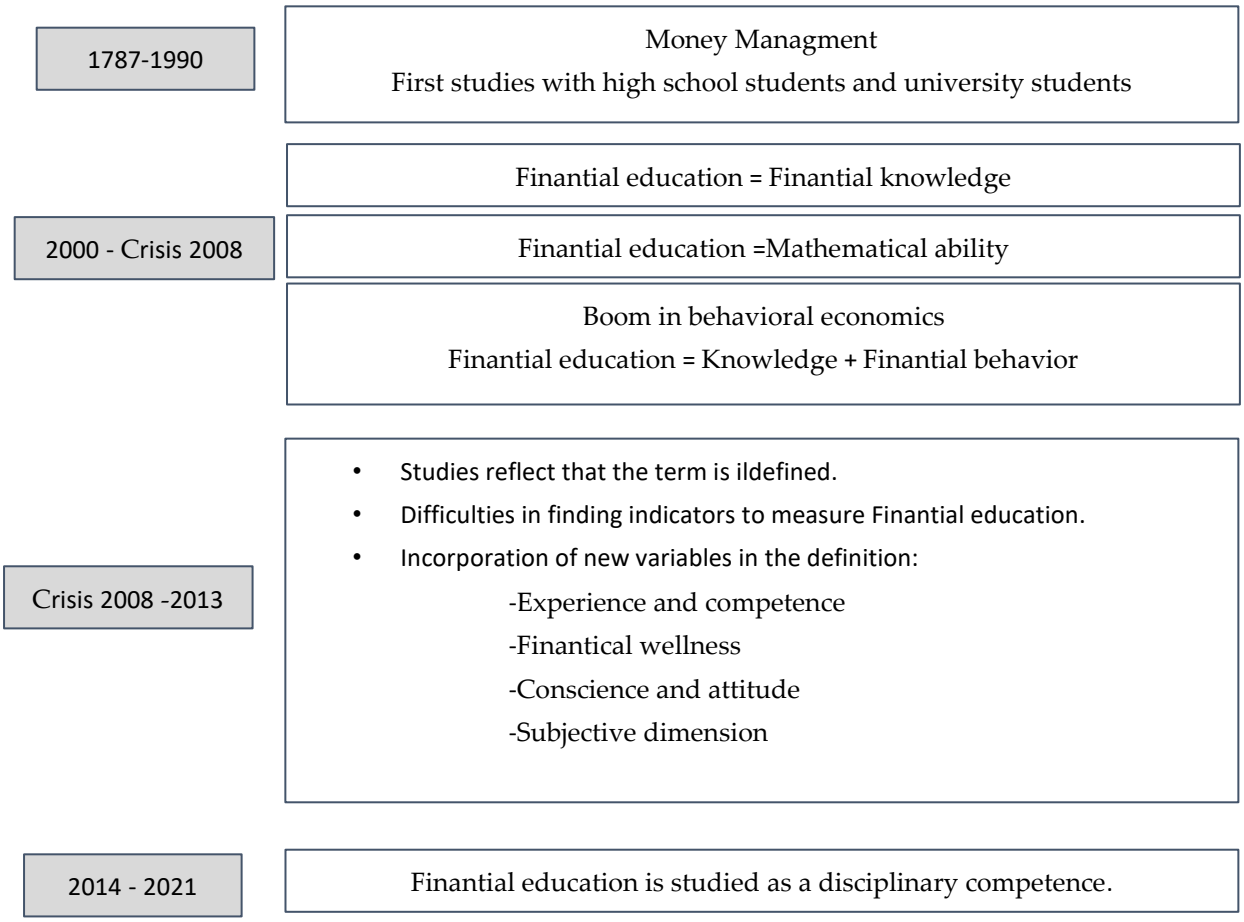

Figure 1. Financial literacy evolution diagram.

3. Methods and Data Collection

3. 1 . Methods

In this research, the structure of the relationships generated in social networks on financial education has been studied using the Natural Language Processing (NLP) technique of social network analysis. An analysis is made of the tweets containing the words "financial literacy", "financial knowledge" and "financial education" on the social network Twitter to find out which are the main terms and sentiments linked to them. The methodology followed in this work is as follows (Figure 2):

Figure 1.Schematic diagram of the methodology used.

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In the first phase, Twitter is chosen for this study because it is an open platform [62], which means that this social network has become a precious data laboratory that allows the analysis of dissemination mechanisms and information content [63] and also provides a series of APIs (Application Programming Interface) with which such data can be obtained. The data extraction, processing and analysis processes have been carried out with the R software, which allows working with large volumes of data. R is used because it is a statistical programming language that consists of thousands of integrated packages and various functions [64]. These packages allow us to handle a high volume of data, use advanced statistical analysis technique and visualize the results. RStudio version 1.4.1106, a very useful R editor, has been used, and RMarkdown documents (.Rmd) are used that provide a writing framework for data science, combining the code, the results, and the comments. The data extraction was carried out by developing our own script in the R programming language, for which the Rtweet library has been used, which allows communication with the API. For this research, the entire API registration process was carried out with permission to download public information present on the platform. Once the API was created, a series of passwords and codes were obtained that served to put RStudio in contact with the API and to be able to perform the download.

After the extraction of tweets, we begin cleaning of the text, within the scope of *text mining*, for which libraries such as *tidyverse, tidytext, stringi* and *topicmodels* are used. Everything that does not provide information is eliminated from the text, such as punctuation marks, numbers, blank spaces, special characters and the so-called "*stopwords*" that add little value to the analysis due to their semantic content. By eliminating the latter from the text we ensure that when developing the analysis they do not appear among the most frequent words found, in addition it is possible to include a term that is considered necessary to eliminate. To facilitate our later analysis, a new variable it is was created with the prepared and cleaned text.

Once the text extraction and debugging process is finished, natural language processing (NLP) is used to analyze the frequencies of words. For this purpose we proceed to create our corpus, nov_corpus object using the VectorSource and Corpus functions. Code created from various R libraries is used, such as Wordcloud commonly used in data science. The word occurrence count also allows word clouds to be made, which is an increasingly widespread method as it is very efficient when it comes to summarizing huge amounts of data, [65,66]. To analyze the terms together to strengthen the understanding and interpretation of the concept word clouds are created for a visual representation of the text and a tokenization process is carried out to divide the text into n-grams (n = 1, 2, 3).

This is followed by lexical-based sentiment analysis, which is a subfield of natural language processing (NPL), to detect and extract opinions from a text. [67]. The subjective content, which contains emotions and feelings, of the text extracted from the social network Twitter is identified and classified as positive or negative. [68].For this purpose, lexicons or dictionaries of words and expressions are established that can be used later by a mathematical algorithm to specify the semantic orientation of the text [69]. To categorize the words of each tweet, the *get_nrc_sentiment* function was used, which returned a data frame which gave us a score for each row of the vector according to the NRC Emotion Lexicon [70]. It has a wide range of applications and is used in a multitude of contexts such as sentiment analysis, product marketing, consumer behavior, and even political campaign analysis. This lexicon composed of ten categories contains a list of words and their associations with eight basic emotions: (anger, anticipation, disgust, fear, joy, sadness, surprise, and trust) and two negative and positive feelings, in which the words of each tweet are classified; as well as the positive or negative score [71]. From this analysis, ten variables are created that measure the frequency of words that appear in each tweet for each feeling or emotion.

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Finally, a sentiment clustering process is applied. From the 10 variables created in the previous step, the tweets are grouped into clusters with a high degree of internal homogeneity and external heterogeneity as explained by Joseph F.Hair in his publication [72].The technique used is the Hierarchical Cluster with the Ward clustering method to minimize dispersion within clusters, and the stopping rule is applied from the analysis of the dendrogram and clustering history.

3. 2 . Data Collection

To carry out this research, a sample of the publications on the social network Twitter was extracted from March 14 to May 30, 2021. Within the twitteR package there are many functions, among which the searchTwitter() function that allows you to download a sample of the tweets that contain any of these keyword chains "financial literacy", "financial knowledge" and "financial education". In addition, filters were applied to capture date and ensure the downloads were in English .

Carrying out this process consists of downloading weekly tweets and then merging the weekly databases into one, which contains the 53,819 collected tweets. This information is processed and analyzed from the R scripts developed, for this. Natural language processing (NLP) libraries are used for word cloud elaboration, sentiment analysis, and Cluster analysis. The resulting database consists of 90 variables and 53,819 rows, most of our analysis is carried out from the text variable that includes the content of the comments. The detail of the weekly downloads of the tweets is shown in (Table 1)

Table 1. Download Details

Date 14/03/2021 from 30/05/2021	Weekly Download of Tweets	Accumulated Tweets
14/03-21/03	3916	3916
22/03-28/03	4485	8401
29/03-04/04	5346	13747
05/04-11/04	6410	20157
12/04-18/04	6216	26373
19/04-25/04	6166	32539
26/04-02/05	5994	38533
03/05-09/05	4617	43150
10/05-16/05	3481	46631
17/05-23/05	3458	50089
24/05-30/05	3730	**53819**

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4. Empirical Analysis and Results

The impact on the lives of millions of people around the world of the coronavirus pandemic has caused a severe blow to the global economy, and as mentioned above, after a crisis the interest in financial education becomes more relevant. In addition, this period coincides with mass vaccinations worldwide, and includes the month of April, which is considered in some countries as the Month of Financial Education

4.1 NLP Analysis

Initially, a frequency analysis is carried out in which the relationship of the downloaded tweets with the chain of keywords consulted in the extraction process is observed (Figure 3).

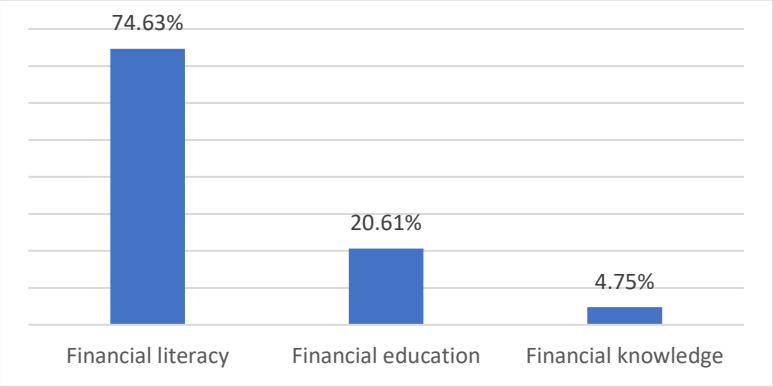

Figure 2. Word string frequency analysis

Although, as mentioned above, these three phrases are frequently interchanged when referring to financial education, it is observed that on the social network Twitter the term that is most used is “financial literacy”. This term is used considerably more frequently than “financial education” and that “financial knowledge, although it appears in some of the academic definitions, its use least frequently in tweets.

In order to identify the most notable topics and concepts related to the three keyword chains used in the downloaded tweets, an analysis of the 100 most common words used in the word cloud of the text of the comments is made (Figure 4). It is observed that those that appear literally in the search occupy the first positions, “financial” appears 60,796 times, “literacy” appears in 38,199 occasions while “education” appears in 13,139 times. The term that comes in fourth is "money", following far behind. Among the first 30 positions, 30% correspond to verbs "can", "help", "learn", "need", "make", "teach", "get", "like" and "know". Other terms with great presence are those related to school and young people "school", "students", "kids" who are aged twenty, twenty-one and twenty-five, respectively. These are related to the importance of receiving financial education from an early age.

Although financial literacy is fundamental throughout the life of any person, the reality is that it is an area of knowledge that, in general, is not studied in schools or universities [73,74] unless it is in matters that are related to the theme.

In addition, there are among the 15 most frequent terms the words "month" and "April", this is because April is considered as the Month of Financial Education in which an effort is made to create awareness and promote

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financial culture. To this end the Jump$tart Coalition and its partners organize events and initiatives throughout the month.

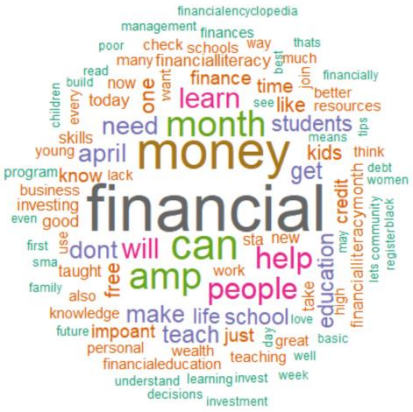

Figure 3. Diagram of a Wordcloud analyzed by NLP

Next, the n-grams (n = 2, 3, 4) of the tweets are analysed. It is observed that the most important contribution comes from the bigrams, which reinforce the understanding and interpretation carried out previously. Without considering the key bigrams used in the collection of tweets, it is identified that "can help" appears in 1274 occasions and "April month" in 1257, followed by others such as "high school" and "financial decisions" (Figure 5).

Financial literacy has great benefits and can help us make informed decisions, such as saving for retirement [75] and negotiating mortgage terms [76] therefore, active Twitter users are aware of the usefulness that financial education offers in our lives, a well-informed citizen will be in a better position in relations with financial entities, which can be manifested In reducing the risk of some financial products and in diversifying your investment portfolio, it will also enable you to be alert to hypothetical fraudulent behavior in the digital age and to know where to turn for help and financial advice.

Figure 4.Diagram of a Wordcloud analyzed by bigrams

4.2 Analysis of sentiments.

The comments on this subject are sensitive to the emotional situation of the person who writes, so it is interesting to analyze the feeling that is extracted from the tweets. It is analyzed whether the conversations

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containing the keyword strings "financial literacy", "financial knowledge" and "financial education" occurred in a positive or negative context in the Twitter community.

The emotions with the greatest presence in the analyzed text are identified (Figure 6). This information provides a ranking of the feelings linked to the speeches made in the collected tweets. It is detected that the predominant sentiment is positive, as Ameliawati says, experience, attitude and financial knowledge have a positive influence on the behavior of financial management [77] .Financial literacy is the fundamental engine for the resilience of the individual economy and contribtes to the acquisition of healthy financial behaviors that favor the financial well-being of society. Financial literacy not only requires knowledge and understanding of financial products, it also requires developing positive attitudes and the ability to identify and manage human tendencies that, at times, undermine the achievement of our financial plans and objectives. Behavioral economics, which takes psychology into account, recognizes that although we are rational beings, we frequently manifest irrational behaviors since our financial decisions are not exclusively guided by logic, reasoning, and analysis, but by emotions, heuristics and prejudices [78].

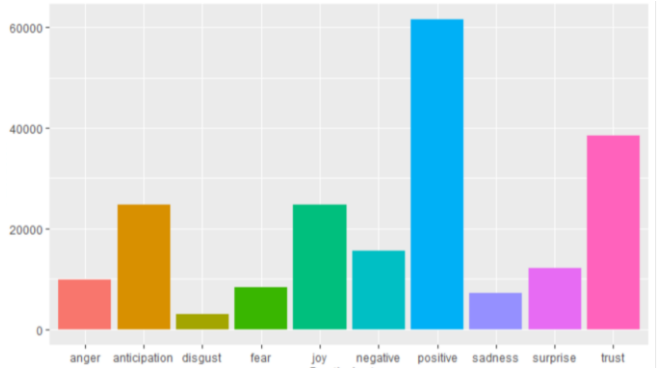

Figure 5. Graph showing analyisis of sentiment.

There are also numerous tweets that reflect confidence, it is realistic to conclude that better knowledge and greater confidence in the system derived from a process of financial literacy in society would lead to favoring behaviors such as saving and investing [79].Along these lines, the next emotion in absolute frequency would be anticipation, advance planning shows that people are future-oriented and willing to improve their financial situation. Financial planning for retirement is a complicated task that requires thinking about the future and saving based on anticipating the economic needs that will be experienced at that stage [53,75,80]. This aspect is particularly relevant because the reforms that are being carried out in almost all countries are in line with transferring greater responsibility to the individual himself in terms of managing pensions and saving for long-term retirement. In addition, some sociodemographic changes also favor increased complexity in decision-making, among which are, the increase in the level of indebtedness in recent decades, the increase in life expectancy and the growing instability in the world of work [81]. In this financial context, people today have a greater responsibility for their financial well-being than in times past.

Negative emotions and feelings have little repetition in the collected tweets, anger, sadness and fear appear timidly. Lack of knowledge also generates fear and inaction, we feel intimidated by what we do not understand, and we feel insecure. Therefore, it is vitally important to train correctly to understand the associated risks, weigh risk and profitability and make informed decisions. Therefore, "Financial education leads to fewer financial worries and a higher level of financial well-being" [82].

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4.3 Cluster analysis.

The tweets collected are of very diverse origin and written by a very heterogeneous population. This section seeks to identify the groups of homogeneous comments in terms of the multidimensional sentiment that they transmit in the Twitter community.

A clustering process is carried out based on the score assigned to each of the 10 feelings identified in the tweets studied. When analyzing the stop rule on the results of the Hierarchical Cluster analysis, it is observed that the sample can be divided into two or three homogeneous groups. The analysis of the characteristics of the tweets in each of the groups shows the need to work with three groups.

Of the 53,819 tweets collected and analyzed, 20,186 of them belong to cluster 1, which is the majority, 13,622 to cluster 2 and 20,011 to cluster 3. The Analysis of Variance (ANOVA) carried out, in which the equality of the mean in the three groups for each variable of emotions and feelings, it concludes that there is a significant difference in the three groups, therefore sentiment and emotion allow the tweets to be classified into three different groups (Table 2).

Table 2.ANOVA: Table of cluster analysis

	ANOVA			Cluster 1		Cluster 2		Cluster 3	
	gl	F	p-valor	Average	Sd	Average	Sd	Average	Sd
Anger	2	4223,736	0	0,1	0,329	0,63	0,715	0,29	0,517
Anticipation	2	16416,391	0	0,16	0,407	1,66	1,081	0,76	0,738
Disgust	2	435,238	0	0,06	0,249	0,17	0,452	0,1	0,314
Fear	2	1681,358	0	0,15	0,381	0,48	0,737	0,23	0,473
Joy	2	36594,183	0	0,1	0,074	1,93	1,113	0,75	0,507
Sadness	2	833,411	0	0,15	0,388	0,38	0,706	0,22	0,470
Surprise	2	11463,502	0	0,03	0,17	0,96	0,884	0,37	0,515
Trust	2	22458,211	0	0,32	0,563	2,42	1,236	1,24	0,887
Negative	2	792,458	0	0,37	0,679	0,72	1,098	0,46	0,704
Positive	2	55068,906	0	0,44	0,524	3,91	1,473	1,98	0,800

In all groups, it is manifested that the predominant average feeling is positive. But it is noticed that in cluster 1 negative sentiment is in the second position, while we must go to positions 6 and 7 to find it in clusters 2 and 3. Therefore, it is possible to conclude that it is this group that shows a more pessimistic mood in conversations that deal with financial education. Group 2 is the one that expresses the greatest emotion, which is why it presents a higher average sentiment in the analyzed tweets. This characteristic indicates that Twitter users, belonging to this cluster use their Tweets to express their ideas and communicate their opinions. In addition, the "joy" feeling is also highlighted in the third location, so we are faced with the cluster that shows more joy and enthusiasm, for all this we can affirm that it is more optimistic, in which the studied tweets appear in a more positive context. Group 3 shares traits with the other clusters, and presents an average sentiment comprised between the other 2 clusters.

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The influence of the "trust" sentiment in the three groups indicates that the analysed tweets reflect connotations of certainty and security about the subject studied. On the other hand, "disgust" is little prominent in the tweets referring to financial education, which conveys that it does not cause negative feelings.

When analyzing the frequency of words in the clusters, it is observed that the most used term in groups 1 and 3 is "financial", with 3,234 and 4355 appearances respectively, while in cluster 2 the most frequent is "money" appearing 5328 times (Figure 7). It should be remembered that it was precisely this group that was the most expressive in terms of showing feelings and the one that developed in a more positive and joyful context. Money is related in the Twitter community with happiness. The three groups coincide in that they have among the first positions verbs such as "can", "help" and "know" and terms related to education such as "school", "student", "education" and "kids". Analyzing the 10 most used words of each group, it is observed that the following 5 terms coincide in the first positions, as shown in (Figure 8). The word cloud detected that "financial", "money", "can", "help", and "people" are the most common which allows us to know which topics are relevant to Twitter and to build a definition of financial education, which is one of the purposes pursued in this study.

Cluster 1	Cluster 2	Cluster 3
		

Figure 6. Wordclouds with relative frequency words divided by clusters

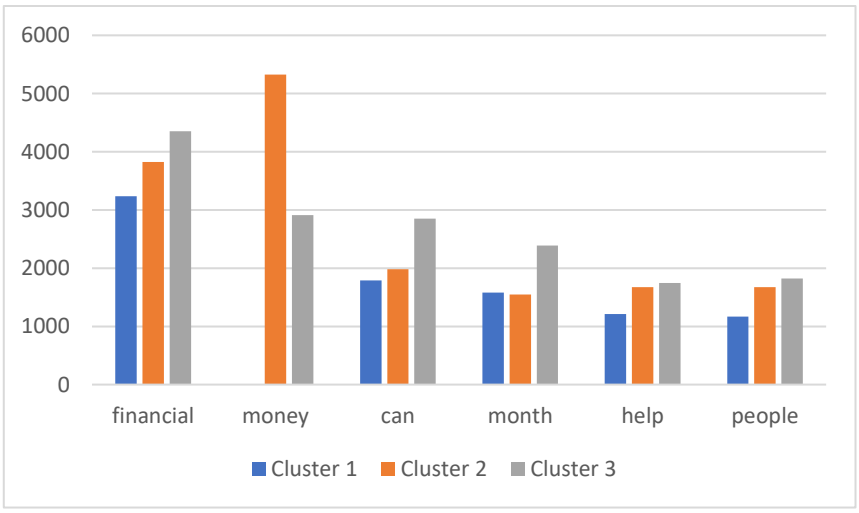

Figure 7: Graph of word string frequency analysis divided by clusters

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Continuing with the analysis, it is detected in the study of bigrams that "can help" is used very frequently by the three clusters and also "can" appears together with other terms that give it greater meaning such as "can help", "can build" and "can use" (Figure 8) In the second group, "money management" stands out as the most repetitive word, which leads us to the first academic definitions of the term financial education. To this day, money remains an essential tool for humanity. The financial historian William Goetzmann [83] maintains in his work "Money changes everything" that financial technologies and institutions favor the development of culture and warns us of the challenge we face in the future, having an increasingly aging population. Along these lines, "young adults" and "high school" also stand out. It is essential to design the necessary mechanisms so that young people have access to financial education and thus not become a burden for governments [84]. To achieve well-being and economic independence, it is necessary to invest in financial education, mainly in young people, since according to the OECD 2010 Younger generations are not only likely to face ever-increasing complexity in financial products, services, and markets, but they are more likely to have to take more financial risks in adulthood than their parents. A person who has received training in personal finance does not consider that all their economic decisions are the product of external circumstances but feels empowered to guide their financial future based on their own goals.

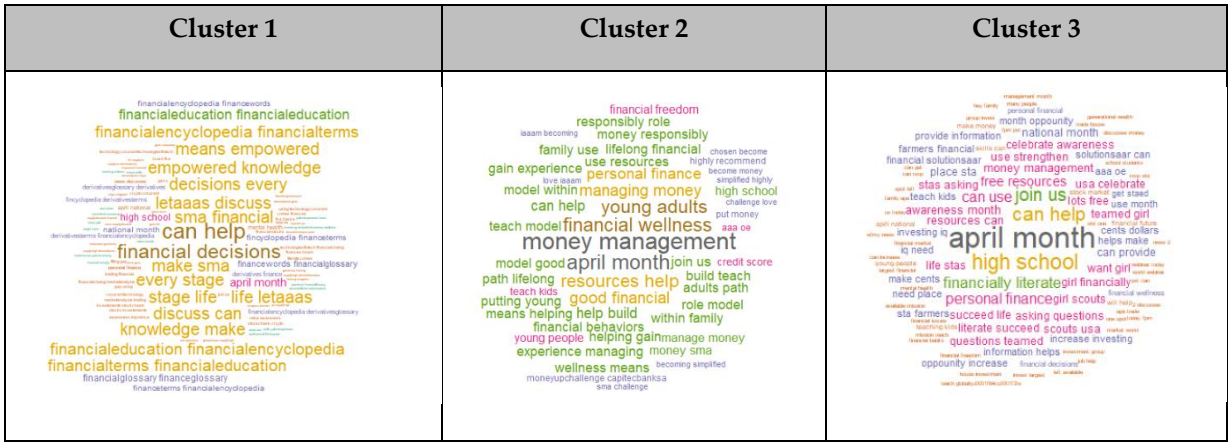

Figure 8. Wordclouds with relative frequency words divided by clusters

On the other hand, expressions referring to the month of April appear again, being the most frequent bigram in cluster 3, since it is the month considered in part of the world as the Month of Financial Education. This indicates that in social networks it was a recurring theme due to the perception about the need for institutions, both public and private, to invest and contribute in greater dissemination of financial education. Financial decision-making processes have puzzled researchers for decades in various fields of research, such as psychology, business management or economics Considering finance as a decision-making process in which emotions play a prominent role, we cannot separate these concepts from behavioural approaches. Until now, financial education programs were limited to transmitting information about financial products and services based on the same false premise of Homo economicus , but as it has been shown, a step must be taken to improve financial decision-making by people throughout their lives and develop positive behaviours related to saving and managing money should be encouraged. To achieve this goal, we must not forget the psychological and emotional aspects of these behaviours. Along these lines, well-founded programs on emotional intelligence could provide useful tools to make the right decisions. Despite not being a reality yet, it is a good place to start.

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4 Definition of financial education

One of the purposes pursued in this study was to obtain a definition of financial education that considers terms or expressions that are used in a more informal environment and that allows contributions to the understanding of the concept, since from its origin it has had different interpretations and nuances. From the study carried out by reviewing the academic literature and complemented with natural language processing and statistical analysis based on the feelings and emotions of the sample of 53819 tweets extracted Twitter, a new definition is proposed based on of the most common terms that are expressed when dealing with the issue and the final definition offered by the OECD in 2020;

That definition is:

"**The combination of awareness, knowledge, skills, attitude and behaviour that helps people make informed financial decisions that ensure their present and future financial well-being.**"

5 Discussion and Conclusions

Considering that financial education is an issue of growing scientific interest, it is important to develop research that allows us to collect and analyse sentiments reflected on in the conversations found in social networks.

Nowadays there is a growing need to involve the analysis of these networks in most of the investigations in which it is required to obtain an understanding and interpretation of the opinions that are registered in them. For this reason, this article presents, in addition to an investigation on the definition and evolution of scientific production that studies financial education, a deepening of the analysis using social listening on Twitter.

This article presents as a novelty the combination of the academic approach with a more informal one on the use of the concept of financial education in social networks, which allows us to observe different perspectives based on the different sources analyzed.

The literature review reveals the lack of a consensual definition of financial literacy, we started from very reductionist definitions, where the term was almost exclusively related to money management or financial knowledge, until those collected more recently than they consider financial behavior and subjective aspects such as emotions, being studied from a multidisciplinary field.

To contrast the goals raised about the concept of financial education and its use in social networks, we used a method of social listening, which allows us to obtain a representative sample of the conversations collected in the tweets by limiting the sample bias. As a result of the research, the findings supported H1, since financial literacy can help people make informed decisions that contribute to their own financial well-being and that will also affect that of society. H2 is also confirmed by frequent conversations in which terms related to education and students appear. In relation to H3, it was justified that the feeling generated by the conversation was mostly positive and that the emotions that it aroused had positive connotations, as was the context in which they were generated. Regarding H4, the information obtained from different approaches favors the creation, by this research, of an updated definition of financial education.

The limitations found in this research are those related to the extraction of tweets, since they were collected at a specific time of year and that the analysis is based exclusively on tweets in English, since they were deliberately obtained in that language due to their scope in the financial environment.

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As a future line of research, it is proposed to carry out the research for other languages, such as Spanish, to help us better understand the term financial education and contribute to its consensus in its conceptual definition, which also allows finding common measurable indicators that allow addressing financial education from a global perspective. In this way, the development of financial education programs and initiatives will be favored to enhance knowledge and skills in this field effectively.

Appendix

Jonh Adams (1787)	All the perplexities, confusión and distress in America arise not from defects in their Constitution or Confederation, nor from wanr of honor or virtue, so much as downright ignorance of the naturale of coin, credit, and circulation.
Noctor M, Stoney S, Stradling R (1992)	Financial literacy as the decision-making ability regarding money management. Defined the term, "the ability to make informed judgments and to take effective decisions regarding the use and management of money
Moore DL (2003)	Financial knowledge, experiences, and behaviors are linked in a relational way. Financial experiences and behaviors together contribute to financial knowledge levels and gains in competency. Key to this assumption is the idea that with more experience and education, individuals become more sophisticated and competent in their financial dealings.
OCDE (2005)	The process by which financial consumers/investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become more aware of financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being.
Widdowson D, Hailwood K (2007)	Financial literacy includes basic computation ability, understanding the yields and risks of financial decisions, familiarity with basic financial management concepts, knowing the channels for consultation and assistance, and the ability to understand the content of suggestions
Mandell L (2007)	The ability to evaluate the new and complex financial instruments and make informed judgments in both choice of instruments and extend of use that would be in their own best long-run interest.
Lusardi A, Mitchell OS. (2008)	Knowledge of basic financial concept, such as the working of interest compounding, the difference between nominal and real values, and the basic of risk diversification. The ability to make simple decisions regarding debt contracts, in particular how one applies basic knowledge about interest

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	compounding, measured in the context of everyday financial choices.
Hung A, Parker AM, Yoong J (2009)	Knowledge of basic economic and financial concepts, as well as the ability to use that knowledge and other financial skills to manage financial resources effectively for a lifetime of financial wellbeing
Mandell L (2009)	Financial literacy generally refers to the ability of consumers to make financial decisions in their own best short- and long- term interests.
Huston SJ (2010)	Financial literacy education, which is aimed at improving a person's level of knowledge and/or ability, can and should be tailored to suit different demographics, life stages and learning styles—certainly not as a one-size-fits-all approach. Thus, it is important to clearly differentiate financial literacy from financial literacy education. Financial literacy has an additional application dimension which implies that an individual must have the ability and confidence to use his/her financial knowledge to make financial decisions.
Remund DL (2010)	Financial literacy is a measure of the degree to which one understands key financialconcepts and possesses the ability and confidence to manage personal financesthrough appropriate, short-term decision-making and sound, long-range financialplanning, while mindful of life events and changing economic conditions
Lusardi A, Mitchell OS (2011)	The knowledge of basic financial concepts and ability to do simple calculations.
Atkinson A, Messy F (2012)	Financial literacy is a combination of knowledge, attitude and behaviour. Financial literacy is a combination of awareness, knowledge, skill, attitude and behaviour necessary to make sound financial decisions and ultimately achieve individual financial wellbeing
OECD, 2014	Knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life.
Xiao JJ, Chen C, Sun L (2015)	Financial literacy can be categorized as objective or subjec-tive. Objective financial literary refers to consumers' actualfinancial knowledge, usually measured by scores of financialquizzes. Subjective financial literacy is the financial knowledgelevel self-

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	evaluated by consumers themselves. Both objectiveand subjective financial literacy factors were used to predictfinancial behavior
Paiella M (2016)	Financial literacy as the ability to collect important information, and also differentiating between diverse financial option, discussing financial issues, planning and proficiently answer that affect financial decision making.
Firli A (2017)	Financial literacy is a conceptual model containing six basic components: (1) Saving Borrowings; (2) Personal Budgeting; (3) Economic Issues; (4) Financial Concepts; (5) Financial Services; (6) Investing.
Kasman M, Heuberger B, Hammond RA (2018)	Financial literacy as a construct that reflects dynamic relationships between knowledge, skills, behavior, and other relevant factors
Hanson TA, Olson PM (2018)	Financial literacy has been shown to affect a wide range of financial behavior; therefore, understanding methods to improve financial literacy is vital for improving financial outcomes in personal finance.
Kadoya Y, Khan MSR (2020)	Financial literacy means understanding the value of money and how to maximize the benefits of money utilization.
OCDE (2020)	Combination of awareness, knowledge, skills, attitudes and behaviors necessary to make good financial decisions and, ultimately, achieve individual financial well-being.

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