White Paper

HOW CAN NEUROSCIENCE HELP IMPROVE FINANCIAL LITERACY?

Neuroprofiler

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IN AN UNSTABLE SOCIAL AND ENVIRONMENTAL CONTEXT, INVESTING TO COVER FUTURE RISKS IS BECOMING A NECESSITY FOR ALL EUROPEAN SAVERS. HOWEVER, THE LATTER ARE STILL VERY CONSERVATIVE AND DISTRUSTFUL OF A FINANCIAL WORLD WHOSE MECHANISMS THEY DO NOT FULLY UNDERSTAND. THIS LACK OF FINANCIAL EDUCATION IS EVEN MORE NOTICEABLE AMONG THE NEW GENERATION. FACED WITH THIS SOCIETAL CHALLENGE, THIS WHITE PAPER PROVIDES A SUMMARY OF WHAT THE LATEST NEUROSCIENCE RESEARCH CAN BRING TO THE DEMOCRATIZATION OF FINANCIAL LITERACY.

1. THE URGENT NEED FOR FINANCIAL LITERACY IN EUROPE

UNDERSTANDING THE MECHANISMS OF THE FINANCIAL WORLD: A GROWING NEED

Budgeting, saving, purchasing, investing, credits... financial decisions impact the quality of life of Europeans on a daily basis.

In a world of social and health uncertainty, understanding financial mechanisms is becoming a necessity to guard against future hazards. According to a study by Uniopss and Vyv published in March 2022, only 43% of French people are optimistic regarding the future of social protection in terms of unemployment insurance, 31% with regard to prevention of loss of autonomy and 29% concerning retirement insurance.

Faced with these concerns, the traditional conservative approach to saving among Europeans is no longer sufficient. With the Covid 19 crisis, according to INSEE, the savings rate of French households will rise sharply to 19.5% in 2021.

Nevertheless, this additional savings has mainly been directed towards deposits (checking account, saving account) for more than 104 billion euros in 2021, against only 39 billion euros for life insurance.

However, in an inflationary context, this type of investment offers a negative net return on investment...

How can this conservative attitude be explained when active investment is becoming increasingly necessary?

Among the many factors that can explain it, financial literacy seems to play a fundamental role.

EUROPEANS' LACK OF FINANCIAL LITERACY

Despite real awareness on the part of regulators and international institutions in recent years, the low level of financial literacy among Europeans is indeed worrying. According to a 2021 survey by the Banque de France, 69% of French people consider their knowledge of financial issues to be average or poor.
This proportion is similar to the one observed in other OECD countries and studies, such as the one conducted by the Possible Finance association in 2021.

70% of adults have not mastered basic financial concepts. This percentage even reaches 75% among Millenials (Possible Finance 2021 study)

The results of a CREDOC survey on the financial culture of the French support this observation:

• Only one person out of two knows that €100 invested at 2% per year leads to a capital of €102 after one year.
• One person in four manages to find, from a list of three possible answers, the definition of a bond.
• Only 45% know what a mutual fund is and 52% know the principle of a dividend.

WHAT IS FINANCIAL LITERACY?

Financial literacy has been defined in a number of ways by international institutions and researchers on the subject. The OECD, for example, defines financial literacy as not only the knowledge and understanding of financial concepts and risks, but also the skills, motivation and confidence to apply that knowledge towards financial decisions. Below is the definition used by the European regulators (EIOPA, EBA and ESMA) at their March 2022 conference on the subject. Financial literacy is defined according to 5 pillars:

- **Earning money**: salary, different incomes (real estate...)

- **Spending**: how to spend money in the most appropriate way and what is the maximum amount to spend according to the available monthly income?

- **Saving and investing:** saving, if feasible, a part of one' s monthly income in order to build up a financial cushion, ideally investing through adapted financial products allowing the savings to grow

- **Borrowing**: borrowing wisely and avoiding toxic loans with high interest rates

- **Protecting**: always ensuring that the financial situation is (as much as possible) secure by taking out appropriate insurance

Lack of financial literacy also reinforces inequality. According to a study by the University of Minnesota, financial literacy is highly unequal based on financial resources, gender and education.

According to this study, women have a knowledge score 10% lower than men and a university graduate investor 30% higher than a high school graduate. If this study was conducted on an American population, we can assume that the influence of these demographic elements affects European investors in a similar manner. Also, this lack of financial education reinforces the very negative image that Europeans have of the financial world.

Hardly transparent, unethical, speculative, the world of the stock market remains a taboo subject for many investors. Investing in real estate or in saving accounts will be perceived as reasonable savings, while investing in the stock market, if we voluntarily overstate the situation, can be perceived as a venal search for short-term profit.

However, today's financial world offers many more opportunities to have a positive social and environmental impact by investing in the stock market than by investing in savings accounts or in real estate.

In addition, direct investment in real estate is far from being more secure than a stock market investment. This situation is all the more worrying as it does not seem to be improving.

According to a study by the association Possible Finance, 75% of Millenials are not familiar with basic financial concepts, compared to 70% of the rest of the population.

These results are in line with the study conducted by Neuroprofiler in July 2021, with a sample of 810 people worldwide, which shows that 80% of respondents do not have the necessary knowledge to invest in advanced or complex products.

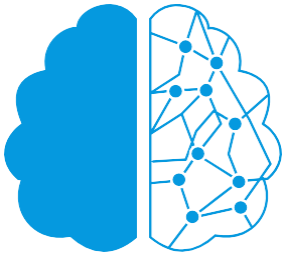
Moreover, this new generation seems to be even more conservative than their elders, with a higher percentage of investment in euro funds. Faced with the urgent need for financial education accessible to all, this white paper explores the contribution of research in educational sciences, and in particular neuroscience, to this societal challenge.

2. NEUROSCIENCE, PEDAGOGICAL SCIENCES AND FINANCIAL EDUCATION

FROM EDUCATION SCIENCES TO NEUROSCIENCES

Seneca, Comenius, Herbart, Rousseau... the subject of education has fascinated scholars for centuries.

Nevertheless, this subject has been structured into a true science of education especially since the 19th century, when school became compulsory in most European countries. Within this discipline, a particular field of research emerged around learning methods.



WHAT ARE EDUCATION SCIENCES?

The first definitions of pedagogical sciences or sciences of education emerged towards the end of the 19th century. The definitions vary according to the authors, but we can take Gaston Mialaret's view, which has the merit of being very open, by considering the sciences of education as the whole of the disciplines that study the conditions of existence, functioning, and evolution of educational situations and facts.

Many theories have emerged on the subject, based on a sociological, experimental or theoretical approach.

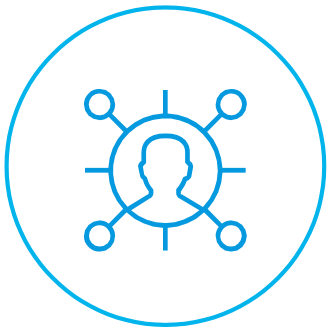
In recent years, this research has been enriched by the cognitive sciences and in particular by neuroscience. Ten years ago, the OECD published the report "Understanding the brain: the birth of a science of learning" which took stock of what neuroscience can contribute to learning methods.

This science, while still emerging and sometimes even surprising on certain subjects, allows us to confirm, but also to invalidate, certain learning theories derived from experimental psychology.

In particular, neuroscientist Stanislas Dehaene, head of the cognitive science chair at the Collège de France and member of the French National Education Scientific Council, has defined four pillars of learning that we summarize below, while drawing out good practices applicable to the specific subject of financial education.

"The structure of the brain is not fixed in time or determined solely by genes. It changes continuously as the person learns and interacts with the environment. This constitutes one of the most fundamental discoveries of modern neuroscience."

–Steve Masson, Professor, Department of Didactics, UQAM.



WHAT ARE NEUROSCIENCES?

Cognitive sciences are an interdisciplinary research field involving all scientific subjects likely to help in the understanding of human behavior, including learning mechanisms (philosophy, artificial intelligence, economics...). Among these disciplines, neurosciences, which consist in the study of our nervous system, have a special place.

Neurosciences have experienced a very strong growth with the technological progress of medical imaging, especially the development of magnetic resonance imaging (MRI) since the 1970s.

STANISLAS DEHAENE'S ADVICE FOR BETTER LEARNING, APPLIED TO FINANCIAL EDUCATION

PILLAR 1: LEARNING TO PAY ATTENTION

Attention and focus are necessary for any form of effective learning.

Stanislas Dehaene identifies more precisely three phases of attention: alertness, orientation and executive control. In the alert phase, the learner's attention must be captured (animation, change of pace, sound, surprise...). Then, it must be channeled to the right object and at the right level.

Finally, the learner must be asked to concentrate on learning by inhibiting any other element that could disturb him ("executive control"). These three phases mobilize massive brain activities. Sources of distraction must be avoided. Thus, working while listening to music, working in noisy open spaces or doing two tasks at the same time is detrimental to the quality of learning. In the context of an e-learning application, a balance must be found between attracting the learner's attention - via a fun and interactive approach - and avoiding any form of distraction, via for example an excess of animations that are not relevant to learning or a visual overload of the screen.

PILLAR 2: ACTIVE ENGAGEMENT

We learn much better in an active state than a passive one. Thus, the traditional educational system based on a lecture followed, a few weeks later, by an exam, is an ineffective method of learning. We learn primarily through exercise and interaction. Otherwise, our attention (pillar 1) wanes very quickly. On the other hand, we can maintain our level of attention if the task at hand continues to whet our curiosity. Making the learning conditions more difficult will therefore result in more learner engagement. However, if the task becomes too difficult, the learner may become discouraged. It is therefore essential to adapt the level of the exercises required to the learner.

PILLAR 3: LEARNING FROM MISTAKES

According to Stanislas Dehaene's research, our brain learns in a Bayesian way.

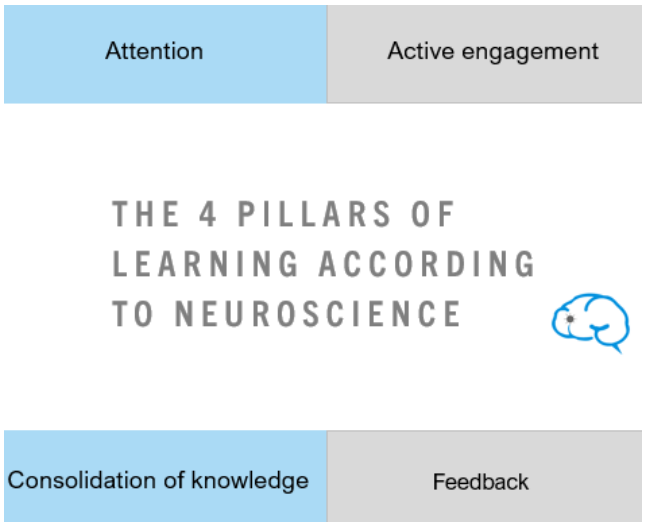
We start with an assumption, for example "investing in the stock market cannot be ethical", and we update this belief as we go along, mainly by making mistakes and correcting them. To learn effectively, it is therefore ideal to allow the learner to experiment actively. The loop described by Dehaene is: prediction, feedback, correction, new prediction. A learning method that is the antithesis of our European educational culture, which is mainly structured around the fear of failure.

Nevertheless, there is one major condition to ensure the effectiveness of learning by error. The latter must be corrected immediately, in order to internalize the correct answer without delay, and in a non-punitive way, stress being a learning inhibitor.

On the contrary, the learner must be rewarded for his or her correct answers. Again, this method of learning is the opposite of the one familiar to today's savers, who grew up in a school system where an exam was followed by its correction one or two weeks later.

PILLAR 4: CONSOLIDATION

Working for 15 minutes a day for 8 days is more effective than working for two hours straight. Sleep has a fundamental role in learning and memorizing key concepts. Spreading out learning allows for longer-term memorization with less effort. In addition to spreading out learning over time, repetition is essential. From a neuronal point of view, this allows us to move from explicit learning, which requires a lot of cognitive effort (prefrontal cortex), to unconscious automatic processing. This frees up brain space for learning new concepts.



THE QUESTIONING OF "NEUROMYTHS" ABOUT LEARNING

NEUROMYTH 1: WE HAVE DIFFERENT LEARNING STYLES

In his various studies, Stanislas Dehaene has shown that the organic architecture of our brain is structurally identical from one individual to another. None of his studies has been able to demonstrate, for example, the existence of different learning styles (auditory or visual), nor of inequalities between genders or social backgrounds. This does not exclude certain disabilities, such as dyslexia, for which certain pedagogical accommodations are necessary.

NEUROMYTH 2 : WE MUST FIRST MASTER THEORY BEFORE MOVING ON TO PRACTICE

The European learning structure, especially in Latin countries, is mainly based on passive learning at first, in front of a lecture, and then on practical exams to validate the acquired knowledge. Neuroscience researchers have demonstrated the inefficiency of this approach. Our brain learns essentially in an active way, through stimulation, interaction and surprise. Thus, according to these theories, it is essential to go as quickly as possible to exercises, in order to "learn by doing", thanks to error and experimentation.

3. EDUPROFILER, EDUCATION BASED ON NEUROSCIENCE RESEARCHES

In order to meet the societal challenge of financial education and to assist financial institutions in training their clients, Neuroprofiler offers EDUprofiler, a fun e-learning application to train individuals in the mechanisms of financial products.

EDUprofiler is based on Neuroprofiler's dual expertise in gamification and neuroscience in order to offer a fluid and interactive experience to its users. EDUprofiler is structured around Dehaene's four pillars of learning.

Via a playful dashboard customized to their level, users can choose to explore new financial concepts either through short infographics, text, or training games that allow them to understand the mechanisms of the products by experimenting and having fun. Each puzzle and game is followed by a reward in case of success, and an immediate corrective feedback in case of wrong answer. The gamification of the course allows to constantly maintain the user's attention and interest. Each module corresponds to the discovery of a concept or a product. The user can understand the mechanisms in a few minutes. They are thus encouraged to train progressively and frequently on their mobile phone, in order to consolidate their knowledge.

EDUprofiler offers training modules for all levels, ranging from investment basics (stocks, bonds, funds...) to more technical concepts (structured products, derivatives...). Modules can be customized, added or removed according to the needs of the financial institution. In addition to democratizing financial education, EDUprofiler also meets the requirements of financial knowledge assessment. EDUprofiler can be used for marketing purposes, to attract new customers or to reengage dormant or conservative customers, but also for compliance purposes. For example, if your client makes mistakes in the MiFIDII adequacy questionnaire, it will be possible to acquire the missing knowledge through the EDUprofiler and thus update his MiFIDII profile during the year thanks to the EDUprofiler. Finally, in addition to your customers, the EDUprofiler can also be used to train your employees in the basics of finance.

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