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## Efficiency of interactive financial education model: Evidence from high school and university students

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**Abstract:** *The objective of this study is to bring new model of financial literacy education for youngsters at high school and college/university, through the use of active pedagogical and didactic methodologies. This study designs new model which serves as a preparation strategy for the PISA test (Program for International Student Assessment) as an alternative to improve financial lives. The method applied was investigation-action in four steps: a) construction of the model, b) implementation, c) testing, and d) improvements in order to develop pedagogical and didactic strategies that improve financial literacy. The model was applied in Colombia to 200 high school students, and 150 university students. It was found that the proposed interactive action learning model stimulates learning through competitiveness and yields positive results at financial knowledge for making appropriate financial decisions for both high school and university students. The results show the use of active pedagogies, through role play, contests, and decision making, generates better knowledge appropriation tools, making the learning model more effective in financial education. The results show significant improvement in the knowledge level of both high school and university students.*

**Keywords:** *pedagogical practices; financial literacy; financial education; PISA; game-based learning; action-learning.*

### 1. Introduction

The economic situation in many countries and current crises that impact many areas, such as social, economic and financial due to the COVID and recession requires enhanced quality of financial education for development of youngsters and thus economies and to support vulnerable population to be able to understand their financial decisions that strengthen their ability to develop life plan (López-Rodríguez and López-Ordoñez, 2022). Authors Gnan et al. (2007) stated that financial education contributes to the general budget of economics. By virtue of this, Avendaño et al. (2021) adds that financial education is a key process for the development of financial competences. Their study confirmed the essential role of financial

perceptions and capacities developed in a university on student sample. The results show that knowledge of topics such as interests, management costs lead to desirable improvement.

In terms of financial behavior, 64% of people in Colombia plan their spending for less than a month or, worse, do not have any plan to calculate the money they will spend, according to data from the World Bank (2017). Consequently, financial education plays a decisive role in the growth and economic development of countries and regions. As Sekita, Kakkar and Ogaki (2022) states, financial literacy has an economically large and positive impact on wealth accumulation. It allows citizens to achieve the knowledge that leads to efficiency in the use of the system's own resources, which, in turn, tend to improve the quality of life of people through successful financing decisions. People with a high level of financial literacy access credits with a greater knowledge, and the selection of better saving and investment alternatives. According to Oberrauch and Kaiser (2022) people with higher cognitive ability and financial literacy are more likely to make patient inter-temporal choices. Cognitive ability and financial literacy play an important role in respondents' allocation behaviours within the experiment and financial literacy is uncorrelated to errors in decision-making at the individual-level. Sekita, Kakkar and Ogaki (2022) decompose financial literacy into 5 sub-categories and find that deposits literacy, risk literacy and debt literacy have significant impacts on wealth accumulation. Authors found that variables suggested by behavioural economics, such as over-confidence, self-control, myopia and risk-aversion are also significant determinants of wealth. Financial education, then, contributes not only to energize the economy, but also to develop skills for informed decision-making, to evaluate risks, and to identify financial opportunities, which generate more prudence against credit services.

Given these problems, the Colombian State has increased its interest in implementing programs that contribute to the financial education of its population. Different entities, have developed pedagogical strategies to strengthen some components of personal finance and the appropriation of basic concepts in the area (Ministerio de Hacienda y Crédito Público, 2011). Law 1328 of 2009, for example, forces financial institutions to develop financial education campaigns for their clients, since the institutions of the same country have seen the need to include the topic of financial economic education (EEF in Spanish) as one of the components of training for young population. However, the aforementioned initiatives show little evidence of the effectiveness of the programs; Banco de la República (2011), argues that there is no unanimity about the impact of EEF (Economic and Financial Education) programs.

### *1.1. Financial education in Colombia*

The normative framework for the EEF in Colombia is composed of the General Education Law (Congreso de la Republica de Colombia, 1994) and Article 2 of the Political Constitution of Colombia, which refer to facilitating the participation of all citizens in the decisions that affect them and in the economic, political, administrative, and cultural life of the Nation; and Decree 457 of 2014 by which an Intersectoral Commission for the EEF in Colombia is created.

Según Cano et al., (2015) in the laws 1450 of 2011 and 1328 of 2009 support the first advances in Financial Education in Colombia; the 1450 law determines that the Ministry of Education should implement in school curriculum of development of basic competences in economic and financial education. In the law 1328, banks were required to develop financial education programs and campaigns.

The National Ministry of Education MEN (2014) defines EEF as a pedagogical project that integrates knowledge, skills, abilities, attitudes, and values, enhancing the capacities of children and young people to solve everyday problems that are directly related to their social, cultural, scientific, technological, and economic environment.

Also, other education institutions, including the Department of Economic and Financial Education (EEF), were participating on the principles of advancement and training in financial education. New training opportunities should improve the quality of education which includes projects for teaching and teaching materials.

Gnan et al. (2007) find that definitions of EEF around the world have three elements in common: they aim to generate greater understanding and capacity for decision making; they favor the recognition of the interrelation of people with the financial system; and they incorporate characteristics and conditions of the social context in which people are empowered to make financial decisions. To comply with this regulation and in order to improve the effectiveness of the EEF, the Central Bank (2012), recommended making experimental designs, using students of economy as operators and making use of active pedagogies.

These pedagogies, according to Mendoza (2002) are based on four elements: spontaneity, by which all regulated learning becomes an obstacle; the functional element, such as intellectual and moral development by means of the stimulation of the individual's interests; the social element, which makes the class life and not the preparation for life; and the person, as an individualized construction of the culture.

### *1.2. Strategy for financial education*

Countries such as United Kingdom, Australia, Japan and United States, have developed Financial Education Strategies based on the importance of the topic for economic stability (Andujar, 2019). In Latin America, the strategies are more frequent. The first to develop a National Strategy was Brazil in 2010; Uruguay and Ecuador in 2012; Honduras and Paraguay in 2015; Chile, Colombia, Mexico and Peru in 2017 and Argentina and Guatemala in 2019 (OECD/CAF, 2020). The OECD (2022) in its report on the evaluation of national financial education strategies, concludes that evaluation strategies in the strategy should be mixed, contemplating quantitative and visual elements. OECD also propose a participatory approach to the development of financial education programs.

In the case of Colombia, the Intersectoral Commission for Economic and Financial Education (CIEEF) set the first National Strategy for Financial Education in 2017; its objective is to promote economic and financial education (EEF) for impact on accountable and informed decisions (CIEEF, 2017). This Strategy work with four local groups: 1- The group of formal education includes all associate professors and students. 2- The vulnerable population group includes people in the coastal situation and the fighting conflict. 3- The "active stage" group is adults between 18 and 55 years old and finally 4- the group of small companies. Additionally, as a cross-sectional segment, the retention group for the retreat and the protection for the ride are included. As part of the Bank of the Republic (2020), the main topics of current initiatives in financial education are: credit usage, investments, financial product use and risk management.

Described financial strategies, policies and focus groups were taken into account and methodology was created using modern interactive methods while implemented on two groups of students and youngsters. This research shows the financial education model that was developed from the review of different strategies that have been used by some financial institutions, as well as from the need that was identified in the results of the PISA (Program for International Student Assessment) tests. In the case of high school students, this model of Financial Education was validated in the municipality of Rionegro, Colombia, with ninth graders, and it showed a positive effect on the appropriation of knowledge in its results evaluation. In the case of higher education students, the model was validated with postgraduate students from a recognized university in Bogotá, Colombia.

Attention to financial education as a fundamental element for consumers to make prudent decisions about personal finances has been highlighted after the financial crisis of 2008 (Eades et al. 2013). Lusardi and Michell (2011) reported that, worldwide, women have a lower level of financial education than men; young and old people have a lower level than those in their middle age; and more educated people have more financial knowledge.

Floyd (2015) compared two university groups in order to measure the level of financial literacy, and it concluded that the years of education in a university are positively associated with financial education. On the other hand, Bernheim and Garrett (2001) studied the effects of financial education on personal savings. They concluded that people who have participated in financial education programs in their jobs, have a greater incentive to save for general purposes and for their retirement plan.

Dewi et al. (2020) conclude that the level of financial education also defines the level of rationality in the volume of financial decisions. Accordingly, Morris et al. (2022) demonstrate the influence of the capacity to learn in the financial sector, and also suggest that financial education should be improved to increase existing financial differences. The statistical results of Mutlu and Özer (2022) revealed that financial education would have a positive effect on financial cooperation. Also, Morgan and Trinh (2020) with their investigation in Laos, demonstrate that people with higher education and better financial knowledge will have more probabilities to make correct decisions.

Given the importance of the topic, the development of a financial education strategy is pertinent and appropriate. The proposed model is based on the theory of Meaningful Learning, stated by Ausubel (1983), since it basically seeks – through active learning pedagogies such as games, workshops, competitions, and simulations – to make the student connect financial education with knowledge that has been already learned, such as mathematics and their own family experiences.

The Discovery Learning proposed by Bruner in 1960, and quoted by Camargo et al. (2010) is also present in the financial education model since the classes are designed in such a way that problematic and ambiguous situations are presented; which can lead to more than one solution and also to let the students put forward what they would do. Based on the results obtained, we proceeded to draw conclusions with the main findings, and to explain how these findings partially or totally support the theoretical concepts intended to be developed.

The two previous theoretical positions used in the financial education model and presented here, are framed within the Vygotsky's Theory of Constructivism, according to which prior knowledge is what gives rise to new knowledge (Payer, 2005). The author continues: "That is in every constructivist activity there must be a circumstance that makes the previous knowledge structure falter and forces a rearrangement of the old knowledge to assimilate the new."

Consequently, we sought students to explore about the acquired knowledge about basic financial topics through a diagnostic test. Then, we proceeded with the active methodologies in which they create their own financial plans using the new financial concepts studied in class. According to Arceo et al., (2001) the optimal learning environment is that where the dynamic interaction between teachers, students, and the activities allow learners to create their own truth. So, the context is essential to understand what happens, and to build knowledge based on the understanding of that reality. By letting the students solve problems, play, and interpret situations of daily life related to financial planning. They are able to recognize how it affects their lives; how budgeting and finance decision-making goes beyond a set of instructions that a teacher dictates to become a skill, because they have been architects of their own learning.

The case method, however, offers the possibility of being much more effective due to its interactive, iterative, and dynamic format (Eades et al., 2013). In the model that has been proposed, the presentation of a critical case formulated as learning based on experiences, has represented a successful strategy to awaken students' interest in appropriating knowledge, and understanding the necessary tools to avoid falling into the same error as the individual under study in the critical case.

Financial education programs have proliferated in recent years as banks are required to set a yearly budget to create EEF (Economic and Financial Education) programs. Their strategy has been the implementation of MOOC (Massive Online Open Courses). However, when the population is evaluated, statistics show that they grasp only a few concepts. Authors such as Osuna-Acedo et al. (2018) performed a review of the state of the scientific literature on the concept of MOOC, which has had a strong evolution as a training proposal based on the construction of participatory learning. Among the main results, the authors present the taxonomic definition of successful characteristics for learning, among others: Authentic tasks, which are given by the application to situations of real life; transfer of learning by competency building; collaborative work, and tolerance, as the pedagogical design have to be adaptable to diverse participants.

Another relevant study on the teaching of financial literacy concluded that the curriculum should relate to the circumstances of students' lives, and should use pedagogical techniques, such as small groups, stories, or exercises, that involve multiple dimensions of the students. Students need to practice and apply concepts to their own lives (Taylor et al., 2012).

According to Ramírez-Montoya and García-Peñalvo (2018) in the open pedagogy processes, the triangle between shared science, co-construction, and open innovation must be the fundamental basis. From this, the adoption of new forms of knowledge construction becomes evident, as well as the new actors, new interrelations of disciplines, new possibilities to open the knowledge that has been generated, and new tools to transfer that knowledge.

The foregoing translates into the creation of spaces for innovation, the resolution of problems and the creative approach of possibilities for civil society. Thus, the financial education project, besides increasing financial knowledge for the participants, contributes to create culture, solve social problems, and improve of the quality of life of those involved.

According to Camilli-Trujillo and Römer-Pieretti (2017), vulnerability translates into concrete human groups that, although they know what is happening around them because of their own social and cultural condition, they are marginalized. These authors carried out an analysis of literacy compared to the empowerment of vulnerable groups regarding Information and Communication Technologies (ICT), which can be overlapped with financial education.

It is important to complement the financial education strategy with training that reaches the family of the involved students in the study. A study carried out by Floyd (2015) proved that there is a positive relationship between the status of the parents and the financial education of children. The authors Novo et al. (2017) recognized that the construction of a connective brain begins at the earliest ages of human development, that it is we develop our mathematical thought, through which key elements to make decisions, solve problems of daily life, treat data, and understand the environment emerge.

The objective of this study is to establish and test new model of financial literacy education for young people (high school and college/university), through the use of active pedagogical and didactic methodologies. This article focuses on students who could be categorized as a vulnerable group, given their youth, and their low economic stability that give them unfavorable conditions and lack of experiences with personal financial plans and actions.

### *1.3. PISA tests*

The Organization for Economic Cooperation and Development (OECD), launched a program to analyze the performance of students in their basic training, and those who are in the threshold of starting work, from the development of standardized tests that provide statistics for the adoption of public policies that improve the quality of education (OECD, 2007). According to Ramos (2013), the Program for International Student Assessment (PISA) aims at making an international assessment of the competencies of these students, among the countries participating in the program.

The test that was applied as part of this project was designed to assess the skills and abilities of students in the analysis and resolution of problems, and to face situations that will arise in adult life through the areas of reading, mathematics, and sciences. The evaluation model deals with a comparative model that is characterized by being a sample (students of 15 years) and cyclical (every three years) (Gallardo-Gil, et al. 2010); and that based on the results offers a profile of the abilities of the participants, as well as information on their personal, familiar, and school context (OECD, 2007).

The PISA tests are not designed to verify specific contents of school programs, but rather to recognize skills that may come from everyday life, from family, social, cultural, and school circumstances (OECD, 2007). In this sense, the proposed financial education model is not only relevant for the mathematical competence subject evaluated in the tests, but also for the adoption of active pedagogical methodologies, which promote the learning of students from situational activities and modeling of real-life cases.

Regarding the mathematical competence that is evaluated in the tests, it is defined within the PISA context as the individual capacity to identify and understand the role played by mathematics in the world (OECD, 2017), understanding these as a set of processes that provide answers to problems. Thus, according to Rico (2007), human beings face mathematical situations in everyday life in different ways, such as: shopping, travel, food, taxes, organization of times, personal finances, among others.

## **2. Materials and Methods**

The population of case study consists of total 350 students from Colombia; 200 ninth graders (high school students) from educational institutions in the municipality of Retiro - Antioquia, in age group 14 to 16 years old, and 150 university students from a university in Bogotá in age

group 21 to 29 years old. Students both from public and private institutions were included. The data collection was anonymous and respondents did not their gender or age. Thus, the exact numbers of males/females or age division are not presented as the research was not collecting such information and only focused on financial literacy of respondents.

The research method used in this study was the investigation-action: The research has an interactive scope with a mixed approach, as follows:

- a) Design of documentary analysis, current financial education models review. The categories were analyzed as a modality of the financial education strategy. We considered tools and instruments used, target audience, developed topics, pedagogies used, and skills developed. In addition, the structure of the PISA tests in financial topics was reviewed in order to incorporate the aforementioned contents in the education model.
- b) Non-experimental design with a descriptive analysis made from the application of a pre-intervention test (diagnosis of financial knowledge). We used financial literacy questions on the test. In the case of high school students, the diagnosis focused on ten topics: income and expenses, personal budget, investment, interest rates, financial institutions, savings, financial products, pensions, stock market and financial instruments. In the case of university students, the diagnosis focused on a three-question test designed by Lusardi and Mitchell (2011) and contained the Financial Burden and Financial Education Survey instrument of the National Administrative Department of Statistics (DANE). In total, 350 students were evaluated using the tests. We identified flaws in students' knowledge in terms of financial literacy basics; they filled a post-intervention test with the purpose of measuring the degree of knowledge in the field after the intervention.
- c) Design of interactive methods of financial education model (see Table 1 for details).
- d) Use of the model in practice for validation.
- e) Test of students' results obtained by pre and post-test.

The analysis techniques that were used are quantitative descriptive techniques and a matrix of hermeneutical comparative analysis. Table 1 summarizes the methodological phases of the project.

Table 1. Methodological design of interactive financial education model

Development of an EEF (Economic and Financial Education) strategy aimed at high school and university students

Design of methodological tools Traditional education-active learning pedagogies		Needs identified through a pilot test	EEF Strategy Impact Assessment
Booklet	Topics Definition Modules Construction Booklet Graphic design Intervention schedule design	Field intervention Personal finance for teachers Contests Media deployment	Instrument design Initial diagnosis Implementation Final diagnosis Implementation
Lectures	Strengthening student operators Preparation of teachers' personal finances		
Workshops	Active learning pedagogies workshops design Traditional education workshops design		
Contest	My First Million "Who wants to be a Millionaire?"		

Firstly, we obtained the design of the methodological tools that combine elements of traditional education with active learning pedagogies in a series of adaptable tools depending on the type of youngsters.

### 2.1. Design of interactive teaching methods focusing on high school students

Financial education was subject of analysis and taught using the following methods: Booklet, face-to-face thematic lectures, conventional and non-conventional workshops, and a contest in which participants were encouraged to actively demonstrate their knowledge. The methods used are described below:

- a) Financial Education Foundations Booklet: a guide consisting of six modules: interest and indebtedness rates, financial institutions, financial products, savings culture, personal finance, and investment in the stock market. The topics of the booklet were selected based on the Financial Education module of the PISA tests, taken from the Instituto Nacional de Evaluación Educativa de España (2014).

- b) Lectures: one of the conventional strategies used is the face-to-face training in classrooms of high school students, and lectures entitled Personal Finance for Teachers, in order to bring them closer to the topic of Financial Education and multiply the impact of the project.
- c) Workshops on active learning pedagogies: they were carried out in the interventions, through active learning and didactic methodologies, and learn-by-doing workshops on the contents. The three workshops were carried out as follows:
  - i. Active Participation Workshop # 1 - Barter: students exchange products, with the purpose of strengthening the concept of barter, and solving the problems or difficulties of negotiations.
  - ii. A.P. Workshop # 2 - Role-play: The moderator assigns the functions following a script in which several situations are described; as the characters are narrated, students must make decisions about what to do with the difficulties that arise as the story unfolds.
  - iii. A. P. Workshop #3 – Financial budget: each student is given a sheet of paper in which first, they must creatively make their own personal financial budget or determine their financial goals.
  - iv. A. P. Workshop # 4 – Selection of funding sources: each participant must choose the best source of financing according to the situations arising from the applied exercise that appears in the booklet.
- d) “My First Million” Contest: a contest among the participating groups with the purpose of testing, in a didactic and playful way, the knowledge that has been acquired during the development of the project. Some of the games that were chosen are One Minute to Win, Ladder, and Kahoot.

## *2.2. Design of interactive teaching methods focusing on university students*

- a) Conference-workshop and initial diagnosis test - The importance of the financial education: the conference seeks to sensitize the student, and initiate the process of awareness of the importance of understanding concepts such as savings, budget, their pension plans, their current credits, and the importance of making adequate decisions on indebtedness and investment. Here, the financial education test is given to the participants to identify their level of knowledge in topics that are related to interest rates, inflation, and savings.
- b) Analysis of critical cases (experience-based learning): a critical case is presented to alert and prevent the student from reaching the limits of over-indebtedness, citing an example: Business Administration Student, 21 years old, with a debt exceeding 30 million pesos

(approximately USD 8.5001), based mainly on consumer products and no assets, who works in a bank and who is about to be reported at credit bureaus. Subsequently, the student's bank statements are reviewed, seeking for them to understand the logic of the purchases with credit card, the implications of the interest rate, and the benefits of the portfolio purchase through their own history.

- c) Workshop-simulation of stock market: using a game of roles, we established teams to play the roles of businessmen, whose main goal is to act as intermediaries in the market with oil bonds and dollars, being all the groups in a direct competition. The aim of the simulation is for the student to understand the effect of the environment, and thus, make sound investment decisions.
- d) Family budget simulation workshop: two volunteers are chosen to participate as family members and economic decision makers. The other people may participate as consultants, in order to advise the family. The family must survive 30 days with a salary, making different decisions such as the choice of a place to live, their transportation expenses, the choice of a health plan, public services, and expenses of the children. Role-playing allows people to develop awareness of their expenses. The main objective of the activity is to reach the end of the month with a positive balance.
- e) Savings ladder: the game is based on a ladder where the students can move forward as long as they answer questions that are related to the financial system, savings concepts, and pension and retirement plans.
- f) "Who wants to be a Millionaire?" Final contest: three teams must be established. Each team is benefited with two aids, 50/50, and the help of the group. Each member must answer a multiple-choice question, or true-false question. The questions are relationated on topics of savings, investment, indebtedness, and pension and retirement decisions.

To validate the model, we developed a diagnostic instrument based on ten questions for high school students and three question-test for university students; the topics were described in the previous section.

As a result of the application of this pre-intervention and post-intervention diagnostic test, an evolution in the knowledge of the beneficiaries of the project was observed, based on a classification of the level of knowledge of the students (high - Grade  $\geq 4$ -, medium -  $3 \leq$  Grade  $< 4$ -, and low - Grade  $< 3$ -) performed at the beginning and at the end of the intervention; it can

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<sup>1</sup> TRM 1 USD = 3.500 COP

be seen how the percentage of students with a high level of knowledge increased in all the institutions at the end of the process.

### 3. Results

The case study and developed model presented in this paper was tested to compare initial results with results after use of the suggested EET model.

The changes to the previous system were the following:

- 1) High school students
  - a) Financial Education Foundations Booklet: modules and topics were upgraded based on current topics and approaches to financial planning
  - b) Lectures: teachers were subject of financial education on personal finance to be able to help students
  - c) Workshops actively involving students
  - d) “My First Million” Contest: modern mobile technologies were used to make all students interact and get actively involved (Kahoot etc.)
- 2) University students
  - a) Conference-workshop and Initial Diagnosis Test: focus on student’s own situation
  - b) Analysis of critical cases (experience-based learning): showing real problems and impact of wrong financial decisions
  - c) Workshop-simulation of stock market: attracting students to investments
  - d) Family budget simulation workshop: creating real family budgets
  - e) Savings ladder: knowledge contest among students
  - f) “Who wants to be a Millionaire?”: use of principles of popular TV game

To compare the results and evaluate the impact of new method, firstly, students’ initial knowledge was tested. As described in methodology, the low knowledge represents grade <3, medium grade 3 to 4-, and high grade  $\geq 4$ . The grades were given based on the test scores.

In the initial administration of the financial literacy test, the results of high school students (ninth grade) were the following: medium level (50.5%), low level (28.6%); and only a small portion of the students (20.9%) presented a high level. However, after the intervention, the results were inverted, since students with a high level represented the highest percentage (59.9%), while those of the medium and low levels represented 29.75% and low 10.4%, respectively.

In the case of the diagnosis of university students, 10% were in a high level, 32% in the medium level, and 58% in the low level. After the intervention the number of students in the high level increased to 62%, medium level 26%, and 12% in the low level. Summary of results and Chi-square test of differences are resented in Table 2.

Table 2. Financial literacy pre and post test

	No of students	Initial level of knowledge			Post-test level of knowledge			Chi-square p-value
		low	medium	high	Low	medium	high	
High school students	250	28.6	50.5	20.9	10.4	29.7	59.9	>0.001
University students	150	58.0	32.0	10.0	12.0	26.0	62.0	>0.001

These results reaffirm the progress, as in addition to having achieved an evolution, the greater number of intervened students culminated with a high level in the appropriation of financial and economic issues, which, although basic, are fundamental in the national development.

Analyzing the progress of the high school (ninth grade) students in the low and medium test levels for each of the topics developed, it was evidenced that, in the two tests applied, the Income and Expenditure module obtained the highest degree of knowledge. This module is followed by Investment, which showed that the modules that have greater daily applicability give better results. On the side of Financial Institutions, it can be concluded that, although it was the lowest rated in the final test, it was the module that represented the highest growth, going from a percentage of effectiveness from 35% to 65% (see table 2). Further, university students post-test evidenced a greater level of understanding in the questions on inflation and interest rate, in comparison to the question about risk diversification. This reiterates the greater ease of understanding in everyday issues, as it was seen in high school students.

#### 4. Discussion

Worldwide, average financial literacy is low, which implies not only a misuse of financial products, but also a low willingness of the less literate population to accept financial advice. As Berková and Holečková (2022) stated, it is necessary to innovate teaching methods with the emphasis on the effective competency development and readiness for the future. Anderson (2017) reported a positive and significant correlation between the level of financial literacy, and the level of saving of people and retirement planning.

Different authors have calculated and analyzed the results of a financial education test that has been administered in different countries such as the Lusardi and Mitchell (2014) in USA, Sekita

(2011) in Japan, Arrondel et al., (2013) in France, Fornero and Monticone (2011) in Italy, Klapper and Panos (2011) in Russia, and Brown and Graf (2013) in Switzerland. In general terms, 50% of the population or more does poorly in the test. According to Lusardi and Mitchell (2014), only 30% of the population managed to answer the questions correctly in the US. In contrast to this study, for the diagnosis, the highest percentage of the population of basic and higher education institutions are classified in the medium and lower levels of financial knowledge.

Our results are consistent with the study by Amagir et al. (2022) who develops a financial education program for students. Emphasis has to be paid to quality of teachers. As Oyenuga et al. (2019) point out, academic staff has to be further educated and upgrade their knowledge to reach the need for up-to date knowledge and offer intellectual benefits to students.

The results confirm that the level of financial knowledge of students has been achieved; meeting their active involvement and objection intentions. On the other hand, in the long run, the results are not taken into account, in order for the authors to suggest a method for developing the effectiveness of their program by recording students' outputs. In the same line, authors such as Rodríguez and Saavedra (2019) conducted an experiment with a group of youngsters to open a banking account in Colombia and a periodic text message campaign containing financial training had been sent on their mobile phones to improve their financial decisions. The study records an amount of the current account balances and shows a reduction of retirement charges. Also, Harcourt-Cooke, Els and van Rensburg (2022) add that use of modern approaches in financial education (including comics) lead to better understanding of students. Modern methods help with perception and applicability of their financial decisions in real life. Therefore, policymakers and schools should support modern financial literacy education.

On the other hand, study by Pérez et al. (2018) on financial education focusing on university students confirmed that the study sample recognizes the importance of personal finance, but they lack knowledge regarding savings and credit. This predominates in the majority of the sample. The students were in fraud of predatory debt.

Study conducted by Rodriguez-Raga and Martinez-Camelo (2022) evaluates the impact of financial education in a sample of schools in Colombia. One of its results is that better financial knowledge and test results are achieved by students of public schools in comparison to privates. This points at the need to create and apply established programs and tailor it to different types of students and schools.

According to Zingales (2015), financial education is fundamental to promote good finances, minimize financial risks, and avoid bad financial practices. Calderón (2018) proposed that the

financial education in Colombia could be the solution to an exclusion; in its study, the implementation of this education in educational institutions will provide students with a project on a sample of good use of money. That is to say, academics hold in research and teaching, a tool of social transformation and social perception regarding the importance of the good use of finance.

Martínez and Rivera-Acevedo (2018) studied the impact of informal indebtedness on the population of vendors in Cali, the third largest city in Colombia in terms of population. The authors identify that, despite the fact that the sellers receive a good income, they cannot improve their living conditions due to the high cost of debt and exclusion from the formal financial system. Consequently, their profits are affected by the high costs of debt. Harcourt-Cooke, Els and van Rensburg (2022) adds that complex financial products are generally poorly understood which negatively impacts financial decisions.

Vučetić et al. (2022) adds that financial literacy positively address anxiety, lack of control, nervousness, and fear of death. Authors state that financially educated people also have better long-term disaster risk management.

Along the same lines, Brown (2016) found how young Americans, who have deficiencies in financial literacy, show high dependence on debt and incorrect payment behavior. This implies that higher levels of financial education bring lowers the level of indebtedness and therefore, better behavior in terms of personal finances. Lo Prete (2022) also documents that across different countries more informed personal finance decisions are associated with financial literacy and use of digital financial products in practice.

Consequently, programs to bring financial education to young people and children have been developed in different countries, similar to the model of financial education for young people that is being implemented in this article. One example is the case of the UK, where the Personal Finance Education Group (PFEG) implements a financial education system for children throughout the country, funded by the government. The program has achieved that from childhood, people have guidelines for financial behavior. despite the fact that it is a complex and challenging task as it is difficult to reconcile the interests of parents and school with those of the financial system which seeks to sell more financial products ignoring over indebtedness (Zokaityte, 2017).

Limitation of implementation of this study is that the method is designed for groups of no maximum 30 students. Thus, the implementation in larger groups would require a greater effort in logistics to replicate the model.

## 5. Conclusions

In Colombia, financial education is being implemented in high school education and is, in turn, one of the greatest needs due to the volatility of the economies, for which society should be prepared as a basis for the creation of a financial culture.

The proposed model uses activities aimed at the youth population during regular education at institutions, such as a role-play, an experiential learning activity called barter, talks, contest, budget workshops, selection of funding sources, using new technologies that are attractive for youngsters. For the case of the university population, it includes activities such as a stock market simulation, a family budget simulation game, the analysis of critical cases of indebtedness, and contests with a similar format to "Who wants to be a millionaire?". Moreover, additional education of teachers is crucial as otherwise teachers are not able to further expand the knowledge of students.

A relevant finding of the study is the validation of the proposed financial education model as the results show significant differences ( $p < 0.001$ ) and the level of tested students reached significant improvements towards high level of financial knowledge. In case of high school students, the level of high knowledge raised from 20.9% (pre-test) to 59.9% (post-test) and university students from 10.0% (pre-test) to 62.0% (post-test).

From this study we concluded that an active pedagogy approach, with didactic teaching strategies, draws students' attention and represents a greater motivation source to acquire financial knowledge. Additionally, the need to compete through the formulated contests represents a stimulus for the apprentices; a positive response was evidenced both in the contest "My first million" and in the contest "Who wants to be a millionaire?" The proposed model shows greater effectiveness, compared to traditional methodologies.

Likewise, in addition to the relevance of the proposed pedagogical model for finance teaching, it seems necessary to spread this innovative style of financial education around education institutions.

Therefore, the inclusion of financial topics in the curriculum of education institutions is pivotal to improve the decision-making processes in our society. These decisions will promote the financial culture, improve the living conditions of the population and strengthen the financial market and the economic growth of the country.

As a general result, a significant improvement in the financial knowledge of the groups was obtained by comparing the pre and post test results. The scores expressed in the results section (Table 2) show the effectiveness of the tools used. The use of the proposed approach motivated

students to learn financial concepts as they found them useful in real life situations. This progress in the financial literacy levels of students pose a significant leap in the economic prospects of the country.

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## The Role of Digital Education in Achieving Sustainable Green Campuses

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**Abstract:** *The paper explores the integration of digital education within the green campus initiatives, adding emphasis on reducing energy consumption and achieving sustainability in the institution of higher learning. This study frames a broad overview of how online education, digital tools, and virtual resources help make campuses sustainable by lessening the authorized use of physical resources, increasing energy efficiency, bringing down carbon footprints, etc. This extends to the theoretical framework on green education that provides the study methods, questionnaires, and evaluation methods used in this research work, together with the practical significance of the results in adopting digital solutions. The findings bring out the role of digital education in promoting sustainability by giving actionable insights for education institutions in the strive towards a green campus.*

**Keywords:** *Green Campus; digital education; sustainability; online learning; energy efficiency; sustainable development; higher education; green technology;*

### 1. Introduction

The concept of environment has come into focus in these last decades due to global warming and climate change. Global climate change is already affecting agriculture, ecosystems, water supplies, commodity supply chain and urban services. It is well-established through multiple lines of evidence and multiple studies that while natural mechanisms contribute to the greenhouse effect, human activities are currently increasing the atmospheric concentration of carbon dioxide and other greenhouse gases (Sundar et al 2022) (Mikhaylov et al, 2020).

Producing and manufacturing industries and energy production are also among the major sources of GHGs. The transport sector, in connection with the working of cars, trucks, planes, and ships, also stands as a major emitting sector. Domestic activities, like running institutions, offices, hospitals, schools, and universities, contribute much toward carbon emissions. The heating and cooling of buildings and, the usage of electrical appliances—all contribute to the consumption of energy that again goes directly as CO<sub>2</sub> emissions.

Global warming and climate change arena for effective abolition require urgent interventions. We find many initiatives taken by the international community to reduce GHG emissions and to foster sustainable development; among them is the Paris Agreement, whose aim is to keep an increase in average temperature well below 2 degrees Celsius above pre-industrial levels and give the best shot to maintain it at 1.5 degrees Celsius (Schleussner et al, 2016) (Rogelj et al, 2016).

In respect to this, individual countries and communities should also take up their responsibilities towards mitigating climate change. This includes improving energy efficiency, developing renewable sources of energy, afforestation, and reforestation, along with reduced deforestation and sustainable land-use practices in areas like agriculture. Similarly, in the field of transport also, electric vehicle development and public transport are equally crucial as regards bringing down emissions. At the level of houses, energy saving has to do with efficient appliances improving insulation, and upgrading heating systems. It also calls for roles by other institutions, offices, and schools in the reduction of energy use and promotion of sustainable practices.

Educational institutions can also significantly contribute to this by establishing a green campus (Corbaci & Ertekin, 2020). A green campus is an institution of learning that responds to issues of sustainability and has, in that regard, applied quite several reducing measures to the ecological footprint through enhancing energy efficiency, use of renewable sources of energy, optimizing waste management, and promoting sustainable transport options (Sonetti et al, 2016) (Prakasha, Chakraborty & Kenneth, 2021).

The role of digital education in the context of a sustainable institution is becoming increasingly important. The two primary ingredients for green campuses are optimization of waste management and promotion of sustainable transport options, but probably more important for educational institutions to derive the many benefits that digital education can provide (Akay, 2024). Using digital education would green the campus through reduced energy consumption by saving physical resources in delivering education (Sugiarto, Lee & Huruta, 2022). Online lessons and e-resources allow students to participate in classes from home or any other location, cutting down the need for travel and its accordance with environmental degradation. Virtual classrooms minimize the usage of paper handouts and sustain institutions in a more environmentally friendly way.

It further offers opportunities for much more effective integration of sustainability issues in educational programs. Interactive online platforms and digital resources help students

understand better such environmental challenges and meet them with innovation. Digital tools that can be used to enhance the ability of institutions to diffuse principles of sustainability more appropriately and more credibly, increasing their environmental awareness (Trevisan, 2023).

Green campuses have impacts that reach beyond the campus boundaries. This is because institutions implement sustainability measures and programs that can be emulated by the local community and encourage other organizations and businesses to adopt environmentally friendly practices (European Commission, 2023). Green campuses are also capable of spurring economic growth at a regional level; this shall be attainable through energy efficiency projects and the use of renewable energy sources.

In the long run, the example and community engagement of these educational institutions can take a lead in fighting global warming and climate change and towards a sustainable future.

## **2. Digital education in achieving the goals of Green Campuses and sustainability**

Many modern educational institutions worldwide have started incorporating digital technologies into their education courses, hence changing pedagogy methods and infrastructure. Digital education, through online learning, distance learning, and educational technology tools, has presented a significant opportunity for adopting green solutions toward the realization of sustainability goals (Akay, 2024). Closely related to the green campus, digital education would be recommended to foster energy- and resource-efficient solutions, reduce the ecological footprint, and sustain commitments (Eudela, 2024).

Probably the top of the list of the most significant advantages of 'being digital' in education is savings in energy and resources. Digital programs of online and remote learning can whittle down much energy that educational institutes spend, as less physical space is needed to conduct lessons. The regular classes, laboratories, and other facilities require a lot of energy use, primarily for heating, cooling, lighting, etc. Online education can reduce institutional energy demand, hence slashing their ecological footprint (Brychkov et al, 2023).

Apart from that, less paper is required with digital learning materials. With so many electronic books, notes, and other learning materials, this will reduce the use of paper and printing costs, thereby reinforcing sustainability goals. Online learning platforms and digital libraries allow students to assess needed resources without having to attend libraries, which in itself means a reduction in emissions from transport (Gorina et al, 2023).

It can also be envisioned that digital education will play an essential role in reducing the emissions associated with transport. In online courses and distance learning programs, students can attend classes right from the comfort of their homes or any other location. Still, within traditional education systems, the movement from the university to the respective home and, inversely, teachers and other staff required commuting daily, adding much to carbon emissions from this sector (Schroeder, 2022).

It also reduces pressure on university campuses in the form of digital education, where there are fewer students/ teachers physically present on campus. That itself relieves the burden of building more parking and transport facilities at institutions but at the same time also eases local traffic and air pollution. Online education facilitates options that both students and teachers can have more flexible schedules, which too can further reduce rush hour traffic (Favale et al, 2020).

### **3. Sustainable education practices**

Digital education has the great potential to incorporate issues of sustainability in their educational programs. The latest research and teaching material on all aspects of sustainability is readily available through online platforms and technology tools, hence easily accessible to educators. The more this kind of content finds its way into educational materials, the more environmental awareness will grow among the students, spreading sustainable practices (Zhang et al, 2022). Online courses and workshops for learning interactively about sustainability, for example, a virtual lab and simulations. The students will be able to analyze real-time data and provide solutions to later problems on sustainability matters. For that reason, digital education not only helps in improving effectiveness during learning but also assists in the acquisition of practical knowledge and skills necessary in the struggle to lead a sustainable life.

Further development of digital education tools and new technologies opens the floor for many more avenues toward sustainability. In particular, intelligent classroom systems, VR/AR technologies for education, and data-driven learning platforms create conditions to extend effectiveness and sustainability in education (Versteijlen, et al, 2017). The intelligent classroom system can optimize energy consumption by automatically controlling lighting and heating by presence sensors. A deeper understanding of sustainability could, through interactive means using VR and AR with virtual ecosystems and simulations on sustainable development, be conveyed to the learners. Data-driven learning platforms allow for the continuous monitoring and optimization of the effectiveness of learning processes that contribute to developing more sustainable education practices.

#### 4. The community synergy of a green concept

The solution to environmental problems needs the input and communion of all forces that come into play in a community: the university, government agencies, NGOs, and the business sector. In that way, such synergy makes possible more efficient use of resources and, by sharing knowledge and experience, a better understanding of the complexity of the problem at hand. Numerous programs are implemented to ensure that communities realize their environmental commitments by reducing environmental impacts while supporting sustainability. These include such initiatives as green business, sustainable offices, green production, green marketing, green human resource management, and green supply chain management. The environmental goals—together with green transformation knowledge and attitude formation—ought to be among the aims of education within the higher focus. The green transformation is not only a phenomenon flowing from an economic or technical/IT context but also considerably from an educational one.

In technical terms, green production is a process of production with least harm to the environment, such as through reduction of energy consumption, waste recycling, and reduction in emitting dangerous elements. Businesses play a vital role in implementing more sustainable methods of production (Du et al, 2018) (Qiu et al, 2020).

In logistics, green supply chain management aims to reduce environmental impacts along the entire supply chain—procurement, production, transport, and recycling. It incorporates sustainability issues into business processes and assists companies in lessening their ecological footprint (Saada, 2021).

As far as economic operators are concerned, green businesses pay consideration to the environment during their activities, minimize pollution, and are based on materials originating from sustainable sources. Such companies play an exemplary role in developing a sustainable economy and contribute to raising environmental awareness among consumers (Lartey et al, 2020).

Corporations reduce energy use, minimize waste, and increase staff environmental awareness; design offices to make them sustainable. Such technologies and practices, used in their offices, help strive toward achieving corporate sustainability goals (Sariya & Supeechea, 2018).

Green marketing is one of the strategies whereby companies emphasize environmental benefits in the advertising of products and services. This strategy increases consumers' environmental awareness and encourages them to pick sustainable products for their needs (Kemper & Ballantine, 2019).

Green human resource management refers to practices that aim to improve companies' environmental performance by involving employees. This mainly involves raising awareness of the environment, encouraging green workplace practices, and training in sustainability issues (Roscoe et al, 2019) (Obeidat et al, 2020).

The high level of promotion in environmental education and the basic principles of sustainability are also being carried out by educational organizations. Universities and schools introduce different programs and initiatives about integrating sustainability into academic practice. Green universities are trying to introduce sustainable practices in all spheres of university activity: energy use, waste management, and curriculum development. It is aimed at enhancing the environmental awareness of students and faculty in such universities, as well as at making principles of sustainability part of their daily lives. According to Wee et al (2018) and Zhao et al (2019) universities pursue similar goals on sustainability as green universities but on a smaller scale. They implement programs that involve educating students about the environment for them to lead sustainable lifestyles. These schools specifically focus on developing eco-friendly infrastructure and community participation in initiatives aimed at sustainability.

This also opens opportunities for building community synergy and strong commitment where the environmental problems are complex, and knowledge gaps delimit understanding. The green programs and initiatives at the current time being implemented by business and education organizations make nineteenth-century examples of how sustainability can be embedded into everyday practices. These efforts contribute to a less degraded environment and a more sustainable future.

## **5. Dimensions of a Green Campus**

The three dimensions that green campuses focus on include behavioral change, educational tools, and physical facilities. These dimensions make it possible to promote a culture of sustainability within the academic environment.

Shaping attitudes: faculty, staff, and students can have attitudes shaped regarding sustainable behavior. Many programs are organized regarding recycling, campaigns for energy conservation, and alternative transport options that reduce one's carbon footprint, as suggested by Sugiarto et al. (2022).

Education for sustainability and environmental awareness: the consideration of sustainability in curricula and research provides an avenue for developing environmental awareness and innovation. In 2015, Lozano et al supplied a case report about the success of integrating the sustainability concept into the educational framework at the University of Maribor, serving as a lead to other universities.

Sustainable buildings: the schemes LEED and BREEAM offer guidelines and standards for new construction and renovation projects that should be sustainable (Syidanova et al., 2020).

Organization of activities in a sustainable manner: the university activities, events, and day-to-day operations need to be organized in a manner that is sustainable for the achievement of a green campus. This ranges from making sustainable purchasing decisions to using energy-saving technologies and waste management systems as recommended by Adomßent, Grahl & Spira (2019).

Digital potential in education can make a difference: Online learning and the use of digital teaching tools can reduce the ecological footprint of universities. Digital education makes it possible to learn from home, thereby curtailing travel and reducing energy consumption by the universities (Versteijlen et al 2017) (Zhang et al, 2022). Moreover, virtual labs and other digital facilities also save physical resources.

## **6. Green Campus framework**

Building from the above, the green campus concept involves reducing the ecological footprint of universities while playing essential roles in promoting environmentally conscious thinking and activities by students and staff. This Green Campus Framework is intended to ensure that universities and colleges develop ecologically friendly operations, reduce their ecological footprint, and set examples for sustainable living. The framework that follows places particular emphasis on teaching methods, digital education, attitude formation, knowledge enhancement and third mission activities, sustainable infrastructure, and sustainable management and work organisation.

### **1. Teaching methods**

### Interactive and practice-oriented education

It is an interactive and practice-oriented teaching of themes connected with sustainability. Students who act upon real projects or participate in practical activities develop a deeper understanding of sustainability-related knowledge and skills. Examples might be the assessment of energy efficiency, designing recycling programs, or creating sustainable transport solutions.

### Sustainability curriculum integration.

Principles related to sustainability should be integrated into the educational institution's curriculum. Issues of sustainability, integrated into subjects and having specific courses and training on this topic, make students understand the environmental challenge and what can be done to solve it.

## 2. Digital education

### Online learning platforms, virtual labs

Digital education can help universities reduce their ecological footprint and enhance teaching efficiency in several ways. Online learning platforms, virtual labs, and digital learning materials lessen the necessity of physical presence, through which the burden on the environment from travel is reduced. Students have flexible access to learning materials and resources, creating a sustainable learning environment.

### Digital tools for sustainability

Digital tools can back up the realization of set targets in sustainability by educational institutions. For example, energy consumption monitoring and optimizing systems, as well as virtual and augmented reality tools, help students learn about sustainability interactively.

## 3. Shaping mindsets

### Campaigns and awareness raising

The raising of sustainability awareness is highly valued by the university community. Corresponding educational campaigns address students and staff members alike. These could be supplemented by campaigning for energy savings, recycling, or environmentally friendly transport alternatives.

### Sustainability workshops and seminars

Workshops and seminars offer staff and students further opportunities to engage themselves at a deeper level with issues related to sustainability and discuss outward-reaching solutions. Involvement in such activities can create incentive effects that spur creative thinking and innovative ideas necessary to realize a university's goals set on sustainability.

#### 4. Expanding knowledge

##### Research projects and collaborations

The educational institutions can participate in active research projects regarding sustainability and such associated collaborations. Typically, the eventual goal of any such project, considering the United Millennium Development Goals and visions, can be the development of new knowledge and technologies in sustainability that will promote scientific and technological innovation. It provides hands-on experience and knowledge enhancement by involving students in research projects.

##### Scientific publications and conferences

The universities can encourage publications of a scientific nature on sustainability issues and participation in conferences. These kinds of activities will enhance knowledge dissemination concerning sustainability and the building up of professional networks to help achieve global sustainability goals.

#### 5. Third mission activity

##### Community engagement and partnerships

Universities can partner with the local community, businesses, or the government in pursuing common sustainability goals. This kind of partnership will also inspire the sharing resources and knowledge to achieve typical environmental goals. For example, a university can participate in the area's sustainability initiatives—establishing urban gardens or popularizing energy-saving technologies.

##### Community services and sustainability programmes

Communities can offer community services and sustainability programs designed to benefit the wellbeing of local communities directly. For example, they may provide advice on energy conservation to individual households, run school recycling campaigns, or provide education in community centers about sustainability.

#### 6. Sustainable infrastructure

### Green buildings and energy efficient systems

Building sustainability is fundamental to any growing green campus. Green building certifications, such as LEED or BREEAM, shall be the goal universities should aim for in their building infrastructure. These certificates ensure the highest possible energy efficiency and sustainability in buildings. These would involve the use of energy-efficient systems, such as solar panels, wind energy, and geothermal heating systems to reduce energy consumption and carbon footprint of the institution.

### Water management and rainwater harvesting

Green campuses depend on the sustainable use of water. Rainwater harvesting and reusing can help to cut down potable water use and hence save the environment. Adopting technologies that allow more efficient monitoring and optimization of water use is vital for any university. For instance, implementing low water consumption equipment and devices brings forth quite substantive savings in water use.

### Sustainable transport infrastructure

Such initiatives as promoting cycle paths and charging stations for electric vehicles will further make campuses more environmentally friendly. This means universities can facilitate students and staff to be involved in environmentally friendly commute options, for instance, through cycling, walking, or public transport. Car-sharing schemes and rental options also serve pretty well with an electric vehicle nature for a sustainable mode of travel.

## 7. Sustainable management and work organisation

### Green procurement practices

Another essential element of sustainable management is the development of environmentally responsible purchasing practices. This means a university has to ensure it procures goods and services in a manner that satisfies sustainability requirements. This may include using recyclable materials, acquiring energy-efficient equipment, or sourcing from local producers to reduce transport costs. Such practices decrease the ecological footprint of institutions and contribute to sustainable economic development.

### Flexible working and teleworking

Offer flexible working arrangements with options for home office or telework to reduce the environmental impact of daily commutes and help decrease energy use. Flexible working hours allow workers to efficiently organize work and private life, keeping as negligible emission from

transport as possible. Universities should encourage this way of working and provide the necessary technological support.

#### Environmental performance assessment and reporting

Environmental performance should be regularly monitored at universities, with improvements to sustainability practices. This means, among others: monitoring and analyzing energy use, water use, waste management, and other environmental indicators. The results will provide the impetus for improving the sustainability strategy and actions of universities. Results and corresponding improvement plans shall be published regularly to ensure transparency, for example, in the form of sustainability reports.

#### 8. Social responsibility and community partnerships

##### Integrating social responsibility in education

Since corporate social responsibility goes hand in glove with sustainability, there is a central role that institutions of learning can play. It can assist in acquainting students with issues relating to CSR and its practice in companies and organizations by including CSR in universities' educational programs. Through classes and projects on CSR, it becomes straightforward for students to understand how they can actively take part in solving social problems and environmental degradation.

##### Developing community partnerships

It is essential for universities to acquire close ties with local communities, businesses, and NGOs. Such cooperation would facilitate knowledge and resource sharing in the implementation of joint projects and initiatives. For example, university activity can be related to local projects on sustainability by creating urban gardens or implementing energy-saving technologies within a community. In other words, through cooperation, it becomes possible for universities to contribute to the development of local communities and achieve sustainability goals.

##### Community services and sustainability programmes

Universities can be engaged in launching community services and sustainability programs that are focused on directly contributing to the well-being of local communities. Some examples of this include the provision of energy conservation advice to individual households, organizing programs for recycling within schools, and providing sustainability education in community

centers. These industry programs promote community participation and the broader uptake of principles concerning sustainability.

Based on the above, the Green Campus framework is shown in Figure 1.



Fig. 1. Green Campus framework

## 7. Summary

The Green Campus Framework allows major educational institutions to make a more significant and more sustainable impact on sustainability. Through this holistic approach, a university not only increases the environmental awareness of its members but also helps contribute toward attaining primary goals for sustainable development.

This would not only spread knowledge about sustainability but also develop students' skills by developing teaching methods and digital education. Attitudes are shaped, and knowledge is enlarged so that students and staff are better informed on the challenges and solutions about sustainability. Third, mission activities and community engagement help in diffusing sustainability into communities.

The development of sustainable infrastructural and transportation solutions decreases the ecological footprint of a university while improving its environmental performance. Efficient and responsible operation of universities in an environmentally friendly way, as well as good

examples of sustainable management and work organization practices, inspire trust in the eyes of the world community.

These dimensions, therefore, make universities a green campus that, other than reducing the ecological footprint of these institutions, helps diffuse sustainability principles into society. About this Green Campus Framework, it is suggested by this paper that it attempts to help educational institutions create an enabling environment for sustainable development by contributing to the mainstreaming of lifestyles and practices sensitive to preserving the environment for a long-term future dealing with sustainability.

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### **About Author**

**Imre TÓBEL** is a master teacher in the field of informatics, computer science and electrical engineering at the Department of Computer Systems and Control Engineering at Institute of Computer Science, University of Dunaujvaros. His research interest is related to sustainability education to emphasizes the integration of sustainability principles into educational practices and the development of environmentally friendly campus infrastructure. Additionally, his involvement in the university's mentoring program underscores his commitment to student development, focusing on personalized guidance.



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## Literacy levels in small villages in relation to local primary school

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**Abstract:** *The question is increasingly being asked at the beginning of the 21st century: does literacy still have a raison d'être? In the information society, all data and knowledge is at our fingertips thanks to the computer networks that surround our entire world and the data warehouses that are now becoming indeterminate in size. Is literacy and its level the same today as it was fifty years ago? Have the concepts that became popular at the end of the 20th century - competence and skills - influenced this in any way? What do people in small towns and villages think about literacy and its importance? Can the local small school and its staff play a role in changing the literacy levels of communities, and can they be expected to do so? Does the tangible proximity of artificial intelligence not pose a threat to literacy and cause its devaluation, deterioration and decline? This study seeks to answer these questions by presenting and evaluating the results of questionnaires filled in by people living in a small area. At the end of the study, it draws conclusions based on the results and presents further tasks that, if carried out, will provide an even broader insight into the relationship between literacy in small villages and the local primary school.*

**Keywords:** *literacy; small town; artificial intelligence; competence; capability;*

### 1. Introduction

Groups, micro-communities, communities and the structure of the settlement in which a person lives play an important role in his or her development and personality formation in the early stages of life. Perhaps the most influential member of this multi-factorial environment, from an educational point of view, is the first institution which has a major impact on the individual's level of education. The size of the school, the number of students attending, the personality of the teachers and the structure of the settlement in which the institution is located all combine to shape and change the early traits of the individual. Small schools in small villages are in an exceptional situation, where these changes are even more profound thanks to personal acquaintance, neighbourly and kinship ties. Small schools play a key role in the life of local communities, not only in terms of education but also as a catalyst for the cultural and social development of the local community. Despite this, the quality and impact of the education

provided by small schools has received little academic attention, especially in the context of small villages. The present research investigates the potential of small schools in the development of the literacy level and community life of settlements, using the example of the South-Fejér region.

The research will be based on questionnaire surveys conducted at two different points in time, in 2022 and 2024. The questionnaires were designed to explore attitudes towards the population's perception of literacy, its level, the role of local schools and the use of AI applications. Respondents were selected through purposive sampling, with a total of 811 respondents from ten municipalities in the region (Farkas 2023).

The results of the first survey showed that the population is aware of the potential role of local schools in improving literacy and community life. Preliminary results from the 2024 survey show that respondents are open to consciously raising their literacy levels and are interested in the application of AI in education.

1.1. Scope of the study

All the settlements in the south-south-eastern part of Fejér county (the area delimited in red in Figure 1.) are referred to as the South-Fejér area. This area includes the settlements of Baracs, Daruszentmiklós, Kisapostag, Mezőfalva, Nagykarácsony, Alsószentiván, Alap, Cece, Vajta and Előszállás. The total population of these municipalities is 20 962 inhabitants (based on KSH data as of 1 January 2022). The data provided by the municipalities in June 2022 show the number of primary schools in these municipalities (Figure 1.).

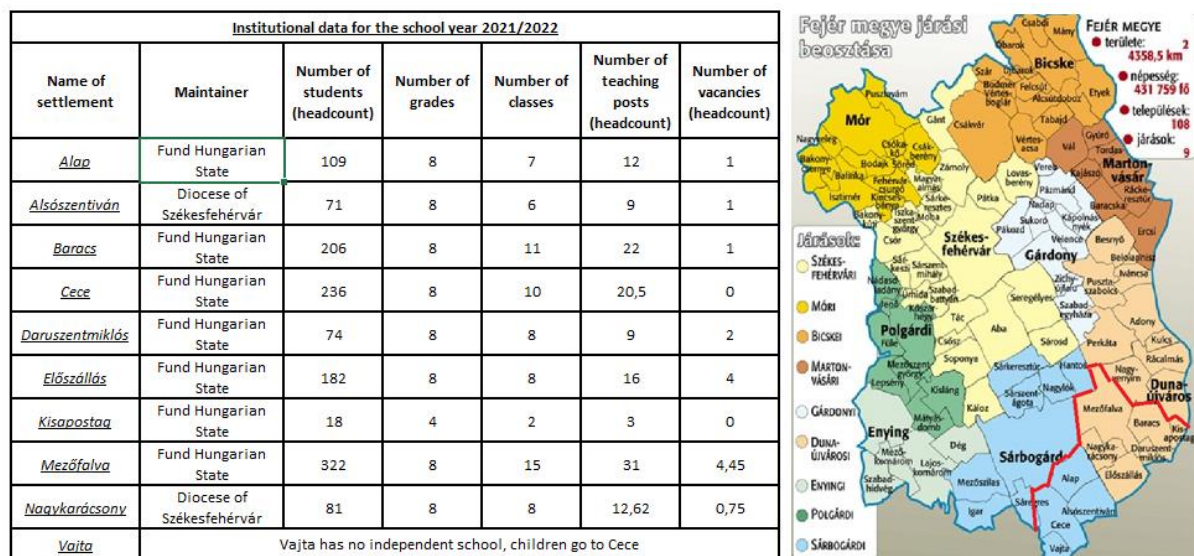


Figure 1. Data on schools in the South-Fejér region

This shows that the school sizes are very different. The three schools with the largest number of pupils are still operating as central schools. In the case of Mezőfalva, the number of children coming from the neighbouring municipality of Hantos (which is not included in the scope of the study) increases the number of pupils. However, it can be noted that most of the schools are small. Since 2022, the number of teachers has not improved and the number of pupils has not changed much.

### *1.2. Clarification of basic concepts*

Two basic concepts that need to be clarified in order to understand the study are literacy and small school. It is important to begin by discussing these concepts because there is not really a single, universally accepted definition of either. The definitions adopted in the study and applied to the research are as follows.

#### **Literacy**

The literacy level of a municipality can be determined from the literacy level of the individuals who make it up. It is very difficult to give an exact figure, since there is no way of assessing the literacy level of all the inhabitants of a settlement. What we do have is data on the educational attainment of the inhabitants of the municipality (region, county, country), based on census data. The question is, does literacy follow directly from education? The meaning of *literacy* (in the dictionary) is: *Knowledge acquired through schooling, which a person acquires through education, reading, experience and various kinds of learning* (Báthory, Falus, 1997). It is also quite obvious that literacy is domain, society and age specific. Just like knowledge, it changes, devalues and requires constant care. "Of course, this concept is normative, it can mean different things from age to age and from society to society, and it is easy to see that in the same society, at the same time, different groups, strata and individuals do not possess the same degree of literacy as a whole. (G. Furulyás, 2015)"

The relationship between literacy and education is also a very important issue. Is the distribution of graduates adjusted to the size of the settlement, and are people with a degree more educated than people without a degree? Determining whether the proportion of graduates has changed more in urban or rural areas is very difficult. "The increase in the number and percentage of graduates is clearly influenced in a positive direction by the larger size of the settlement, its higher level of development and its proximity to colleges and universities. The spatial distribution of tertiary graduates is gradually becoming more even, mainly due to the fact that Budapest and the large cities concentrated fewer graduates in 2011 than in 2001 (Németh & Dövényi, 2018, p. 16)."

Active community life and the level of education in the municipality must be in harmony. This was also explored in the project *The need for community relations - a chance to renew democracy*, where it is stated: "The data from our previous nationally representative survey, which was linked to the research objective, made it clear that the dominant determining indicators of political and social needs and participation are literacy, education and the level of material and material well-being that provides security. With this in mind, we assumed that public life will be stronger in villages where the majority of the population lives in a financially secure situation and has a level of education and literacy that is equal to or higher than the national average (Utasi, 2012, p. 4)."

### **Small school**

There are many people working on this topic, but in the literature review two names came up a lot. These are Katalin R. Forray and Helga Andl. Katalin Forray R. Forray deals with school districts, school rehabilitation, village schools, school maintenance, ethnic-ethnic education (Györgyi, 2012). Helga Andl is also concerned with the state of small schools and their closure, but she is more concerned with the situation of small schools in Baranya County (Andl, 2012). In her doctoral thesis, she writes about the concept of small schools "(...) there is no clearly agreed number of pupils (number of corners) neither for settlements nor for schools; however, when we look at the issue of small schools, we find that the definition is typically based on numericality - it is interpreted in terms of the number of inhabitants of the settlement, the number of pupils in the school, the number of grades and classes per grade." (Andl, 2015, p. 17)

A very good approach and description can be found in the analysis of Small Schools in Small Settlements, published in 2006. This formulation is also the focus of the present study, and it is on the basis of these characteristics that the concept of a small school can be considered. "When defining the scope of small schools in small towns, we should consider the following three aspects:

- they are located in villages where there is only one primary school place of work;
- the school has no more than one separate class in any grade;
- the school does not have an eighth-grade education (no eighth-grade pupils attend the school).

Schools can therefore be considered small schools if they fulfil the first condition and at least one of the second and third conditions. That is to say, *small schools are those in villages with one class per year and those in villages with less than eight classes per year.*" (suliNova, 2006, p. 6)

## 2. Research methodology

This topic is a pilot project, because no other study has been carried out on this topic in this area (at least, no study on a similar topic can be found in easily accessible sources). Therefore, for the literature analysis, I could not find and would not use any existing literature on this topic (neither locally nor nationally for any area or municipality), and therefore studies were examined that have the same content as parts of the topic of this analysis.

Throughout the study, the research seeks to answer four key questions:

- Is literacy still an important attribute for people living in the municipalities of the South-Fejér sub-region?
- Do the inhabitants really think of raising the level of literacy in their commune through community programmes?
- What role could the local small school play in raising literacy levels, and how acceptable would its presence in this area be?
- What impact could the rapid development of artificial intelligence have on literacy levels?

### 2.1. Hypotheses of my study

The hypotheses of the research are based on personal observations and preliminary evaluations of the experiences of the author and his immediate environment. The hypotheses were formulated in the hope of disproving the last hypothesis. The questionnaires were accessible to residents of all ages and educational levels, which may have resulted in spontaneity and variety of responses, even without careful reflection on the questions.

Hypotheses related to the questions:

- Hypothesis first: Literacy is still important for the inhabitants of the study area.
- Second hypothesis: The respondents consider that the best way to increase literacy is through community programmes.
- Third hypothesis: The local small school plays an important role in the development and increase of the literacy level of the inhabitants of the sub-region.
- Fourth hypothesis: The widespread use of AI applications does not increase literacy levels.

### 2.2. Questions and tool for the online questionnaire

The questions formulated and clarified in the research will be answered through the online sharing of the questionnaire, one of the research methods. The questionnaire was not intended

to explore in-depth correlations (it is not suitable for this purpose), but only to gather the opinions of the inhabitants of the municipality. Does the average resident think that there is a correlation between the effectiveness of the local educational establishment and the level of education, schooling and quality of community life in the municipality?

The advantages and disadvantages of the questionnaire method are:

- The main advantage is that it allows a large amount of data to be collected in a short period of time;
- The main disadvantages are that it cannot reveal the deeper context of the research, the individual characteristics of the subjects, and that there is a high risk of multiple completions and direct bias (which was not present in the survey).

There are many factors to take into account when compiling a questionnaire. The order of the questions in the questionnaire and the type of questions used are very important. Usually, when compiling the forms, demographic questions are asked first, followed by questions that are relevant to the research. A very important rule is to take into account who the respondents are when constructing and formulating the questions. Before constructing the questions, it is important to understand how the questions are asked. There are basically two ways of asking questions:

- Explicitly: specifically, by asking directly for the information you need.
- Implicitly: we obtain the information indirectly, inferring the information we need from the answers to the questions asked.

In this study, both types of questioning were used in order to confirm the consistency and thoughtfulness of the answer to each question. The types of questions to use when constructing a form are as follows:

- Open questions (projective questions);
- Closed questions (alternative questions, multiple choice questions, ranking questions, semi-closed questions, anecdotal questions);
- Intensity questions.

Of all the types of questions listed, the use of closed questions was the only option, as with open questions, the infinite number of possible answers would have made the results completely uninterpretable during the study.

An introductory text was included at the beginning of the questionnaire to explain the reason for its creation. Demographic questions (gender, age, education, place of residence) were asked as a prelude. This was followed by questions relevant to the topic. The number of questions

was maximised by the author to between 20 and 22. When compiling the questions, the time planned for completion was set at no more than 10-15 minutes. The average completion time was just over 10 minutes for the first questionnaire and almost 9 minutes for the second.

Before creating the questionnaire, the author tried several form designers (both paid and free). Microsoft Forms was the final choice. This program also offers the possibility to design forms to a high standard and is available free of charge thanks to Office365. A very good feature of the application is the possibility to keep track of the results in graphical form during the response collection period. What you should pay attention to is that the questions should be written well before sharing, because if you change them during the completion period, the results previously given for the modified questions will be grouped into an Other item, the separation of which will appear as extra work for later processing.

### **3. Description of the results of the questionnaire**

As already mentioned in the introduction, the second form was distributed and completed in 2024 (February) for the residents of the sub-region. This form was available for 2 weeks and 453 people filled it in during this period. This is more than two percent of the surveyed population. Not all the questions were answered by all the respondents, which is why the number of responses to some questions is always different.

#### *3.1. Demographic data of respondents*

The set of demographic questions is very important for those analysing the form, as very interesting correlations can be found between these data and the answers to the other questions. For this study, there were four important questions in this area. The first one is the name of the municipality where the respondent lives, because this will show the extent to which the questionnaire was delivered to all ten municipalities and will be used to decide how representative the survey population is. The second is how long the respondent has lived in the municipality, since those who have lived here since birth are likely to have started their education in the municipality's primary school and therefore have an idea of the relationship between the literacy level of the municipality and the local school (Figure 2.).

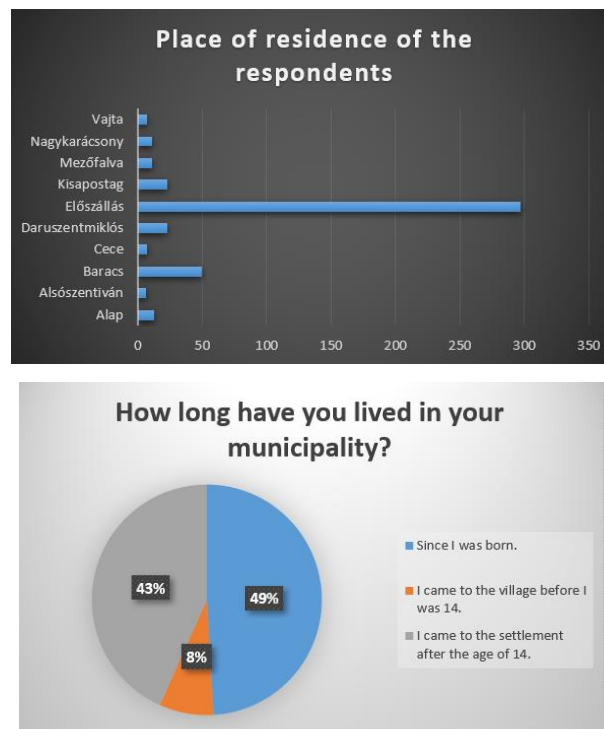


Figure 2. (a) Municipality of respondents; (b) How long have you lived in the municipality

The diagrams show that the respondents are mostly from Előszállás (roughly 2/3 of the respondents, which is not unexpected as the author lives there), and more than half of them have lived in the municipality since the age of 14.

The third demographic question is the age of the respondents, which is interesting because the conclusions that can be drawn after evaluating the answers to each question (in the case of a homogeneous age group) may not be true for the whole population. Also important demographic data is the educational attainment of respondents. There is a popular saying that "*the more I learn, the less I know.*" This is due to the fact that people who are constantly expanding their lexical knowledge know that there is more and more knowledge in the world that they do not know. It also follows that the older a person is (presumably having undergone a process of becoming more literate), the more confident they are that their literacy level is low, because they know how much they don't know.

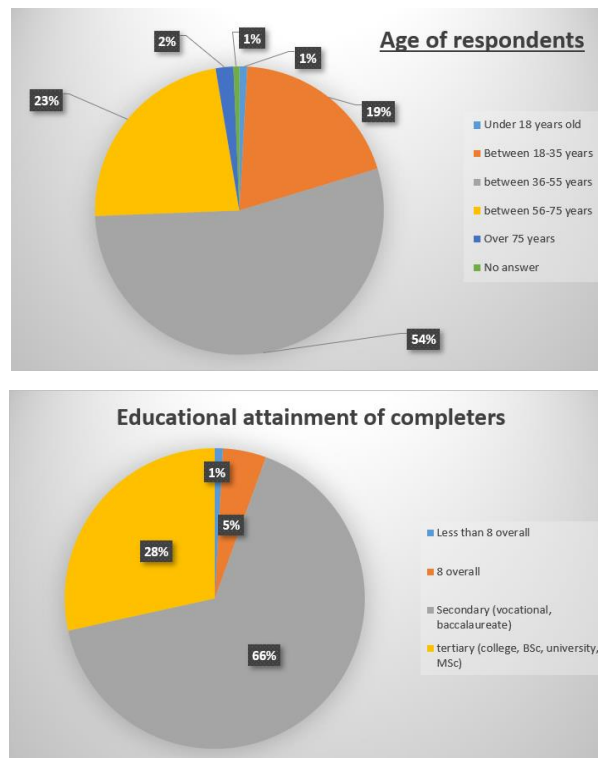


Figure 3. (a) Age of respondents (b) Education level of respondents

Responses show that respondents are middle-aged and most have a secondary education (Figure 3.). This is worth highlighting because, as already mentioned in the discussion of literacy, its meaning is certainly age-dependent. Different age groups may mean different things, even if some of the questions have been asked to indicate what they usually mean. And secondary education means that the majority of respondents have been in education for at least 11-12 years.

### 3.2. Evaluation of literacy questions

At the heart of the whole inquiry is whether literacy, as defined and accepted, is still relevant and valuable today? So the first question in this context was this: literacy is defined by many as the knowledge acquired through education, through reading, and through various kinds of learning (including knowledge acquired through self-discipline).

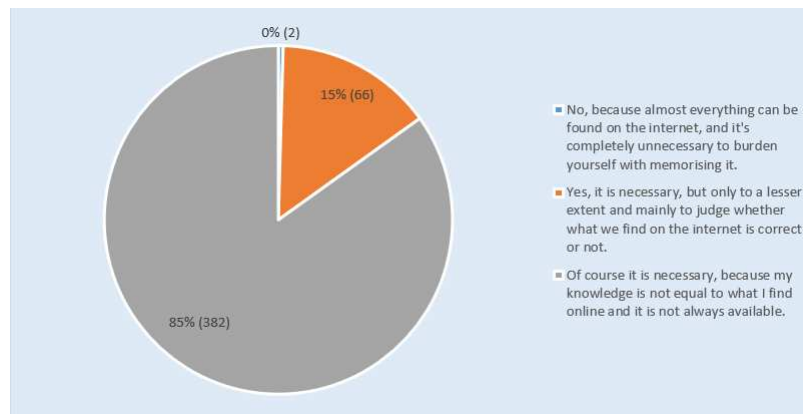


Figure 4. Do we still need literacy?

The vast majority of respondents still consider literacy necessary, although 15% feel that it helps in interpreting and deciding what is real and right and what is not (Figure 4.). Closely related to this is the question: should increasing the literacy level of a municipality be an area of concern for municipal leaders? To this question, 69% of respondents answered yes. So it can be said that not only do the inhabitants of the communes consider this important at an individual level, but they also think it is important at a commune level.

Questions included whether respondents would like to increase their level of literacy. Again 69% said yes. The reason for this was given by the majority of responses to a subsequent question: *Maybe this would help them to get around and find their way in this fast changing world* (66% answered this). This is really the best answer to increase literacy, as younger generations are also sitting more at the school desk (in the case of online education, in front of the computer) to gain the knowledge they need to get by in life.

The biggest surprise in the results of the 2022 questionnaire was how respondents would most like to raise their literacy level. This was confirmed by the following question (Figure 5.).

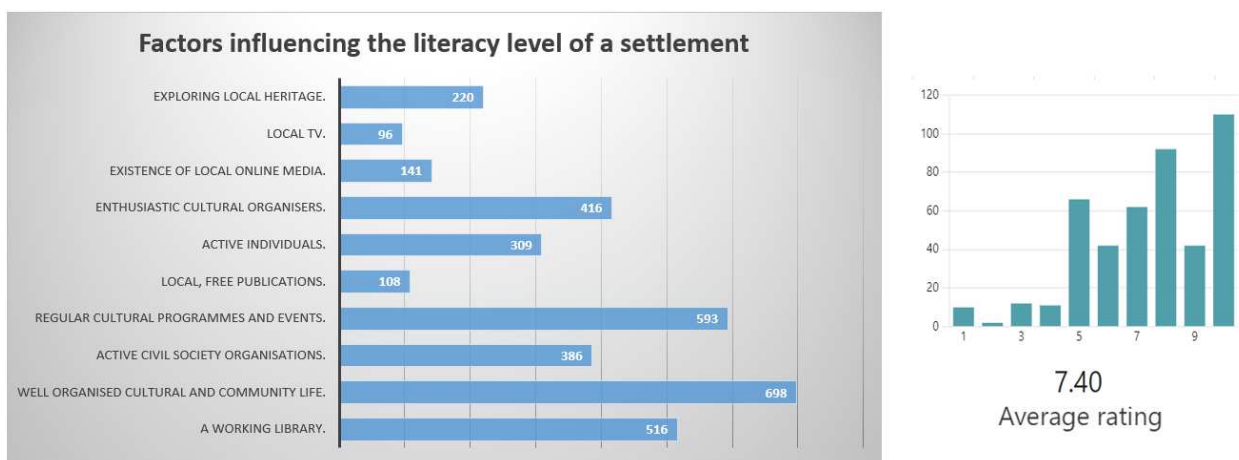


Figure 5. (a) Factors that play a role in raising literacy levels (2022) (b) How much do they agree (2024)

It is clear that the majority of people living in settlements believe that community programmes can help to raise the literacy level of the settlement. The question in the 2024 form reads. How much do you agree (1 disagree, 10 strongly agree)? The results show that they still think so. This is also confirmed by the result of the answer to the next question, which confirms the variation between community and individual activities (Figure 6.).

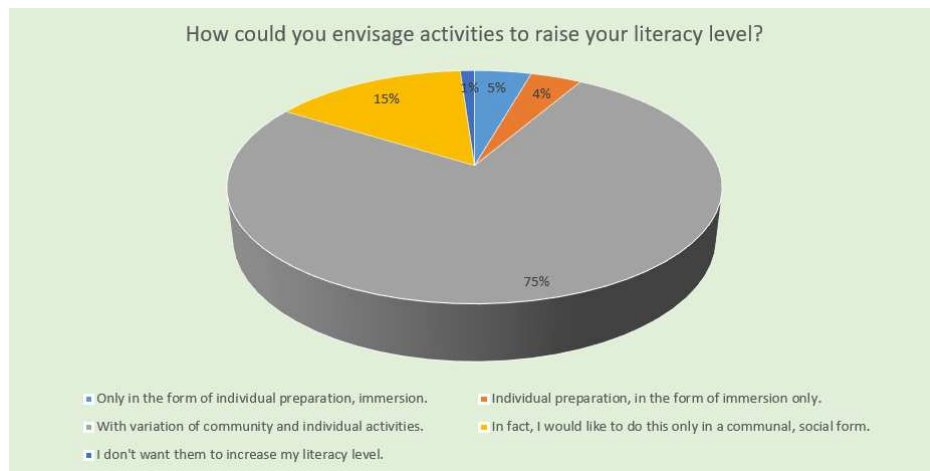


Figure 6. How activities to raise individual literacy levels

Even after a year and a half, there is full agreement that the community form is seen by respondents as playing an important role in raising the level of municipal literacy. If the school in the municipality (the teachers working there and the location) can play a role in this activity, it would seem that it should only *be implemented within the framework of community programmes*. The answer to the next question somewhat overshadows this picture.

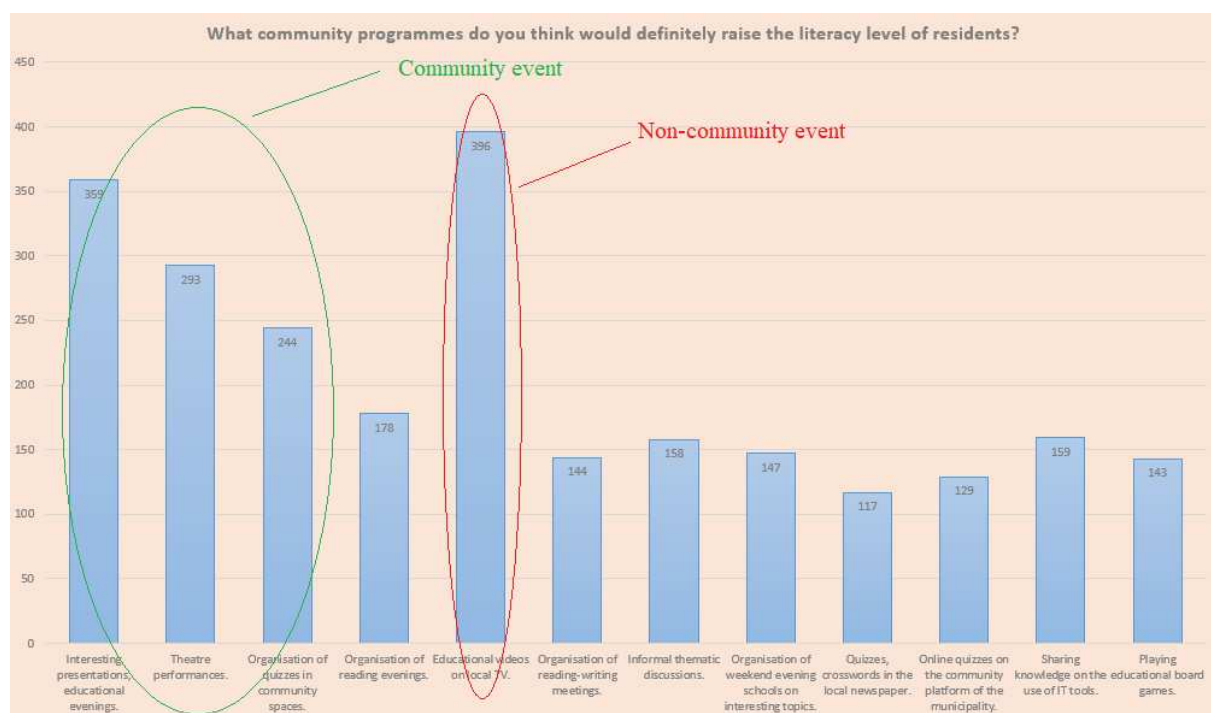
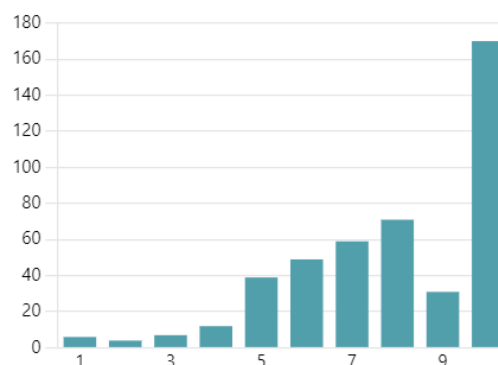
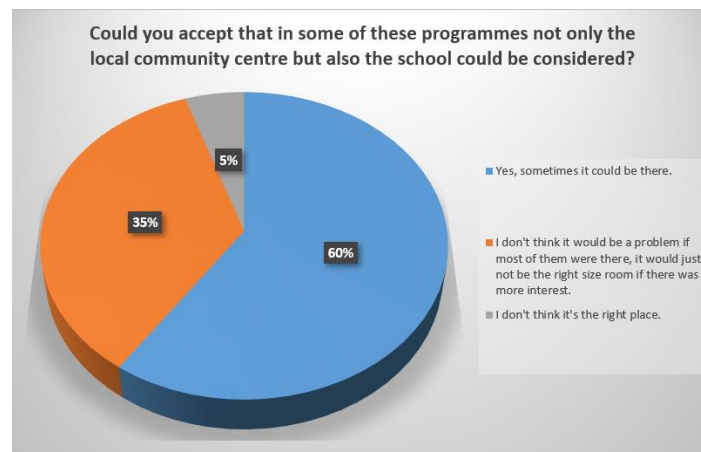


Figure 7. Which community programmes are sure to raise literacy levels?

The most frequently mentioned alternative is to *show educational videos on local TV* (Figure 7.). This was selected by 396 out of 452 respondents. This is a surprise because it is not a community programme at all, although the most marked response as a result of the tenth question (varying community and individual activities) had already predicted this at some point. True, the next three, which received marks above 50%, are all community programmes. Perhaps respondents may have been influenced by the appearance of the word educational in the response, and linked this more closely to education.

The present study concerns the extent to which small schools (the teachers who work there) could influence the literacy level of the municipality. Therefore, it was also important to ask whether the inhabitants could imagine the school as a venue for events aimed at raising literacy levels, and whether they would accept the presence of local teachers as organisers and facilitators of these events.



7.88  
Average rating

Figure 8. (a) Acceptance of the school as a location (b) Acceptance of the school and the local teacher

The majority of respondents can accept the fact that these events could be hosted by the local school and would welcome the presence of the teacher who teaches there (Figure 8.). This rightly raises the question of the extent to which people in a municipality think that this role should be the responsibility of teachers in a municipality.

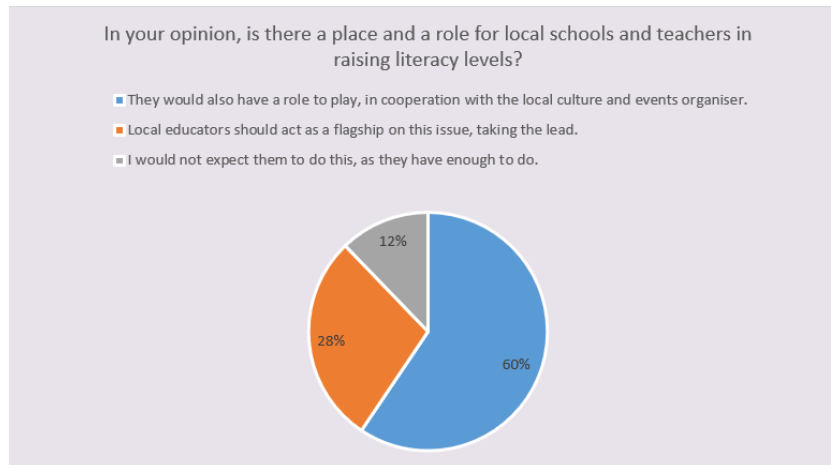


Figure 9. To what extent is it a teacher's responsibility to raise literacy levels?

The result is quite surprising, because if not only expected from them, the local teaching staff is considered by the residents to be one of the main driving forces in the field of literacy. Only 12% of respondents think that this is not their responsibility (Figure 9.). It will be interesting to see what the opinion of the educators who teach in the area would be if they were confronted with this fact.

Questions included how willing the respondents were to take a literacy test to determine their level of literacy. Most people experience such surveys as a competitive situation and try to present the best possible image of themselves. Often at the cost of using an aid (it is online, so no one can see it with a note). Therefore, one could also legitimately ask whether such a literacy test could be completed with the help of an aid to achieve a better result, and whether this could be an AI-based application.

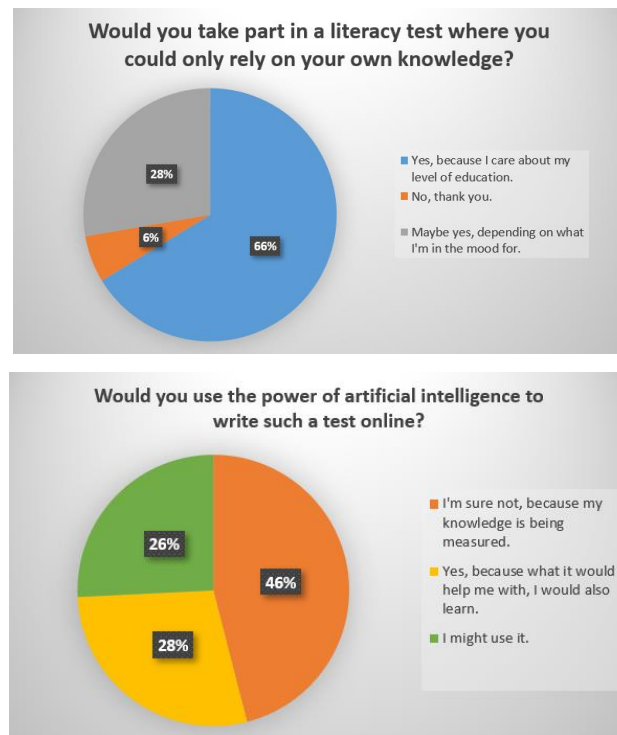


Figure 10. (a) Willingness to participate in literacy test (b) Intention to use AI application

1/3 of respondents would be willing to take a test to measure their literacy level (Figure 10 (a)). This is significant because it would be useful to set up such a test in future studies to assess the literacy level of the inhabitants of the municipalities. It could be used to give some prediction of the literacy level of the whole municipality. However, it is very surprising that more than half of the respondents would consider using an AI application (Figure 10. (b)). It was not previously expected that people living in small villages would consider using such apps. This was closely followed by two questions in the questionnaire on the use of AI-based applications and their impact on literacy levels.

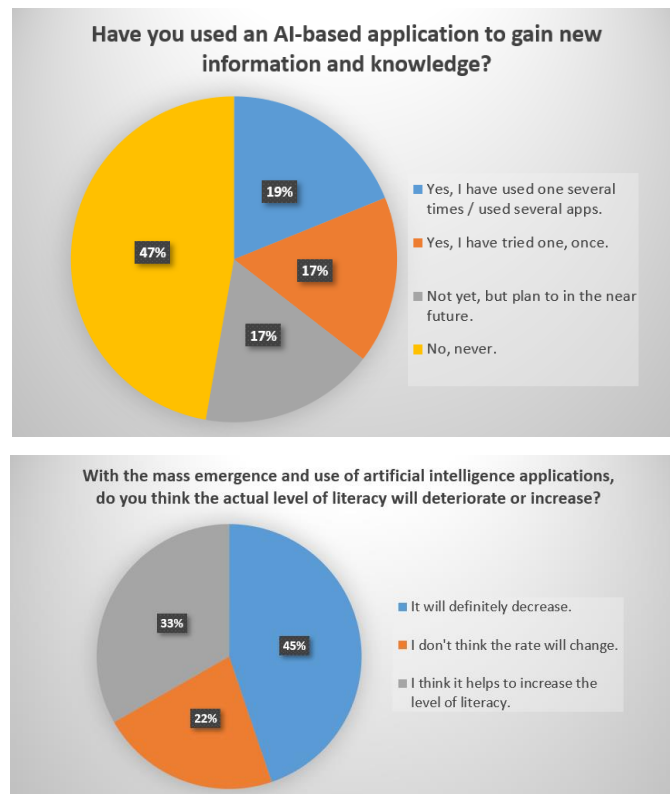


Figure 11. (a) Frequency of AI use (b) Impact of AI use on literacy level

More than half of the responses received showed a positive attitude towards AI-based applications (Figure 11. (a)). More than a third had already used such applications. This is of great importance for the study, because it reflects the fact that people in small towns are also open to technological developments, and that they are not only used by people living in cities. It is a much more difficult question, and the responses show this, as to the influence of these developments on the increase in literacy levels. 45% of respondents suspect that the field of AI is not moving literacy levels in the right direction (Figure 11. (b)).

The final question was what the respondents do to increase their literacy level. It was already clear from the first questionnaire that if there is openness to increase their literacy level, it is reasonable to assume that they are trying to increase it in some way themselves (Figure 12.).

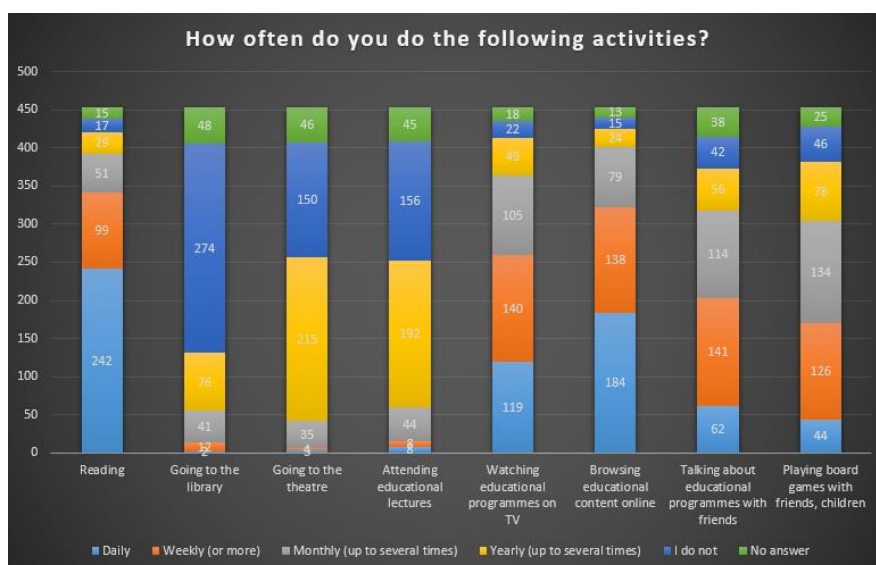


Figure 12. Frequency of literacy activities

The graph clearly shows that there are three types of activity where the answer "I don't usually" appears in a very high proportion. It is true that for these three activities (*going to the library, going to the theatre and attending educational shows were not expected to be daily activities*). It is significant for the research that the activity most frequently mentioned as a daily activity was reading (although it was not specified whether this was print or online). The other two most common activities were *browsing educational content online* and *watching educational shows on TV*, which were not surprising. There are some measurements (not scientifically validated) that show that people nowadays sit in front of the TV for more than 5 hours on average. They mainly watch movies and news programmes. Perhaps TV is a means of recreation and not specifically used by most people to increase their lexical knowledge. It also takes a lot of time out of the 24 hours a day to do business online, to search for information, to build and maintain social contacts. According to some measurements, young people spend more than 3 hours a day on the Internet (mainly on social media). It is therefore understandable that these are the activities that can be increased in terms of literacy levels, which are most often carried out by the research participants.

### 3.3. Finding correlations between respondents' answers to the questions

To examine the relationships between the questions, this study used two statistical value calculations. One is correlation and the other is cross tabulation analysis.

Often the evaluation of questions stops at the examination of frequency, although it can be more interesting for science to see how two phenomena are related. In the case of tests, this means looking for correlations between the answers to individual questions (e.g. demographic

questions between other questions). Accordingly, mathematical statistical tests can be divided into two groups:

- diversity tests, which aim to detect differences between data series;
- correlation tests, which aim to detect relationships between data series (Lengyelne, 2013)

Correlation is one such method that can be used to describe the relationship between answers to questions. In some cases, correlation can only be calculated between data series with a normal distribution, so to avoid this, we can use rank correlation, the so-called Spearman's rank calculation. The degree of correlation between data can be determined using the table below (Figure 13.).

There are several approaches to infer the relationship from the correlation value		
0		: no linear relationship
0 - 0.2	(-0.2 - 0)	: weak, almost negligible
0.2 - 0.4	(-0,4 - -0,2)	: certain, but weak link
0.4 - 0.7	(-0,7 - -0,4)	: medium correlation, significant relationship
0.7 - 0.9	(-0,9 - -0,7)	: high correlation, significant relationship
0.9 - 1	( - 1 - -0,9)	: very high correlation, strong dependent relationship

Figure 13. Level of correlation

Cross-tabulation (chi-square analysis) is a widely used method of analysis that examines the relationship between two or more variables, or their combined frequency distributions (nominal and/or rank scales of results, but no direction). This requires plotting the responses to two questions in tabular form. The row and column totals are calculated at the end of each row and column, as well as the total. We form a conceptual table by entering the product of the row sum and the column sum divided by the total sum in the space corresponding to each cell. This creates a table that is randomly generated and it is assumed that there is no correlation between the rows. The cross-tabulation analysis is used to test the similarity between the original (generated from measured values) and the derived theoretical table. If this number (significance) is less than a given number (e.g. 0.05), then there is no similarity between the two tables, i.e. there is a correlation between the rows and columns of the original table.

### **The relationship between community form and the willingness to increase literacy**

Since the first survey in 2022 showed that the inhabitants of the sub-region would expect to increase their literacy level through community programmes (Figure 5), the first correlation analysis includes this. The study focuses on the extent to which the willingness to increase literacy levels is associated with the expectation of this through community programmes. In

both cases, the response to the question was on a scale of 1 to 10 (Table 1.). A ranking was constructed based on their frequency, with the correlation between them being as shown below.

Table 1. Responses to questions on agreement with the community form and willingness to increase literacy level, ranking and correlation value.

Order	How much do you agree that community programmes are expected to raise literacy levels?	Value of responses.	How much do you want your literacy level to increase?	Order
9	10	1	1	10
10	2	2	1	9
7	12	3	2	8
8	11	4	3	7
4	66	5	33	6
6	42	6	35	5
3	62	7	72	3
2	92	8	101	2
5	42	9	37	4
1	110	10	165	1

Correlation value: 0,9393939

The correlation value suggests that there is a very strong correlation between the answers to the two questions. That is, those who agree that literacy should be increased through community events are more likely to want to increase their literacy level. This statement cannot be clearly established from this study, only that the frequency of respondents' numerical responses to the two questions is similar. In order to detect a clear answer to the previous hypothesis, a cross tabulation analysis between the two questions had to be performed (Table 2.).

Table 2. Values of responses to questions on agreement with the community form and willingness to increase literacy level, significance value.

		How much do you want to raise your literacy level?										L. summ
		1	2	3	4	5	6	7	8	9	10	
Agreeing with the community form.	1	0	0	0	0	1	0	0	2	1	6	10
	2	0	0	0	0	0	0	0	0	1	0	1
	3	0	0	0	2	2	1	2	1	1	3	12
	4	0	0	0	0	2	3	2	2	0	2	11
	5	0	0	0	0	8	12	9	17	1	19	66
	6	1	0	0	0	8	3	9	7	5	8	41
	7	0	1	1	0	3	2	19	11	3	22	62
	8	0	0	1	1	3	6	17	30	11	23	92
	9	0	0	0	0	2	2	7	13	4	14	42
	10	0	0	0	0	4	6	7	16	10	67	110
C. summ.	1	1	2	3	33	35	72	99	37	164	447	

significance: 1E-09

**Elvi táblázat**

0,0224	0,0224	0,0447	0,0671	0,7383	0,783	1,6107	2,2148	0,8277	3,6689
0,0022	0,0022	0,0045	0,0067	0,0738	0,0783	0,1611	0,2215	0,0828	0,3669
0,0268	0,0268	0,0537	0,0805	0,8859	0,9396	1,9329	2,6577	0,9933	4,4027
0,0246	0,0246	0,0492	0,0738	0,8121	0,8613	1,7718	2,4362	0,9105	4,0358
0,1477	0,1477	0,2953	0,443	4,8725	5,1678	10,631	14,617	5,4631	24,215
0,0917	0,0917	0,1834	0,2752	3,0268	3,2103	6,604	9,0805	3,3937	15,043
0,1387	0,1387	0,2774	0,4161	4,5772	4,8546	9,9866	13,732	5,132	22,747
0,2058	0,2058	0,4116	0,6174	6,7919	7,2036	14,819	20,376	7,6152	33,754
0,094	0,094	0,1879	0,2819	3,1007	3,2886	6,7651	9,302	3,4765	15,409
0,2461	0,2461	0,4922	0,7383	8,1208	8,613	17,718	24,362	9,1051	40,358

The significance value has become very low, confirming the previous assumption. It can be concluded that if the focus is on increasing the literacy level of the municipality, the residents will be most receptive to this through community events.

**The relationship between the school as a location and the willingness to raise literacy levels**

It may also be an interesting study to see to what extent those who want to increase their literacy level are willing to accept that the local school should be the place to do so. This is a very important question for further research, because if there is no correlation between these questions, then there is no point in investigating the role of the small school in the development of literacy levels and exploring the possibility of its involvement in their growth (Table 3.).

Table 3. Values of responses to questions on agreement with school as a location and willingness to increase literacy level, significance value.

		How much do you want to raise your literacy level?										L. summ.
		1	2	3	4	5	6	7	8	9	10	
Agreement with the school as a location.	1	1	0	0	1	0	1	0	1	0	3	7
	2	0	0	0	0	1	1	1	0	0	1	4
	3	0	0	0	0	1	2	2	0	0	2	7
	4	0	1	0	0	2	3	3	0	2	1	12
	5	0	0	0	0	13	5	5	6	2	8	39
	6	0	0	0	0	5	9	15	11	2	7	49
	7	0	0	0	1	4	4	21	18	6	5	59
	8	0	0	0	1	2	6	8	35	3	16	71
	9	0	0	1	0	1	0	7	2	13	7	31
	10	0	0	1	0	4	4	10	26	9	112	166
C. summ.	1	1	2	3	33	35	72	99	37	162	445	

significance: 8,80799E-44

**Principle table**

0,02	0,02	0,03	0,05	0,52	0,55	1,13	1,56	0,58	2,55
0,01	0,01	0,02	0,03	0,3	0,31	0,65	0,89	0,33	1,46
0,02	0,02	0,03	0,05	0,52	0,55	1,13	1,56	0,58	2,55
0,03	0,03	0,05	0,08	0,89	0,94	1,94	2,67	1	4,37
0,09	0,09	0,18	0,26	2,89	3,07	6,31	8,68	3,24	14,2
0,11	0,11	0,22	0,33	3,63	3,85	7,93	10,9	4,07	17,8
0,13	0,13	0,27	0,4	4,38	4,64	9,55	13,1	4,91	21,5
0,16	0,16	0,32	0,48	5,27	5,58	11,5	15,8	5,9	25,8
0,07	0,07	0,14	0,21	2,3	2,44	5,02	6,9	2,58	11,3
0,37	0,37	0,75	1,12	12,3	13,1	26,9	36,9	13,8	60,4

It is clear from the significance value that there is a strong relationship between the willingness to raise literacy levels and the acceptance of school as a place, which merits further investigation.

**The relationship between increasing literacy and the level of literacy**

When questionnaires are prepared, similar questions are asked quite often in order to ensure the reliability of the answers. This was also used in the present study to ensure that answers to

questions considered important were thoughtful. These questions were related to increasing literacy levels (Table 4.).

Table 4. Correlation between increasing literacy level and its degree, significance value.

		How much do you want to increase your literacy level?										L. summ.
		1	2	3	4	5	6	7	8	9	10	
Do you want to increase your literacy level?	Yes, I've been planning this for a long time, and it would make me feel good to have a more varied, deeper knowledge.	1	0	0	0	12	13	32	73	31	148	310
	I might think about it, although it depends on how much effort I have to put in.	0	0	0	2	17	18	38	26	5	15	121
	No, thank you. I'm perfectly fine as it is, because you can't learn everything anyway.	0	1	2	1	4	4	1	1	1	1	16
C. summ.		1	1	2	3	33	35	71	100	37	164	447

significance: 7,732E-32

Principle table									
0,69	0,69	1,39	2,08	22,9	24,3	49,2	69,4	25,7	114
0,27	0,27	0,54	0,81	8,93	9,47	19,2	27,1	10	44,4
0,04	0,04	0,07	0,11	1,18	1,25	2,54	3,58	1,32	5,87

It was important for the research that the answers to the two questions show a strong correlation, so the intention to increase literacy levels among the respondents is real.

**The relationship between the intention to raise literacy levels and teacher engagement**

The following correlation is also important to examine before further work is carried out. This is whether the intention to raise literacy levels is correlated with the extent to which respondents attribute this task to the teachers who teach in the local school (Table 5.).

Table 5. The value and significance of the extent to which literacy levels have increased and the role of teachers in this.

		How much would you like your literacy level to increase?										L. summ.
		1	2	3	4	5	6	7	8	9	10	
In your opinion, is there a place and a role for local schools and teachers in raising literacy levels?	They would also have a role to play, in cooperation with the local culture and events organiser.	1	1	2	1	24	23	51	66	18	80	267
	Local teachers should act as a flagship on this issue, taking the lead.	0	0	0	1	5	3	15	23	15	66	128
	I wouldn't expect them to solve this problem, as they have enough to do.	0	0	0	1	4	9	6	12	4	19	55
C. summ.		1	1	2	3	33	35	72	101	37	165	450

significance: 0,005155667

Principle table									
0,6	0,6	1,2	1,8	20	21	43	60	22	98
0,3	0,3	0,6	0,9	9,4	10	20	29	11	47
0,1	0,1	0,2	0,4	4	4,3	8,8	12	4,5	20

Again, the significance between the theoretical and the actual table is quite small, so it can be concluded that the respondents would like teachers to play a significant role in raising literacy levels.

#### **4. Summary**

The purpose of designing a questionnaire for research is to confirm or refute hypotheses about the area under investigation. They can be used to make statements that either confirm or contradict the direction of the research, or they can be used to identify new areas for investigation, raising questions that have not yet been examined. The relationship examined in the present study has not been the subject of any scientific publication to date, so any findings in this area are new.

As a result of the evaluation of the questionnaire, the following findings can be made in relation to the hypotheses:

- Based on the responses of the respondents, there is a need to improve and increase the level of literacy and therefore the first hypothesis can be stated to be confirmed.
- To increase the literacy level in the municipality, the inhabitants would mostly expect it in the form of community events and group activities, although individual activities also appear. The second related hypothesis was only partially confirmed.
- The school as a place and the teachers as important actors in raising the level of literacy are supported and accepted by the majority of the inhabitants of the communes. The third hypothesis is confirmed on the basis of these results.
- AI tools and applications are used by the inhabitants of the study area, but their impact on individual and municipal literacy levels cannot be clearly established at the moment. As a result, the quarters hypothesis has not been confirmed.

#### **5. Directions for further investigation**

With the questionnaires under study, only the side that plays a role in increasing the literacy level of the municipality as the subjects of the increase was examined. Further investigations are needed to determine the attitude of the persons and institutions that activate, support and encourage the increase of the literacy level. What tools (pedagogical, information, motivational) can be used to achieve success, wider acceptance and motivation to increase literacy levels.

Possible directions for further analyses and studies:

- interviews with the municipal administration, community education organiser and the headmaster of the small school;
- seeking the opinion of teachers in the municipal schools (teaching methods, forms, tools, motivation);
- to assess the literacy levels of the inhabitants of the municipalities (definition and quantification of the initial situation);
- to assess the existence of competences and skills that have an impact on literacy.

If the results of these studies are combined, it is possible to draw conclusions that could indicate the potential of the local small school in raising the literacy level of the municipality.

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Imre Farkas, a certified secondary school teacher of computer science and mathematics. For 23 years he has been teaching computer science and mathematics related subjects in the Computer Systems and Control Engineering Department of the Institute of Informatics at the University of Dunaújváros. He study the role and potential of small schools in the development of literacy levels in municipalities, and how this is affected by the emergence and rapid development of artificial intelligence applications.