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QUO VADIS TECHNICAL AND SCIENTIFIC EXTRA-CURRICULAR ACTIVITIES

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Abstract

The extracurricular activities within the Children's Palaces represent a valuable educational resource for the whole didactic endeavour and for the sake of developing the personality of the students. The complexity of educational purposes and outcomes requires the combination of curricular and extracurricular activities. The existing legislation in the Romanian education system predicts the necessity of organizing extracurricular activities specific to the age characteristics of the students, their psychological needs, inclinations and specific interests. The scientific-technical activities integrate all the domains involved in a coherent learning paradigm based on real-life applications. Today's students are motivated if the subjects are taught from different perspectives and if they are based on facts from everyday life. This questionnaire investigates the opinion, role, importance and complementarity of the technical-scientific extracurricular activities. It analyzes the students' conception of how the certain clubs should look like, what the content should include, how the activities should be carried out. The study was conducted at a national level among children and an online questionnaire was applied (N=3945). The results show us the important role of the technical-scientific activities, activities that together with the formal education help to improve the results and are complementary in the development of the basic competences in science and technology. The study helps to analyze the strengths and weaknesses of extracurricular activities, the results shed light on what the students need, and to what extent the use of the student-centred extracurricular educational strategy will help to achieve better results in education and reduce school dropout.

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Keywords: Extracurricular education, creativity, educational strategy, complementary education, technical-scientific activities, Children's Palaces

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1. Introduction

Increasing the complexity of the educational act, the interaction of the sciences, the flexibility and open character of education, research in the field of educational sciences, globalization, and comparative pedagogy are some elements that require the introduction of the interdisciplinary character (Albulescu & Catalano, 2014). The extracurricular activities have this opportunity to organize the interdisciplinary activities, to organize the educational meetings in such a way that the student is placed in the centre of the activity, to transform the theoretical knowledge into practical knowledge.

Interdisciplinarity in extracurricular activities may also refer to the transfer of teaching methods from one discipline to another, transfer with different degrees of involvement or completion. The connection between the disciplines taught and the extracurricular activities can be realized at the level of their contents and objectives through complementarity, and at the same time creating a favourable environment for each student to express themselves freely, to work in a team or individually (Isvoran & Erdei, 2001).

Achieving from the perspective of interdisciplinarity the needs, requirements of children, harmonious and complex development of the educable can be achieved through the interaction of the three forms of education: formal, non-formal and informal. Non-formal education through extracurricular activities at Children's Clubs and Palaces includes the traditional skills of the traditional education system with an additional contribution of skills gained under the conditions of maximum freedom of expression, activities that eliminate the stress of the marks, the required subject and mandatory tasks. These free activities within the Children's Clubs and Palaces are accessible to all, are adaptable, do not impose restrictions or conditions, have an interdisciplinary character and do not offer rewards like those offered by formal education, they simply offer perspectives and opportunities in countless areas and help to complete the goals in the school syllabus. They are free.

2. Literature Review

The specifics of the extracurricular education within the Children's Palaces and Clubs are achieved through the interference of the educational forms with the requirements of the local community, of the specific area, with the use of the student-centred teaching strategy. The extracurricular didactic activities are interdisciplinary, student-centred and organized around the key competences, in such a way as to correspond to the educational requirements of the modern society.

Forms of education through "student-centred learning provide students with greater autonomy and greater control over study disciplines, learning methods and the pace of study" (Gibbs, 1992, p. 23).

Activation of the subjects of education, active and interactive pedagogy, educational design, introduction of competences as aims of the school curriculum in secondary school (grades 9-12) education (between 2001-2004) and middle school (grades 5-8) (in 2009),

the issue of the National Education Law no. 1/2011 and of the OMNE (Order of Ministry of National Education) no. 4624/2015 – Regulations for the organization and operation of the units that offer extracurricular activity, all these have given new importance to the triplet of formal-non-formal-informal learning and to the specific activities in Romania. These laws are the results of psycho-pedagogical research

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in the education sciences and have made the transition from a traditionalist education, in which the teacher had the role of transmitting often useless information and conducting an assessment based on the academic rendering of the accumulated knowledge, to an education focused on competence, where the student plays the main role and the teacher is the conductor, the facilitator of the activities, in an orchestra with many individualities, personalities (Albulescu, 2008).

The characteristics of extracurricular education must be explored from the perspective of different forms of education; their investigation is necessary, because the extracurricular activities are complementary to the formal education, in helping developing personality and to achieve the educational aims proposed for the integration of the educable ones in a modern society.

Education through extracurricular activities places great emphasis on developing "practical skills, interests, desires" (Cristea, 2017, p. 196). These activities take place outside the school and some are regulated by laws.

In Romania, children's leisure time is institutionalized within "Sports Clubs, Children's Palaces and Clubs, school camps, sports facilities, tourist and leisure centres or other accredited units in this regard." (art. 81 of N.E.L.- National Education Law, no. 1/2011 paragraph (1)), and the instructional-educational activities are organized in such a way as to be, in a way, complementary to the formal activities, to help "deepening and diversifying knowledge, to train and develop the skills specific to the vocation and to capitalize children's free time through their involvement in educational projects" (M.E.R.S.-Ministry of Education, Research and Sports order no. 4624/2015 – Regulation on the organization and functioning of units that offer extracurricular activities - art.1. par.(1)).

A positive aspect of the extracurricular activity is the autonomy of this type of education and the fact that they are adapted to the community, to the group, being centred on their own learning pace. The curriculum of extracurricular activities, the development programs are structured and organized on areas of interest and not on years of study or academic disciplines, they have clear learning objectives, allow moments of abstraction by extracting knowledge from real life. The contents are flexible, the period of achievement of results is shorter than in formal education and the satisfaction is higher among the children. Diversification, extension of the learning framework, flexibility of learning space and time is the duty of the circle leader. The respective activities complement the formal education, respectively the accumulation of knowledge, skills, attitudes that help the personal development of the children. The demands of children and the community, motivating students to participate in non-formal activities in addition to other activities likely to be more interesting or relaxing, requires efficient management and a modern pedagogy focused on competency through education that emphasizes the consolidation of theoretical information through their practical applications (Cărușel & Lazăr, 2008).

Changing the place of the activities reduces monotony, routine; the laboratories, the workshops, the circles of non-formal activities must offer an alternative. The possibility to see other forms of education, to compare them to what is happening in school, requires a change of place of activities. Children's Palaces and Clubs come to help shape the personality of the child, the place of "play is within the institutionalized framework, but outside the educational system, in institutions that do not have an explicit educational destination" (Bocoș & Jucan, 2017, p. 25).

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Children's interests change, therefore, the extracurricular education, an integral part of the educational system, must be interactive, participatory, optional, stimulating, fun, motivating, sustainable, flexible, attractive, creative, dynamic, multicultural, accessible and adjustable. These characteristics can be achieved with the help of active-participatory teaching strategies applied by the teachers and the management of the institution. The learning-evaluation methods are constantly changing, and teachers and circle leaders must participate in programs for personal and professional development, use active-participatory methods, otherwise the circles will remain empty, monotony, routine, illness will be installed which will affect the cognitive development of all participants in education (Chiș & Albulescu, 2010).

A special activity of the extracurricular activity is the technical-scientific ones. These activities integrate all the domains involved (physics, technological education and practical applications, chemistry, biology, mathematics) in a coherent learning paradigm based on real-world applications. The basic concepts in this approach are interdisciplinarity and application in different contexts. Today's students, especially in secondary school (Kerekes, 2019), are more motivated if the subjects are taught from different perspectives and if they are based on facts from daily life. The motivation of the students for science and technology increases with the introduction in the process of assimilating information and acquiring new operations and skills of the educational game (Albulescu & Catalano, 2019).

One of the key competences recognized at European level is mathematical and basic competences in science and technology (European Commission/EACEA/Eurydice, 2012). Developing key competences in European schools: Challenges and Opportunities for Policy. Eurydice Report. Luxembourg: Office for Publications of the European Union). In this document of the European Commission it is highlighted that there is a low interest of young people in the study of the disciplines of the curricular areas of Mathematics and Sciences, Technologies, therefore there are less and less qualified personnel in the related fields (Kerekes, 2019). Also, it was found that the large mass of students, like vulnerable groups, is not included in the initiatives to encourage the motivation to choose the technical-scientific careers, the forecasts showing that in the near future we will have less and less specialists and young people will not choose vital careers for the competitiveness of the economy (Baldea et al., 2017)

The purpose of the scientific-technical activities is to apply the knowledge acquired scientifically in practice, to show their usefulness and to shed a new light on the connection between scientific knowledge and application in practice.

The quality of the technical-scientific activities depends on the way the development programs are built, the flexibility of the circle leader, the complementarity with the formal activities and to what extent the students can be motivated to participate in the respective activities. The competences of the teacher, the leader of the circle, must be so developed and trained so that the secondary school students raised in the age of technology become the main partner of the activities in the technical-scientific field, to find the meaning of the information received in these activities. The accomplishment of the pedagogical act requires a focus as much as possible on the student, flexibility, adaptation of the different styles of management of the activity according to the needs and requirements of the students (Cucoș, 2017).

In order to develop the skills in science and technology, the leader of the circle must ask questions, and in building the development program he must assume responsibility for: what to teach the child in the

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technical-scientific circles, how to teach, why should the child learn, what is and what will be the purpose of the development program in everyday life?

The 21st century came with a lot of novelties, first of all, everything accelerated, society became multicultural, the children are different, but the essence of the technological education remained the same, to prepare competitive, active people for the 21st century society. The circle leader of the activity in the technical-scientific field has a very important task, to find those areas of activity that will grab the attention of the children and, at the same time, to satisfy the demands of society, to develop the capacities of the students, to solve the problems and to make decisions, to develop the capacity for creative and critical thinking, to increase curiosity and the ability to search for information, to select and to evaluate depending on its scope (Stan, 2001). The working methods, generally those in the group, favour cooperation, collaboration, interpersonal communication, putting the student in the presence of different points of view and forcing him to organize his own arguments, so as to avoid the inherent contradictions that may appear in its relations with others. Such a competition will generate and maintain a stimulating climate, specific to extracurricular activities (Oprea, 2009). There are aspects to be taken into account by each circle leader, the activities must be student-centred, and the development projects must be built on flexible and motivating, modern content, this being the only way to a high quality non-formal technological education. Workplaces where automation, robotics have made it easier for people to work require skilled, competent people. It is a false claim that robots will replace workforce, it's rather the workforce that must be prepared, able to "collaborate" with modern technology, a technology that requires a high-performance educational system and non-formal activities capable of developing the skills needed for the 21st century.

The role of the teacher, of friends, of family is to keep these students always on the waterline, even if sometimes the activity requires extra effort, the success will always erase the unpleasant memories related to the activity (Barabas, 2019).

3. Research Questions

1.What are the reasons why the technical-scientific circles within Children's Palaces/Clubs (carting, electronics, aero-naval modelling, computer science, experimental chemistry, and applied electronics) are less frequented by students?

2.To what extent are the development of skills in science and technology influenced by the technical-scientific activities?

3.Is the development of skills related to the family situation of the students?

4.Is there a complementarity between the disciplines of the curricular areas and the technical-scientific activities within the Children's Palaces and Clubs?

4. Purpose of the Study

The aim of the research is to analyze the focus and complementarity of nonformal activities within Children's Palaces and Clubs by comparing the development of key competences among pupils attending extracurricular activities at the Children's Palaces and Clubs in comparison with students who do not attend these activities.

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5. Research Methods

The online questionnaire was completed between February and March 2019 in 38 counties in Romania on a sample of 3945 children attending formal education and different forms of non-formal education. Another study carried out in Covasna county area on a batch of 150 students investigated the role of the technical-scientific activities in the development of the technological competences, carried out in the 2018-2019 school year. Statistical analyses were performed using SPSS26.

6. Findings

The questionnaire was conducted among the children to analyze and show the importance of extracurricular activities within Children's Palaces and Clubs and to identify those obstacles that stand between students and the technical-scientific activities. The introduction of the school programs for middle school education included in Annex no.2 of the OMNE no. 3393/2017 focused on the 8 key competencies also brought changes in extracurricular activities.

Extracurricular activities within Children's Palaces and Clubs through complementarity with formal education can help develop key competencies. First of all, they have to intervene in the motivation of children to develop those skills that are the strengths, and the ones where there are difficulties, and to find those solutions that will help to obtain the best results in the national and international assessments, but also in finding a hobby for to spend their free time developing their personality. This process requires from the teachers an extra effort by reorganizing the teaching strategies by combining the traditional methods with the modern learning-assessment methods in order to get closer to the generation of the modern world, to motivate students for finding the importance of knowledge of phenomena, of modern technology and to reduce functional illiteracy and school dropout among children.

The research addresses the above-mentioned questions and offers a set of practical information that teachers can use to increase interest in extracurricular activities.

From the data communicated by the National Institute of Statistics, in the 2018-2019 school year in Romania, a number of 3,015,552 students were present at pre-university activities, of which 323,237 attended the circles of Children's Palaces and Clubs (10.72%). The number of students participating in the research was 3,945 (0.14%), a number relevant enough to be able to draw quite relevant conclusions.

Through the curriculum formal education constantly urges the teachers to organize activities in the field of fun science and technology, an approach that can help students to improve their understanding and knowledge. The didactic game that characterizes them, especially extracurricular activities with a well-defined purpose and an attractive content, can motivate students for science and technology (Albulescu, 2019).

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Table 1. Percentage of students attending extracurricular technical-scientific activities by educational level

				Extracurricular activities		Technical-applicative	Total
				Yes	No	Yes	
Educational level	Primary (ISCED1)	Count		809	136	202	945
		%within cycle	29,6%	85,6%	14,4%	24,9%	100,0%
		Adjusted Residual		12,4	-12,4		
	Secondary lower (ISCED2)	Count		1134	538	522	1672
		%within cycle	41,3%	67,8%	32,2%	46,03%	100,0%
		Adjusted Residual		-1,9	1,9		
	Secondary superior (ISCED3)	Count		796	532	115	1328
		% within cycle	29,1%	59,9%	40,1%	14,44%	100,0%
		Adjusted Residual		-9,2	9,2		
Total		Count		2739	1206	839	3945
		% within cycle	100%	69,4%	30,6%	30,63%	100,0%

The pedagogical research highlights the students' lack of interest in science and technology, a disinterest that is highlighted in the poor results of the PISA 2018 assessments. The PISA tests are indicators illustrating how the students' results and performances change, how they accumulate information, the basic skills needed in adult life, for lifelong learning.

The technical-scientific activities through the projection of the theoretical knowledge into practical knowledge come to the aid of the formal education by completing the informational deficiencies that the formal education cannot offer. The technical-scientific extracurricular activities are open to students in primary (grades 0-4), middle and secondary school.

Based on the research it can be observed the increase of the importance of the technical-scientific activities with the advancing of age of the students due to the increase of interest in science and technology. As shown in Table 1, the primary school students participate almost 29.6% in extracurricular activities often chosen by their parents or proposed by the school. The extracurricular activities preferred by the students of the primary cycles are educational instructional processes that mainly develop motor skills. The respective activities must be approached through play, students can discover truths, they can train their ability to act creatively, to know the strategies of the game which are essentially heuristic strategies, in which cleverness, spontaneity, inventiveness, initiative, patience, daring are manifested (Albulescu & Catalano, 2018).

The biggest contribution to non-formal activities comes from middle school students. They participate in a percentage of 46.03% (see Table 1) in these interdisciplinary activities that are complementary to the formal education, are free and develop their personality, skills, creativity. At adolescence, children try all kinds of extracurricular activities until they find the ones that they are attracted to. The role of extracurricular activities decreases significantly when accessing a higher cycle, only 14.44% participate among those surveyed in non-formal activities. Secondary school students participate in these activities based on those declared to develop self-esteem, practical knowledge and to dedicate themselves to a hobby.

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As a general objective at all cycles, it is to stimulate creativity in order to modernize the didactic approach and to carry out a quality educational act, by stimulating the interest for the in-depth study in the targeted fields, developing the capacity of documentation, communication and the use of media in order to make the discoveries accessible, awareness of teachers of the need to use new learning and evaluation methods, promotion of teachers' experiences in a multidisciplinary context.

According to the analysis of the quantitative data, the boys' participation in the technical-scientific activities within the Children's Palaces and Clubs is 55.4% and 65.5% (see Table 1) of the girls prefer culturally artistic activities. Students prefer these activities to improve school performance, even if the time is allocated to them at the expense of free time or homework preparation.

As shown in Table 1, the technical-scientific activities are attended by 55.4% of which 26.9% boys from primary school, 22.8% from middle school and 12% from secondary school. These data are consistent with statistics from the Council of the European Union in 2019 (Behtoui & Leivestad, 2018).

Studies come and reinforce the above and demonstrate that extracurricular activities help to build a positive attitude towards learning, encourage teamwork and solidarity, but also the ability to find solutions and solve problems more easily.

Table 2 refers to activities that will stimulate students to pay greater attention to the disciplines in the curricular areas of science and technology, whose curricula are based on the idea of education with the help of five different disciplines: chemistry, physics, biology, technological education and practical applications and mathematics and it involves cohesive learning based on real-world demands, integrated into a cohesive, interdisciplinary learning paradigm and not the study of four different disciplines.

The technical-scientific activities within the Children's Palaces and Clubs develop their logical thinking, creativity and focus on solving problem-situations by applying real-life solutions. This type of education can be applied starting from the smallest classes, middle school, secondary school and until university, included. The scientific-technical circles within the Children's Palaces and Clubs have activities that help to develop the basic competences in science and technology. The activities are interdisciplinary in which the artificial boundaries between the disciplines of mathematics, chemistry, physics, biology, technological education and other disciplines are crossed, solving problems that can be considered the most important driving force of integration, can be solved more easily due to its practical relevance (Albulescu, 2008). Practical activities such as aero-naval modelling, applied electronics, carting, experimental chemistry, are some circles that lose ground to humanistic circles.

Modern teaching strategies, in particular the use of the research method, the creation of a network of teachers to help them improve their activity, to stimulate the involvement of girls in the technical-scientific field, but also to promote the participation of local authorities and communities in the reform of science teaching in cooperation actions at a European level, the teachers' efforts to carry out motivating activities for students who ignore technical-scientific activities. The results show that the message for the correct and coherent reception of the information, the methods, the procedures, the mode and the modalities used like the pedagogical tact of the circle leader represents the strong points of this kind of activity.

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Table 2. Factors influencing students' participation in technical and scientific activities

	Primary (ISCED1)	Secondary lower (ISCED2)	Secondary superior (ISCED3)
	Yes	Yes	Yes
Teachers do not keep up with technology	26,1%	30%	30,6%
Adjusted residual		2,5	
The equpment and equipment of the laboratories are obsolete	86,2%	73,4%	67,7%
Adjusted residual	10.1		
The works/exercises are too demanding	29,3%	33%	34,7%
Adjusted residual		2.5	3.8
Teh completion/practice time is too long	24,8%	33%	39,9%
Adjusted residual			5.8
I have no friends in activity	31,6%	37,2%	41,5%
Adjusted residual		2.4	3.4
They are not useful	39%	38,1%	40,1%
Adjusted residual	2.4		3.8
Teachers are not well prepared	46,4%	41,7%	42,9%
Adjusted residual	2.1		
Others	46,4%	41,7%	42,9%
Adjusted residual	2.1		

The equipment of laboratories, of the technical-application circles are the main barriers that make the pedagogical act difficult and is an important reason for which middle school students (73.4%) and secondary school students (67.7%) do not attend the respective circles (see Table 2).

Attention and patience are one of the major problems of the contemporary generation that develops with time, patience and hard work. Instead, children have a natural curiosity about the surrounding world, the human being, at every stage of its development, has needs, needs, interests, and later on aspirations that have certain specificity. Their knowledge and respect ensure the child's involvement in these educational activities. The child is motivated to learn if what he is learning is related to reality, if it is useful and helps him in his daily life, if he starts from what he knows and what corresponds to his experience. He learns by doing, interacting directly, acting practically, applying, analyzing, appreciating, observing, drawing conclusions, that is, if he is actively involved mentally and, especially at a young age, through sensory and motor skills. Effective learning is carried out in a pleasant, supportive atmosphere, where the child feels he can decide, that he has a certain degree of freedom, in which he is allowed to make mistakes and in which he is supported to correct the mistakes, not criticized for them or be compared to others. At a young age, and not only, the playful aspect of learning is very important and motivating (Albulescu & Catalano, 2019).

The respective activities must be managed in such a way, using didactic strategies to motivate them, to not require long time to achieve, to perform, and not to be too demanding (Barabas, 2019).

Children, especially from the primary cycles, think that the activities are too demanding (70.7%). As they get older, work and exercises have to be done, more sophisticated problems have to be solved – secondary school students do not participate in these activities because they are too demanding (67%), they think that the introduction into the sophisticated world of technology must be progressive. The time of accomplishment and exercise is another impediment that is not to the liking of the students, 67% of the

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middle school participants consider the time too long to carry out a work or an exercise fact confirmed by the secondary school students (60.1%) as well.

As shown in Table 2, students consider that the teachers are well prepared (53.6% in the primary cycle, 58.3% in the middle school cycle and 57.1% in the secondary school cycle). Learning has an important relational side, which is why connecting the circle leader and the parent with the child, appreciating the effort put into the task and not the end result, encouraging, trusting that he will succeed are important elements in learning, especially in the repetitive, difficult, frustrating times, that the learning process means.

Students appreciated teachers' use of modern learning methods, such as online platforms, generally PhET simulations, methods based on extensive education and training of students in an intuitive environment, similar to games where students can learn through exploration and discovery (Nyíri, 2018).

These are means that students really like, and which can be masterfully introduced by teachers. It helps children, because technology is part of their lives, and its use by circle leaders means making learning attractive, friendly, taking into account their concerns and interests.

Science and technology are part of our lives, and using them in a way that brings value is important. With the help of a "Science and technology in your life" development program the Children's Palace in Sf. Gheorghe organized extra-curricular activities for a year to help students develop skills in technology. The program had a flexible content, complementary to the formal education and was based on the transposition of the theoretical knowledge learned at school into practical knowledge using also modern technology. The technology itself is not a bad thing, but the way we use it can be an advantage or a disadvantage for the students. What helps them develop healthy thinking is useful, but using technology to keep them busy in a passive state, it's no longer acceptable. The development program is a concept that goes beyond formal education in schools and reaches a realm of creativity and imagination, going to the first form of learning in children's lives: play. The program aims to promote and use teaching methods based on direct investigation and analysis, to involve students directly, but also by presenting career models in the field, so that older students can find an example that they want to follow in their adult life.

The research was carried out in Covasna county, the experimental group was made up of 75 middle school students and they followed the technical-scientific extra-curricular activities based on the development program mentioned above. A control group consisting of 75 students attended only the formal activity courses without participating in extracurricular activities. The students were tested before completing the school programs and the development program in September 2018 and retested after the completion of the school program in June 2019.

To consider that the statistical difference between the two results is primarily due to the independent variable "Science and technology in your life" but also to the school programs, we will use the data obtained by using the test t for independent samples for which we formulated the following hypotheses:

H0-null hypothesis: there is no significant difference between the final test results (RETF ≈ RCTF) at the pre-testing/post-testing stages of the students of the experimental group following the school programs and the development program "Science and technology in your life"

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H1-research hypothesis: there will be a significant difference between the two test results (RETF ≠ RCTF) applied to the experimental and control group following the school programs and the development program.

Table 3. Comparison of the final results from the posttest (R_{ETF}, R_{CTF}), experimental sample and control sample, stage of the formative experiment

Group Statistics					
	Sample group	N	Mean	Std. Deviation	Std. Error Mean
result **R_{ETF}**	Experimental sample	75	33,00	13,987	1,615
	Control sample	75	33,28	11,052	1,276
Result **R_{CTF}**	Experimental sample	75	58,71	9,712	1,121
	Control sample	75	40,72	11,979	1,383

Table 4. Data collected following the application of the t test, comparing the final posttest results (R_{ETF}, R_{CTF}), experimental batch and control batch

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
rezultat **R_{ETF}**	Equal variances assumed	3,713	,056	-,136	148	,892	-,280	2,058	-4,348	3,788
	Equal variances not assumed			-,136	140,486	,892	-,280	2,058	-4,350	3,790
rezultat **R_{CTF}**	Equal variances assumed	4,158	,043	10,101	148	,000	17,987	1,781	14,468	21,506
	Equal variances not assumed			10,101	141,930	,000	17,987	1,781	14,467	21,507

F=4,158, p_F=0,043, t(141,930)=10,101, p=0,000

The statistical results of the t test for independent samples show a significant increase in the average post-test results of the experimental group. Mean difference $M=M_{RETF}- M_{RCTF}=17,987$ (M_{RETF}-average of experimental group results, M_{RECTF}-average of control group results), result obtained by comparing the experimental group to the control group at post-test (Table 3).

Since the Levene test is significant (Table 4) (F=4,158, p=0,043, p is less than the theoretical significance of 0,05 the null hypothesis can be rejected. The results of the t test with the values t(141,930)=10,101, p=0.000 indicates the rejection of the null hypothesis and the statement that in the pedagogical experiment the increase of the average of the post-test results was mainly due to the independent variable “Science and technology in your life”.

Changes in the family structure, whether it is about the formation of couples and families, about divorces, are closely related to other social fields and especially to that of the school institution – itself in

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Corresponding Author: Kerekes Jenő
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

full change both in terms of forms and functions. Children's school success also depends on the social environment.

The family is the privileged interlocutor of the school. With the increase in divorce rates, efforts have been made to know the consequences of parental separation on the educational development of their children. Divorce has become commonplace and its consequences for children's school success has disappeared and is all the more detrimental the lower the social standard. The separation of parents in itself is less of an explanation on the depreciation of school success than residential adjustments is, conflicts with parents and/or stepparents, which make the school journey less safe or making the teenager try to escape from living in a home crushed by quarrels (Barabas, 2019).

Children whose parents have divorced do not get good scores when compared to children from intact, unbroken families. The effects are generally most evident in the period immediately following the divorce. Usually, the period of about one year after a divorce is marked by a higher level of anxiety, depression and parent-child conflicts. Often, both the child and the parent make an effort to adapt to the new and stressful circumstances, and each person's negative reactions can affect the other in a cyclical manner, taking on proportions. Although the obvious immediate effects of divorce generally dissipate over time, the consequences do not necessarily disappear. Children whose parents have divorced still face the risk of developing various problems, including antisocial behaviour, low self-esteem, difficulties at school and poor relationships with both siblings and other children (Hetherington et al., 1998).

Table 5. Comparison of initial and final results from the posttest (R_{ETF}, R_{CTF}), experimental group and group of students from traditional families, single parents or orphans of both parents

Group Statistics					
	Family situation	N	Mean	Std. Deviation	Std. Error Mean
results $\mathbf{R_{ETF}}$	Both parents	114	34,14	11,693	1,095
	Single parents	32	31,97	14,150	2,541
	grandparent	4	12,25	6,500	3,250
results $\mathbf{R_{CTF}}$	Both parents	114	51,57	14,243	1,334
	Single parents	32	42,94	12,535	2,251
	grandparent	4	47,25	7,805	3,902
retest september	Both parents	114	45,54	13,387	1,254
	Single parents	32	37,97	12,582	2,260
	grandparent	4	42,00	4,899	2,449

The analysis carried out throughout a school year highlights those reported by specialists. Students living in a traditional family performed better on all three tests. As shown in Table 5, students consider that the teachers are well prepared a significant increase of the results can be observed from 34.14 to 51.57, a difference of 17.43 compared to 10.67 in the case of single-parent students. Although the number of students who lost both parents was quite small, it can be seen that in our research the jump was quite highlighted, especially that the 4 students participated twice a week in technical-scientific extracurricular activities within the Children's Palaces/Clubs in Covasna county and obtained significant results, an increase of 35 units.

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Corresponding Author: Kerekes Jenő
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Table 6. Data collected following the application of the t test, comparing the initial and final results from the posttest (R_{ETF}, R_{CTF}), experimental group and group of students from traditional families, single parents or orphans of both parents

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
results **R_{ETF}**	Equal variances assumed	3,259	,073	,876	143	,383	2,173	2,481	-2,732	7,077
	Equal variances not assumed			,785	41,793	,437	2,173	2,767	-3,413	7,758
Results **R_{CTF}**	Equal variances assumed	,547	,461	3,066	143	,003	8,635	2,816	3,068	14,201
	Equal variances not assumed			3,300	53,028	,002	8,635	2,617	3,386	13,883
retest september	Equal variances assumed	,524	,470	2,825	143	,005	7,567	2,678	2,273	12,862
	Equal variances not assumed			2,928	50,057	,005	7,567	2,584	2,377	12,758

F_{TI}=3,259, p_{TL}=0,073, t(143)=0,876, p=3,383;, F_{TF}=0,547, p_{TF}=0,461, t(143)=3,066, p=0,003

Because the Levene test is not significant in either the initial test (IT) or the final test (FT) Table 6) (F_{IT}=3,259, p_{LT}=0,073, F_{FT}=0,547, p_{FT}=0,461, p is greater than the theoretical significance of 0,05 so the null hypothesis cannot be rejected, meaning that the results are not different in the two family situations. The results of test t with the values t(143)=0.876, p=3.383 do not indicate the rejection of the null hypothesis and the statement that in the pedagogical experiment at the initial test the results are not consistent with the family situation. In the case of the final test that took place after a year of study things have slightly changed, it can be seen that F_{FT}=0,547, p_{FT}=0,461, is not significant but the results of test t with values t(143)=3.066, p=0.003, indicate the rejection of the null hypothesis and the statement that in pedagogical experiment at the final test, the results show a close link between school/extracurricular results and the family situation.

The results of the studies show once again the importance and role of extracurricular activities, whether students are members of a traditional family or not, they do spend much time in a family setting called Children's Palace or Clubs without being influenced by family circumstances during the activity.

Sixth grade students take the annual assessment of fundamental competencies acquired in the lower cycle of the middle school (5^{th}-6^{th} grade). According to the National Education Law no. 1/2011, with subsequent amendments and completions, the results of EN VI aim to develop individualized learning plans for students.

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Corresponding Author: Kerekes Jenő
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The students of the experimental group went through a development program that aimed to develop skills in science and technology, grouped into specific skills.

Extracurricular technical-scientific education allows for a systematic assimilation of knowledge and facilitates the development of some capacities, of some skills, of some aptitudes and attitudes necessary for the insertion of the individual in the given society. The respective activities aimed at complementarity with the disciplines physics, technological education and practical applications, biology, mathematics in order to develop the respective competencies.

The national assessments of mathematics and natural sciences for the 6th grade aim at the 6 competencies, all of them found and formed with the development program of "Science and technology in your life".

Below is a comparison of the results of students who participated in extracurricular activities and developed skills in science and technology by participating in the activities organizes by Children's Palaces and Clubs, with the results of students who did not benefit from these opportunities.

For the statistical evaluation of data to highlight the role of extracurricular and statistical activities we formulate two hypotheses:

H_0-null hypothesis: the students of the experimental group and the students of the control group obtained similar results at the National Assessments at the end of the 6th grade, at the mathematics and natural sciences tests,

H_1-research hypothesis: the students of the experimental group obtained better results at the National Assessments at the end of the sixth grade, at the mathematics and natural sciences tests than the students of the control group.

Table 7. Data, averages obtained at the National Assessments at the end of the sixth grade, the Mathematics and natural sciences test than the students of the experimental and control group,

Group Statistics

	Sample group	N	Mean	Std. Deviation	Std. Error Mean
ENVI	Experimental sample	75	490,0000	28,47474	3,28798
	Control sample	75	393,4667	60,63835	7,00191

Table 8. Data collected following the application of the t test, comparing the results of the National Assessments at the end of the sixth grade, the Mathematics and Natural Sciences test by the students of the experimental and control group

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
ENVI	Equal variances assumed	20,463	,000	12,479	148	,000	96,53333	7,73548	81,24708	111,81958
	Equal variances not assumed			12,479	105,122	,000	96,53333	7,73548	81,19552	111,87115

F=20,463, p=0,000, t(105,121)=12,479

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Corresponding Author: Kerekes Jenő
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The Levene test (Table 8) is significant (F=20.463, p=0.000). The data from the table will be read from the second row from which it results (F=20,463, p=0.000, t(105,121)0=12.479) that p<0.05 the theoretical threshold of significance and following the results we can reject the null hypothesis and state that the students of the experimental group obtained better results with 93,533 units than the average of the students in the control group (study conducted in Covasna county, Table 7).

The results of the study are also confirmed by other research which shows that participation in extracurricular activities is regarded by the family as generally beneficial (Barnett, 2007, p. 316; Shannon, 2006, p. 400) observes that some families encourage students to participate in various extracurricular activities, such as athletic activities, vocational clubs, and so on. International studies on the effects of extracurricular activities at secondary school level are positively correlated with higher grades, positive attitudes towards school (Fredricks & Eccles 2008).

Results consistent with other studies show that students who generally participate in extracurricular activities are positively correlated with school performance, personality and acceptance by colleagues, thus emphasizing both academic and social benefits and family influence plays a secondary role (Golu, 2015).

7. Conclusion

The scientific research was carried out on a sample of 3945 students in 38 counties of Romania (questionnaire) respectively 150 students from Covasna county, students who participated in a science and technology development program called “Science and technology in your life” (School year 2018-2019) at the Children’s Palace and Clubs in Covasna county. The topics of developing skills in science and technology were addressed, respectively the reasons that positively or negatively influence students' participation in technical-scientific activities, or their departure from the exact sciences. The questionnaire also conducted an opinion poll on extracurricular activities that help develop the child’s skills and personality.

From the study carried out results the importance of the extracurricular activities realized within the Children’s Palace and Clubs, activities that are complementary to formal activities. The motivation of the students to participate actively during chemistry, physics and biology, technological education lessons is largely influenced by these extracurricular activities, the personality of the teachers and the active-participative methods used during the lessons and the circles.

Combining and finding the relationship between traditional and modern teaching methods is a positive aspect among teachers regarding increasing students’ motivation for the respective curricular areas. This aspect can be achieved through several vocational trainings along with the change of the teachers’ mentality.

The equipment of laboratories and circles within Children’s Palaces and Clubs is a negative aspect that is in the way of students, especially of the boys to participate in these activities, equipment are needed to keep up with the technological developments and to create an educational framework that allows the student to be trained for a future job.

Following the processing of the answers received to the items of the test, the post-test, the retest and the application of the development program “Science and technology in your life” to the experimental group, we managed to draw some conclusions: the formal contemporary education needs the

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complementarity of the extracurricular education. Creation, development and promotion of a program of development at the level of Children's Palaces and Clubs complementary to the formal education capable of offering the students a complete, balanced and quality extracurricular education; students regardless of age should be encouraged to think deeply, so that they have the chance to become inventors who can solve the most sought-after challenges of our future. The specialized papers consulted and referred to support the complementarity of the extracurricular activities in the technical-scientific field and the importance of the activities in the development of competences in science and technology.

The family environment should not be approached from a single perspective, despite the fact that it provides us with information relevant to the student's space of existence. It is important that any statement that revolves around the issue of the educational environment takes into account the whole constellation of factors of family, school, those related to the personality of the teacher, as well as those appearing in the informal environment, as a result of the student's achievements and behaviour.

A school-family partnership requires stronger family interaction and involvement in school, in extra-curricular and school activities, in the student's family life. School, extracurricular activities become an organic component of the daily life of the family, where parents are aware that they provide them with knowledge, culture, professional training and professional status, all absolutely necessary for employment.

The obtained results refer not only to the cognitive acquisition or the development of skills in science and technology, but also to behavioural and attitudinal ones. The research done is not a complete one, but it opens up prospects for new investigative approaches in the field of extracurricular activity.

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