

Take your knowledge to the fair!

Science Fair as a form of learning from the perspective of student-researchers,
student spectators and educators

Institute: Kiss Bálint Protestant Primary School

Address: 2 Kossuth square Szentes, 6600, Hungary

Teachers: Éva Bacsa, Szilvia Tomcsányi Lucz, Zoltán Niethammer, Judit Négyesi,
Emília Varga, József Horvát, Julianna Nagypál, Gabriella Karikó-Tóth, Aranka Repa

Collaborators: Erzsébet Korom, Nóra Fűz, Márta Héreginé Nagy
MTA-SZTE Science Education Research Group, University of Szeged, Hungary

Age of the students: 10–14 years



In the 21st century, only a small proportion of learning happens within the walls of schools, during classes. The digital world has expanded the boundaries by making the primary goals of schools the provision and development of the necessary and relevant skills (e.g. independent learning, problem solving, information acquisition) and the creation of a learning environment where students can practice those skills.

Answering new challenges, we introduced a Science Fair in our school four years ago, which resembles the program of the Science Fair Day in American schools in style, and is based on a theoretical model of the project and research-based learning. Our program was formed as a result of longer preparatory work, preceded by significant professional studies, and studies of the relevant literature in this field. Adapted to our school, this program – as we refer to it in our logo – is a competition that everyone can participate in, not just the best students. Although our students find this form of learning not literally a game, it is still easier and more enjoyable for them than traditional schoolwork.

Aims

Our goals formulated upon launching the program are consistent with the National Core Curriculum:

- establishing independent exploration and creative work in childhood,
- facilitating diverse skills and competences,
- promoting sciences, especially natural sciences, and reinstating them into the interests of students,
- talent education,
- renewing the content and design of academic competitions,
- complex, practical, cross-curriculum way of thinking instead of knowledge based on individual, separate subjects,
- introducing non-subject-specific, complex forms of learning organization,
- developing personalized, learner-centered, interactive teaching and learning,
- providing opportunities for students to present their specific areas of interest, and activities that require more in-depth research and exploration.

In addition to the compulsory curriculum, we encourage our students to carry out experiments, do their own research and creative work in order to experience the joy and success, and sometimes pain and hardship it involves. All of these activities provide excellent ground and refined skills for future challenges.

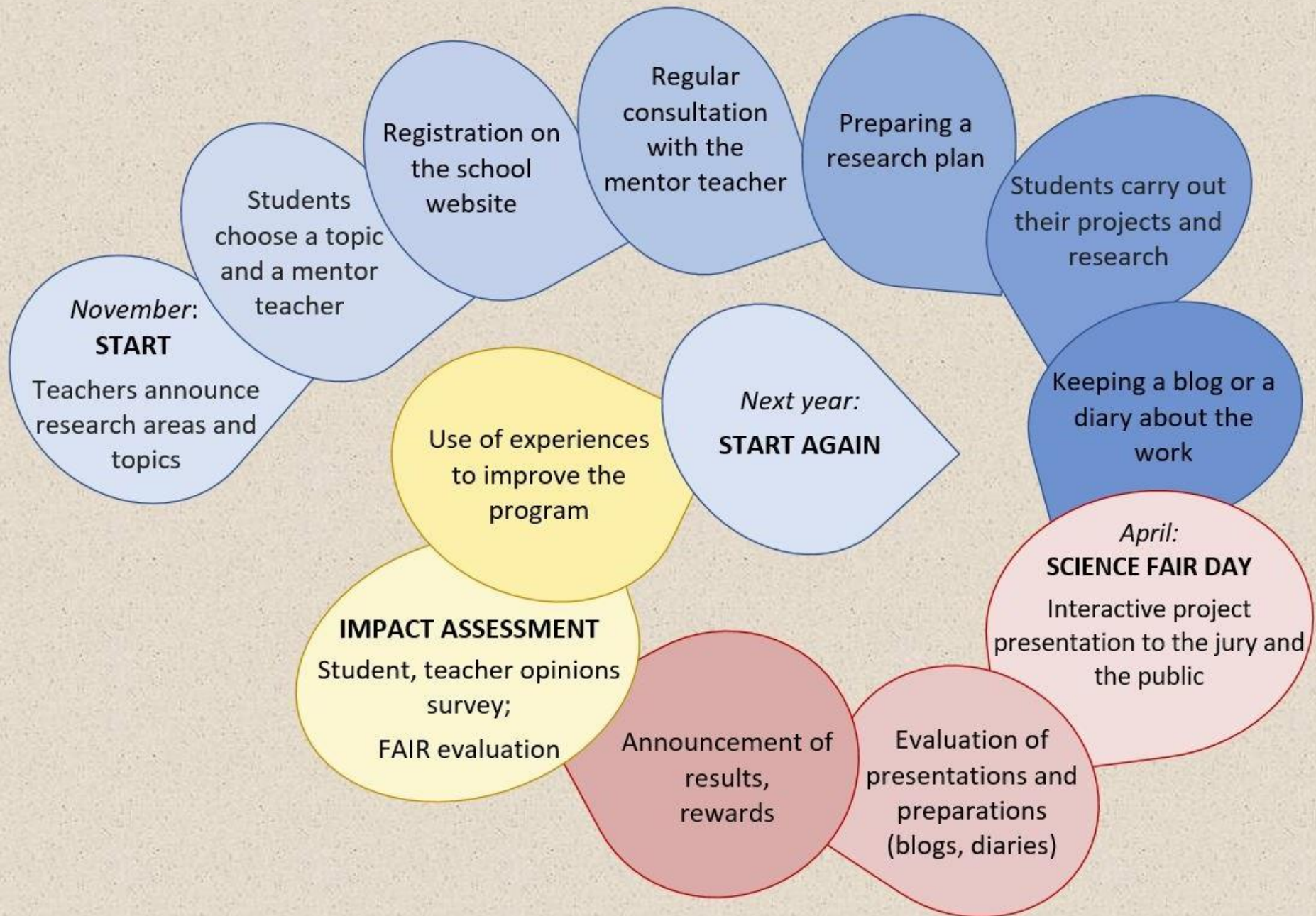
Participants

We announce this program primarily for upper-primary students, but we are pleased to see that interest is growing in the lower grades as well. We are also glad to see that it is not only the best students who are volunteering for these activities, as is the case with traditional academic competitions. What is more, we often find that students who are not really at the forefront of learning come up with great ideas, great solutions and presentations.



Science Fair

Timetable for preparation





Models from gummy bears
Consultation with the mentor teacher

Science Fair is a learning opportunity for students including both researchers and spectators. In addition to dealing with interesting topics, project makers can compare their knowledge and skills with their peers'. An important element of the Science Fair program is the feedback, evaluation, and rewarding of the best projects. Young researchers also receive direct feedback from their fellow students, teachers and the jury of three school teachers.

Criteria followed by the jury:

- ✓ relevance of the topic,
- ✓ structure and methods of research,
- ✓ project / research development,
- ✓ documentation of the work, nature of reflections,
- ✓ quality of presentation, interactivity.

Science Fair in the 2018/2019 academic year

This year we have organized the Science Fair for the fourth time in our school, and we can say that this program has become a celebration of independent, creative activity in our school. The event in the school gym created a real trade fair atmosphere.



Peter and his classmate Balázs constructed a circulatory model demonstrating how the heart works



Here Peter is explaining the circulatory process



Máté and Lehel studied Carol Dweck's mindset theory. Here the audience is informed about the proportion of students in our school who have a growing or fixed mindset



The girls have studied the effects of different light effects on plant growth



Students are modeling a volcanic eruption



At each stand, the "researchers" presented their work and discoveries to their fellow students, teachers, interested people and the jury through a personal consultation. Numerous presentations made presenters more and more confident, and they became more committed and self-confident through their self-acquired knowledge.



This day is all about knowledge and creative activity. Those who are not involved in projects can solve interesting tasks related to the themes presented after visiting the fair and take part in various brainstorming activities, thought-provoking tasks, creative games (e.g. board games, chess, Sudoku, Triviador, etc).



Here are some exciting questions students answered at this year's Science Fair:

- What kind of world appears under a microscope?
- How does fashion reflect ancient Greek society?
- What is the impact of garbage islands on marine life?
- How does laser appear in our everyday life?
- How does lattice structure appear in architecture?
- How can we protect our birds?
- How does aquaculture crop production work?
- Does the power of sight affect us?
- What can we learn about twins?
- How do God's eternal laws live in our thinking?
- To what extent do students at our school have a growing or fixed mindset?
- How to build an automatic pancake fryer?
- How does the heart work?
- How do volcanoes work, and what kind of destruction do they cause in their environment?
- What secrets do our eyes keep?

During the Fair, we could also have a look at the details of the projects. The little researchers documented the process of their several months of work from design to construction through photos, diaries, and blogs.



Documentation of plant growth

A blog post about the realization of hydroculture planting in coconut fiber

9. MÁR. 20.

Írta: S. és D. blog



Szólj hozzá!

AHOGY ELKÉPZELTEM A NÖVÉNYT....

Én (Dorina) egy rajzot készítettem arról, hogy hogyan fog kinézni a hidrokultúrás növényem. A rajzon információk is találhatóak.



*A levek növekedésén és
kék színű*



*A növények nem
kellene az állott víz*

*A növények kokusz-
szalagon fejlődnek*

A váza oldala direkt átlátszó, hogy lehessen látni a rendszerét a növény ültetésének. Ez persze már egy sokkal nagyobb növény, mint a mieink. De ez semmi gond, hiszen egyszer mi is eljutunk eddig.

HIDROKULTÚRÁS NÖVÉNYTERMESZTŐ BLOG

KERESÉS

FRISS TOPIKOK

CÍMKÉK

Cimkefelhő

BLOGAJÁNLÓ

Nineteen Eighty - Friss dal Joe Satrianiól
Ahogy erről nemrég írtunk, hamarosan új lemezzel érkezik hazánkba Joe Satriani, minden idők egyik legnagyobb gitárhőse. Nos, Joe nem beszélt levegőbe, ugyanis ma reggel közzétett egy friss, Nineteen Eighty című szerzeményt a Youtube-esatornáján, amiről azon kívül, hogy a legutóbbi What Happens Next...

langologitarok.blog.hu



ARCHÍVUM

- 2019 április (2)
- 2019 március (9)
- 2019 február (6)
- 2019 január (4)
- Tovább...

FEDEK

Awards

After evaluating the research plans and diaries, the jury went through the fair, listened to the presentations and made its decision. The students who achieved the most scores received a diploma and a reward, and at the end of the school year, all students who participated in the program with their project went on a day trip with their teachers.



The participants of the Science Fair visited the Visitors' Center of the Hungarian Television this year.



Empirical impact assessment of Science Fair

The Science Fair has become a stable, clear and accepted program in the life of our school in recent years. Each year we monitor its feasibility, effectiveness and, if necessary, change or modify it. We also consider it important to classify good practices not only on the basis of experimental and observational practices, but also to carry out empirical research using more objective research methods and to develop skills and competences supported by scientific results.

The impact assessment of the Science Fair was conducted by the MTA-SZTE Science Education Research Group, in the framework of which the students' and teachers' attitudes towards the fair held in spring 2019 were revealed. Students and teachers from the school (grades 4 to 8) participated in the study. Table 1 shows the composition of the student sample.

Table 1. Distribution of students by grade and gender

Grade	Participants (number)	of whom girls (number)
4	30	19
5	43	17
6	47	24
7	50	27
8	49	26
Total	219	113

Student questionnaire

The student questionnaire consists of: (1) the previous year's grades, attitudes toward subjects and the previous year's Science Fair (five-point Likert scale); (2) student opinions on the Science Fair (short open questions); (3) the impact of the event on learners (four-point Likert scale); (4) general attitudes towards the event (based on a four-point Likert scale, Orion and Hofstein's 1991 questionnaire).

The sample of teachers is made up those of teachers who have been involved as mentors and organizers in the program. The sample size of the teachers is 17 (82.4% female).

Instruments

Students participating as researchers or viewers completed an online questionnaire (recorded on the eDia-platform). Teachers' views were revealed through a paper-based questionnaire supplemented by a semi-structured interview with the deputy head of the institution.

Teachers' questionnaire

The teacher questionnaire, which is partially equivalent to the student questionnaire for comparability, consists of the following subscales: (1) the effect of Science Fair (four-level Likert scale); (2) the general attitudes towards the Science Fair among teachers (based on a four-point Likert scale, Orion and Hofstein's 1991 questionnaire), (3) the students' preference for the Science Fair.

Data analysis was performed with the help of SPSS statistical analysis program. The questionnaires proved to be reliable: for the whole student questionnaire, the Cronbach- α reliability value was 0.917, Science Fair impact subscale was 0.896; and a subscale of the general attitudes of Science Fair was 0.828. The reliability of the whole teacher questionnaire is also good (Cronbach- α =0.790).

Results

The success of the event is illustrated by the increasing number of students planning to participate in the Science Fair next year. Compared to the Fair of 2018 their number has increased from 30 to 81. Eighteen of them have already participated as researchers this year. The reasons for participating again were explained as follows:

- ❖ I really liked it.
- ❖ I can work with my friend.
- ❖ I like to do research and try new things.
- ❖ I like to show and learn new things.
- ❖ I am very interested in science and like to work on a project with my friend.
- ❖ I like to search the Internet.
- ❖ I find interesting new things to discover.
- ❖ I am interested in the topic we are working on.
- ❖ I love the Science Fair.
- ❖ I liked it last year as well.

17 statements of *General attitudes toward Science Fair* subscale were the same across the three subsamples (researcher, spectator, teacher). Variance analysis was performed in order to compare the three samples. Table 2 shows for which items the difference between the subsamples is significant.

Table 2. General attitudes toward Science Fair - year 2019 (4-point Likert-scale)

Attitudes	Researcher (N=30)		Spectator (N=189)		Teacher (N=17)		Difference
	Mean	SD	Mean	SD	Mean	SD	
What students like best about Science Fair are the jokes told by their friends. (-)	1.77	0.97	2.14	0.93	1.88	0.70	R<T,S
The Science Fair had too much information for the students. (-)	2.57	0.86	2.77	0.90	1.88	0.86	R,S>T
It is a pity that we do not have more Science Fairs, since this is an enjoyable way to learn.	3.04	0.85	2.88	0.83	2.53	0.87	R,S>T
The Science Fair helps to build class spirit.	3.03	0.96	2.57	0.84	2.76	0.97	R>T,S
The Science Fair helps to get to know more friends.	2.90	0.98	2.23	0.85	2.94	0.66	T,R>S
The Science Fair is important since it demonstrates and illustrates the concepts learned in class.	3.21	0.86	2.78	0.72	3.06	0.66	R>T,S
The projects of the Science Fair help to understand the subject/material learned in class.	2.83	0.97	2.53	0.82	3.24	0.75	T,R>S
Students are more likely to learn at the Science Fair than in the classroom.	3.47	0.73	3.16	0.88	3.30	0.69	n.s.
The Science Fair is fun for students.	3.38	0.73	3.20	0.63	3.36	0.49	n.s.
The Science Fair increases the students' interest in the learning material and encourages them to search for additional information.	3.10	0.86	2.53	0.72	3.42	0.62	T,R>S
The material learned during a Science Fair will remain in students' memory for a long time.	2.45	0.87	2.58	0.81	3.53	0.52	T>R,S
The Science Fair increases my enjoyment of the subject matter.	3.43	0.69	2.07	0.76	3.59	0.62	T,R>S
The Science Fair is interesting.	3.04	0.96	3.24	0.76	3.65	0.49	T>R,S
The Science Fair is a good way to learn.	3.00	1.05	2.95	0.67	3.83	0.39	T>R,S
During the Science Fair the atmosphere was good.	3.27	0.87	3.11	0.59	3.94	0.24	T>R,S
Students gained a lot of experience at the Science Fair.	3.54	0.64	3.19	0.65	3.94	0.24	T,R>S
The Science Fair is spectacular.	3.55	0.63	3.35	0.60	4.00	-	T>R,S

Notes: T=Teacher, R=Researcher, S=Spectator; (-)=Negative statements; n.s.=non-significant

The results show that the attitudes toward the Science Fair are more positive among the students who participated in the fair as researchers and project presenters, than among those who were merely observers of the event. Researchers, for example, believed that they had gained more experience, and better remembered what their peers presented and explained than did the viewers. The little researchers thought that the works and experiences presented at the Science Fair were related to the curriculum, and the event aroused their interest in the topics they had learned and encouraged them to learn more. They also considered the possibility of forming new friendships and the growth of team spirit better. There was an agreement between the three subsamples that learning at the Science Fair was more enjoyable and fun than learning in the classroom.

Summarizing the most important results of the survey it can be said, that the opinions of both teachers and students support the success of the event. They are all in agreement that children are more likely to remember the things they have tried, made, seen, experienced, than the ones they have only learned in a traditional classroom setting. It is more enjoyable to study outside the classroom.



Reflection

Éva Bacsa (deputy director, organizer):

The survey provided data and confirmed our personal experiences with this extra-curricular form of learning. The short and long-term effects of the program can be seen below:

- ✓ There is a growing interest in science, including natural sciences.
- ✓ Students' attitude towards scientific research, creativity and exploration is improving
- ✓ Creative activities give students a sense of success and improve their self-esteem.
- ✓ The program engages students with different interests and abilities. We are delighted to see that students who are not likely to be the best and most productive in their schoolwork share their knowledge and discoveries with interested people with glittering eyes, proudly showing the loads of efforts they have made.
- ✓ By evaluating projects in many ways, the competition can have several winners.
- ✓ During preparation, teachers and students interacted and shared a learning experience; knowledge is not transferred by the teachers, but teachers facilitate knowledge construction.
- ✓ Independent work contributes to the development of student autonomy, responsibility and self-regulation.
- ✓ Participants develop creativity, critical thinking and communication skills.