Final Evaluation Report on Added Value Pilot Programme

January, 2020

ERASMUS + PROGRAM

Project 2017-1-PLO1-KA201-038851

ADDED VALUE Partners

Universal Learning Systems (Ireland)

Dr Alan Bruce

Imelda Graham

Szkola z Klasa (Poland)

Agata Łuczyńska

Michał Szelag

NHL Stenden (The Netherlands)

Dr Roelien Wierda

Ron Barendsen

Harma de Vries

Associacion Smilemundo (Spain)

Aleksandra Zemke

Matylda Zawadzka

Project Leader Partners Financed by

Introduction

A critical component of all EU funded project activity is evaluation. Evaluation enables project stakeholders to reflect on what has been undertaken and to draw conclusions as to the effectiveness or impact of project activities. It also enables those who invested in the project to determine the value for money of actions undertaken and whether or not their outcomes will be sustainable in the medium and longer terms. Finally, it enables beneficiaries to judge whether actions undertaken and results achieved will be of defined benefit to them and their communities.

Evaluation is therefore a tool to measure success or to indicate reasons for shortfalls. It is, at its best, a marvelous tool for self-reflection and critical thinking. When undertaken effectively, evaluation enables all actors to define the terms of their engagement and to adjudge the impact of actions, products, processes and outputs. The learning generated is designed to feed back in to the broader thrust of EU project aims and objectives in improving the quality of education and innovative learning strategies.

In the Added Value (AV) project, a range of initiatives was undertaken within the broad remit of learning around mathematics and STEAM approaches in selected European schools (in Poland, Spain, the Netherlands and Ireland). This final evaluation report describes the processes and outcomes for the survey evaluations of the pilot programme which was conducted as part of the Added Value project, between January 2018 and January 2020.

In particular, the report details the methodology, participants and the survey format and content. It provides the summary responses and analysis of these in the context of addressing innovative quality approaches to the teaching and understanding of mathematics and STEM approaches.

This evaluation report forms part of the overall final project report.

Alan Bruce
Imelda Graham

Universal Learning Systems

January 2020

Project ADDED VALUE
Leader SZKOŁA Z KLASĄ FUNDACJA
Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo
Financed by Erasmus+

Background and Context

The primary aim of the Added Value project has been to create change in teaching mathematics in Polish and European schools. The intention was to enable teachers to become guides, to show their students the real world that can be described and better understood with the use of innovative tools focused on mathematics and STEAM subjects. This real world starts at school, continues at home with everyday activities, and expands to wider national and global issues that nowadays are within reach at all times and that impact the world of which we are a part. The aim was to show the practical side of mathematics to students, to put mathematics in everyday contexts. A wider objective was to enable students to believe that they could successfully learn mathematical content and to appreciate the reasons for doing so.

The project was designed to help them to reinforce cooperation and demonstrate how their subjects are interconnected, despite school divisions. Tools were piloted in schools in all partner countries, among them 260 schools from Poland and three from the other partner countries. Over 195 teachers were involved (some worked alongside colleagues who taught other subjects) and 5296 students.

An additional group targeted consisted of European educational institutions and organizations aimed at innovation, decision-makers, headmasters, educational leaders, sectoral media, but, above all, other teachers (apart from the ones taking part in the pilot implementations) reached through the wide and well-established network of contacts in each organization.

Mathematics is still considered by many students in Europe as a 'blackboard subject', a subject aimed at abstract calculations with no link to reality. However, mathematics should serve to solve problems, starting with everyday life issues and concluding with work or scientific environments that exist in our adult lives. Mathematical competencies, widely underestimated, can open the door to careers in many fields.

PISA studies over many years have shown that all European countries share this experience. Therefore, the Added Value project involved four organisations who would bring valuable and relevant expertise in tools that would address these issues, such as using design thinking, project-based learning, and inquiry based learning: School with class Foundation (Poland), Universal Learning Systems (Ireland), Asociación Smilemundo (Spain) and the Stenden University of Applied Sciences (Netherlands). Profiles and skills of the organizations are complementary: two NGOs, a consulting and research company, and a university. Teachers reflect the educational system they work in. The project aimed to strengthen their professional position, self-esteem and effectiveness. The Report from the Polish Educational Research Institute demonstrated that mathematics teachers were respected in schools but, at the same time, their relationship with students was weak and underdeveloped.

Within the project partners worked to prepare a mathematical toolbox: a set of topics from different educational levels (so it can be useful for a wide range of teachers) with ideas on how to teach them in practice. As a complementary set of materials, the project created a set of posters showing how the impact of mathematics can be seen in everyday life. In developing the materials, the project involved a team of teachers and experts. In the Added Value project, the main target group was teachers of mathematics, but also teachers of other subjects that willing to take part in interdisciplinary projects (mainly STEAM: Science, Technology, Engineering, Arts and Mathematics).

Project ADDED VALUE
Leader SZKOŁA Z KLASĄ FUNDACJA
Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo
Financed by Erasmus+

Purpose of the Evaluation

The evaluation was conducted in order to determine the value and effectiveness of the tools and resources that were developed through the project. These tools and resources were designed and developed based upon needs identified through the initial research conducted as part of the project and to link with the curriculum for mathematics in each country for the target age groups *(see: Added Value Research Report July 2018).*

In particular, the AV project developed a set of challenges and interactive posters that could be used by teachers of mathematics and other STEAM [Science, Technology, Engineering, Arts and Mathematics] subjects, together with their pupils, in order to demonstrate that **'Maths is Everywhere'**. These tools are intended to bring the subject of mathematics to life for students in the age groups 10-14 years old, as agreed by the project partners, and to fulfill the aims of the project, as set out in the final report. They were designed following the findings of the AV Research report (2018), which drew upon the findings from each partner country regarding the position of mathematical teaching in their country and, using the PISA framework, to:

- Emphasize a more interactive approach to teaching mathematics
- Emphasize the full range of cognitive competencies (processes) during teaching
- Implement a better balance of context-free questions and questions that are embedded in real-world contexts.
- Emphasize more use of language in mathematics classes
- Help students to develop mathematical knowledge in the context of solving problems. *(AV Research report Executive Summary 2018).*

Following the research, the project outputs consisted of:

(1) Series of challenges for teachers and pupils with which to work in the classroom under the following titles and including recommended lesson plans:

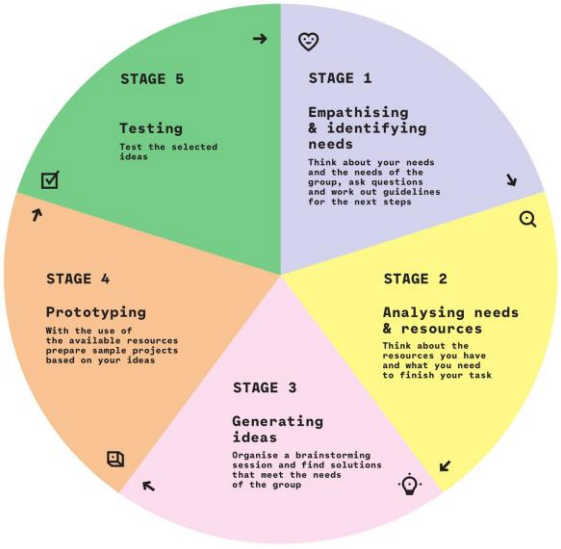
1. Create a dream classroom
2. Less plastic in the waste bin
3. Make your class more active
4. Plan a sight-seeing route
5. Make your own cupcakes
6. Prepare a dream salad
7. Organise a school trip
8. Reduce your sugar intake

Project ADDED VALUE Leader SZKOŁA Z KLASĄ FUNDACJA Partners universal learning systems NHL STENDEN university of applied sciences smile mundo Financed by Erasmus+

(2) Nine Interactive Posters with instructions

(3) Supporting materials including Lesson Plans for Teachers, information and materials to support the proposed mode of use, Design Thinking, as illustrated:

Design Thinking Circle:



The finished set of tools is now available through the project website, in all partner languages on mathsiseverywhere.eu/ .

Project ADDED VALUE
Leader SZKOŁA Z KLASĄ FUNDACJA
Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo
Financed by Erasmus+

Evaluation Methodology

When the draft set of tools was completed, each partner undertook to pilot them in their own countries. To determine the effectiveness and usability of the tools, teachers were invited to participate in a structured survey using Google forms, which enabled successful data gathering and analysis. In order to manage the language issues, the survey was conducted in Polish, other partners were able to complete in English.

Survey Format

All partners invited participants, teachers in schools, working with students between the ages 10-14 years, to pilot the tool kit and supporting resources. Following this they were asked to complete a survey. It was determined that a structured survey using Google Forms would be the most effective method to achieve clear results. This survey used common questions which had been developed, tested and discussed by partners, going through each part of the testing phase: selecting materials, planning with pupils, implementation and reviewing. The questions referred to the different aspects of the pilot: the actual materials, instructions, preferences, ease of use, popularity and effectiveness in the classroom.

Two versions of the survey were conducted in order to manage the language barrier. Questions and summary responses are included under the findings section.

Survey Responses

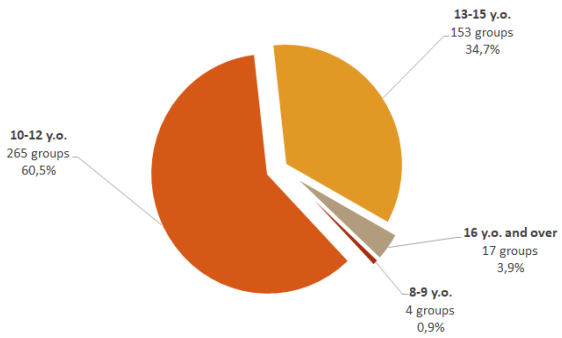
There was an enthusiastic response among Polish teachers to the piloting of the tools, with 191 teachers returning the surveys. This reflects the research findings in terms of innovative mathematical education (AV Final Research Report 2018), where Poland exhibited a lack of innovation in the teaching of mathematics compared with the other partner countries. These pilots afforded them a unique opportunity for trying innovative and new methodologies in their teaching practice.

In Spain, Ireland and The Netherlands the pilot was conducted in one school each. Results were similar to those of the Polish teachers, as can be seen in the following analysis.

Pilot Project: Ages of Participating Children

The summary responses show the following:

In Poland:



In other partner countries the age groups were 10-12.

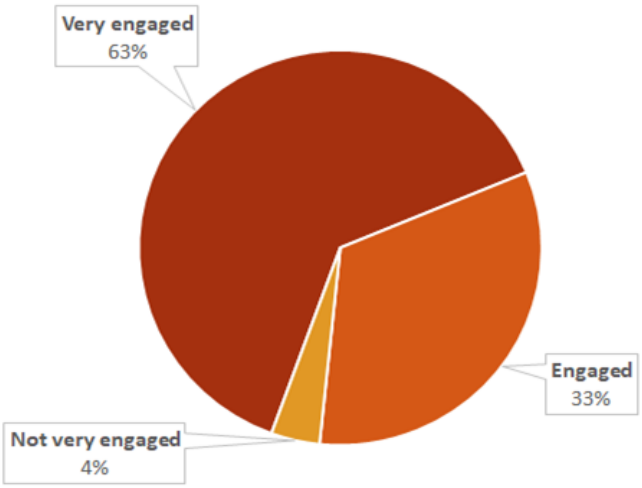
Findings

The results establish that the age group who used the tools most was the 10-12 age group. The target group was 10-14, in Poland mixed age groups were engaged, in the other partner countries the age groups were 10-12.

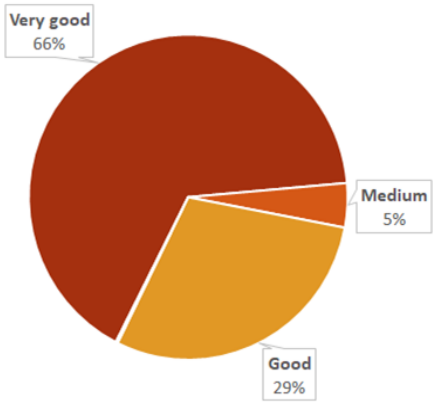
Project ADDED VALUE
Leader SZKOŁA Z KLASĄ FUNDACJA
Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo
Financed by Erasmus+

Overall Feedback on Challenges

The overall feedback was that the challenges were interesting and engaging. The figure outside Poland was 100% 'interesting', whereas in Poland it was 99%. This very slight decrease could reflect the number of older age groups participating in the Polish schools, the materials suit the younger age group better. The level of engagement is illustrated by the pie chart from Poland, showing that 96% were very engaged/engaged.



The materials were rated as 'very good, good' by 95% of students



with the reasons offered stating that they were:

(Polish Feedback, English Summary)

Project ADDED VALUE
Leader SZKOŁA Z KLASĄ FUNDACJA
Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo
Financed by Erasmus+

Feedback from Teachers and Students

Comments from all of the participating children were positive and illustrated a number of valuable findings for the project. The comments included:

(1) Poland

> *"it was great, for the first time in school I got to plan and do everything from the beginning to the end." (student in Polish school)*

Participants in Poland completed a greater number of challenges than in the other partner countries, this, and the high number of participants, provided rich findings for all the challenges. Detailed feedback was provided, examples include:

> *"Working on classes by this method is very interesting, the only problem is the very large number students in classroom."*
>
> *"The method used during the classes is very interesting. It involves all students, even the weakest ones and gives the desired results."*
>
> *"The task "going beyond" the textbook and notebook, it has prompted the entire class to activity. Students willingly cooperated with each other, sharing knowledge and skills. On their own initiative, they enriched the projects with additional elements. The form of classes appealed to the students, as evidenced by the willingness to take part in the next challenges."*
>
> *"The classes surprised me a bit, I did not think that the work would involve the students so much."*
>
> *"Students were delighted with the classes themselves. They loved the challenge and the way they can work."*
>
> *"I have learned more about my students during those classes than in many months before."*
>
> *"Lesson extremely interesting, activating all students. Students who were weaker in mathematics had interesting ideas, which meant that they were perceived as valuable members of the team. Students are very creative. Classes gave them the opportunity to work together in a team, respect their views and work out compromises. The students recorded messages from several branches of mathematics."*
>
> *"It showed that students lack the competence of applying in real life what they have learned in school. All lessons should look like this, to change it."*
>
> *"Every student felt engaged, without any exceptions. They had to negociate, be creative and find a compromise."*
>
> *"The challenge triggered emotions of students."*
>
> *"The class learned a lot about each other and got integrated."*
>
> *"Very positive. Children can not wait for the next classes - and this is the most important thing."*
>
> *"The lesson was dynamic, sometimes funny."*
>
> *"It let everyone relax a little and learn a lot."*
>
> *"Super math classes, although not all students claimed it was mathematics, and that's what it's all about!"*

Project ADDED VALUE | Leader SZKOŁA Z KLASĄ FUNDACJA | Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo | Financed by Erasmus+

"A much needed lesson for a student, work with full commitment."

"Children noticed the aspects that had not been known to them so far."

"The students enthusiastically approached the project. They could not wait for the presentation. They realised that mathematics is useful in every area of life."

(2) Partner Countries

Feedback from the surveys mentioned:

(a) Spain: The students enjoyed the exercise. One girl said: "I absolutely forgot that we were doing a maths class". They specially valued to do something real, concrete. And also, that they practiced other things like ask questions to someone, think about places to visit or prices of things, not just maths.
(b) Ireland: Really enjoyed it, especially describing their recipe and presenting to the class. The children found the q and a at the end very easy, as they could easily explain how they worked together and how they got the end result
(c) The Netherlands: the children found it difficult to get to concrete things, children really need to be put to work in a concrete way

Teachers commented that they *'liked the diversity of the process, I can work with many things, listen to others speak, make questions…..liked collaborative learning'*. More comments included *"all the lessons provided are based on interesting topics for the class to work on, very well laid out and engaging"* (Ireland).

One negative response mentioned that *"It's too simple for me, and for me is not an added value for my work"* (Spain), the respondent did not intend to work with the materials again, although the teachers in Ireland and The Netherlands would work with them again.

The teachers from the partner countries [to Poland] all agreed that the challenges were compatible with their curricula.

Findings

Participants in all countries reported positive feedback in their use of the project tools. The comments indicate much satisfaction with the impact of the tools on areas such as collaborative learning, listening, freedom to ask questions and explore mathematics in a way that reflected reality.

Teachers [in Poland] found that:

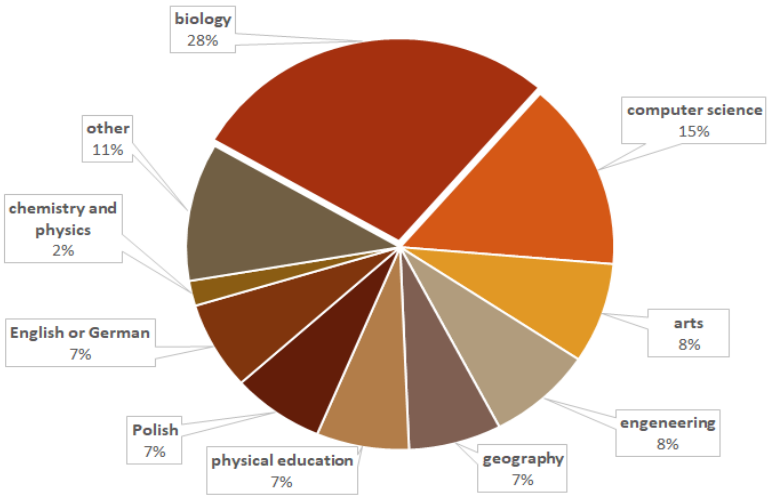
- The materials were very interesting.
- Students pointed out that finally they understood the real application of maths.
- Students engaged more than usual.
- Challenges fostered collaboration and creativity and integrated the class.
- Weeker students were engaged and put valuable input to the group.
- Challenges dealt with issues from the Polish core curriculum to a wider extent than expected.

Project ADDED VALUE Leader SZKOŁA Z KLASĄ FUNDACJA Partners universal learning systems NHL STENDEN university of applied sciences smile mundo Financed by Erasmus+

An important outcome, reflected in comments particularly from the Polish schools, is that students perceived as typically weaker in the area of mathematics were empowered to fully participate, to see the relevance of mathematics and to find a new role as valuable members of the teams in their class, with their ideas and opinions being respected by their classmates. The distinct nature of these challenges, where they are closely linked to typical real-life situations compared with traditional text-book maths problems, and the interactive nature of the Design Thinking method would have helped to achieve this outcome.

Interdisciplinary Use of Materials

The materials encouraged links with teachers of other subjects, especially in the STEAM area. In Poland 40% of the teachers of mathematics engaged with teachers of other subjects, successfully implementing the challenges together. The subjects are illustrated here and demonstrate the versatility of the materials:

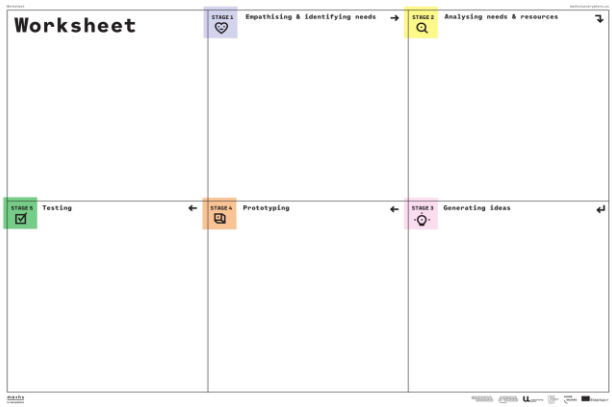


Instructions for Teachers and Use of Design Thinking Methodology

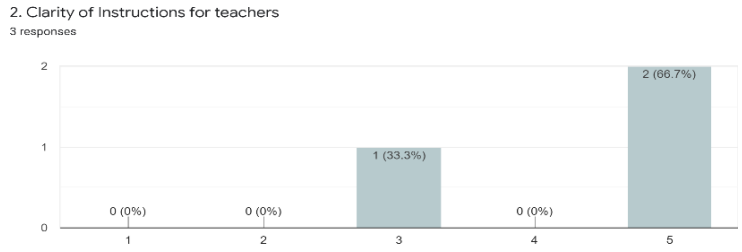
The project team included a method which it was felt would help teachers to plan and implement the challenges. This method, Design Thinking, originated in engineering, and it was felt that it would support the implementation and also provide a common method for pupils of learning problem solving skills which would be transferable to other situations.

This method was supported by the teacher instructions and the worksheets provided for the students, and offered as part of the toolkit.

Project ADDED VALUE
Leader SZKOŁA Z KLASĄ FUNDACJA
Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo
Financed by Erasmus+

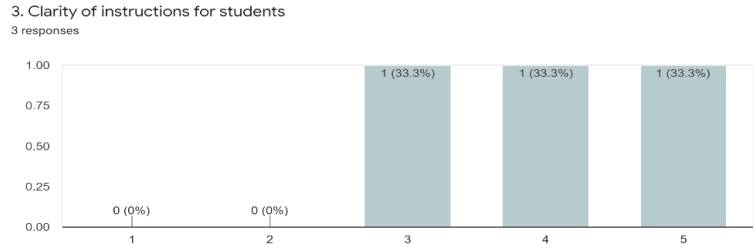


The Design Thinking method was commented on by a small number of participants. In Spain the comment was made that *'design thinking ..was added value'.* In Polish responses an issue to be tackled was that '*Teachers need a preliminary training on design thinking method'.* Otherwise the method was included with the teacher instructions, which in general were considered satisfactory:



Instructions for Students

There was overall a satisfactory response to the clarity of instructions for students. The Feedback in Spain, The Netherlands and Ireland showed 100% satisfaction:



Project
Leader
Partners
Financed by
Erasmus+

Findings

Polish schools had some helpful comments regarding instructions and use with students. While students *'loved the challenges',* some comments indicated changes that could be made including:

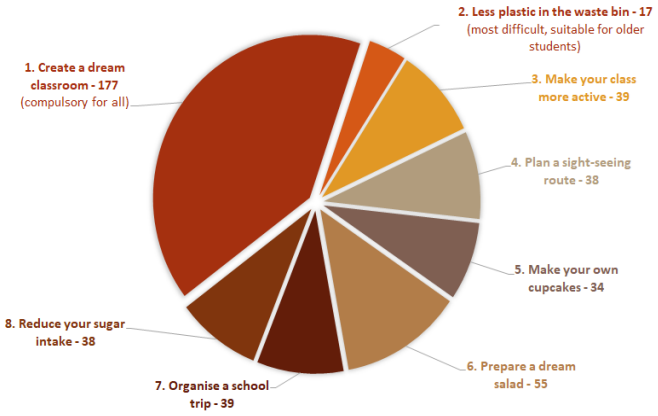
- *Tips for students needed.*
- *Too difficult language for younger students (age 10).*
- *Too much text for students.*

It was also identified by some teachers that more instruction on the recommended method of Design Thinking would be of benefit.

Choice of Challenges

Eight challenges had been developed and piloted. The choice of challenge for the participating schools was left open. Feedback shows the following challenges as being the most used:

[1] In Polish Schools:



[nb in Poland the 'Dream Classroom' was compulsory for all]

[2] In the other partner countries the challenges used were Prepare a Touristic Visit (Spain), CupCake Challenge (Ireland) and Create a Dream Classroom (The Netherlands).

Time Taken to Complete Challenges

The challenges were designed to accommodate typical duration of maths lessons, approximately 45 minutes. Some challenges could be undertaken over two or more classes, and some preparation work could be completed by students outside school.

Key Findings

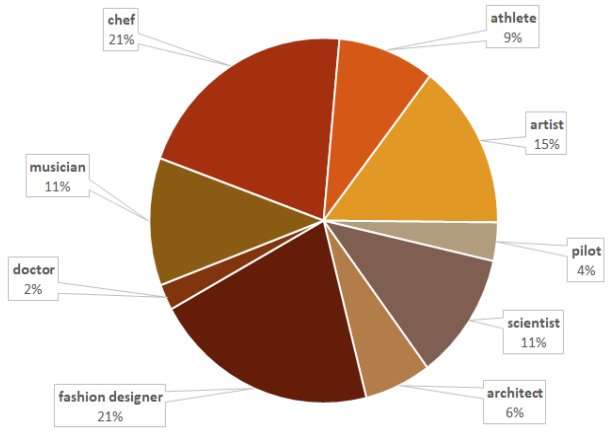
The variety of the challenges offered afforded the teachers and students the opportunity to choose activities that best suited their circumstances, such as time available, ages of students, available resources and supports. Satisfaction was high with the tools provided. The challenges were effectively used particularly by students at the lower end of the project's target age group.

Project ADDED VALUE
Leader SZKOŁA Z KLASĄ FUNDACJA
Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo
Financed by Erasmus+

Interactive Posters

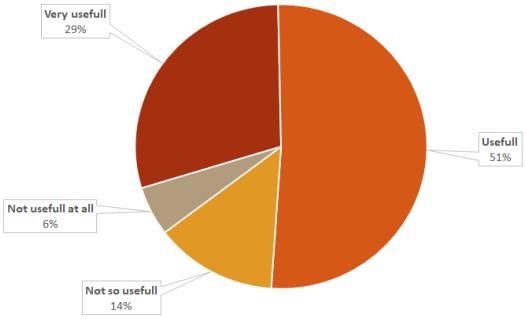
Usage and Feedback

In Poland participating schools expressed preferences for the posters as follows:

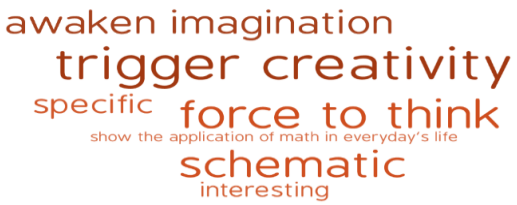


In the other partner countries', the posters were not used during the piloting of the challenges.

In the Polish schools, 80% felt that the posters were very useful/useful. Comments mentioned that they could be used:



Following their use in the Polish schools, the teachers commented that they:



Findings

The majority of participants that used the posters, who were in Poland, were satisfied. However, it was disappointing that they were not used in the other partner countries. The reason for this is not clear, for example a full printed set was made available to the Irish school.

For the future, they are available on the website, so it is possible that teachers may choose to use some or more of them.

Project ADDED VALUE
Leader SZKOŁA Z KLASĄ FUNDACJA
Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo
Financed by Erasmus+

Conclusion

Overall the findings from the pilot studies show that the tools were successful in fulfilling the project aims of creating change in mathematic teaching in the partner countries. There was particular success in Poland with the large numbers taking part in the pilots to a level of high satisfaction. The particular method used for implementing the challenges with students, design thinking, was accepted as a useful method with clear instructions for use although a small number of schools would prefer some extra instruction for teachers in this method and clearer tips for students. The extra tools developed, the Interactive Poster Set, were used by Polish Participants but not in the partner countries, although as the materials are disseminated following the project, they will be available to teachers and may achieve wider use.

The aim was to show the practical side of mathematics to students, to put mathematics in everyday contexts, and the innovative nature of the challenges were successful in meeting this aim. Particular mention is made of the achievement of the wider objective, which was to enable students to believe that they could successfully learn mathematical content and to appreciate the reasons for so doing. This achievement is reflected especially in the manner in which students who had been perceived as weaker, and who did see themselves as weaker with less confidence in their mathematical abilities, became confident contributors in their classes to conducting the challenges successfully.

In conclusion, the Added Value tools have successfully added innovative methods to the teaching canon across partner countries, and widespread dissemination should ensure the adding of value to the teaching of mathematics and STEAM across Europe. The actions undertaken and results achieved will therefore be of defined benefit to them and their communities

ULS

January 2020

Project ADDED VALUE
Leader SZKOŁA Z KLASĄ FUNDACJA
Partners universal learning systems, NHL STENDEN university of applied sciences, smile mundo
Financed by Erasmus+