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Kitchen Lab for Kids: A Programme for Shaping STEM Skills in Preschool

Kitchen Lab for Kids. Program kształtowania umiejętności STEM w przedszkolu

KEYWORDS

food, kitchen,
scientific laboratory,
early education,
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ABSTRACT

The authors of the article: "Kitchen Lab for Kids: A Programme for Shaping STEM Skills in Preschool" have presented the assumptions of the project financed from the European Funds within the Programme "Erasmus+ Action 2. School education – strategic



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partnerships for school education” (KA 201). The objective of five research teams from Italy, Ireland, Spain and Poland, is promoting the international exchange of the best practices and experiences in selecting active learning at the level of early childhood education and care (ECEC), as well as stimulating and encouraging teachers to find new, modern and interactive teaching methods, especially in the scope of STEM education. In the first part of the article the authors analysed the EU documents being the basis for the project actions. Also, they emphasized the meaning of improving the quality of teaching young children. In the further part of the article, they presented the methodological assumptions of the project and expected intellectual results.

SŁOWA KLUCZOWE

żywność, kuchnia,
laboratorium
naukowe, wczesna
edukacja, Kitchen
Lab for Kids

ABSTRAKT

Autorzy artykułu „*Kitchen Lab for Kids* – Program kształtowania umiejętności STEM w przedszkolu” przedstawiają założenia projektu, dofinansowanego z Funduszy Europejskich w ramach Programu „Erasmus+ Akcja2. Edukacja szkolna – Partnerstwa strategiczne na rzecz edukacji szkolnej” (KA201). Celem działań pięciu zespołów badawczych z Włoch, Irlandii, Hiszpanii i Polski jest promowanie międzynarodowej wymiany najlepszych praktyk i doświadczeń w zakresie wspierania aktywnego uczenia się na poziomie wczesnej edukacji i opieki nad dzieckiem (ECEC), a także stymulowanie i zachęcanie nauczycieli do znajdowania nowych, nowoczesnych i interaktywnych metod nauczania zwłaszcza w zakresie edukacji STEM. W pierwszej części artykułu przedstawiono analizę dokumentów unijnych, które stanowiły podstawę dla podjętych działań projektowych. Przybliżono znaczenie podnoszenie jakości kształcenia małych dzieci. W dalszej części artykułu zamieszczono założenia metodologiczne projektu oraz planowane rezultaty intelektualne.

Introduction

Kitchen Lab for Kids is an international project that received some funds from the European Union within the Programme “Erasmus+ Action 2. School education – strategic partnerships for school education” (KA 201). The project is carried out by the research teams from Poland (Jesuit University Ignatianum in Krakow), Italy (Fondazione Politecnico di Milano and Libera Università Maria SS. Assunta di Roma), Ireland (Dublin City University), and Spain (Universitat Internacional de Catalunya).

The objective of this article is to describe the project assumptions included in the application submitted to the Polish National Agency of Erasmus+ Programme in 2018. Such assumptions include:

- justifying the actions aimed at the creation of STEM education programme for preschool children;
- the importance of improving the quality of early childhood education and care systems (ECEC) in the light of the European Union documents;
- the methodological assumptions of *Kitchen Lab for Kids*;
- the expected intellectual results.

The objective and subject of the project

On the basis of the analysis of the EU documents (*Europe 2020*; *Council recommendation*, 2019/C 189), the international research team specified the subject and objective of the project that fulfils the recommended strategy for smart and sustainable development, as well as improving the quality of the systems of early childhood education and care (ECEC).

Thus, the subject of the research includes good practices in working with the child at the first educational level, which constitute the basis for shaping key competences in lifelong learning. The objective of the research is promoting the international exchange of the best practices and experiences in supporting active learning at the level of early childhood education and care (ECEC), as well as stimulating and encouraging teachers to find new, modern and interactive teaching methods, especially in the scope of STEM education (STEM stands for Science, Technology, Engineering and Mathematics).

The definition of STEM worked out by the National Science Teachers Association (NSTA) says that it is an “interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering and mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy” (Gerlach 2012).

Justification of the project actions

Kitchen Lab for Kids, according to the *European strategy for smart, sustainable and inclusive growth* fulfils three priorities that were formulated in the above-mentioned document as:

- “smart growth – developing an economy based on knowledge and innovation;
- sustainable growth – promoting a more resource efficient, greener and more competitive economy;
- inclusive growth – fostering a high-employment economy delivering economic, social and territorial cohesion” (*Europe 2020*: 3).

The first priority aims at increasing the role of knowledge and innovation as the driving forces of the future development of the European countries. According to the European Commission, the achievement of this assumption “requires improving the quality of education, strengthening our research performance, promoting innovation and knowledge transfer throughout the Union, making full use of information and communication technologies, and ensuring that innovative ideas can be turned into new products and services that create growth, quality jobs and help address European and global societal challenges” (*Europe 2020*: 8-9).

Other priorities are strictly related to the first one, and their common objective is aiming at reducing poverty and maintaining sustainable economic growth. Referring to research results, the Commission claims that applying research and development, as well as innovative actions in all sectors of economy, and using the resources in a more effective manner, shall increase the competitiveness of the European countries as well as employment opportunities.

According to the Commission, developing employment opportunities and improving the quality of life can be achieved through improving the quality of education focused on innovativeness, and through making it possible for people to achieve higher education. The European Parliament and Council (*Recommendation of the European Parliament*, 2006) recommend that in lifelong learning one should take into account eight key competences that should gradually be developed at particular levels of education. Also, the achievement of the objectives assumed by the Commission is related to the need to increase the quality of education in, first of all, teaching exact sciences and acquiring the following key competencies: mathematical and scientific-technical skills, IT skills, the ability to learn, as well as being active and innovative. At the same time, it is recommended to carry out the research and promote (Policy Department A: Economic and Scientific Policy, 2015) information on STEM education and introduce it into the education system in the EU countries.

These recommendations have been implemented by the member states supported by the EU funds within the Erasmus+ Programme (<https://ec.europa.eu/programmes/erasmus-plus/projects/>). The end results of those projects included the curricula based on STEM at different levels of children and youth education, methodological guides, as well as programmes of training sessions for teachers aimed at improving their STEM education qualifications. Analysing the related literature and research reports, one can conclude that the idea of STEM education is getting more and more popular as well as extended by artistic activity.

Kitchen Lab for Kids is one of the projects which, first of all, takes into account the EU recommendations for promoting STEM education; second – assumes increasing the quality of teaching scientific skills to preschool children with the use of a kitchen

as a laboratory; and third – facilitates the international exchange of experiences and good practices in the society of pedagogy students and teachers.

As compared with the previous initiatives concerning STEM education in Europe, the innovativeness of *Kitchen Lab for Kids* includes the selection of the target, i.e. children aged 2.5-6/7.

According to the research, “it is in the early years that children create the foundation and capacity to learn throughout life” (*Council recommendation*, 2019/C 189/02: 3). Also, in that period of their lives, “they have the capacity for conceptual learning and the ability to the skills of reasoning and inquiry as they investigate how the world works” (McClure 2017: 15). This assumption is the basis of our actions focused on preparing the programme for young children aimed at developing their scientific thinking through experimenting in the kitchen.

The results of the research carried out in the USA among 8642 early education children (Sackes et al. 2011) indicate that scientific experiments in preschools influence the development of scientific knowledge and skills of schoolchildren. Therefore, STEM education should be implemented as early as possible, because it helps the children to develop scientific knowledge and it shapes their scientific attitude, i.e. it develops their critical thinking. It is important to introduce exact sciences into the learning process in a way that matches the children’s level of development. Such a learning process should be based on acting, providing adequate contents, reinforcing sensory impressions, creativity, experimenting, as well as problem solving by children.

STEM education for very young children is certainly challenging, because – in this context – the teacher’s task is to establish the relation between the “common” knowledge (knowledge of the “real world”) and scientific knowledge – between “playing” and “learning at school.”

The project *Kitchen Lab for Kids* aims at combining learning with the real world known to the child through building scientific knowledge while performing everyday activities connected with cooking and processing food. Such activities are related to the guidelines concerning the importance of good quality of early childhood education and care, which are specified below.

The importance of improving the quality of the systems of early childhood education and care in the light of the European Union documents

Early childhood education and care (ECEC) refers to any regulations concerning the child from the moment of birth up to the school age, which varies in different EU countries. Such regulations include day and family care, care financed from private

and public funds, care provided by a day minder, by childcare institutions, as well as by preschools (*Council recommendation, 2019/C 189: 02*).

In the report *Benefits of Early Childhood Education and Care and the Conditions for Obtaining Them*, it is determined that high quality early childhood education and care is the foundation for the child's further success in education, welfare, employment opportunities, and social integration. Such education is particularly important for the children from discriminated environments, as it helps to make their chances equal and reduce crime (Vandenbroeck, Lenaerts, Beblavý 2018: 5).

It is confirmed by the research carried out by, i.a. James J. Heckman and Dimitriy V. Masterov (2004). In their opinion, the family is mainly responsible for the child's education, persistence and motivation, which are the constituents of the man's productiveness. The quality of early childhood education and care is very important in dysfunctional families. Educational activities are more effective than other preventive measures applied in such situations (Heckman et al. 2004: 1). The researches carried out in various scientific disciplines clearly show that high quality of early education is not only beneficial at the individual level (in terms of education and development), but also at the economical and social level (increased participation in the labour market, especially among mothers; reduced expenditure for social care; decrease in crime; increased revenue from taxes; and a better social consistency).

The report also mentions the following demographic and economic changes that the EU member states have experienced over the last years:

- the growth of women's labour market participation,
- extension of the grandparents' working lives,
- greater diversification of the society in cultural and linguistic terms,
- evolving career aspirations,
- declining fertility rates,
- the rising age of women giving birth to their first child.

Such factors resulted in an increased demand for formal and professional childcare outside the home. Also, they changed the way of organizing such childcare (Vandenbroeck, Lenaerts, Beblavý 2018: 5).

Another factor to take into account is the past financial-economic crisis, which led governments to scale down spending on early education in some Member States. Spending on early childhood education and care is generally lower than that on other education levels, despite the evidence for its importance for future learning (Ibidem).

In May 2019, the European Commission approved of the Council's recommendation (*Council recommendation, 2019/C 189: 02*) concerning high quality early childhood education and care systems, which aims at supporting the member states in their attempts to improve the access to and quality of the systems of early childhood education and care.

The general framework, based on the three crucial principles, was established:

- “high quality childcare services are key factors that support children’s development and learning, and – in a long-term perspective, improve their educational opportunities,
- families should be involved in all aspects of education and care for their children. Family is the first and most important place for children to grow and develop, and parents and guardians are responsible for each child’s well-being, health and development,
- early childhood education and care services need to be child-centred; children learn best in environments that are based on children’s participation and interest in learning” (*Council recommendation*, 2019/C 189: 13).

Important factors that determine high quality education include qualified staff and “a curriculum based on objectives, values and pedagogical approaches that make it possible for children to fully develop their potential. Such a curriculum should take into account the children’s social, emotional, cognitive and physical development, and their general welfare” (Ibidem: 12).

Taking into account the above guidelines, as well as the newest research results indicating that high quality of early childhood education plays a significant role in their acquisition of key competences, the research teams that carry out the *Kitchen Lab for Kids* project aim at promoting the idea of STEM education among teachers and students preparing to work as teachers.

Methodological assumptions and planned results

The project actions were divided into six stages the final result of which shall include publishing a guide for teachers in an on-line and traditional form, in four languages: English, Polish, Spanish and Italian.

During the first stage (State of Art. Analysis), the teams carried out qualitative and quantitative research the objective of which was the analysis of the literature of the subject, including the research reports, national and international initiatives, as well as projects and training sessions concerning STEM education.

Another step included the preparation of the sheet for analysing the curricula of preschool education. The objective of the research was evaluating and comparing the educational assumptions in the preschool curricula in terms of STEM education in Ireland, Spain, Italy and Poland. The establishment of similarities and differences in the analysed documents was the basis for preparing the common matrix of objectives, contents and skills related to STEM education in preschool. The research results shall be presented in a separate article.

On the basis of the interview questionnaire prepared by the Spanish team, a focus group interview was carried out in two groups. One of them included the students (women) of preschool and early school pedagogy. The other included female kindergarten teachers. The research subject of the interviews was centred around the questions concerning theoretical and practical knowledge of STEM education in preschools, the ways of solving process skills, the possibility to use the experiments based on food, and the evaluation of the current level of education in this scope. On the basis of the result analysis, the team prepared a survey questionnaire which was filled in online by the students and teachers. The results of the focus group interviews and the survey (Zdybel et al. 2019) are being analysed and prepared for publishing.

The second stage of the project includes the collection and initial evaluation of the existing good practices fulfilled in the researched countries, and the creation of teaching resources (Teaching SET). They shall be published, along with the methodological description, on the website of the *Kitchen Lab for Kids* project (http://kitchenlab4kids.eu/?page_id=85). After completing this stage and selecting the best resources, the students and teachers shall be invited to the active participation in creating the new ideas for STEM education in the kitchen. The suggestions included in the website shall be evaluated by the practitioners and complemented with their own experiences. Along with the research teams, new lesson scenarios shall be created and later introduced into practice.

The fourth stage of the project actions is verification of the prepared lesson scenarios in the preschool practice. Conducting the lessons is to indicate strong and weak points of the suggested practices and STEM teaching methods. The introduced experimental factor shall be properly monitored by the research teams. The research shall be carried out before and after its fulfilment. The results shall make it possible to introduce the next stage of the project actions that will end with publishing the Toolkit for Educators.

All the actions, as well as planned publications, shall be included on the website of *Kitchen Lab for Kids*. The sixth stage of the project and its final result is publishing the research results in the Online Hub and Learning Environment. In March 2020, the International Conference Kitchen Lab 4 Kids is to be held. During the conference, the initial results of our research shall be presented, and training session for teachers promoting STEM education in the kitchen shall be organised.

Conclusion

Early childhood education and care constitutes an important stage in the process of lifelong learning. Supporting the children's cognitive curiosity and making it

possible for them to explore the world is very important. Improving the quality of early childhood education is one of the priorities of the international actions that follow the European *Strategy for smart, sustainable and inclusive growth (Europe 2020)*. The universities which educate teachers and improve their qualifications are obliged to carry out the research and prepare new programmes of studies that warrant high quality education. *Kitchen Lab for Kids* is one of the suggestions that support both the academic community and teachers-practitioners in developing a modern approach to teaching young children.

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