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Национална агенция  
за оценка на качеството  
на образованието  
и мобилността



## **STRATEGIC ACTION PLAN FOR TRANSNATIONAL COOPERATION IN THE FIELD OF EDUCATION FOR ITS DEVELOPMENT BY USING OF INNOVATIVE EDUCATION METHODS**

### ***PROJECT OUTPUT 03***



**Project name: AUGMENTED REALITY EDUCATION MODULE - DEVELOPMENT AND IMPLEMENTATION  
OF INNOVATIVE ICT - BASED EDUCATIONAL TOOL IN STEM ORIENTATED SCHOOL SUBJECTS**

**Project Acronym: AR EDU**



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## 1. Introduction

The Erasmus+ project “**Augmented Reality Education Module - Development and implementation of innovative ICT - based educational tool in STEM orientated school subjects**” **AR EDU** is being implemented in three European municipalities: Ludbreg, Kochani, and Pazardzhik, for the period of 24 months, from November 2018 till October 2020, under the Contract No. 2018-1-MK01-KA201-047179.

Today's students in secondary schools are not enough interested in Science, Technology, Engineering and Mathematics (STEM). At the same moment, STEM orientated school subjects are helping students to develop the skills needed to succeed in the global labor market, especially taking into account that scientific and technological innovations have become increasingly important as students face the benefits and challenges of globalization and a knowledge-based economy. Survey among the students in PPs high schools shows that not enough students consider a career in STEM so main questions that arise and lead to the idea for preparation of this project proposal were: How to overpass stereotypes that STEM are hard and boring? Can the modern technology help us?

The main aim of the project is development and use of new software solution - innovative ICT based educational tool (Augmented Reality - AR learning module) to connect students with STEM fields, as a non-traditional approach beyond the limits of classic classroom.

Main objectives of the project are:

- to create strategic partnership for transnational cooperation among different socio-economic organizations (education institutions, civil sector and ICT SMEs);
- to improve educational approaches in three secondary schools with new innovative educational tools;
- to increase awareness of the importance of the STEM school subjects;
- to increase students' interest for STEM subjects in school.

Partnership include different types of organizations: Local government of Ludbreg (HR), a high tech company Techko Net Dooel, three high schools: SOU Ljupco Santov Kocani (MK), PGIM – Pazardzhik (BG), and Srednja shkola Ludbreg, and two NGOs, LAG (MK) and CSEG (BG).

Taking into account project objectives and project activities, the purpose of this document will be to establish a basis for strategic cooperation and transnational partnership in the field of education between the municipalities of Ludbreg, Kochani, and Pazardzhik by involving representatives of the local, educational, and civil sectors.

Education is a key element for the social and economic life of the society. The power of quality education gives results on two levels: 1) the level of personal development of a citizen and 2) the level of development of the society.



At an individual level, education allows people to gain knowledge, skills and form an approach for critical thinking and thus making a choice in the direction of improving their quality of life.

At the social level, education is a strategic sector which influences the overall development of the community. In fact, education is of strategic significance for the development of the society within one municipality/region.

Educational curricula for children from 14 to 19 years of age in Bulgaria, Croatia, and North Macedonia are identical to a great degree, but emphasis of the current project will be given to: ICT in teaching, local governance and civil sector and their involvement and tasks in the educational processes. The process of strategic planning aims to jointly define a vision for the future, to set priorities, to present possible actions and resources within the three regions, and to ensure that councilors, mayors, school representatives, civil society representatives and other stakeholders who are involved in the process, will support the realization of the common goals of project “AR EDU – Augmented Reality Education Module - Development and implementation of innovative ICT - based educational tool in STEM orientated school subjects”, funded by the Erasmus+ Program. The strategy contains a vision for development of the strategic partnership between the educational stakeholders of the three participating regions, main principles for implementation of the strategy, as well as the strategic priorities and measures for achieving the identified vision. The strategy sets the priorities and measures which could be taken by the stakeholders by defining some possible activities and initiatives for future cooperation.

## 2. Present situation in educational sector of the 3 participating municipalities

### 2.1. Kochani, North Macedonia

Education is compulsory between the ages of six to 19 for general secondary education, or from six to 17, 18 or 19 for vocational education and training depending on the selected VET track.

The educational system in the Republic of North Macedonia consists of three sub-systems:

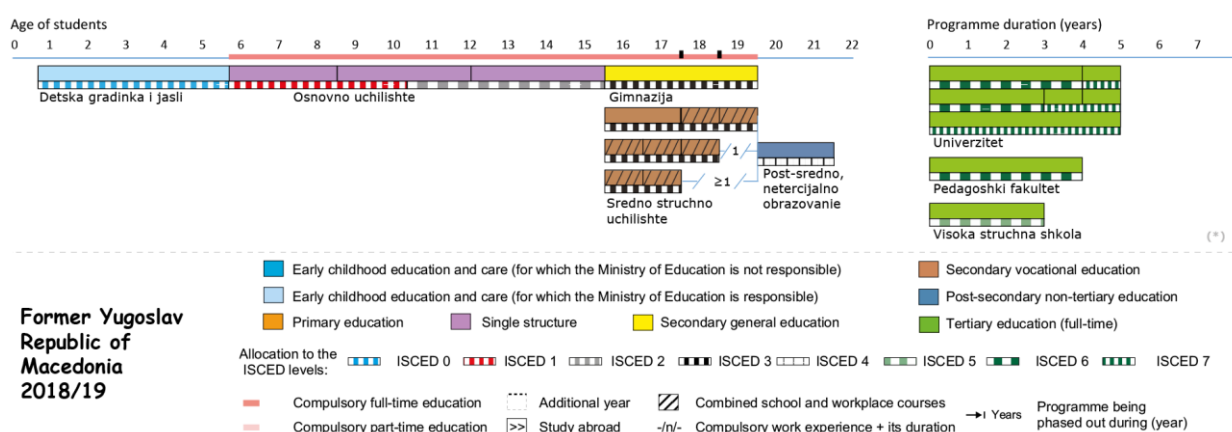
- **Primary education** (ISCED 1 and ISCED 2): in duration of nine years, free of charge and compulsory for all children aged 6 to 15, with no regards to the gender, religion and nationality. The primary education activities are defined and regulated by the Law on the Primary Education and with the Concept for Nine-years Primary Education. The mission of this sub-system is to raise, educate and guide. In the first three grades the assessment of the pupils is descriptive, and for the rest of the grades is numeric (marks 1 to 5). Private primary education schools are not recognized in Macedonian education system. However, private primary schools exist and their pupils are mainly of foreign citizenship. There are 347 primary schools in the country (around 1100 including satellite offices).
- **Secondary education** (ISCED 3): general secondary education (Gymnasium) in duration of four years and vocational education (Vocational Schools) in duration of

two (vocational education of two years), three (vocational education for professions) or four years (vocational technical education). The secondary education is compulsory and comprises all children in the age cohort 15 to 19 years for the general secondary education, and for the age cohort 15 to 17, 18 or 19 in the VET depending on the selected track. The activities and responsibilities of the secondary education are defined and regulated with the Law on the Secondary Education and the Law for Vocational Education and Training. The secondary education is free of charge in the public secondary schools. The pupils also have the legal option to enroll into the private secondary schools which are officially recognized by the educational system of North Macedonia; there are 16 private secondary schools in the country. In several schools in the country there are bilingual classes in which the teaching of non-language subjects is performed in foreign language (French or English); In total there are 124 secondary schools, 108 are public and the remaining 16 are private. Of the secondary public schools, 23 are gymnasiums; 43 are professional; 33 also offer gymnasium and vocational education; 4 schools are for students with special educational needs; and 5 are art schools.

- **Higher education** (ISCED 5, 6 and 7): implements under-graduate, master and doctoral studies in the higher educational institutions and institutes which are autonomous and independent. There are seven state universities and 14 private universities in the Republic of North Macedonia. The activities are defined and regulated by the Law on the Higher Education. In accordance to the national policy for provision of equal access to the higher education, social cohesion and lifelong learning, the state introduced the Project 35/45, which promotes enrollment of the students from the age cohort 35 to 45 years.

The educational system comprises also the children with special needs and who are enrolled in the schools for special education or within the regular teaching process depending on the preferences of the students and their parents. There is separate curriculum for these schools.

### Structure of the National Education System



Source: Eurydice 2018/19

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## General Information on the Educational system in Kochani municipality:

In municipality of Kochani there are six primary schools, one of which is a musical school and there are two secondary schools.

The situation in the primary schools in the school year 2019/20 is as follows in the table below:

Primary school	Number of students	Number of classes	Average number of students per class
PS "Krste P. Misirkov"	224	19	11,78
PS "St. Cyril and Methodius"	972	48	20,25
PS "Rade Kratovche"	478	30	15,93
PS "Malina Popivanova"	546	33	16,54
PS "Nikola Karev"	500	36	13,8
<b>TOTAL</b>	<b>2 720</b>	<b>166</b>	<b>16,38</b>

As for the Secondary schools in Municipality of Kochani, the situation in the school year 2019/20 is as follows:

Secondary school	Number of students	Number of classes	Average number of students per class
SS "Ljupcho Santov"	619	32	19,34
SS "Gosho Vikentiev"	667	36	18,52
<b>TOTAL</b>	<b>1 286</b>	<b>68</b>	<b>18,91</b>

From August 5<sup>th</sup>, 2019 (National gazette 161 of Republic of North Macedonia), there are changes in the national Law for education that emphasize the inclusion of the children with special needs and working systematically with the gifted and talented children.

As potential weaknesses in the educational curriculums in the STEM (science, technology, engineering and mathematics) subjects related to the main topic of this project, is that:

- There is not enough IT equipment at the disposal of the school. The equipment that is already present in the schools is old and does not support the new trends in the IT opportunities;
- The computer literacy of the teachers is at a low level;
- Speaking English language which is a must for collaboration and networking between different countries is at a low level among teachers both in primary and secondary schools.

## 2.2. Pazardzhik, Bulgaria

### General Information on the Educational system in Bulgaria:

The Pre-school and School Education Act (effective from 1.08.2016) provides the legal foundation for the overall education system in the country and establishes the right of citizens to continuously enhance their education and qualifications. The Act recognizes the

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right for education for all children; guarantees equal treatment regardless of their ethnic or social background and residential locality; ensures conditions and provides opportunities for further development and accomplishment of a high level of knowledge in the system of education.

Bulgarian education system has traditionally been organized within the public sector. However, a number of private schools exist at different levels of schooling. The education in Bulgaria is mainly supported by the state through the Ministry of Education and Science (MES). Financial autonomy is given to schools by financial decentralization and the so-called “delegated budgets”. The financial decentralization transfers rights and obligations that are related to the constitution and execution of a budget (delegated budgets). Schools have more operational rights in relation to budget constitution and expenditures, and execute their own independent policies.

Education and training of children starts in kindergartens. They may be public, municipal or private, depending on the type of their budget. Kindergartens are for children at the age between 3 and 6 (when they begin first grade). Pre-primary groups for children aged 5 and 6 are compulsory and may take place either in a kindergarten or in a primary school. School readiness is assessed at the end of pre-school education stage by comparing acquired learning outcomes with the learning outcomes described in the state standards. School readiness certificate is issued.

School education is free at pre-primary, primary and secondary level in the public sector. It is compulsory for children between the ages of 5 and 16 (0-8 grades). The levels of schooling in Bulgaria are:

- primary education (grades 1- 4 inclusive);
- pre secondary education (grades 5 – 7 inclusive)
- lower secondary education (grades 8 – 10 inclusive);
- upper secondary education (grades 10 – 12 inclusive).

Schools in Bulgaria are state, municipal, private or spiritual and as according to the type of training and teaching they provide – non-specialized and specialized. According to the stage or degree of education, non-specialized schools are:

- primary (I - IV grade inclusive);
- elementary (I - VII grade inclusive);
- secondary (VIII - XII grade inclusive);
- unified (I - X grade inclusive);
- high school (I – XII inclusive).

According to the content of the training, the secondary schools can be

- profiled or
- vocational.

Special profiled-schools shall include in-depth competences in a specific profile in accordance with the state education standard for the special profile education.

Special profiles are the following:

- foreign languages;
- humanities;
- social sciences;
- economic development;
- software and hardware science;



- entrepreneurship;
- mathematics;
- natural sciences;
- visual arts;
- music;
- physical education and sports

Vocational training shall include competences needed for the acquisition of vocational qualifications, as well as for the meeting of the eligibility requirements of the occupation or profession, if any, including regulated professions and occupations.

Vocational high schools shall aim at attaining the state education standard for the acquisition of vocational qualifications during the two gymnasium stages of the secondary education degree course.

There can be also innovative schools, which are declared such upon an ordinance of the Council of Ministers and those schools should constantly achieve improvement of education quality by:

1. Developing and introducing innovative elements regarding the organization and / or content of the training;
2. Organizing in a new or improved way the management, the training and the learning environment;
3. Using new teaching methods;
4. Developing innovative training content, school curricula, and school plans.

Specialized schools train experts in specific fields like sport, arts, culture and the needs of religions. Specialized schools are:

- Sport schools (V to XII inclusive)
- culture schools (grades I to XII, V to XII, or VIII to XII inclusive);
- arts schools (grades I to XII, V to XII, or VIII to XII inclusive);
- spiritual schools (grades VIII to XII inclusive).

Religious schools can also be opened for the needs of religious denominations at the request of the religious institutions registered under the conditions and by the order of the Religious Denominations Act. They can train students who graduated Primary education.

The primary education starts normally when a child turns seven, but it is not uncommon for parents to consider their children able to start the 1st grade at the age of six. After finishing the fourth grade, students get a certificate for elementary education. To get a basic education diploma, students can go to a lower-secondary school or choose to attend a general secondary school.

In most schools, the school year begins on 15th of September and continues till 15th or 30th of June. Each school year has two terms. In most of the secondary schools, competitive exams for admission are required. Pupils can choose from a number of various types of schools, each offering a different focus (such as mathematics and sciences or foreign languages).





## General Information on the Educational system in Pazardzhik municipality:

Pazardzhik municipality is located in the Eastern part of Pazardzhik region. It occupies an area of 636,722 km<sup>2</sup> that is 14.21% from the region's territory. The municipality takes the proud second place among 12 municipalities within the region. Pazardjik municipality consists of 32 settlements – administrative centre town of Pazardzhik and 31 villages. It ranks the ninth position over the rest municipalities according to territory occupation.

According to data of the National Statistical Institute for the year of 2017, Pazardzhik has a population of 108 376 inhabitants, out of which 68 572 live within the city of Pazardzhik and 39 804 within the surrounding villages.

The Educational system of Pazardzhik Municipality consists of 32 municipal kindergartens and 46 schools – 40 municipal and 6 state.

Type of institution from the system of preschool and school education	Financing	Number
Kindergartens	Municipal	32
Primary I-IV grade	Municipal	6
Elementary I-VII grade	Municipal	25
Unified I-XII grade	Municipal	4
Selective/Profiled high schools	Municipal	3
Vocational high schools	State	6
	Municipal	1
Sport high schools	Municipal	1
Centers for Special Educational Support/	State	1
	Municipal	2
Schools dormitories/housing	Municipal	1
<b>Total:</b>		<b>82</b>

According to data of the National Statistical Institute for Pazardzhik Municipality in 2017/2018

- number of children enrolled in kindergartens is – 3 378
- number of students within the schools is - 12 267
- number of pedagogical personnel /teaching staff/ in kindergartens is – 260
- number of pedagogical personnel /teaching staff/ in schools is – 1019
- number of kindergarten groups is – 134
- number of school classes is – 539

**Table: School sector in Pazardzhik Municipality**

Educational Institutions	Number of Educational Institutions	Number of classes	Number of pedagogical personnel/teaching staff/	Number of pupils/students
<b>Municipal kindergartens</b>	32	134	260	3 378
<b>Municipal specialized and non specialised high schools</b>	39	424	812	9 512
<b>State and municipal vocational schools</b>	7	115	207	2 755
<b>Total:</b>	<b>78</b>	<b>673</b>	<b>1 279</b>	<b>15 645</b>

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In two of the secondary schools High School “Georgi Bregov” and High School “Dimitar Gachev” there is a total of 162 students divided in 7 classes in ART profile – visual arts and music. In the Sport School in the city at the moment the current number of students being educated is 223 divided in 11 classes. The number of the vocational classes in the municipal schools is 24 and they account for the total of 426 students.

Below you can find a list of all profiles that can be selected by secondary students within the Municipality after graduation of VII-th grade.

HIGH SCHOOL NAME	Profile
High School „Georgi Bregov”	Music
	Visual arts
High School of Mathematics and Natural Science „Konstantin Velichkov”	Mathematics
	Software and hardware
	Natural Sciences
Profiled High School „Ivan Sergeevich Aksakov”	Humanities
	Natural Science
Language High School „Bertolt Breht”	Foreign Languages
High School „Doctor Petar Beron”	Entrepreneurship
High School „Dimitar Gachev”	Music

Number of children with special needs enrolled in schools:

- within the city – 159;
- in the surrounding villages – 37.

Number of children in Centers for Special Educational Support:

- within the city – 67;
- in the surrounding villages – 3.

### Potential weaknesses:

- Few lessons are dedicated to ICT, and practically they do not teach topics like WEB 2.0 tools and Open Educational Resources;
- Need to increase capacity among teachers on topics like: EU programmes and funding, potential opportunities for a professional collaboration with other similar institutions and schools at EU level, and establishment of a teachers’ network for exchanging professional ideas and experience.
- As a result of globalization and migration, population in rural regions has started to decline and it leads to shrinking numbers of student and pupils enrolled in schools.

## 2.3. Ludbreg, Croatia

### Educational sector in Croatia at the National Level:

Eight-year elementary education in the Republic of Croatia is compulsory and free for all children at the age of six to fifteen. This refers to all children with permanent residence in the Republic of Croatia, irrespective of their citizenship.

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There are three segments of elementary education. Compulsory elementary education conducted in regular elementary schools and special institutions for students with developmental difficulties, art education in elementary music and dance schools, and elementary education of adults conducted in regular schools and specialized institutions. Elementary music education is also conducted in certain regular elementary schools, as a separate educational program.

### ***Croatian National Educational Standard (CNES)***

The orientation of the Croatian and national educational policy towards creating and developing a knowledge-based society is contained in the document titled Education Sector Development Plan for 2005 - 2010, which was adopted by the Government of the Republic of Croatia on June 9, 2005.

The changes have been initiated on all the levels of the educational system. The basic objective of the change is to improve the quality and advance the educational system on all levels.

The Croatian National Educational Standard has been created as a basis for the changes in the teaching programmer and work methods in the elementary school system for the purpose of developing the "school tailored to pupils". The purpose of the CNES is the unburdening of the workload by abandoning redundant educational programs, introducing modern teaching methods based on research-based classes and individual and group work and applicable knowledge and skills.

### ***Secondary Education in Croatia at the National Level***

Secondary education provides everyone, after completing primary schooling, under equal conditions and based on individual capability, the opportunity to acquire knowledge and the competence needed to enter the labor market and to undertake further education at higher education institutions.

Secondary education is provided by secondary schools and other legal persons and includes various types and forms of instruction, education, qualification and training that are carried out according to the provisions of the Primary and Secondary School Education Act (Official Gazette of the Republic of Croatia, 87/2008, 86/2009, 92/2010, 105/2010-cor., 90/2011, 16/2012, 86/2012, 94/2013 and 152/2014).

Secondary school institutions are: secondary school student's dormitories.

Secondary school programs are as follows:

- secondary school diploma programs;
- secondary profession degree programs;
- basic professional degree programs;
- qualification and training programs.

Secondary schools, depending on the type of the programe they offer, are as follows:

- gymnasiums;
- vocational or trade schools;
- art schools.

Gymnasiums prepare you for further education at higher education institutions, vocational schools prepare you to enter the labor market or provide you with the possibility of continuing



education at higher education institutions, and art schools acquire knowledge, develop skills, abilities and creativity in different artistic fields.

## **General Information on the Educational system in Ludbreg municipality:**

### ***PRE-SCHOOL EDUCATION IN LUDBREG***

In pre-school education in Ludbreg are available three kindergartens which have capacity for three hundred children from Ludbreg area.

Kindergarten “Radost” Ludbreg has five groups of primary programs and one group of pre-school programs. The kindergarten is owned by the local self-government unit of the City of Ludbreg. Currently, there are a total of 18 employees, 13 in care and education, and 5 in other jobs. The average number of children per year in all programs is 140.

Within the regular primary program, children attend English and German language learning programs conducted by educated teachers with a program verified by the Ministry of Science and Education. Children who wish to attend a religious education program of Catholic catechism led by our educators with a completed canonical mandate verified by the competent ministry.

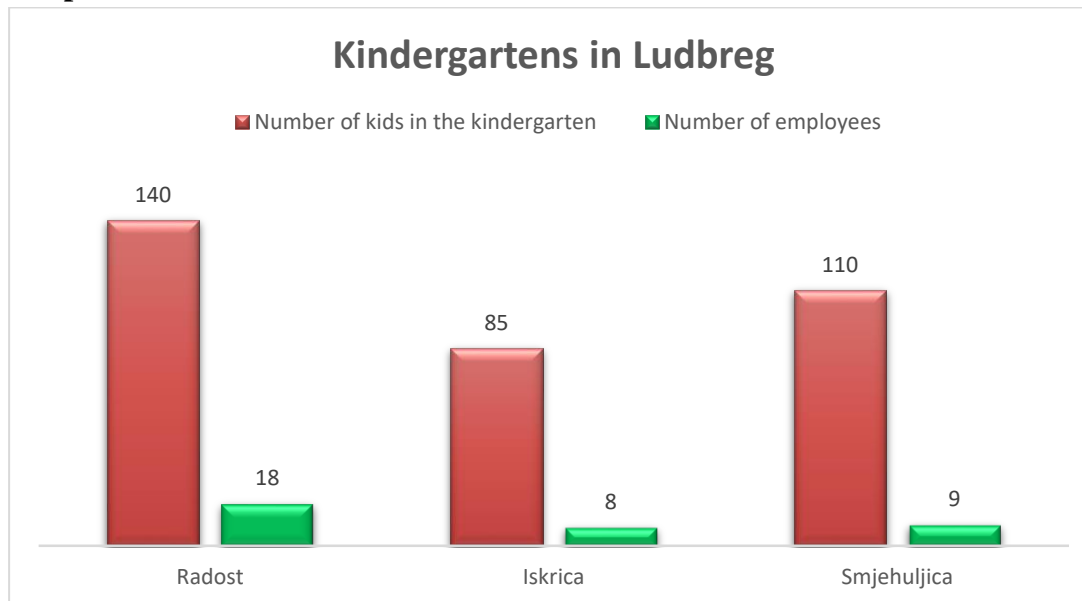
The pre-school program for the elderly children is part of a regular program, and the shorter pre-school program for non-kindergarten children is held in the afternoon. Parents have the opportunity to start with a child's adaptive playroom before enrolling in a kindergarten so that the child can easily adapt and the parent knows about the way they work. Children with disabilities and children of national minorities are integrated into groups, and assistance with working with provides a psychologist.

Kindergarten participates in all the manifestations of our city and cooperates with associations, institutions and organizations on various projects, with the aim of involving children in the life and work of their immediate environment influenced by other children and parents.

Kindergarten “Iskrica” attends a maximum of 85 children. There are eight employees in Kindergarten. Kindergarten performs a primary comprehensive program of pre-school education, and from short programs it carries out a program of early English language learning, a religious program and a program of work with gifted children. Also, the Kindergarten has an adaptation toy.

The “Smjehuljica” kindergarten currently employs 9 full-time employees. Kindergarten cooperates with 2 external associates, psychologist, logopedist and tutor. The kindergarten starts with a maximum of 110 children in three educational groups: nursery, younger and older kindergarten groups. Besides the regular program in Kindergarten are organized religious program and workshops for children.

**Graph 1.**



### ***LUDBREG PRIMARY SCHOOL***

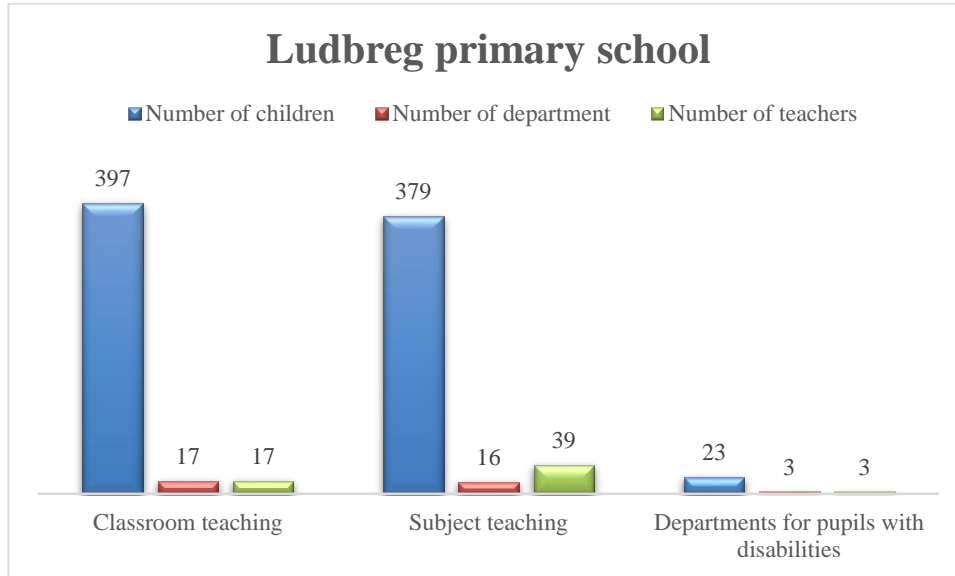
Ludbreg primary school is a public institution of general education of children and youth. School performs the educational and training activities. Primary education in the Republic of Croatia is regulated by Law of education in primary and secondary schools and therefore primary school Ludbreg implemented mandatory and regular primary education. In addition, performs the activity of basic music education for the following programs: piano, guitar, accordion, block flute, flute, clarinet, trumpet, horn, saxophone, drum and voice development (solfege). The school operates on the basis of the school curriculum and the annual plan and program of work.

Today, Ludbreg primary school has a total of 35 departments - 17 departments of classroom teaching and 16 departments subject teaching. School has a total of 776 pupils - 397 pupils from 1st to 4th grade and 379 pupils from 5th to 8th grade. Also, the school has implemented three departments for pupils with disabilities which attend a total of 23 pupils. Music department of school has six departments and enrolls 152 pupils.

Primary school Ludbreg besides regular classes has elective classes in which pupils can choose additional elective subject such as Computer Science, German or Catechism.

Moreover, school organizes various extra-curricular activities which seek to activate and motivate pupils to school and learning. Also, through participation in extracurricular activities pupils acquire new skills and competences that can help them throughout their schooling. Some extracurricular activities are: drama, young researchers, creative workshops, art workshops, playroom, reading rooms, sports activities, dance groups, choir, young technicians, first aid and others.

**Graph 2.**



### ***LUDBREG SECONDARY SCHOOL***

The Ludbreg High School is a newly established school institution that started the work of the school year 2013/2014. Ludbreg High School moved to this new location in February 2015 at Trg Sv. Trinity 16, to the moment when a new school building is being built.

Ludbreg High School provides education in 4 annual education programs:

- General Gymnasium
- Economics - economist

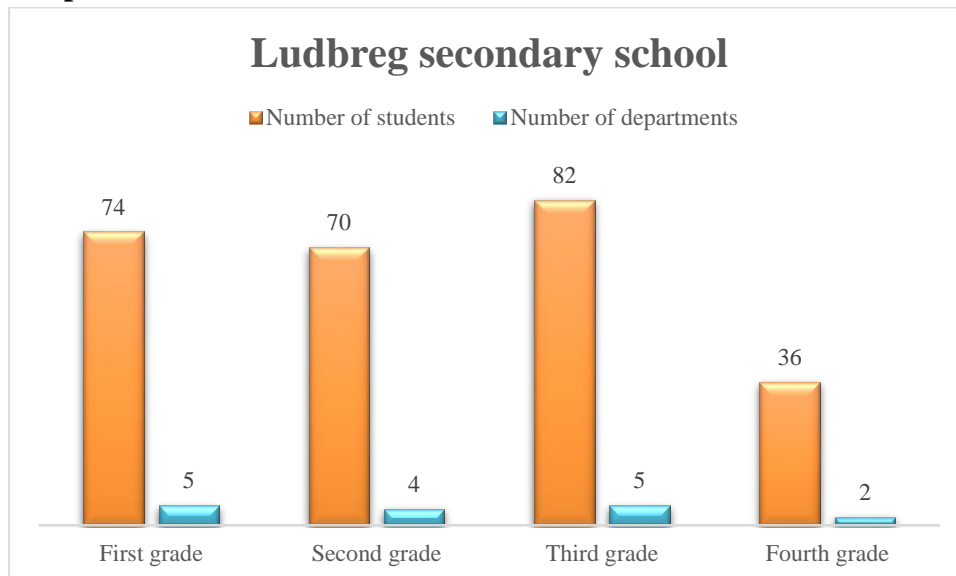
And 3 years of vocational education programs:

- Machine Locksmith, Turner, Baker (JMO)
- CNC operator
- Auxiliary occupations (chef, pastry, gardener) - (TES)

In addition to regular classes at school will run additional courses that will enable students to practically apply the acquired knowledge and creativity, to gain new knowledge, skills, values and attitudes relevant to students so that they could later effectively engage in life. This form of instruction is intended for students who show particular interest or talent in a specific field of study and want to learn more or prepare for all levels of competition.

Additional classes will be organized at a certain time when such a form will be needed for students and will include active didactic - methodical approaches such as workshops, projects, field teaching, observation, tracking and encouragement of gifted students and preparation for competitions. Supplementary education is for those students who have difficulty in mastering a particular part of the course. Such teaching does not have a character of continuity, but will be maintained according to the needs and needs of the pupil from those teaching areas and / or subjects that are needed. Extracurricular activities focus on the development of students' interests and talents in different areas, and will mainly be conducted in the form of work and project teaching as well as foreign language learning.

**Graph 3.**



### **Potential weaknesses (Ludbreg):**

The ICT sector is growing year by year, but despite its growth it brings with it several weaknesses that not only affect the educational system but also the entire society.

In the educational system, the accelerated growth of the ICT sector and technology does not accompany the parallel education of teachers and professors in the same sector. Professors who are employed do not improve their existing knowledge and skills, while students who are trained to become professors do not have adequate education to follow and be closely related to the latest technologies. Accordingly, the number of professionals entering the market is declining.

## **3. Good practices from the 3 participating regions**

### **3.1. Good practices from Bulgaria**

#### ***Project ECO EDU 'We grow up with Eco resources' (2018 – 2017), Erasmus+ Programme***

The project started at the end of 2015 with duration of 2 years, and it was funded by the EU Programme ERASMUS+.

The two municipalities, Kochani and Pazardzhik, decided to create an innovative approach for their youngest inhabitants namely students in primary schools, by developing a Strategic partnership through preparation of a "Strategy for development of education cooperation between schools from Kochani and Pazardzhik".

The project involved 2 pilot primary schools from the 2 countries which participated in the development of innovative teaching methods for implementing of renewable sources (RES), energy efficiency (EE) and environmental protection (EP), in an adequate way taking into consideration students' age. Teacher's training was supported by experts from the 2 NGOs from Kochani and Pazardzhik (LAG and CSEG) who have broad experience in RES

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utilization, EE and EP as well as great practical experience in implementation of Open Education Resources (OER) for educational purposes.

Targets which were achieved within the project included reaching of over 900 students from the two Pilot Primary schools that were presently studying with increased knowledge on EE, RES and EP by using contemporary OER, as well as all future students from the primary schools in the two municipalities could take advantage of the ECO-EDU approach.

### ***Project “Two and a half minutes to midnight – innovative education approach for addressing the climate change issues in primary schools”***

The project “2 and ½ minutes to midnight” has been implemented in three European municipalities: Kochani, Ludbreg, and Peshtera for the period of 24 months, from November 2017 till October 2019.

The main project objective was to develop a new more attractive education approach to implement climate change issue in STEM related school subjects, which were a mix of theoretical (by use of ICT based free on-line available OER) and practical education tools (school experiments) suitable for students in primary schools in Bulgaria, Croatia and North Macedonia. The second objective was to establish long-term strategic transnational partnership among representatives of local bodies, civil sector and educational institutions from regions of Kochani (MK), Ludbreg (HR), and Peshtera (BG).

#### **3.2. Good practices from Croatia**

The growth of the ICT sector necessitates the application of new knowledge and technologies. In the educational system, Croatia has implemented the "e-Diary" and "e-Matica" systems, which make it easier for teachers and professors to work and provide parents with quick and easy access to information.

"E-Diary" is a web application that has replaced the class book of students. The application has all the functionality of an existing classroom book, with additional functionality enabled by the use of information and communication technologies. The added value is in the system of reports that enable analyzes in pedagogical monitoring and in the preparation of reports that are prepared for teacher council meetings.

"E-Matica" is a centralized system of the Ministry of Science and Education, which is used to enter the most important data on students and employees of primary and secondary schools. The application is intended to be a digital form of the Handbook that is hand-filled in schools. At the end of the school year, it is possible to print certificates based on the entered data on students' education.

#### **3.3. Good practices from North Macedonia**

The project “**Eight strings to our bows**” is an ERAZMUS+ funded project where the high school “Ljupcho Santov” together with partner schools from United Kingdom, Turkey, Italy, Portugal and North Macedonia implemented the following aims:

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Encouraged students to understand the importance of using their own strengths to approach different topics and to think about their favorite style in life. Through various activities, interaction and exchange the students were motivated to understand how their new skills can be used in everyday life and make less favorite subjects more interesting and accessible. Through the students' activities they also learned to embrace customs, culture and heritage from other countries and to see that we are all the same, even in our differences.

The basic idea of the project was to apply Multiple intelligence theory which, contrary to the traditional approach to all students in the same way, envisages the development of different approaches to specific teaching topics.

The project was implemented from December, 2017 to March, 2018.

The project “**Lifelong maths**” was also implemented in the high school “Ljupcho Santov”-Kochani, funded by ERASMUS + programme from December, 2016 to March, 2017. The partner schools were from Turkey, Italy, Cyprus, Romania and North Macedonia.

The project was focused on the subject Mathematics, as a subject that requires abstract and specific thinking, and at the same time addressing the challenge that all project partner schools situation - many students find mathematics boring and difficult to understand. The main impetus for initiating the project idea was the level of student achievement in this subject, which is not high enough, and classical teaching and learning methods are not an adequate response to the challenge.

The main goal was to improve students' performance, especially those less interested in the subject, to raise the level of student success, to make teaching more effective and efficient, to use new techniques and methods, and to enable collaboration with colleagues from other project partners.

The project used a variety of methodological approaches such as: ICT tools, group discussion, research, lesson planning, problem solving, audio-visual presentations, small group work, creative and collaborative activities.

In the project was also used Google Classroom application that is a worldwide educational application.

#### **4. Principles and values of the cooperation between countries**

The implementation of the strategic partnership in the area of education between municipality of Kochani, municipality of Pazardzhik and municipality of Ludbreg will be based on the following principles and values:

**Cooperation** – with the aim of ensuring safe and positive environment in which the young population will grow, develop and be partners;



**Stability and lasting values** – in order to guarantee quality of the realization of the educational processes and at the same time to create conditions for the function the education of the future generations;

**Integration** – uniting achievements at implementation of the activities, determined with the strategic aims, which are dedicated to ensuring optimal distribution of the present resources and integrating all categories of factors, especially the students, also continuous consideration of the needs of the poor and vulnerable groups;

**Motivation** – so as to achieve maximum effect in the accomplishment the competence;

**Legality** – with the aim of guaranteeing the implementation of accepted strategic document in compliance with the corresponding laws and the general public acceptance of the local population;

**Professionalism and accuracy** – in order to implement the activities in compliance with the legal norms and procedures and through the use of proved positive practices and justification of the political decisions;

**Participation** – so that all citizens in all groups of interested sides can be included in the processes of consultations and implementation of the competence also in the public policies with local significance;

**Continuation** – so as to preserve and encourage the tradition for creating educated people who have quality and usable knowledge and skills for improving the quality of life and with responsible participation and contribution to the community;

**Openness and orientation** - in order to respond to the needs of the citizens and the job market also to encourage the health – with the aim of creating conditions for healthy population.

## 5. Mission, Vision and main aims

### Mission:

Improvement of experience and knowledge of the students and teachers in high schools on the project topics; to continue, maintain and expand further cooperation between the participating partners; to introduce new innovative methods of teaching by using ICT tools; to create a strong connection between the organizations of the project partners during the implementation of project activities; to share good practices and innovations; to train teachers on various contemporary topics, which they will be using later during their teaching activities with students.



### **Vision:**

Our vision is that the project activities and follow-up actions based on this strategy paper will lead to:

- Increased attractiveness of the STEM disciplines and consequently enlarge the number of the students choosing a technology oriented career/educational path;
- Ensure the European labor market with a more adequate number of engineers and technologists.

### **Aims:**

#### **Main aims:**

- Supporting and deepening the cooperation between the three municipalities, pre-school management, teachers and developing strategic partnership for education at school level;
- Use of the open educational resources and other ICT-based tools for teaching of specific topics like protection of environment, climate change issues, energy efficiency and renewable energy sources, etc.;
- Participation of teachers from the three municipalities through using methods of open educational forum;

## **6. Key partners, challenges and measures**

### **6.1. Key partners:**

The key partners in Implementation of the strategy are: All project partners

### **6.2. Challenges**

- Ensuring relevant support by all the key partners included in the strategy;
- Limited financial resources, human resources and time;
- Acceptance of the new innovative methods (Such as Augmented reality module) by the teachers in the schools;

### **6.3. Potential actions/measures**

Areas and actions for improvement of educational process with active involvement of Municipalities, Public utilities and NGO sector in towns of Ludbreg, Kochani, and Pazardzhik.

Following areas and actions for improvement are determined as the most suitable and with high level of probability for successful implementation within the future cooperation among the project partners.

**Municipalities, civil sector, and educational authorities** can ensure improvement in the following areas:

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- e entrepreneurship & co-worker spaces with establishing of interconnection with SMEs from private sector;
- supporting of career advisory activities for students for better acknowledgement of their own skills and competences,
- improvement of the transnational cooperation and contacts of teachers and students in the frame of international projects;

**NGOs** can ensure increasing of overall skills and competences of students and teachers by:

- providing of expertise and support to educational staff in development of project ideas and preparation of project applications (for example small scale projects for educational equipment for practical utilization of solar energy);
- preparation and realization of relevant trainings for capacity building of STEM teachers in the topics of utilization of RES, EE, climate change and environment protection;
- support in establishing of relevant international contacts (between schools, involved services, public enterprises and institutions, sponsors ...) in the frame of their other transnational projects;
- motivate students and teachers to continuously participate in actions beneficial for community (ecological and social activities)
- support and stimulate active participation of teachers/professors in the NGO sector in the frame of small scale projects

**ICT and high-tech companies** can ensure increasing of overall skills and competences of students and teachers by:

- providing of expertise and support to educational staff in development of project ideas and preparation of project applications on specific research and ICT topics;
- supporting of career advisory activities for students for better acknowledgement of their own skills and competences,
- preparation and realization of relevant trainings for capacity building of teachers in the topics of contemporary ICT educational tools;
- support in establishing of relevant international contacts (between schools, involved services, public enterprises and institutions, sponsors ...) in the frame of their other transnational projects;
- support and stimulate active participation of teachers/professors in the private sector in the frame of small scale projects

## 7. Action plan

In the activity plan all main purposes are appointed according to the preliminary shown examples where in an identical way are presented in accordance with achieving a certain aim – a performer of the activity, time for implementation, expected results, other participants, what means of human resources are needed, as well as prerequisites for implementation of foreseen activities;

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### Activity 1:

Description of the activity	Proposal for policy improvement at national level (HR, BG, MK). Additions in educational curriculum of STEM subjects in primary and secondary schools: <ul style="list-style-type: none"> <li>- More school lessons on topics like: climate changes, protection of environment, EE, and RES.</li> <li>- More practical experiments</li> <li>- More schools lessons dedicated to OER and ICT</li> </ul>
Performer of the activity	Schools, NGOs, local authorities
Expected results	Improvement of educational policy
Period of performance	2021-2025
Human resources	School principals, NGOs, local authorities
Budget	N/A
Financial sources	N/A

### Activity 2:

Description of the activity	To continue cooperation in terms of development and applying for projects of mutual interest. For example: exchange of students to share experience on topics like: ICT, circular economy, climate change issues and sustainable energy, etc.
Performer of the activity	All project partners and involve other stakeholders
Expected results	Develop and apply at least 2 project proposals
Period of performance	2021-2025
Human resources	All project partners
Budget	N/A
Financial sources	Different EU and national programmes and funds from private sector

### Activity 3:

Description of the activity	Dissemination of project products and good practices to other educational institutions. Participating teachers and students can visit other schools which do not participate in the project and present project activities to them. NGOs can perform dissemination to their on-going and upcoming projects and initiatives. Local authorities can disseminate project results to other public authorities from their respective countries.
Performer of the activity	All schools together with other partners
Expected results	Improvement of knowledge and capacity on STEM subjects and ICT topics among other schools and educational authorities.
Period of performance	2020-2024
Human resources	All project partners
Budget	N/A
Financial sources:	N/A



#### Activity 4:

<p>Опис на активността</p>	<p><b>Becoming familiar with STEM subjects</b></p> <p>STEM is the acronym for Science, Technology, Engineering and Mathematics and in practice encompasses a vast array of subjects that fall into each of those terms. While it is almost impossible to list every discipline, some common STEM areas include aerospace, engineering, biochemistry, civil engineering, computer science etc. As evidenced by the multitude of disciplines, it is clear that STEM fields affect virtually every component of our everyday lives.</p> <p>It is said that today’s students are tomorrow’s leaders. Occupations in STEM-related careers are some of the fastest growing and best paid and they often have the best potential for job growth. However, a major drawback of nowadays’ education is the lack of compulsory STEM subjects in its everyday curriculum. STEM interest has to be instilled in students from an early age so that it can spark a lasting desire for them to pursue a career in any of these fields. STEM subject should be considered as a high demand subjects and students should have enough knowledge and desire to enter the STEM workforce and feel appreciated.</p> <p>How could students become more familiar with STEM subjects? How could we “take away” the fear factor and raise the profile of science, technology, engineering and math’s career?</p> <p>This potential project proposes a number of activities that aim at making students aware of the STEM related professions and subjects in an interesting and exciting way.</p> <ul style="list-style-type: none"> <li>• Students shall team up and join a Climate Detective initiative. Teams of students, supported by their teachers, should be called to make a difference by identifying a climate problem, investigating it, and then proposing a way to help reduce the problem. Students will learn about climate on Earth as a complex and changing system and the importance of respecting our environment. NGO experts will give feedback on their investigation and will take part in supporting students and teachers. At the end, all participating teams will share their research findings with a final presentation. They will get closer to the science profession, will learn terminology, collect data, learn analyses and get the feeling of studying and exploring.</li> <li>• Another direction, which can be explored within the project, is the engineering field. Engineering sees</li> </ul>
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	<p>people working together to share ideas and come up with a solution to the problem they are working on. Whether that be the best way to use materials, the most efficient way to put something together, or how to use advancements in science to make advancements in engineering. To do this students will get acquainted with energy and energy resources. Exploring engineering through the eyes of innovation in energy resources. They will team up again and talk about transport, energy efficient buildings, energy efficient equipment, etc. Lessons for solar power plus vocabulary and presentation will be developed and explained. The same for wind and water power. Students will learn alternatives for power generations and the engineering mechanisms behind it. They will learn more about passive buildings and energy saving materials and green buildings.</p> <p>Within the frame of the project students will learn how to measure their energy consumption at home, how to measure their carbon footprint and ways of analyzing results. They will team up and give ideas of how to reduce these and how to contribute to a clean and healthy atmosphere.</p> <p>All this will help students find their career path and make them more confident when choosing a life occupation. They will mix their knowledge on various subjects and understand the complexity of the STEM science. Last but not least, they will be better prepared for the world that awaits them and will have the power to decide what is really of interest to them.</p>
Performer of the activity	NGOs, ICT companies, schools and local authorities
Expected results	Improvement of students on STEM-related topics
Period of performance	2020-2024
Human resources	All project partners
	EUR 10,000 – 15,000 per partner
Financial means:	Erasmus+ Programme; Other potential EU programmes from the next programming period 2021 – 2027.

### Activity 5

Description of the activity	<p><b><i>Promotion of the concept “sustainable development” in the schools</i></b></p> <p>Sustainable development means economic and social progress without harming the environment. It relies on the idea that development must not jeopardize the future of future generations by consuming renewable energy sources and destroying and polluting the environment in the long run. In other words, sustainable development is a way of production and consumption that takes into account the natural resources</p>
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	<p>of the ecosystem within which these processes take place.</p> <ul style="list-style-type: none"> <li>The European Union is committed to implementing the United Nations Sustainable Development Program 2030, which sets 17 goals. One of the goals is responsible consumption and production by ensuring sustainable consumption and production. It is about promoting resource efficiency, sustainable infrastructure and access to basic services, green and dignified jobs and a better quality of life for all. In responsible consumption and production that aims at "less work for more and better", students can carry out several STEM-related activities:</li> </ul> <p>By combining knowledge of biology, chemistry, physics, technology, and mechanical engineering, students can research, design, and suggest ways to reduce food production losses. The food production process and all the research can be done within the high school student community.</p> <ul style="list-style-type: none"> <li>By combining the same STEM areas, students can develop a way to reduce waste by increasing the share of recycling and reuse. Waste recycling and reuse can be done entirely within the student community. In addition to the whole recycling process, students can organize workshops for locals on the importance of waste sorting, how to use it again, and so on.</li> </ul> <p>These activities can be implemented through teamwork, with the support of teachers, and end with a presentation of the results of teamwork. Upon completion of the activity, students will be enriched for new experiences and will be able to apply the acquired knowledge when entering the labor market.</p>
Performer of the activity	Schools, local authorities, communal enterprises, NGO
Expected results	<ul style="list-style-type: none"> <li>- Improving the knowledge of interesting topics among students and teachers;</li> <li>- Exchange of good practices on topics such as sustainable development, issues related to climate change, renewable energy sources.</li> </ul>
Period of performance	2021-2025
Human resources	School principals / teachers, local government representatives, utility experts and NGOs.
	EUR 10,000 – 50,000
Financial means	Erasmus + program, Other potential EU programs from the next programming period, 2021 - 2027.

## 8. Financing the activities

The activities described in this strategy will be financed with the budgets of the municipalities or with funds ensured by different projects and programs.

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