

A CONTRIBUTION TO THE DEVELOPMENT OF IT, STEM/STEAM AND SOFT SKILLS OF WOMEN IN RURAL AREAS

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Abstract: The paper provides an overview of the results of the WINnovators project, aimed at developing entrepreneurial and STEM/STEAM skills of women in rural and underdeveloped areas, with limited opportunities to go to college. Specifically, the paper presents the factors that can contribute to raising the level of knowledge and skills of this target group in the field of information technologies. Several courses have been developed for this target group with the idea to stimulate the development of their knowledge and skills in information technologies, as well as their soft skills, which are also important for entrepreneurship. The paper shows the importance of acquiring new knowledge for the target group in order to ensure the placement of their products and a better quality of life in rural areas.

Key words: IT skills, STEM/STEAM, rural areas, courses, soft skills, entrepreneurship

1. INTRODUCTION

The International Day of Rural Women was first established in 2008 by the United Nations General Assembly within the framework of resolution 62/136 of December 18, 2007. This resolution recognizes “the critical role and contribution of rural women, including indigenous cultures, to the advancement of agricultural and rural development, improving food security and reducing poverty.”

A small percentage of women in the countryside own property, and at the same time, they are engaged in heavy physical work. In the rural areas of Western Serbia, women put family and work duties first. Most often, these women produce and process food, but their contribution is hardly appreciated.

In addition to agricultural products, women in Western Serbia also deal with tourism and craft products, but to a lesser extent. Most often, they are engaged in food production and are responsible for food safety. They produce dairy products, winter shelters, collect medicinal plants, make handicrafts, and engage in beekeeping, as well as in rural tourism. In addition, they are engaged in agriculture, mainly livestock and fruit growing.

If they decide to live in the village, the largest percentage give up further education and higher quality education. In addition to numerous obligations, the chances of attending formal higher education are reduced to a minimum. Despite the desire to improve, there is a lack of time because women in Western Serbia are engaged in household and agricultural activities, without the division of labor into male and female.

The only opportunity for these women is lifelong, non-formal education in the form of online or live training and courses that are organized so that they can attend flexibly in terms of their time and class schedules. The main goal of the paper is to present a possible contribution to the development of IT, stem/steam and soft skills of women in rural areas.

2. STEM EDUCATION

STEAM is an abbreviation that stands for Science, Technology, Engineering, Art and Mathematics. This concept implies that mathematics, chemistry, physics, biology, informatics and technology are studied in mutual correlation. These areas are interconnected and applicable in learning. Through STEM, students develop critical thinking and independence.

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The rapid advancement of technology has had the effect of creating a gap between school curricula and real needs, and this gap is getting deeper and deeper over time. In order to follow the development of technology, young people today must master functional knowledge and the ability to connect different disciplines into new competencies. Workforce representation in STEM is uneven, with research indicating women are under-represented in STEM professions [1]. STEM education establishes a connection between a real-life problem and the content and endeavors to combine science, technology, engineering and mathematics disciplines [2]. STEM education has a unique role to play because of its ability to solve real-world problems in the areas of health, energy and environment [3, 4, 5].

The STEM principle is to replace the traditional ex-cathedra approach based on memorization and reproduction of facts.

The advantages of the STEM approach in education are related to learning that is more engaging, and that refers both to concrete and abstract phenomena. It also enables easier access to work opportunities, as well as expands the base for the development of the STEM industry and the knowledge-based economy.

This approach is starting to be applied today in many educational systems throughout the world. However, in Serbia, it is still in its infancy, through project interventions and initiatives.

Effective teaching of STEM develops

- Critical thinking
- Independent learning
- Excellent communication and cooperation
- Digital literacy
- Problem solving
- Creativity
- Self-reflection/reflection

A good STEM lesson should be hands-on, mimicking real-world scenarios and integrating math and science into projects.

STEM also aligns with the way we work and solve problems in everyday life. Students develop a sense of curiosity that constantly seeks activities that can challenge them. Maintaining this curiosity helps them maximize their capacities. Such projects help in reaching conclusions, making connections and exploring a deeper meaning and understanding of their areas of interest.

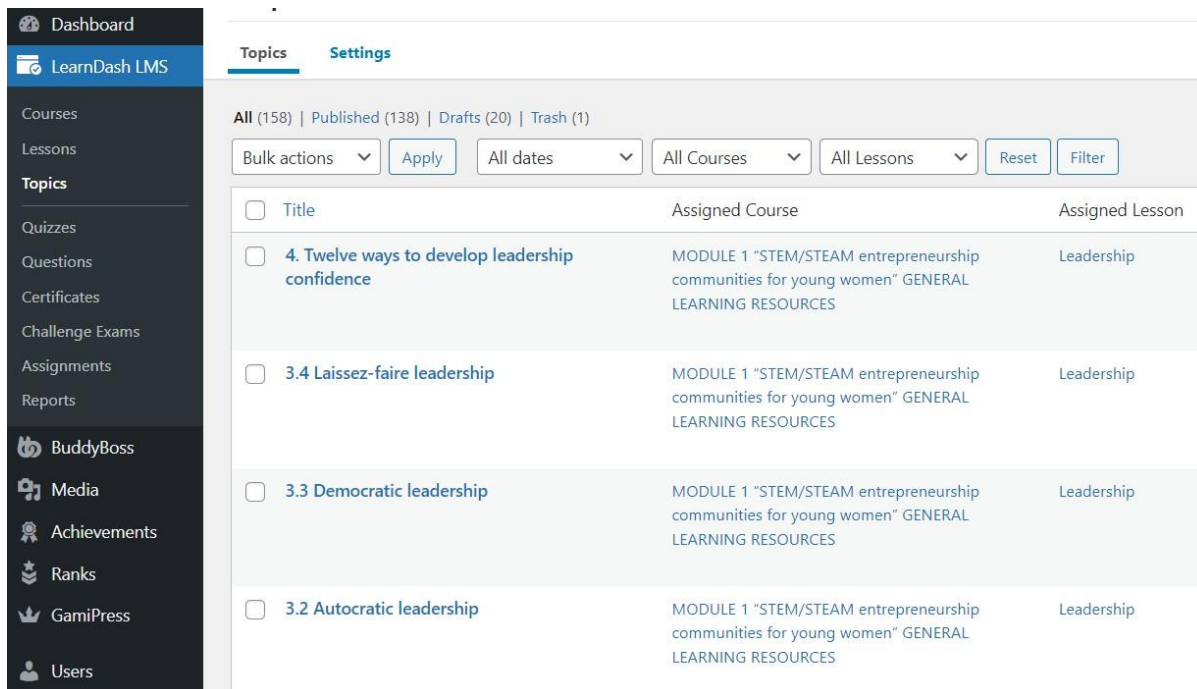
3. PROMOTING NEW SKILLS AMONG YOUNG WOMEN

3.1. New training practice

New STEM/STEAM, innovation and sustainability skills among young women from rural areas are promoted through developed online courses. Courses are developed for different fields, in order to encourage young women in rural areas to enhance their skills and use them to provide better quality of life. New training practice is proposed through the platform winnovators-space.eu. Courses are organized through the following categories

- “STEM/STEAM entrepreneurship communities for young women”
 - General learning resources
 - Challenge

For every module, the opportunity is defined in order to earn the badge, through the lesson view, or by passing the test. Figure 1 presents the part of developed modules



<input type="checkbox"/>	Title	Assigned Course	Assigned Lesson
<input type="checkbox"/>	4. Twelve ways to develop leadership confidence	MODULE 1 "STEM/STEAM entrepreneurship communities for young women" GENERAL LEARNING RESOURCES	Leadership
<input type="checkbox"/>	3.4 Laissez-faire leadership	MODULE 1 "STEM/STEAM entrepreneurship communities for young women" GENERAL LEARNING RESOURCES	Leadership
<input type="checkbox"/>	3.3 Democratic leadership	MODULE 1 "STEM/STEAM entrepreneurship communities for young women" GENERAL LEARNING RESOURCES	Leadership
<input type="checkbox"/>	3.2 Autocratic leadership	MODULE 1 "STEM/STEAM entrepreneurship communities for young women" GENERAL LEARNING RESOURCES	Leadership

Figure 1-Review of a few developed modules [6]

The platform also includes the Achievements section which encompasses the following categories:

- **Learning to be** (Achiever, Adapting, flexible to change of perspective, Autonomous, Self-caring, Protecting health and well-being, Coping with uncertainty and ambiguity, Creative, Generating ideas, Envisioning changes, Future literate, Proactive, Exploratory, Frustration tolerate, Individual initiative, Learning and unlearning, Managing digital identity, Passionate, Self-motivated, Persistent, Prepared to meet challenges, Resilient, Risk-taking, Role modelling, Inspiring engagement, Motivating others, Seeking for goals, Seeking for opportunities, Self-aware, With self-perception, Self-confident, Self-reflective, Self-regulative, Self-diagnosing for gaps, Taking ownership, Trustworthy, Reliable, Responsible, Envisioning, With a stretching mindset);
- **Learning to value** (Acting on values, Caring for others, Committed to common good, Digitally building of collective values, Embodying sustainability values, Empathetic, Equitable, Fair, Honest, Inclusive, Inspiring hope, Lifestyle thinking, Open, Promoting nature, Seeking for common understanding, Socially responsible, Delivering sustainability values, Tolerant to multiple views and diversity, With normative and values' thinking);
- **Learning to live and work together** (Co-creating, Collaborating interdisciplinary, Collaborating interpersonally, Collective action, Communicating, Digital communication and co-creation, Negotiating for alternative futures, Networking, Persuasive, Seeking for common ground, Understanding, Creating and maintaining interdependent relationships);
- **Learning to comprehend and contribute** (Actuating for wellbeing and sustainability, Anticipatory and with futures thinking, Copying and appropriating, Creating shared opportunities, Critical thinking, Decision-making, Digital content creation, Digital problem-solving, Embracing and dealing with complexity, Engaging in citizenship)

- through digital mode, Holistic approach, Information and data literacy, including digital information and data, Integrated problem solving, Knowledge of environmental sustainability, Learning from the past, Political agency, Socially entrepreneurial, Strategic thinking, Sustaining the transformative changes, System thinking, Transformative social change, Understanding and acting degrowth, Understanding and acting eco-design)
- **Learning to empower and lead** (Ability to lead by example, Ability to shape collective thinking, Coaching, facilitating and mentoring, Committed to work contract, Demanding efficiency and quality, Evidence based decision making, sound judgement, Focusing on tasks, Issuing conflict resolution, Leadership, Monitoring the progress, People management, Providing directions, strategies, Providing visions, Recognizing resistance and overcoming, Responsive project management, Systematic planning, Teamwork, Uptake sustaining).

Figure 2 present teams within Winnovators platform.

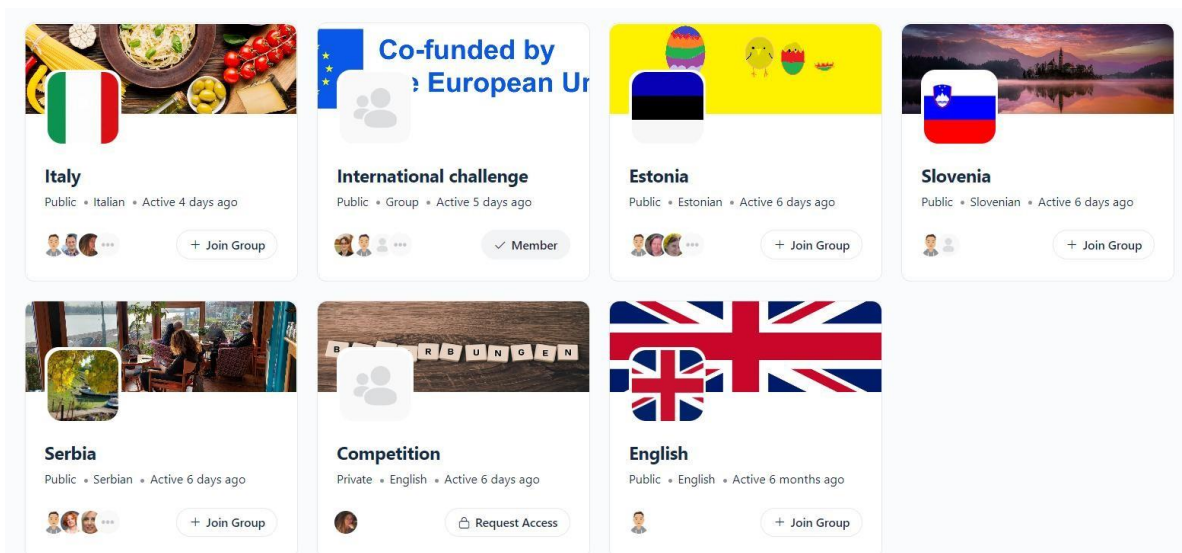


Figure 2-Review of a Winnovators teams

3.2. Developing new teaching and training approaches in HEIs

In order to build the required skills among the students, they were tasked with developing solutions that would be helpful to women in rural areas who are engaged in some kind of agricultural activity, crafts or tourism. In that process, the students showed exceptional engagement and creativity, and some of the proposed solutions include:

- A web shop for products
- The development of a blog for product promotion
- An overview of potential accommodation within rural tourism
- The development of databases for recording and sharing recipes, etc.

In order to adequately achieve the planned outcomes, STEM teaching methods were used. These methods are continuously developing and changing, and, therefore, require a creative and adaptive approach from the teacher. It is necessary to create an adequate learning environment that allows asking questions and encourages creative thinking. An important part of this type of teaching is that student's failure is part of growth.



9. KONFERENCIJA SA MEĐUNARODNIM UČEŠĆEM PRAVLJANJE ZNANJEM I INFORMATIKA, Kopaonik 2023.

Some of the techniques used in this course are:

- Project learning

This method encourages students to learn skills and apply their knowledge by collaborating on a project. Students work on selected project topics during the semester to explore all aspects and find a solution. The teacher's role is to coordinate the work and encourage them to assume adequate roles in the team.

- Problem-based learning

There are similarities between this method and project-based learning, but the key difference is that students must analyze and evaluate the problem, which requires more complex analysis. This learning method encourages creativity and teamwork. An example relates to the creation of a solution that solves the problems of young women in rural areas.

- Inquiry-based learning

The main purpose of inquiry-based learning is to emphasize the role of students in the learning process. Critical thinking skills are developed with the mandatory questions accompanying the research.

The role of the teacher in planning STEM lessons is extremely important. In order for students to acquire and maintain an interest in STEM, it is necessary that the teacher creates such an environment in which students understand the concept and apply it to their projects. The teacher transmits knowledge, but also acts as a facilitator or a guide in situations when the student has doubts throughout the learning process. It is precisely for this reason that it is necessary for the teacher to be not only an expert in their own field of interest, but also to be familiar with the trends in STEM methodology

4. CONCLUSION

Bearing in mind everything stated above, several conclusions can be reached:

- STEM and IT skills, as well as soft skills are necessary for a better position of young women in rural areas in order to improve the quality of their lives and adequately offer their products on the market;
- The developed courses on the proposed platform represent the starting point for the lifelong education of women in rural areas and enable their continuous development;
- Future work refers to the further development of the courses as well as their evaluation with constant contact with the target group.

5. REFERENCES

[1] Bøe, M.V.; Henriksen, E.K.; Lyons, T.; Schreiner, C. *Participation in science and technology: young people's achievement- related choices in late- modern societies. studies in science education*, 47(1), 37-72. 2011.

[2] Bozkurt Altan, E.; Yamak, H.; Buluş Kırıkkaya, E. *FeTeMM Eğitim Yaklaşımının Öğretmen Eğitiminde Uygulanmasına Yönelik Bir Öneri: Tasarım Temelli Fen Eğitimi*. Trakya Üniversitesi Eğitim Fakültesi Dergisi, 6(2), 212-232. (2016).

[3] Durik, A. M.; Hulleman, C. S.; Harackiewicz, J. M. One size fits some: instructional enhancements



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PRAVLJANJE ZNANJEM I INFORMATIKA, Kopaonik 2023.

- [4] to promote interest. *Interest in Mathematics and Science Learning*, 1(1), 49–62. https://doi.org/10.3102/978-0-935302-42-4_3, 2015.
- [5] Martín-Páez, T.; Aguilera, D.; Perales-Palacios, F. J.; Vílchez-González, J. M. *What are we talking about when we talk about STEM education? A review of literature*. *Science Education*, 103(4), 799–822. <https://doi.org/10.1002/sce.21522>, 2019
- [6] truyf, A.; De Loof, H.; Boeve-de Pauw, J.; Van Petegem, P. *Students' engagement in different STEM learning environments: integrated STEM education as promising practice?* *International Journal of Science Education*, 41(10), 1387–1407. <https://doi.org/10.1080/09500693.2019.1607983>, 2019.
- [7] WINNOVATORS – Web Platform, (winnovators-space.eu)