Digital Entrepreneurship Competencies: Empowering Rural Youth through Microcredentials

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Abstract: The aim of this research is to analyse the impact of microcredentials-based training on the development of digital competencies among young people living in rural areas. The authors hypothesise that participation in microcredential-based training significantly improves digital and entrepreneurial competencies, as well as self-confidence and initiative among rural youth. The research seeks to understand how acquiring such competencies affects young people's attitudes toward entrepreneurship and their ability to apply digital tools effectively. Additionally, the study aims to identify how the integration of these two domains – digital competences and entrepreneurship – can contribute to reducing the competences and employment gap in rural regions. The study involves a sample of 200 young people (aged 18–30) from rural areas, who are mainly at the early stages of their professional careers and have limited access to digital resources and/or entrepreneurial education. Participants are engaged in training modules focused on entrepreneurship and digital competencies, allowing for the assessment of the impact of such training on both their personal and professional development. A mixed-methods approach is employed, combining survey questionnaires and comparative analyses to gather both qualitative and quantitative data. The survey questionnaires explore participants' experiences and perceptions of entrepreneurship and the use of digital tools, while the comparative analyses allow for evaluation of the effectiveness of the training in shaping attitudes among rural young people. The research provides insights into the effectiveness of microcredential-based training in enhancing digital and entrepreneurial competences. It contributes to a better understanding of how these competencies influence the potential career development of young people in rural communities. The innovative aspect of this research lies in the application of microcredentials – modern, modular form of learning – in the context of rural youth, while integrating two critical areas: digital competencies and entrepreneurship. This is the first study of its kind to explore this intersection from an academic perspective, offering new insights into the transformative potential of competence development for rural economies.

Keywords: Microcredentials, Digital Competences, Entrepreneurship, Rural Areas, Young People.

1. Introduction

The transformation of rural economies in the context of digitalisation and entrepreneurship has become a central theme in contemporary research on youth employment (e.g.: Saxena 2012; Mazumdar & Ahmed, 2015; Lekhanya 2018). Rural areas in Europe continue to face persistent socio-economic disparities, including limited access to quality education, digital infrastructure, and employment opportunities (Akifieva et al., 2021; Stojanova et al., 2022; Liu & Li, 2024). These challenges are particularly acute for young people, who often encounter structural barriers to entering the labour market or launching entrepreneurial ventures in rural settings (Hotge & Whitby, 2024). At the same time, rural development strategies increasingly underline the role of digital skills and social entrepreneurship as key drivers of youth development (Elia et al., 2020; Rijswijk et al., 2021).

Digital competencies, defined as the confident and critical use of information society technologies for work, leisure, and communication (Heine et al., 2023), are no longer optional, but essential (Peiro & Martinez-Tur, 2022), especially in the context of rural development. Research indicates that rural youth are often lacking digital literacy, due to infrastructural gaps and insufficient training opportunities (Arslan et al., 2021). As such, equipping young people in rural areas with digital competencies is seen not only as a response to the digital development, but also as a foundation for enhancing their employability, social participation, and entrepreneurial capacity (Palacios-Rodriguez 2023; Tomczyk 2024).

On the other hand, entrepreneurship, characterised by the pursuit of innovative solutions to environmental, social, and economic challenges through entrepreneurial approaches, has gained attention as a tool for community empowerment and sustainable rural development (Lipatova et al., 2021; Hossain et al., 2023). Enterprises in rural contexts often address problems such as youth outmigration, underemployment, and access to basic services.

Digital competencies and entrepreneurship are often recognised as strategic aspects for rural development, but there is limited empirical research on their synergies (Kozma et al., 2021). Few studies have explored how digital

tools can enhance the capacity for entrepreneurship in rural surrounding, or how educational training that combines both elements can shape the aspirations and behaviours of rural youth (Haugen et al., 2022). Moreover, the literature suggests that educational interventions in rural areas often lack contextual adaptation, flexibility, and long-term sustainability (Astro & Yasui, 2017; Barrera et al., 2017).

In response to these gaps, microcredentials have emerged as an innovative educational model. Their modular structure and digital delivery make them particularly suited for populations with limited access to conventional education systems (Wheelahan & Moodie, 2021; Oliver 2019). The integration of microcredentials into lifelong learning strategies is increasingly promoted by European policy frameworks, especially in the context of the Digital Education Action Plan and the European Skills Agenda (European Commission 2020; Cedefop 2021).

In the article the authors examine how microcredential-based training can develop digital and entrepreneurship competencies among rural young people. The study investigates how such training influences young people's professional development. Through a mixed-methods approach involving 200 participants aged 18–30 in rural areas, the research offers new insights into how skill development through innovative educational formats can address rural competences gaps.

By situating the research at the intersection of digital inclusion, rural entrepreneurship, and microcredential-based education, this article contributes to an emerging field of inquiry with significant implications for rural policy, educational design, and youth empowerment.

2. Methodology

The research sample consists of 200 young people aged 18-30 from rural areas across selected regions in Poland. Participants were recruited through local youth organisations, educational institutions, and community networks. The inclusion criteria required that participants be at the early stages of their professional careers and have limited prior exposure to structured entrepreneurial or digital training.

The steps of the research methodology were the following:

Step 1: Pre-assessment – participants completed a structured pre-test questionnaire designed to assess basic knowledge of digital tools and related concepts related to the proposed educational training. In order to assess their knowledge, the authors used a 4-point Likert scale. This pre-assessment provided data for comparison with post-training results and allowed identification of competence gaps.

Step 2: Participation in Microcredential Training Programme – participants completed twelve (12) training microcredentials designed in upskillingRural project[1]. The microcredentials covered the following topics:

- M1 – Digital Skills Apps and Tools for Rural Tourism;
- M2 – Digital Skills for Employment;
- M3 – Green Skills;
- M4 – Circular Economy;
- M5 – Employability in Rural Tourism Entrepreneurship;
- M6 – Social Entrepreneurship;
- M7 – Community Engagement & Involvement;
- M8 – Building Long Lasting Networks and Relationships;
- M9 – Internationalization / Foreign Clients;
- M10 – Marketing;
- M11 – e-Marketing -Video based Content;
- M12 – e-Marketing using AI & Metaverse Spaces.

Each microcredentials included PPT presentations, and interactive exercises.

Step 3: Post-assessment (Post-test) – following completion of the proposed training, participants completed a post-test identical in structure to the pre-test. This enabled a direct comparison of knowledge and self-assessed competency levels before and after training, providing a quantitative measure of learning outcomes.

[1] *Transformative change and ensuring sufficient access to learning opportunities for youth of rural areas* (upskillingRural), 2023-2026, No 2023-1-PL01-KA220-YOU-000150982 (Erasmus+ programme).

Step 4: Evaluation of Module Effectiveness – to assess the quality and usefulness of each microcredential, participants rated all twelve microcredentials using five evaluation criteria:

- C1 – Practical applicability and everyday relevance (weight: 0.25);
- C2 – Adaptation to local needs and context (weight: 0.15);
- C3 – Innovation and use of technology (weight: 0.15);
- C4 – Accessibility and learning flexibility (weight: 0.20);
- C5 – Increasing self-confidence and initiative-taking abilities (weight: 0.25).

In order to establish the weights for the criteria, the AHP method was previously used. This methodological approach enables the delineation of crucial elements when selecting criteria. AHP's structured framework, hierarchical representation, pairwise comparisons, mathematical consistency, flexibility, adaptability, and sensitivity analysis capabilities render it a highly apt method for hierarchisation in decision-making processes across diverse domains, including project management, resource allocation, risk assessment, and strategic planning.

Step 5: Weighted Sum Approach (WSA) Analysis – to aggregate the multi-criteria ratings and generate an overall effectiveness score for each microcredential, the Weighted Sum Approach (WSA) method was applied. For each microcredential, the mean score obtained for each criterion was multiplied by the criterion's assigned weight. These weighted scores were then summed to produce a composite score, which formed the basis for ranking the microcredentials. This method allowed a balanced integration of learner perceptions across multiple dimensions, highlighting which microcredential were perceived most impactful from the learners' perspective.

3. Research Results and Discussion

Step 1 and Step 3 concerned the completion of the questionnaire (Tables 1, 2, and 3). The participants responded the questions in the scale 1-5, where 1 means I totally disagree, and 5 – I totally agree.

The questionnaire was divided into three (3) sections: digital competences, green & entrepreneurial competences, and attitudes.

Table 1: Section A – Digital Competences

No	Statement	Average PRE	Average POST	Difference	% Change
A1	I can use digital applications and tools relevant to rural tourism.	2.7	4.2	1.5	55.6%
A2	I am familiar with tools for online collaboration (e.g., Zoom, Teams).	3.0	4.3	1.3	43.3%
A3	I can use social media for promotional purposes.	2.9	4.4	1.5	51.7%
A4	I know the basics of creating video content.	2.4	4.0	1.6	66.7%
A5	I can identify a target audience and match marketing channels.	2.6	4.1	1.5	57.7%
A6	I am familiar with basic AI tools in e-marketing.	2.1	3.9	1.8	85.7%
A7	I understand the concept of the 'metaverse' and its use in marketing.	1.9	3.5	1.6	84.2%
A8	I can independently create a simple online promotional campaign.	2.5	4.0	1.5	60.0%
Average result		2.51	4.05	1.54	61.4%

Source: Authors.

Table 2: Section B – Green & Entrepreneurial Competences

No	Statement	Average PRE	Average POST	Difference	% Change
B1	I understand the concept of circular economy.	2.6	4.0	1.4	53.8%
B2	I can identify specific green actions.	2.8	4.2	1.4	50.0%

No	Statement	Average PRE	Average POST	Difference	% Change
B3	I know the basics of social entrepreneurship.	2.4	4.1	1.7	70.8%
B4	I can describe the structure and ethics of a social enterprise.	2.3	4.0	1.7	73.9%
B5	I am aware of employment opportunities in rural tourism.	3.0	4.3	1.3	43.3%
B6	I feel confident in planning business initiatives in rural areas.	2.5	4.1	1.6	64.0%
B7	I can establish and maintain professional relationships.	2.9	4.3	1.4	48.3%
B8	I know how to engage the local community.	2.7	4.2	1.5	55.6%
B9	I feel prepared to work with international clients.	2.8	4.2	1.4	50.0%
Average result		2.67	4.16	1.49	55.8%

Source: Authors.

Table 3: Section C – Attitudes

No	Statement	Average PRE	Average POST	Difference	% Change
C1	I feel confident using new technologies for work and learning.	3.0	4.4	1.4	46.7%
C2	I feel ready to take initiative in my local community.	2.9	4.2	1.3	44.8%
C3	I know where to look for further training in digital skills.	2.7	4.0	1.3	48.1%
Average result		2.87	4.2	1.33	46.3%

Source: Authors.

The analysis of the pre- and post-training assessment results among 200 participants shows a clear improvement across all measured areas. The evaluation was divided into three main sections: Digital Competences (Section A), Green & Entrepreneurial Competences (Section B), and Attitudes (Section C).

In Section A – *Digital Competences*, the average score before the training was 2.51, while the post-training average rose to 4.05, representing an increase of 61.4%. Participants showed the most significant gains in their familiarity with artificial intelligence tools used in e-marketing and in understanding the marketing potential of the metaverse, both exceeding 80% improvement. Competences related to social media, video content creation, and identifying appropriate marketing channels also saw notable increases, indicating enhanced readiness to use digital tools effectively in the rural tourism sector.

Section B – *Green & Entrepreneurial Competences* also indicated strong improvement. The average pre-training score was 2.67, increasing to 4.16 after the training, which reflects a 55.8% growth. Participants particularly strengthened their understanding of social entrepreneurship and the ethical foundations of social enterprises, with gains of over 70%. They also improved their ability to plan rural business initiatives, identify green practices, and recognise employment opportunities within the rural tourism industry.

In Section C – *Attitudes*, participants' confidence and motivation increased significantly, with the average score rising from 2.87 to 4.20 – an improvement of 46.3%. They reported feeling more confident in using new technologies, more prepared to take initiative in their communities, and more aware of where to seek further digital competences development.

To sum up, the proposed educational programme was highly effective, leading to marked increases in knowledge, practical competences, and confidence levels. The most significant progress was noted in digital literacy and approaches to marketing, but improvements were evident in every category. These results suggest that the program successfully enhanced participants' capabilities for active engagement in rural tourism development.

The next step was the assessment of the usability, the friendliness and the clarity of the microcredentials taking into account the proposed criteria. The WSA method involved multiplying the average score of each microcredential for a given criterion by that criterion's predetermined weight. These weighted scores were then summed across all five criteria to generate a final composite score for each microcredential. This approach allowed the authors to account for both the importance of different evaluation aspects and the perceived performance of each microcredential against those aspects. The resulting weighted totals enabled a robust, transparent ranking of the modules, reflecting a balanced consideration of multiple factors influencing participant preferences. By using WSA, the authors ensured that the final rankings were not skewed by any single criterion, but rather represented a comprehensive assessment aligned with stakeholder priorities.

The assessment of each microcredential considering the indicated criteria is presented in Figure 1.

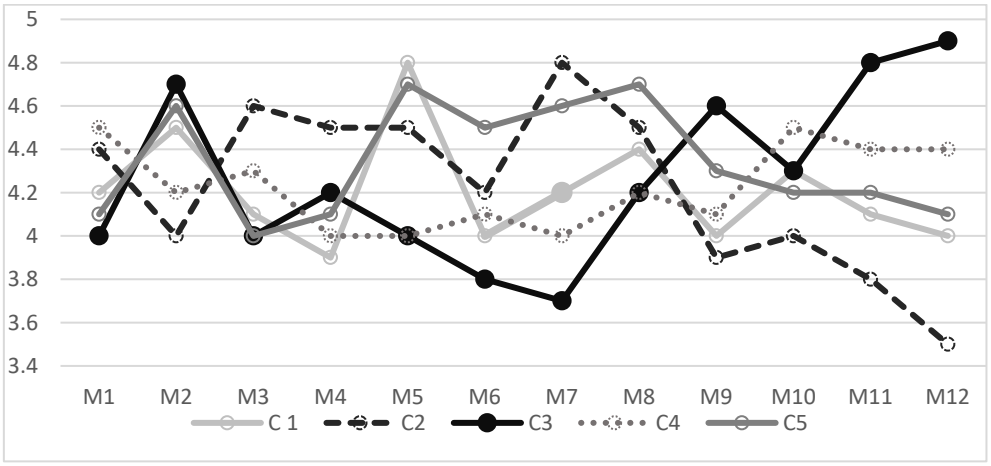

Figure 1: The assessment of the microcredentials using WSA method

Source: Authors.

In order to calculate the final result, the following quota was used:

$$\text{Result} = \Sigma \text{ (average assessment} \times \text{weight)}$$

The results are indicated in Figure 2.

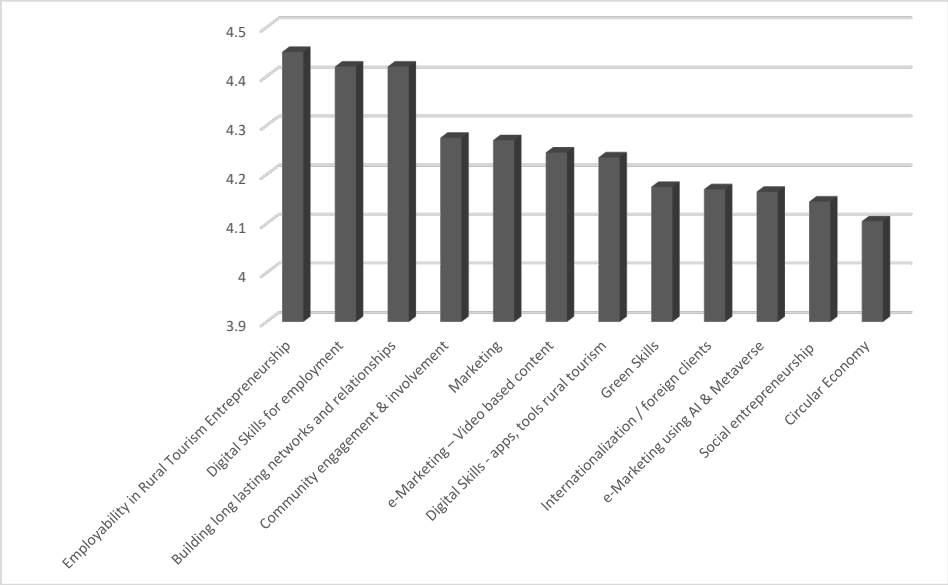

Figure 2: Final results of the comparison

Source: Authors.

Based on the evaluation conducted by the participants, the top-rated module was *'Employability in Rural Tourism Entrepreneurship'.* This microcredential was chosen for its strong practical relevance and alignment with

local needs, especially in rural contexts where tourism offers a viable and sustainable economic opportunity. Participants appreciated that it provides concrete tools for launching and managing entrepreneurial ventures, empowering them to become self-reliant. Moreover, it scored highly in enhancing self-confidence and initiative-taking, which are essential attributes for aspiring entrepreneurs operating in local tourism sectors.

The second place was adjusted to *'Digital Skills for Employment'*, which resonated strongly with participants due to its practical utility and modern content. In a rapidly digitalising world, acquiring competences in digital tools significantly improves employment opportunities. The microcredential's strength lies in its innovative educational programme, its flexibility in learning formats, and its focus on real-world applicability, which together contributed to high scores across multiple criteria.

The same score was achieved by *'Building Long Lasting Networks and Relationships'*, a microcredential that addresses the importance of social capital in both professional and community contexts. Participants valued its emphasis on relationship-building, collaboration, and communication skills – competencies that are important in both entrepreneurship and project-based work. The microcredential's ability to foster confidence and long-term engagement through strategic networking was a key reason for its high evaluation.

The fourth place was taken by *'Community Engagement and Involvement'*, a microcredential closely related to local empowerment. Participants recognised its relevance to rural community development, noting that it encourages them to take an active role in shaping their environment. It was especially well-rated for how it adapts to local needs and contexts, as well as for building a sense of responsibility and encouraging initiatives.

On the other hand, at the end of the ranking the authors identified *'Circular Economy'* microcredential that received the fewest points among all the evaluated microcredentials. Although the topic is highly relevant in the context of sustainability and green transformation, participants perceived the microcredential as abstract and less directly applicable to their immediate needs. The practical utility of the content was rated lower, possibly because the circular economy is a complex concept that may require more contextualisation or examples tailored to rural settings. While its alignment with local and global sustainability goals is acknowledged, participants may have struggled to see how to implement these ideas in their own environments without clearer guidance or case studies.

Just above the aforementioned microcredential, the authors identified 'Social Entrepreneurship' microcredential that also received a relatively low score. It addresses important foundational knowledge, but it was likely viewed as too theoretical and conceptual, lacking the level of hands-on application that many participants were looking for. While topics such as ethics and organisational structure are valuable, participants may have preferred a stronger focus on practical steps, tools, or success stories that show how social entrepreneurship is actually carried out in rural or local contexts. Additionally, it may not have scored as high in the *'Innovation and Use of Technology'* criterion, which was a differentiator for higher-ranked modules.

The third lowest-ranked microcredential, *'e-Marketing using AI & Metaverse spaces'*, also presented a paradox. Although it was rated highly in terms of innovation and technological advancement, its overall score suffered due to limited perceived accessibility and practical relevance to metaverse spaces. For many participants, especially those in rural areas with limited digital infrastructure, the concepts of AI-driven marketing or the metaverse may have seemed too far or disconnected from current capabilities. Despite its cutting-edge content, the microcredential may have lacked enough real-world examples or simplified explanations to make it approachable and useful in their specific contexts.

4. Conclusions

Microcredentials-based training has demonstrated a significant and positive impact on enhancing digital competences among young people living in rural areas. These short, focused, and practical learning experiences are particularly well-suited to the needs of rural youth, who often face barriers such as limited access to traditional education, digital infrastructure, or professional development opportunities.

Through proposed microcredentials, participants gained essential competencies in using digital tools, navigating online work environments, and applying technology to everyday tasks and job-related activities. The flexibility of microcredential formats – including online and hybrid options – was especially beneficial in overcoming geographical limitations and allowed learners to progress at their own pace.

Furthermore, the proposed upskillingRural training fostered not only technical skills, but also broader digital literacy, which is critical for increasing employability and participation in the digital economy. Young people

reported feeling more confident in using technology for communication, problem-solving, and accessing information, which in turn opened up new opportunities for remote work, online entrepreneurship, and digital collaboration.

Importantly, the relevance and practical nature of the content made the learning experience more engaging and immediately applicable. Participants appreciated the real-world orientation of the microcredentials, which helped bridge the gap between abstract digital concepts and their actual use in rural work environments or community projects.

In conclusion, upskillingRural microcredentials-based training serves as an effective and inclusive tool for equipping rural youth with digital competences that are essential for modern employment and community engagement. By combining flexibility, relevance, and practical application, these programmes empower young people to take an active role in the digital transformation of their local areas. The results suggest that participants prioritise practicality, clarity, and personal empowerment in their educational experiences. Microcredentials that bridge theory with practice, and which are adapted to the participants' local context, were clearly more appreciated. This highlights the importance of designing educational content that not only introduces innovative ideas but also ensures that these ideas are tangible, inclusive, and grounded in the participants' everyday realities.

Future research in this area could focus on longitudinal studies that track the actual impact of these educational modules on participants' career development, entrepreneurship success, and community involvement over time. Such studies would help determine whether the microcredentials that received high evaluations in this short-term assessment genuinely lead to measurable outcomes, such as increased employment rates, successful business launches, or greater civic participation in rural areas. Additionally, integrating qualitative methods, such as interviews or focus groups, could provide deeper insight into the personal experiences and perceived value of the training from the learners' perspectives.

Another area of investigation is the adaptability and scalability of these microcredentials across different rural regions or cultural contexts. Researchers could explore how microcredentials need to be adjusted to better fit diverse local realities, infrastructure limitations, or socio-economic conditions. This would also open opportunities to assess the role of digital inclusion and accessibility, especially in relation to advanced topics such as AI and the metaverse, which currently may be beyond the reach of some rural learners but hold future potential.

Finally, future studies might examine educator preparedness and instructional design – investigating how trainers deliver these microcredentials and what support they need to effectively engage rural learners. By linking learner outcomes with pedagogical strategies, research can contribute to the development of more evidence-based, learner-centred educational curricula that bridge innovation with accessibility and empower participants in meaningful, lasting ways.

One limitation of this study is the short-term nature of the evaluation, which does not allow for assessing the long-term impact on employment or business creation. Additionally, the self-reported nature of the questionnaire may introduce bias, and the sample may not be representative of all rural youth demographics.

Ethics Statement

Ethical approvals have been obtained with precautions taken to ensure participants' informed consent and confidentiality.

AI Statement

The authors state that Artificial Intelligence tool was not used in this study.

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