Microcredentials in Adult Education. From Design to Verification

Lessons Learned and Recommendations from the Block.Ed Project

White Paper of the Project Block.Ed – Empowering Adult Learners through Microcredential Blockchain Integration

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Abstract

The Erasmus+ project Block.Ed addresses the need for flexible, quality-assured learning in adult education through microcredentials. This White Paper presents an integrated framework connecting four key components: learning design, quality validation, professional capacity building, and digital credential infrastructure. By implementing a blockchain-enabled platform integrated with Moodle and a Verifier App for tamper-resistant verification, the project demonstrates that technology can enhance security but cannot create trust on its own. Instead, trustworthy credentials fundamentally rely on clear learning outcomes, valid assessment, and robust quality assurance. The White Paper provides actionable recommendations for providers, policymakers, and technology developers to foster interoperable and recognized microcredentials across Europe

Key Words

Microcredentials; Adult Education / Lifelong Learning; Blockchain Technology; Digital Credentials & Verification; Quality Assurance & Validation; Learning Design & Assessment; Interoperability & Trust;

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Content

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Executive Summary

Microcredentials can help adult education respond more flexibly to changing skills needs. They can make learning more modular, provide evidence of specific competences and support learners in presenting what they have achieved. However, their value depends on more than issuing a digital certificate. Learners, employers and education providers need to be able to trust what a credential represents, understand how it was earned and verify its authenticity.

The project Block.Ed explored how microcredentials can be designed and implemented in adult education to support quality, transparency, recognition and trust. The project brought together three closely connected elements: the design and validation of learning, the development of competences among adult learning professionals, and the use of digital technology for issuing and verifying credentials. It developed a Guide for Designing Microcredentials, a Validation Framework, a training course and a blockchain-enabled credential environment, and tested these approaches through practical use cases.

The project experience leads to seven main conclusions:

1. Quality comes before technology. A credible microcredential starts with clear learning outcomes, appropriate assessment and effective quality assurance.
2. Microcredentials should provide evidence of competence. They should communicate what a learner can do, not simply document participation in a course.
3. Adult educators need practical support. Understanding the concept of microcredentials is not enough. Professionals need examples, tools, training and opportunities to apply what they have learned.
4. Common approaches need to allow for different contexts. A shared framework can support consistency, while implementation must reflect national, institutional and learner needs.
5. Blockchain can support trust, but it cannot create it. Blockchain can strengthen the integrity and verifiability of a credential, but it does not replace sound learning design, assessment, quality assurance or the credibility of the issuing organisation.
6. Technology should remain simple for users. Learners and verifiers should benefit from secure digital credentials without having to understand the underlying technology.

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7. The value of a microcredential extends beyond its issue. Credentials need to be portable, understandable and usable, and the competences they represent need to be recognised by relevant organisations.

Since Block.Ed started in 2024, the European and national environment has moved further towards practical implementation of microcredentials. Policy frameworks, digital credential infrastructure and national initiatives have developed, but recognition, quality assurance, interoperability and implementation capacity remain important challenges.

The main message of Block.Ed is therefore not that blockchain is the solution to the challenges of microcredentials. Rather, trustworthy microcredentials require a combination of sound learning design, valid assessment, quality assurance, capable professionals, appropriate technology and recognition beyond the issuing organisation.

For adult education providers, policymakers and technology developers, the priority should now be to move from experimentation towards practical, interoperable and recognised microcredentials that provide genuine value to learners.

1.Introduction

1.2 European developments in microcredentials

Microcredentials have gained increasing attention in European education and skills policy. They are intended to support flexible, targeted learning and to provide evidence of specific competences acquired through short learning experiences.

At the same time, their implementation across Europe remains uneven. Countries and sectors differ in how microcredentials are defined, designed, quality-assured and recognised. The European policy framework provides common principles, but translating these principles into consistent practice remains a challenge. Key issues include quality assurance, assessment, recognition, interoperability and the relationship between microcredentials and existing qualifications.

This is particularly relevant for adult education, where the systematic use of microcredentials is still developing. Block.Ed therefore started from the assumption that the value of microcredentials depends not simply on their format, but on the quality of their design, the competences of the professionals implementing them and the trust that learners and other stakeholders can place in them.

1.2 Why adult education needs trustworthy microcredentials

The value of a microcredential goes beyond providing a digital certificate at the end of a short course. A useful credential should provide credible information about what a learner

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has achieved, how this achievement was assessed and who stands behind the credential. Trust is therefore a central condition for the usefulness and recognition of microcredentials.

This starts with the design of the learning programme. Short learning programmes need clear and assessable learning outcomes rather than simply being shorter versions of existing courses. The relationship between learning outcomes, assessment and the credential should be transparent. Credentials should also be described in ways that allow learners and other stakeholders to understand and compare them across providers and, where possible, across countries. European tools and standards such as the European Skills, Competences, Qualifications and Occupations (ESCO) framework and the European Learning Model can support this process.

Trust also has a digital dimension. As credentials increasingly move from paper-based certificates to digital formats, learners need to be able to store, share and present them, while employers and other stakeholders need reliable ways to verify their authenticity. Digital technologies can support these functions, but they also raise questions about data protection, interoperability, usability and long-term accessibility.

Block.Ed explored blockchain as one possible technological layer for supporting trust in digital microcredentials. The project did not treat blockchain as a substitute for pedagogical quality, quality assurance or institutional credibility. Instead, it examined whether blockchain could strengthen the integrity and verifiability of credentials once the underlying learning and assessment processes had been properly designed.

This distinction is central to the Block.Ed approach: **a technically secure credential is not automatically a meaningful or trustworthy credential**. Trust ultimately depends on the quality of the learning offer, the validity of the assessment, the credibility of the issuing organisation and the ability of relevant stakeholders to understand and use the credential. Technology can support these conditions, but it cannot create them on its own.

1.2 The Block.Ed project

The Erasmus+ project Block.Ed – Empowering Adult Learners through Microcredential Blockchain Integration – was launched in autumn 2024. The two-year project brought together organisations with expertise in adult education, higher education, research, e-learning and technological innovation. Its central objective was to explore how microcredentials could be designed and implemented in adult education in ways that support quality, transparency, recognition and trust.

Block.Ed took an integrated approach. It developed a Guide for Designing Microcredentials and a Validation Framework, followed by a training course for adult

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learning professionals. In parallel, the project developed a blockchain-enabled environment for issuing and verifying digital credentials. These elements were tested through use cases addressing topics including the digital and green transitions, inclusion, diversity and equity.

The project therefore connected three areas that are often addressed separately: **learning design and assessment, professional capacity, and digital credential infrastructure**.

This White Paper brings these areas together. It focuses not on describing the project outputs in detail, but on what the partnership learned from developing, testing and applying them. It also considers how the European and national context has evolved during the project and what these developments mean for the future use of microcredentials in adult education.

The purpose is therefore not to present blockchain-enabled microcredentials as a universal solution. It is to identify **where they can add value, what conditions are needed, and what challenges still need to be addressed**.

2. The Starting Point

When Block.Ed was developed, microcredentials were already part of the European policy debate, but their practical use in adult education was still at an early and uneven stage. There was neither a complete absence of microcredentials nor an established European system. Instead, countries and sectors were experimenting with different forms of short, competence-oriented learning and certification, while common approaches to quality, recognition and digital provision were still developing.

The project's initial needs analysis together with its review of existing validation approaches in the partner countries identified several common challenges, while also showing important differences between national contexts. These findings provided the starting point for the development and piloting work undertaken by Block.Ed.

2.1 A fragmented European landscape

At the beginning of the project, microcredentials were used and understood differently across the six countries represented in the partnership: Slovakia, Greece, Portugal, Germany, Italy and Switzerland. Some countries had already begun to establish legal or policy frameworks, while in others microcredentials were mainly being explored through higher education institutions, projects or individual providers. Many existing approaches originated in higher education, while their systematic use in adult education was less developed.

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This diversity reflected different national traditions and institutional structures. Vocational and continuing education systems, qualification frameworks, higher education initiatives and digital learning environments provided different starting points for developing microcredentials.

At the same time, the comparison revealed a common challenge. Microcredentials were increasingly seen as useful for flexible learning, reskilling and upskilling, but the conditions needed to make them meaningful, comparable and trustworthy were not yet consistently in place.

The national situations illustrated this in different ways. Slovakia had made legislative progress but still faced gaps in training related to microcredentials for adult education institutions and e-learning facilitators. Greece had experience with short learning programmes and MOOCs, but faced technological and recognition challenges. In Germany, microcredentials were emerging within an established vocational and continuing education landscape. Italy had a broad range of approaches to competence certification and continuing education, but recognition procedures varied between institutions and sectors. Portugal was exploring digital and blockchain-supported approaches to make credentials more secure and transparent.

The common picture was therefore one of growing activity, but limited coherence.

2.2 From course completion to evidence of competence

One of the main issues identified by the initial analysis was the relationship between a microcredential and the competence it is meant to represent.

Microcredentials were increasingly associated with short learning opportunities. However, in some cases their granularity remained close to simply completing a course. This raised a basic question: **Does a credential show that a learner has acquired a specific competence, or does it mainly document participation in a learning activity**?

The analysis pointed to the need for competence-based descriptions supported by evidence. Credible microcredentials therefore need:

- clearly defined and assessable learning outcomes;
- alignment with relevant national or European competence and qualification frameworks;
- transparent assessment showing that the stated competences have been achieved; and
- appropriate quality assurance

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This distinction is particularly important in adult education. Adults acquire competences through formal courses, work experience, non-formal learning and other forms of learning. A useful microcredential should therefore communicate more than the fact that a person attended or completed a course. It should provide clear and credible information about what the learner can actually do.

These four elements later became important reference points for the Block.Ed approach.

2.3 Recognition, quality assurance and stackability remained unresolved

A second major challenge was what happened after a microcredential had been issued.

Recognition could not be taken for granted. In several contexts, the value and credibility of a microcredential still depended heavily on the reputation of the issuing institution or on individual recognition arrangements. Quality assurance mechanisms were often linked to higher education institutions or particular sectors rather than to common approaches that could be applied across microcredentials.

The same problem affected stackability. Microcredentials are often described as building blocks that can be combined into larger learning pathways or qualifications. In practice, however, such pathways could not yet be assumed across programmes or countries. Existing systems often relied on credits or institutional recognition without ensuring that microcredentials from different providers could be combined in a meaningful and portable way.

The challenge was therefore not simply whether a provider could issue a digital certificate. The more important question was whether the credential would remain **credible, understandable and useful beyond the original learning context.**

This created a need for practical guidance and validation approaches that adult education providers could use in their own work, rather than relying only on quality assurance systems developed for higher education or specific sectors.

2.4 Digital credentials were developing faster than interoperability

Technology was another area where the initial situation was characterised by experimentation but limited standardisation.

Digital badges and other forms of digital credentials were already available in several contexts, but their use at scale was still developing. Credentials could be stored in portfolios and similar systems, but interoperability between platforms and services was

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not yet seamless. In some contexts, digital badges were still seen mainly as motivational or gamification tools rather than as reliable evidence of competences.

Blockchain-based credential verification was at an even earlier stage. The initial analysis found that it was largely limited to research and pilot projects rather than being an established part of national education infrastructure.

This was the technological starting point for Block.Ed. The project did not enter a mature market in which blockchain-based credentials were already an established standard. Instead, it explored whether blockchain could address a specific problem: **how to strengthen the integrity and verifiability of digital microcredentials**.

This technological question could not be separated from the issues discussed above. A secure credential has limited value if the learning outcomes are unclear, the assessment is weak, or the credential cannot be understood and recognised by others.

2.5 A particular gap in adult education

The initial analysis also highlighted a specific gap. Microcredentials were receiving increasing attention in higher education and vocational education, while adult education had fewer initiatives focused on their practical implementation and on the competences needed by adult learning professionals. The project proposal therefore identified a need to strengthen adult trainers' skills in instructional design, pedagogy and technology for short learning programmes leading to microcredentials.

Implementing microcredentials is not simply a matter of adding a certificate to an existing course. Educational professionals need to make decisions about learning outcomes, assessment, course structure, workload, competence frameworks, quality assurance and credential design. Organisations also need to consider how credentials fit into their existing provision and digital infrastructure.

The needs analysis therefore pointed to a combined challenge: **adult education needed not only a concept for microcredentials, but also the practical capacity to design, validate, issue and use them effectively**.

2.6 Why Block.Ed?

Taken together, the initial analysis pointed to a gap between the growing European interest in flexible, transparent and portable microcredentials and the practical capacity to implement them consistently in adult education.

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Adult education providers needed practical support in four connected areas:

- designing microcredentials around clear learning outcomes and appropriate assessment;
- validating quality and competence evidence;
- building the skills needed by adult learning professionals; and
- using digital technologies to issue and verify credentials reliably.

They also needed practical experience showing how these elements could work together in real learning contexts.

Block.Ed was designed in response to these needs. The project therefore combined pedagogical guidance, validation, professional training, technological development and practical use cases rather than treating any one of these elements as a solution on its own.

The starting point for Block.Ed was therefore one of **potential combined with uncertainty**. Microcredentials offered new possibilities for flexible and competence-oriented adult learning, but important questions about quality, recognition, competence evidence, interoperability and technology remained open.

The following chapters examine what Block.Ed developed in response to these challenges and, more importantly, what the partnership learned from putting these ideas into practice.

3. What Block.Ed developed

Block.Ed translated the needs identified at the beginning of the project into four connected outputs: a Guide for Designing Microcredentials, a Validation Framework, a training course for adult learning professionals, and a blockchain-enabled platform with a Verifier App for issuing and verifying digital credentials.

Together, these outputs address four aspects of microcredential provision: **design, quality assurance, professional capacity and technology**.

3.1 Guide for Designing Microcredentials

The Guide for Designing Microcredentials provides practical guidance for developing, implementing and assessing microcredentials in e-learning. It covers the main stages in the microcredential lifecycle, including learning outcomes, instructional design, assessment, quality assurance and verification.

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The Guide also addresses the role of the awarding body and shows how European frameworks and tools, including ESCO and the European Qualifications Framework (EQF), can support the design and description of microcredentials. It also introduces the potential uses of blockchain and discusses related challenges.

The Guide is intended as a practical resource for professionals developing short learning programmes that lead to microcredentials.

3.2 Validation Framework for Microcredentials

The Validation Framework complements the Guide by providing a structured approach to assessing the quality and effectiveness of microcredentials.

It defines criteria and standards for validation and proposes a process that can include peer review, expert evaluation and stakeholder feedback. The Framework is designed to be adapted to different providers, educational sectors, contexts and target groups.

It also includes tools and examples that providers can use to assess their own short learning programmes and identify areas for improvement.

The Framework therefore provides a practical way of checking whether a microcredential meets defined quality requirements before and during implementation.

3.3 Training Course for Adult Learning Professionals

Block.Ed also developed an e-learning course for adult trainers and other professionals involved in designing and delivering learning programmes with microcredentials.

The course translates the concepts introduced in the Guide and Validation Framework into a practical learning experience. It addresses the knowledge and skills needed to design short learning programmes, apply appropriate pedagogical and instructional-design approaches, and integrate microcredentials into e-learning provision.

The course was subsequently piloted with participants from partner organisations. The results of this piloting are discussed in Chapter 4.

3.4 Blockchain-enabled Microcredential Platform and Verifier App

The technological component of Block.Ed consists of a blockchain-enabled platform for issuing and managing digital credentials, integrated with a Learning Management System (LMS). The project used Moodle as the LMS environment.

The **Block.Ed architecture** represents an issued digital certificate on the blockchain through a non-transferable **SoulBound Token (SBT)** and associated cryptographic

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information, including a **hash** of the certificate. The full certificate is not stored on the blockchain as a complete document. Instead, the blockchain stores its tamper-resistant digital representation and associated cryptographic information, which can be used to support credential verification.

The project also developed an **Android Verifier App** through which Block.Ed certificates can be checked. The verification process uses the information contained in or linked to the credential to reconstruct or check the relevant cryptographic information against the blockchain record.

It is important to distinguish this role of blockchain from other conditions for the portability and value of a microcredential:

- **Blockchain** supports the **integrity, authenticity, traceability and verification** of the digital credential record;
- **Standards and interoperable** systems support **portability and exchange** across platforms;
- **Recognition and practical value** depend on education and training **providers**, **employers** and other relevant **stakeholders**.

Trust in a microcredential is therefore built across several layers, and blockchain addresses only one of them. It does not determine whether the underlying learning programme is of sufficient quality, whether the assessment provides valid evidence of competence, or whether another organisation will recognise the credential. These functions depend on learning design, assessment, quality assurance, standards and the wider recognition ecosystem.

3.5 From individual outputs to an integrated approach

Block.Ed brings its pedagogical, validation, professional and technological outputs together in an integrated four-step framework for developing and implementing trustworthy microcredentials: **The Block.Ed integrated framework for trustworthy microcredentials in adult education**.

The framework connects the quality of the learning offer with validation, the competences of the professionals implementing it, and the digital infrastructure used to issue and verify credentials.

The four elements of the framework are intended to work together: microcredentials are first designed around meaningful learning outcomes and appropriate assessment (**Guide**), then validated for quality (**Validation Framework**), implemented by appropriately supported professionals (**Training Course**), and finally issued and made verifiable through digital credential infrastructure (**Platform and Verifier App**).

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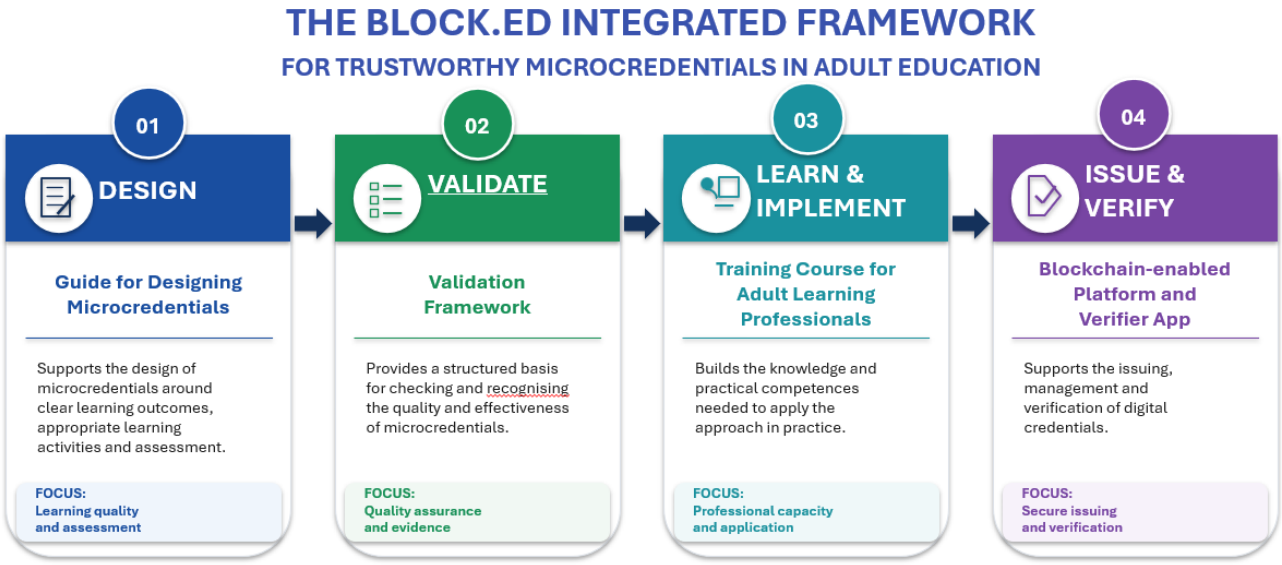
Fig. 1 The Steps of the Block.Ed Framework



The project tested this integrated approach through training activities and practical use cases. The following chapter examines what the partnership learned from putting the framework into practice.

4. Lessons learned from the implementation

The development of the Block.Ed outputs provided a basis for testing the integrated framework in practice. The project piloted the Training Course, applied the Guide and Validation Framework in 19 short learning programmes, and implemented the Platform and Verifier App for credential issuing and verification. In this way, the implementation phase tested how the different elements of the framework worked together in practice.

The experience showed that the main challenges are not only technical. Designing credible microcredentials requires clear learning outcomes, appropriate assessment, quality assurance and practical competences among those who develop and deliver them. Technology can support this process, but it also introduces new requirements for integration, technical support and interoperability.

The following sections summarise what worked well, what proved difficult and what the project experience suggests for future implementation.

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4.1 Designing high-quality microcredentials

The Guide for Designing Microcredentials and the Validation Framework were tested as part of the project training and piloting activities. The feedback was broadly positive, particularly regarding the clarity of the design process, the learning objectives and the description of the assessment process.

More than 90% of respondents rated the course structure and its modular sequencing positively. Learning objectives received the strongest rating of all evaluated dimensions, with no participant disagreeing that they were clearly defined. Participants also rated the Guide and Validation Framework positively and found the terminology and design steps easy to understand.

The results also identified areas for improvement. Some participants asked for a stronger balance between theoretical content and practical activities, including more case studies, exercises and real-world implementation scenarios. The practical resources in the Guide, such as worked examples and evaluation rubrics, received more mixed feedback than its conceptual content.

These findings point to two practical lessons. First, microcredential design processes benefit from clearly defined and assessable learning objectives expressed in plain language. Second, guidance is more useful when it breaks a complex design task into explicit steps and supports these steps with examples and opportunities for practice.

4.2 Supporting adult educators

The training course was piloted with 61 participants from Greece, Germany, Slovakia and Italy. Most participants were teachers, trainers or lecturers, while others worked as education managers, researchers or in related roles. Most had little or no prior experience with microcredentials.

The results showed a clear increase in participants' knowledge. Average knowledge scores rose from 7.36 in the pre-assessment to 9.92 in the post-assessment, corresponding to an improvement of 34.78%. Participants also reported a good understanding of learning outcomes, implementation, quality assurance and validation.

The course was also well accepted. Participants considered it relevant to their professional work, found the Moodle-based learning environment easy to navigate and were highly willing to recommend the course to others.

At the same time, the evaluation revealed an important gap between **understanding and application**. Participants were generally confident that they understood the concepts, but were more cautious about applying them independently in their own institutions. About one third remained neutral when asked about their confidence in

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applying the knowledge in practice.

This suggests that training alone is not enough. Adult learning professionals need opportunities to practise the design and implementation of microcredentials, work with realistic examples and receive feedback. They may also need access to technical support, particularly when implementation involves digital credentialing or blockchain-based systems.

The pilot therefore points to a practical principle for future capacity building: **combine conceptual learning with hands-on application and continued support during implementation**.

4.3 Implementing blockchain in practice

Block.Ed tested blockchain as a technological layer for issuing and verifying digital microcredentials. The implementation connected Moodle with a private, permissioned blockchain infrastructure and automated the registration and verification of certificates. The experience showed that blockchain can be integrated into an existing learning environment without requiring major changes to the learner's normal workflow.

Box 1 Technical Implementation in Block.Ed

Technical implementation at a glance

Learning environment: Moodle
Blockchain: Private, permissioned blockchain based on Quorum
Credential: Digital certificate linked to a verifiable credential

Integration: Moodle connected to the blockchain through an intermediary service and APIs

Issuing: Completion of the learning activity triggers automatic registration of the credential

Verification: Credentials can be checked through a QR code or URL

Data: Personal data is kept off-chain; the blockchain is used to register the credential and support its integrity and verification

Purpose: To provide a tamper-resistant and independently verifiable record of issued credentials

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Integrating blockchain into existing systems

One of the main lessons was that blockchain should not be treated as a separate learning platform. In the Block.Ed implementation, Moodle remained the main environment for learners. Once a learner completed a course, the existing certificate process triggered the blockchain registration automatically. An intermediary service connected the LMS and the blockchain infrastructure through APIs. This kept the two systems technically separate and avoided modifications to the Moodle core.

This approach reduced the impact of the technology on existing educational processes. It also showed that integration is an important part of the implementation challenge: institutions need to be able to use the benefits of digital credentialing without having to redesign their entire learning environment or take on extensive additional administrative work.

Keep the technology in the background

The pilot showed that learners do not need to understand blockchain in order to use a blockchain-supported credential. Learners continued to receive their certificates through the LMS, while blockchain registration took place automatically in the background. Verification could be initiated through a QR code or URL.

This is an important usability principle**: the technology should be largely invisible, while its benefits should be visible.** For learners and verifiers, the relevant functions are receiving, storing, sharing and checking a credential – not understanding the underlying blockchain infrastructure.

Verification, privacy and trust

The implementation also demonstrated the potential of blockchain-supported credentials to provide a tamper-resistant record that can be checked by third parties. The verification process was designed to use the information needed to confirm the authenticity of a certificate without unnecessarily exposing personal data. This is particularly relevant where digital credentials need to be shared with employers, education providers or other organisations.

At the same time, the project experience confirms an important limitation: **technical verification is only one part of trust**. A blockchain can provide evidence that a credential was issued and has not been altered, but it cannot establish whether the underlying learning programme was meaningful, whether the assessment was appropriate or whether the issuing organisation is credible. These questions depend on the educational and quality-assurance processes described in the preceding sections. Similarly, blockchain-based verification does not by itself make a credential portable across systems or ensure its recognition by other organisations. Portability depends on

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standards and interoperability, while recognition depends on the acceptance and use of the credential by relevant education and training providers, employers and other stakeholders.

Interoperability and practical implementation

Interoperability was an important design principle. The use of APIs and defined interfaces means that the approach is not tied to changes in the Moodle core and can potentially be adapted to other learning environments. The open technologies used in the project also support reuse and adaptation by other organisations.

The experience therefore points to a broader principle for digital credential systems: **interoperability should be designed from the beginning**. Credentials should not be restricted to a single proprietary platform if they are expected to remain useful beyond the organisation that issued them.

Technical feasibility is not the same as practical necessity

The project implementation did not identify significant scalability problems for the expected use case. The number of transactions associated with certificate issuance was relatively limited, and the permissioned blockchain infrastructure was able to handle the expected volume.

However, the project does not provide evidence that blockchain is necessary for microcredentials in general. It demonstrates that blockchain-supported issuing and verification are technically feasible and can be integrated into an existing learning environment. Whether blockchain is the appropriate solution for a particular organisation depends on the requirements for trust, verification, interoperability, data protection and long-term maintenance.

The main lesson from Block.Ed is therefore not that adult education providers should adopt blockchain. It is that **technology should be chosen according to the problem it needs to solve**. Where blockchain provides clear additional value for the integrity and verification of credentials, it can be used as part of the infrastructure. Where simpler technologies meet the same requirements, there may be no reason to introduce the additional complexity of blockchain.

4.4 Experiences from the Use Cases

The use cases provided the most direct test of whether the Block.Ed approach could be applied in real adult-learning contexts. Across the partnership, 19 short learning programmes were developed in the areas of Green, Digital and Inclusion, Diversity and Equity. Six programmes – one from each partner – were selected for piloting.

The use cases differed in topic, target group and national context, but several common

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patterns emerged.

Microcredentials work best when they focus on a clearly defined learning purpose. The programmes generally addressed specific competences or practical knowledge rather than trying to compress a full course into a shorter format. This supports the original Block.Ed approach of using microcredentials for targeted learning and upskilling.

Context matters. Partners adapted their programmes to national priorities and specific learner groups. The topics ranged from inclusive teaching and leadership to sustainability, digital skills and workplace-related competences. The common approach could therefore be used across different contexts without requiring identical learning content.

The credential is only as strong as the learning and assessment behind it. The use cases reinforced the importance of a clear connection between the learning programme, assessment and credential. The digital credentialing process can support this relationship, but cannot compensate for weak learning design or assessment.

Several factors supported successful implementation:

- clear and manageable learning objectives linked to a specific competence or learning need;
- practical relevance to participants' professional or everyday contexts;
- adaptation to national and thematic contexts;
- a clear link between learning, assessment and certification; and
- a combination of pedagogical and technical support.

The implementation also exposed several limitations. Technical integration required specialised expertise, and not all adult education providers can be expected to have this capacity. Providers also need skills in instructional design, assessment, quality assurance and digital credentialing.

Finally, the use cases highlighted a question that should guide future technology choices: **Can the technology be used?** is not the same as **Should it be used?** Blockchain can support secure issuing and verification, but its benefits need to be weighed against the additional technical and organisational effort.

Overall, the use cases showed that a common approach can work across different national and thematic contexts, provided that learning content is adapted and providers have access to appropriate pedagogical and technical support.

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4.5 Cross-cutting lessons

Taken together, the development and piloting of the different elements of the Block.Ed integrated framework point to seven lessons for the future implementation of microcredentials in adult education.

1. Quality comes before technology

A credible microcredential starts with clear learning outcomes, appropriate assessment and effective quality assurance. The technology used to issue the credential cannot compensate for weaknesses in these areas.

2. Microcredentials should provide evidence of competence

A microcredential should show what a learner has achieved, rather than simply document participation in a course. This requires a clear link between learning outcomes, assessment and the credential.

3. Practical guidance needs practical application

Guidance and frameworks can make the design process clearer, but professionals also need examples, templates, practice and feedback to develop the confidence to apply them.

4. Capacity building is essential

Implementing microcredentials requires competences in areas such as instructional design, assessment, quality assurance and digital credentialing. Training therefore needs to combine conceptual knowledge with practical application and continued support.

5. A common approach can support different contexts

The 19 use cases showed that a shared methodology can be applied across different topics, learner groups and national contexts. The common framework should support consistency without requiring identical learning content.

6. Blockchain can support trust, but it is not a solution in itself

The project demonstrated that blockchain can support the secure issuing and verification of digital credentials. It addresses only part of the trust question, however. The credibility of a microcredential still depends on the quality of the learning and assessment process and on the credibility of the issuer. Blockchain does not by itself ensure portability or recognition: portability depends on interoperability and common standards, while recognition depends on relevant organisations accepting and using the credential.

7. The value of a microcredential extends beyond the course

Issuing a credential is only one step. Its value also depends on whether learners can

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understand, store, share and use it, and whether relevant organisations recognise the competence it represents. Interoperability, portability and recognition therefore remain important challenges.

5. How the landscape has evolved since 2024

When Block.Ed started in autumn 2024, microcredentials were already well established in the European policy debate, but their practical implementation remained uneven. The project's initial analysis identified several challenges: the need for clearer competence-based descriptions, reliable quality assurance, recognition and stackability, better interoperability of digital credentials, and more practical experience with new technologies. Blockchain-supported credentials were still largely at the pilot and research stage.

Two years later, the landscape has moved further from exploration towards implementation. European policy has become more focused on implementation and monitoring, digital credential infrastructure has matured, and several partner countries have introduced or prepared concrete measures. At the same time, the developments show that many of the challenges identified in 2024 have not disappeared. Recognition, quality assurance, interoperability and implementation capacity remain important issues.

The main change is therefore not that the challenges have been solved, but that **the discussion has moved closer to practical implementation**.

5.1 Changes at the European Level

Since the beginning of Block.Ed, the European approach to microcredentials has moved further from policy development towards implementation and monitoring.

A significant development was the European Commission's 2025 Progress Report on the implementation of the 2022 Council Recommendation on microcredentials[1]. Based on information from all EU Member States and three associated countries, the report examines progress in areas including common definitions and standard elements, quality assurance, recognition, funding and the use of microcredentials across higher education, VET and employment. The systematic monitoring of implementation reflects an important shift: attention is moving from the potential of microcredentials towards their actual adoption and integration into education, training and employment systems.

[1] https://op.europa.eu/en/publication-detail/-/publication/d6e3213e-daf4-11f0-8da2-01aa75ed71a1/language-en

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Cedefop has also expanded its work on microcredentials. Its current research phase (2025–2027) looks in particular at microcredentials emerging outside formal education and training, their use in specific labour-market sectors and their potential contribution to social inclusion[2]. This points to a broader understanding of where microcredentials may be used, including company-based and sector-based learning.

Microcredentials are also becoming more closely connected to European skills policy. The European Skills High-Level Board, established in 2026, has called for stronger links between businesses, education and training providers and regional authorities, and identifies microcredentials as one possible element of more flexible skills development[3].

A further change concerns the technical infrastructure for digital credentials. The European Learning Model (ELM) has been further developed, and the European Commission has brought key elements of the ELM and European Digital Credentials infrastructure together in an open-source repository. These developments provide organisations with more common data models, documentation and technical resources for describing, issuing and verifying learning credentials.

For microcredentials, the practical significance is important: Europe is moving towards a more shared infrastructure for digital learning credentials. This strengthens interoperability and portability, but it does not make blockchain a European standard. The European approach is based on common data models, digital signatures and interoperability standards, which can be implemented using different technologies.

Overall, the European landscape is more mature, but it is not yet consolidated. The main challenge is increasingly practical: **how to make microcredentials work reliably within education and training systems, ensure their quality and recognition, respond to skills needs, and make digital credentials genuinely portable and useful**.

5.2 National Developments in the Partner Countries

The national updates show that the microcredential landscape has become more concrete since the beginning of Block.Ed. The pace and form of development differ between countries, but the available updates point to a common shift: microcredentials are moving from individual projects and policy discussions towards more structured approaches within adult learning, vocational education and skills development.

Several countries have introduced or strengthened policy and institutional frameworks

[2] https://www.cedefop.europa.eu/en/projects/microcredentials-labour-market-education-and-training
[3] https://employment-social-affairs.ec.europa.eu/news/european-skills-high-level-board-calls-stronger-business-education-links-boost-europes-skills-2026-07-15_en

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for microcredentials and short, competence-based learning. In some cases, this includes new legislation, quality-assurance arrangements or funding programmes. At the same time, digital credentialing is becoming more established, with providers increasingly exploring European standards and infrastructures for issuing and verifying digital credentials.

The developments also show that progress at policy level does not automatically translate into widespread use. Recognition by employers and education providers remains uneven, and approaches to quality assurance, certification and interoperability are still developing. Smaller adult education providers may also face practical barriers, particularly where implementation requires new technical systems or specialist expertise.

The five countries therefore represent different stages of a broader transition. Some have already established elements of a national framework, while others are still developing the structures and practices needed for wider adoption. What they have in common is that the questions identified in the initial Block.Ed analysis – particularly around quality, recognition, interoperability and implementation capacity – remain relevant, but are increasingly being addressed in practical rather than purely conceptual terms.

Table 1 Country Developments since 2024

Country	Main Developments	Main Remaining Challenges
Germany	Growing uptake, especially in higher education	Fragmentation and limited adult-education uptake
Greece	Stronger policy basis and ongoing national development	Implementation and common QA
Italy	Stronger links between competence certification, VET and digital credentials	Fragmentation and recognition
Portugal	Expansion of modular and digitally supported learning	Cross-system recognition
Slovakia	New legal and institutional framework	Moving from regulation to adoption

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6. Recommendations

The Block.Ed integrated framework for trustworthy microcredentials in adult education provides the basis for the recommendations that follow. As set out in Chapter 3.5, the framework brings together four complementary elements: the design of meaningful microcredentials, their validation for quality, the competences required to implement them, and the secure issuing and verification of digital credentials. The experience of applying these elements in practice also shows that trustworthy microcredentials depend on conditions beyond the individual steps of the framework, particularly interoperability and recognition by relevant stakeholders.

The central finding of Block.Ed is therefore that trustworthy microcredentials require more than a technological solution. They depend on the combination of sound learning design, reliable assessment and quality assurance, competent educators, secure credential issuing and verification, interoperability, and an ecosystem in which credentials can be understood, recognised and used.

The following recommendations translate these findings into practical guidance for adult education providers, policy makers and technology providers.

6.1 For Adult Education Providers

1. Start from a clear learning need

Microcredentials should address a specific and meaningful competence need. Providers should avoid simply shortening existing courses and labelling them as microcredentials.

2. Design learning, assessment and the credential as one package

Learning outcomes, learning activities, assessment and the information contained in the credential should be closely aligned. The credential should provide credible evidence of what the learner has achieved.

3. Use proportionate quality assurance

Providers should establish clear criteria for the quality of their microcredentials and, where appropriate, involve peers or external experts in their validation. Quality assurance should be robust enough to ensure credibility, but proportionate to the size and purpose of the learning offer.

4. Build practical competences and support

Developing microcredentials requires competences in learning design, assessment, quality assurance and digital credentialing. Staff need opportunities to learn by doing,

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using examples, templates and feedback. Where digital credentialing requires specialist knowledge, providers should have access to appropriate technical support.

5. Design for portability and use technology only where it adds value

Providers should use recognised standards and structured metadata and consider from the outset how credentials can be stored, shared and verified outside their own learning environment. Technology should serve a clearly defined purpose. Blockchain or other advanced technologies should not be objectives in themselves; providers should choose the simplest solution that meets their requirements for security, verification and interoperability.

6.2 For Policy Makers

1. Focus on implementation

European and national frameworks are increasingly in place. The priority should now be to make them work in practice across adult education, VET, higher education and employment.

2. Strengthen recognition and trust

Microcredentials need to be understandable and credible beyond the organisation that issued them. Policy makers should support common approaches to quality, transparency and credential information and encourage recognition by employers and other education and training providers.

3. Support interoperability

National systems should align with European digital credential infrastructures and standards. This can reduce fragmentation and make credentials easier to use and verify across institutions and borders.

4. Support smaller providers

Digital credentialing can create significant technical and organisational demands, particularly for small adult education organisations. Shared infrastructure, guidance, training and support services can help ensure that smaller providers are not excluded.

5. Connect microcredentials to real skills needs

Microcredentials can respond to changing skills needs, but only if their development is informed by labour-market, sectoral and regional needs. Cooperation between employers, education and training providers and public authorities should therefore be strengthened.

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6. Evaluate before scaling

New microcredential offerings should be monitored for participation, completion, learning outcomes, recognition and relevance to learners and the labour market. Decisions to expand an offering should be based on evidence of its value rather than simply on the number of credentials issued.

6.3 For Technology Providers

1. Design for interoperability, not technological lock-in

Credentialing solutions should use open standards and allow credentials to move between different platforms, wallets and verification services.

2. Keep technical complexity in the background

Users should not need to understand blockchain, cryptography or data models in order to receive, store or verify a credential. Technical complexity should be handled by the system wherever possible.

3. Integrate with existing learning environments

Technology should connect with commonly used LMS and education systems rather than requiring providers to build entirely new infrastructures. APIs and clearly defined interfaces can help achieve this.

4. Make verification simple and accessible

Employers, education providers and learners should be able to verify a credential quickly and understand what it represents. A dedicated verifier application can provide a convenient interface for this purpose, as demonstrated by the Block.Ed Verifier App. However, verification should not be restricted to a single proprietary platform or service. The underlying credential should remain verifiable through open standards and interoperable verification mechanisms.

5. Design for long-term validity

Digital credentials need to remain verifiable even when software, institutional systems or cryptographic technologies change. Long-term preservation and mechanisms for handling status changes should therefore be considered from the beginning.

6. Start with the educational use case

Technology providers should work closely with educators and learners. The purpose of credentialing technology is to support trustworthy recognition of learning, not to make the technology itself the centre of the solution.

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6.4 For future Erasmus+ Projects

1. Build on existing European infrastructure

Projects should avoid developing parallel systems where established European standards and infrastructures already exist. Compatibility with initiatives such as the European Learning Model and European Digital Credentials for Learning should be considered from the outset.

2. Pilot in real educational contexts

Technical development should be accompanied by genuine use with learners, educators and organisations. Real-world piloting reveals organisational and pedagogical challenges that technical testing alone cannot identify.

3. Allow time for iteration

Guidance, training and technology all benefit from testing and refinement. Project plans should allow sufficient time for piloting, feedback and improvement rather than treating piloting as a final validation step.

4. Involve the wider microcredential ecosystem

Projects should involve not only education providers and technology developers, but also learners, employers, quality-assurance actors and policy makers. Their perspectives are important for assessing whether credentials are useful and recognised in practice.

5. Measure practical value, not only project outputs

Success should not be assessed primarily by the number of courses, credentials or technical components produced. Evaluation should also consider learning outcomes, usability, recognition, portability and benefits for learners and providers.

6. Treat technology as one component of the solution

Projects should continue to explore innovative technologies, including blockchain where appropriate, but technology should be considered alongside the wider questions of quality, trust, recognition and interoperability.

6.5 Conclusion: From more credentials to better credentials

The recommendations point to a common principle: the aim should not be to produce more microcredentials as such, but to make the credentials that are produced meaningful, trusted and useful.

Block.Ed's experience shows that trustworthy microcredentials require several elements to work together. The Block.Ed integrated framework brings together meaningful learning design, robust validation, competent implementation and secure issuing and verification.

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Educational quality, appropriate recognition and interoperable digital infrastructure must work together to ensure that credentials are not only trustworthy, but also useful in practice.

Trust is therefore built across several layers rather than provided by any single element or technology. Blockchain can support the integrity, authenticity, traceability and verification of the digital credential record, but it does not determine the quality of the learning and assessment process, ensure portability across systems, or guarantee recognition by other organisations.

The central lesson is therefore to focus not simply on producing more credentials, but on creating the conditions for better credentials: credentials that are meaningful, trusted, portable and recognised.

7. Outlook

7.1 The future of microcredentials in adult education

Microcredentials are likely to become a more established part of adult education as learning needs become more diverse and skills need to be updated more frequently. Their value, however, will depend less on the number of credentials issued than on their quality, recognition and practical use.

The main opportunity is to make adult learning more flexible and responsive to changing individual and labour-market needs. Microcredentials can provide focused learning opportunities that are easier to complete and recognise and that can, where appropriate, be combined with other learning over time.

The next phase should therefore focus less on promoting microcredentials as a new format and more on integrating them into existing adult education and lifelong-learning systems. This includes stronger links to skills needs, qualifications and progression pathways, as well as greater recognition by employers and other education and training providers.

The developments described in Chapter 5 suggest that many of the basic policy and technical conditions are now being established. The next challenge is to make microcredentials work reliably across different providers and systems and to ensure that they provide genuine value for learners.

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7.2 The future role of blockchain

Block.Ed demonstrated that blockchain can provide a reliable infrastructure for issuing and verifying digital microcredentials. At the same time, developments at European level show that blockchain is not a prerequisite for digital credentialing. European Digital Credentials for Learning are based on common data models, digital signatures and interoperability standards that can be implemented without blockchain.

The future role of blockchain should therefore be considered pragmatically. It may provide advantages in specific contexts, particularly where a shared and tamper-resistant record adds value. But its use also brings additional requirements for infrastructure, governance, technical expertise and long-term maintenance.

The central objective should therefore not be to use blockchain, but to provide **trustworthy, portable and interoperable credentials**. Blockchain should be one possible technical option where its specific properties provide clear added value.

For adult education providers, this means that technology choices should start with the requirements of the credential and its users. As European digital credential infrastructures develop further, compatibility with common standards is likely to be more important than the choice of a particular underlying technology.

7.3 Remaining challenges

Several of the challenges identified at the beginning of Block.Ed remain unresolved. Recognition by employers and across education and training systems is still uneven. Quality assurance needs to be credible while remaining proportionate to the size and purpose of a learning offer. Many providers, particularly smaller organisations, need additional capacity and technical support. Interoperability between systems and the long-term validity of digital credentials also require further attention.

These challenges are interconnected. A technically verifiable credential has limited value if the learning behind it is not trusted. A high-quality learning programme has limited value as a digital credential if it cannot be understood or verified outside the issuing organisation. And a well-designed microcredential will have limited impact if learners and employers do not know how it can be used.

The future development of microcredentials will therefore depend on building trust across the whole ecosystem: trust in the learning offer, in its assessment and quality assurance, in the issuing organisation and in the digital credential itself.

Block.Ed contributes to this development by showing how pedagogical, organisational and technological elements can be brought together in practice. The next step is to apply

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and test these lessons more widely, while continuing to improve the quality, recognition, interoperability and usability of microcredentials.

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White Paper

Microcredentials in Adult Education.

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