



Advancing research on adult learning

Using and innovating quantitative approaches to support effective policies

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ABSTRACTS

Measuring Attitudes and Opportunities to Adult Learning and Education: Bridging the Theoretical and Measurement Gap

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Despite growing political ambition around lifelong learning, participation in Adult Learning and Education (ALE) across Europe remains persistently low and deeply unequal. The European Union's target of 60% adult participation by 2030 stands in sharp contrast to the current EU average of just 46.6%, with adults holding lower levels of educational attainment lagging far behind. Understanding why this gap persists requires not only better policy, but better measurement.

Existing large-scale surveys, most notably the Eurostat Adult Education Survey (AES) and the OECD's Programme for the International Assessment of Adult Competencies (PIAAC), have not kept pace with theoretical advancements in the field. Contemporary frameworks, like adult learning systems theory (Desjardins, 2017; Desjardins & Kalenda, 2025) and comprehensive lifelong learning participation model (Boeren, 2016, 2023), conceptualise ALE participation as a multilayered interaction between individuals' attitudinal and motivational dispositions on the one hand, and the structural opportunity conditions available to them on the other. Yet, both AES and PIAAC continue to operationalise behavioural variables, namely barriers to participation, in ways that are both theoretically inadequate and methodologically narrow.

Two interconnected deficiencies stand out. First, current surveys treat participation primarily as a mechanical outcome driven by available provision and individuals' resources, sidelining the attitudinal and motivational drivers that a substantial body of social science (from expectancy-value theory and self-determination theory to the theory of planned behaviour) has long identified as central. Concepts such as perceived relevance and value of learning, expected returns, self-efficacy beliefs, prior learning experiences, and social norms around education are largely absent from the dominant measurement frameworks, resulting in a systematic misspecification of the behavioural decision-making process that underlies participation.

Second, the operationalisation of opportunity structures in existing surveys is critically restricted. Barrier items are typically presented only to non-participants who have already expressed a willingness to learn, leaving the views of the broader adult population, including those who never considered participating, entirely unmeasured. This routing design forecloses more detailed analysis of how adults across the full participation spectrum perceive the availability, accessibility, affordability, and flexibility of ALE provision, or the roles they assign to the state and employers in supporting access.



Together, these deficiencies produce a systematically incomplete picture of why adults do or do not engage with learning. This paper argues for a reconceptualised approach to barrier measurement that captures the interaction between attitudinal drivers and opportunity structures across the entire adult population, regardless of participation status or expressed intention. Such an approach, more closely aligned with current theoretical frameworks, would yield substantially more robust evidence for diagnosing participation inequality and designing policies capable of expanding ALE in a genuinely inclusive direction.

Informal learning: four measurement shortcomings and potential ways forward

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This presentation will investigate ongoing challenges with the conceptualisation and operationalisation of ‘informal learning’. While informal learning is recognised as a valuable pathway to skills development, it continues to receive limited attention in wider lifelong learning policies. We will review scholarly debates on the definitions of informal learning, contrast these with the measurement of informal learning in leading international survey programmes, and present potential scenarios for future measurement.

The triadic classification distinguishes between formal education, non-formal education and training and informal learning (Kalenda & Boeren, 2025). Europe’s Classification of Learning Activities (CLA-2016) defines the three types through nine attributes, entailing (1) intention to learn, (2) organisation, (3) institutional framework and location, (4) hierarchy grade-level structure, (5) admission requirements, (6) registration requirements, (7) pre-defined teaching / learning methods, (8) duration of at least one semester, and (9) recognition of the programme by the relevant national education or equivalent authorities (Eurostat, 2016). While formal education meets all nine attributes, CLA-2016 defines informal learning through the absence of these attributes, except for the intention to learn. CLA-2016 provides the conceptual framework for the operationalisation of ‘participation in adult learning’ variables in the Eurostat Adult Education Survey.

Recent research by the OECD has shown variation in definitions of informal learning as adopted by its Member States (OECD, 2025). However, current approaches to operationalisation and measurement does not reflect such diversification. Firstly, the CLA-2016 takes an explicit stance on the intentional nature of informal learning while scholarly debates have argued that not all learning is conscious and deliberative (Schugurensky, 2000; Assinger & Biasin, 2023). For example, adults additionally learn new things incidentally and often unconsciously. Secondly, CLA-2016’s categorical nature ignores debates on the ‘fuzzy’ boundaries between formal, non-formal and informal learning. Such research suggests measuring adult learning participation through continuous rather than categorical variables (Eraut, 2004). Thirdly, current measurement does not reflect the nuances between individual informal learning versus informal learning with or from others (Lofti et al., 2025). Fourthly, measurement has not yet fully kept pace with emerging forms of informal learning such as GPT chatbots, interactive learning games, and remote working platforms (OECD, 2025).

As part of our presentation, we will showcase novel approaches to measurement on informal learning. A novel survey project in the Czech Republic developed a new questionnaire that addressed the four shortcomings listed above. Data were collected among 1237 adults between the



ages of 25 and 64. We will unpack the survey team's approach to the operationalisation of informal learning and compare its findings with the more limited approach taken in other international surveys.

Vignette studies as a third way to shed light on decision-making for lifelong learning

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The measurement of adult learning through surveys such as the AES or CVTS often focuses primarily on participation or barriers, asking respondents whether they participated or not. Policy advice is frequently derived from the analysis of these participation patterns by European research teams (e.g., CEDEFOP 2015, Käpplinger et al. 2024; Markowitsch et al. 2013). Occasionally, costly randomized field experiments are conducted—for instance, regarding the use of vouchers (cf. Schwerdt et al. 2012)—to estimate the effects of public interventions.

Vignette studies (or factorial surveys) might be able to offer a 'third way' between these two approaches. They provide the opportunity to ask prospective questions based on specific scenarios and their attractiveness. Thus, they can reveal which policy interventions are more or less likely to influence individual behavior.

This presentation will first provide a brief overview of already existing vignette studies especially in adult learning research (e.g. Osiander&Dietz 2016, Osiander&Stephan 2018, Nisic&Auspurg 2009). Secondly, a recent study (Käpplinger et al. 2022) and selected results will be presented. These results highlight the fundamental need to inform effectively the public about co-funding possibilities, as many individuals are simply unaware of these options or even rights. Consequently, their participation decisions suffer very often from a lack of basic information. Finally, the presentation will discuss the pros and cons of vignette studies and their potential role in policy advice.

Advancing Quantitative Models for Measuring Adult Learning and TVET Participation in Dynamic Labour Markets

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Accelerating technological change, restructuring of global value chains, and shifts in occupational skill demands have intensified the need for robust quantitative approaches to measure adult learning participation. Technical and Vocational Education and Training (TVET) play a pivotal role in equipping adults with labour market relevant skills; however, its measurement remains fragmented across surveys and administrative systems. Persistent issues of recall bias, inconsistent classification of modular or work based TVET, and limitations in cross country survey comparability constrain policy relevant inferences.

This study aims to: (1) diagnose and quantify measurement error in existing adult learning and TVET indicators; (2) develop an integrated methodological framework for combining heterogeneous survey and administrative datasets; and (3) estimate the causal impact of adult learning and TVET participation on labour market outcomes, particularly resilience to automation-induced risks.

The analysis employs a multi-method quantitative design. Measurement validity is assessed through latent class analysis (LCA) and item response theory (IRT) models to detect misclassification,



differential item functioning, and survey response inconsistency across demographic subgroups. To improve data integration, probabilistic record linkage, multiple imputation via chained equations

(MICE), and model-based harmonisation are applied to merge microdata from adult education surveys, labour-force surveys, and administrative TVET enrolment systems. Determinants and outcomes of adult learning are analysed using hierarchical linear models, generalised structural equation modelling (GSEM), and double machine learning (DML) estimators, enabling semi-parametric causal inference with high dimensional covariates. Survey-design diagnostics—nonresponse modelling, calibration weighting, and design effect adjustment—ensure estimator robustness.

Preliminary findings reveal systematic under-reporting of TVET participation in self-reported surveys, particularly in short cycle and employer provided programmes. LCA and IRT models indicate measurement non invariance across age, educational attainment, and migration background. Integrated datasets show that adults participating in modular or sector-specific TVET exhibit significantly higher probabilities of upward occupational mobility and reduced exposure to automation vulnerable tasks. DML estimates suggest that these effects persist after adjusting for selection bias, employment history, and workplace characteristics.

The results underscore the need for: (1) harmonised TVET classification systems and improved survey instruments to reduce measurement error; (2) integrated data infrastructures linking survey and administrative systems to provide policymakers with real-time, occupation-specific skill intelligence; (3) targeted investment in flexible, modular, and work-based TVET pathways to support adults in automation susceptible sectors; and (4) evidence-driven policy cycles that incorporate causal impact metrics into TVET programme design and funding mechanisms. These advances can enhance the responsiveness, scalability, and inclusiveness of national adult learning systems.

By applying advanced quantitative modelling techniques and integrating heterogeneous data sources, this study provides a rigorous empirical foundation for improving measurement of adult learning and TVET participation. The findings demonstrate how methodological innovation can directly inform the development of effective, equitable, and future ready skills policies in rapidly changing labour markets.

Measuring competences as relational affordances: a methodological proposal for assessing adult learning in innovation contexts

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European definitions of competence, including those adopted by Cedefop, recognise competence as the ability to apply learning outcomes in a defined context. However, the prevailing quantitative instruments used to measure adult competences tend to treat them as stable individual attributes, effectively disconnecting measurement from the context in which competences are actualised. This tension generates two documented but insufficiently measured phenomena: skills underutilisation, as highlighted by the European Skills and Jobs Survey (ESJS), and the low transfer rate of training investments targeting adults, particularly within CVET aimed at organisational innovation. The consequence for European policy is a systematic underestimation of the contextual determinants of learning outcomes.

The paper proposes a multilevel measurement framework — the Relational Potentials Matrix (RPM)



— that operationalises adult competences as affordances: possibilities for action that emerge from the coupling between (a) the person’s potentials, (b) the socio-technical and organisational configurations of the workplace, and (c) the available opportunities for innovation. Inspired by

Gibsonian ecological psychology and relational ontology, the framework does not replace traditional individual assessments, but integrates them with contextual and coupling measures, producing operationally quantifiable indicators of potential–context fit.

The RPM is structured around three sets of measurable variables:

Individual potential indicators — relational sensitivity, repertoire of action patterns, perceptual attunement capacity, operationalisable through validated Likert scales and situational judgment tests;

Contextual affordance indicators — decision-making structure, latitude for experimentation, time horizons, stakeholder alignment, operationalisable through composite indices derived from organisational surveys;

Actualisation indicators — frequency and quality of episodes in which individual potential is translated into innovative action, measurable through event sampling and behavioural traces.

The interaction among the three levels is modelled through multilevel Structural Equation Modelling (ML-SEM) to estimate causal paths between individual potentials, contextual mediators, and actualisation outcomes, and through latent class analysis (LCA) to identify typological profiles of person–context coupling that predict differences in learning and innovative performance.

A pilot application is currently underway in selected Italian organisations across four sectors — tech, manufacturing, consulting, and the public sector — with the aim of testing the construct validity and predictive power of RPM indicators in relation to adult learning outcomes. For adult learning policymakers, the framework proposes an operational shift in perspective: from funding decontextualised certifications to co-funding learning ecosystems in which competences can be actualised. For European monitoring systems, it suggests introducing indicators of actualisation alongside the currently predominant measures of participation and completion.

This contribution directly addresses Track 1 of the call, concerning theoretical considerations on the measurement of adult learning, and also engages with Track 3 by proposing design elements for multilevel surveys. It opens a methodological discussion on how to integrate the contextual dimension into large-scale European surveys — such as AES, CVTS, and ESJS — thereby moving beyond the limitations of purely individual-level measures.

Methodological Challenges in Researching Adult Participation in Lifelong Learning: Between Standardisation and Cultural Conditionality

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Measuring adult participation in lifelong learning represents one of the key areas of contemporary educational policy and research. Although standardized methodological frameworks have been developed to enable international comparability of data, the application of identical instruments



across different cultural and educational contexts raises a number of epistemological and methodological issues. These include the boundaries between categories of formal, non-formal, and informal learning; cultural perceptions of learning; traditions of educational systems; as well as language and the interpretation of survey questions.

This paper analyses the fundamental approaches to measuring adult participation in learning and critically examines the limitations of applying these approaches within diverse cultural and educational traditions. The study is based on the assumption that adult participation in learning is not a neutral indicator, but rather reflects the culture of learning, labour market and educational structures, educational policies, and prevailing social norms. Particular emphasis is placed on differences in the definition of learning, the interpretation of research instruments, and the influence of institutional and socio-economic factors on research outcomes.

Measuring Adult Participation in Dual VET for Policy Development

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Work-based learning is a powerful tool for supporting adult learning and human resource development; however, its full potential has not yet been fully exploited in Europe (Cedefop, 2025). The preparation of a qualified workforce remains a key challenge for European vocational education and training (VET) systems. Expanding work-based vocational education and training to a broader range of target groups could significantly contribute to addressing this challenge in times of economic and social transformation.

The present study aims to analyse the possibilities for developing a concept of dual education for adults through the application of an analytical approach. The paper proposes models for measuring the participation of adults in dual forms of training that may support the formulation of adult education policies. Data on the participation of adult learners in dual education are presented, alongside concepts for its broader implementation in response to the needs of a transforming labour market. The study seeks to determine the extent to which the current dual education system is open not only to young people, but also to adults, including unemployed adults. Particular attention is paid to the profile of adult learners participating in dual forms of training and to the occupations in which professional qualifications have been acquired in recent years.

Adult vocational education and training represents a field of research with considerable potential (Vidigal-Alfaya et al., 2024), and an increasing number of countries are seeking ways to implement it more effectively. Gessler and Howe (2015) emphasize that adult upskilling and reskilling, alongside labour market transformation, are two parallel and interconnected processes, highlighting the role of work-based learning in the development of professional competences.

Dual education may provide an effective solution to the mismatch between labour market demand and the supply of skills and could become a major focus of lifelong learning programmes across all Member States of the European Union.



The Atlas of Work and Qualifications and the National System of Skills Certification in Italy: Territorial Dynamics and Initial Quantitative Analyses

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The National System for the Certification of Skills (SNCC), established in Italy by Law 92/2012 and governed by Legislative Decree 13/2013, represents the fundamental regulatory framework for the recognition of lifelong learning. In a global context characterized by rapid technological transitions, the traceability and portability of skills acquired in formal, non-formal, and informal contexts have become strategic levers for employability and competitiveness in the labor market. This paper presents the results of the first national quantitative monitoring conducted by INAPP, aimed at mapping the implementation status of Identification, Validation, and Certification (IVC) services in the Regions and Autonomous Provinces.

The research is based on a structured dataset constructed by collecting administrative data from 17 regional and provincial administrations, covering the four-year period 2018-2021. Subsequent monitoring is in the process of being started.

A multidimensional survey design was adopted that integrates variables related to the type of training program (leFP, IFTS, regional training, IVC), the relevant Economic Professional Sector (SEP) according to the Atlas of Work, and the socio-demographic characteristics of the recipients.

A total of 1,009,889 certifications were issued during the period analysed. The analysis highlights a clear prevalence of third-party certifications (75.3%) and a strong concentration in the formal context (97.3%), confirming the still limited use of validation services for non-formal and informal learning (2.7%). Regional vocational training represents the primary issuance channel (74.9%).

From a sectoral perspective, approximately 59% of the certifications were associated with a specific SEP. The leading sectors are Tourism Services (17.4%), Common Area (15.3%), Mechanics (14.4%), and Social and Health Services (11.3%). The time trend shows a significant contraction in document production in the two-year period 2019-2020 (-35.8%), attributable to the effects of the COVID-19 pandemic, followed by a partial recovery in 2021. Regarding users, a progressive rebalancing of gender (49.5% women in 2021) and a prevalence of young recipients (18-24 years old) are observed.

The monitoring reveals an active system, but one characterized by "gradual operation" and marked regional heterogeneity. Although Lombardy and Piedmont lead in quantitative production, there is a critical need to further standardize digital archiving procedures and improve the interoperability of regional information systems. The consolidation of the SNCC therefore appears to be conditioned by the ability to fully integrate the recognition of non-formal contexts and complete the referencing of qualifications to national standards, fundamental objectives for supporting the occupational transitions envisaged by the PNRR and the New Skills Plan.

Labour Market Information Systems for Skills Anticipation: A Comparative Benchmark of Tools and Institutional Landscapes

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Skills anticipation is the backbone of effective adult upskilling, vocational education and training (VET), and workforce development policy. Without reliable, timely intelligence on how labour



market demands are evolving, policymakers lack the evidence base needed to design responsive training systems, allocate resources efficiently, or anticipate emerging skill gaps. Yet building or reforming a Labour Market Information System (LMIS) capable of generating such intelligence is a complex undertaking — one that requires a clear understanding of the full landscape of available tools (traditional and emerging), their interactions, and the institutional conditions under which they can be effectively deployed.

This paper pursues two objectives. First, it provides a comprehensive comparative benchmark of LMIS tools and the institutional landscapes that employ them, mapping and characterising the main skills anticipation tools identified across the case studies. This includes differentiating traditional tools (surveys, administrative records, econometric models, occupational taxonomies, sectoral expert panels) from 4.0 innovations (Big Data analytics, natural language processing applied to online vacancy data, machine learning-based nowcasting, and AI-driven occupational classification), and analyzing the conditions that render them effective across four dimensions: institutional design, data sources, analytical tools, and dissemination mechanisms. Second, drawing on the comparative findings, it offers guidelines for policymakers seeking to design or reform an LMIS — framing the process as an audit of existing capacities and data sources, identification of gaps, and the gradual integration of existing tools with new ones into a coherent, functional system. To pursue both objectives, the study draws on a structured comparison of eight case studies (Germany, Australia, France, Canada, Colombia, South Korea, England, and Spain), combining systematic desktop research with semi-structured expert interviews with specialists in key fields.

The findings show that 4.0 tools represent a qualitative leap, enabling near-real-time, granular, occupation-level skill-demand tracking that was previously unattainable. However, the effectiveness of 4.0 tools hinges on two critical preconditions. First, they require a digitalized and largely formalized labour market — conditions common across developed economies but a binding constraint in lower-formality contexts. Second, they require deliberate prior system design: data must be pre-structured and drawn from multiple complementary sources so that it can be meaningfully crossed, producing a coherent and interoperable system rather than fragmented outputs. Indeed, traditional tools are not displaced by 4.0 innovations; they provide the structural backbone that makes advanced analytics meaningful. Beyond the tools themselves, translating data into policy advice demands more than good data or sophisticated tools. As the cases of Germany, Canada, and South Korea demonstrate, it requires a clear institutional architecture with defined roles, sustained continuity, and strong cohesion among key actors. Emerging technological tools substantially expand the potential of LMIS but harnessing that potential is ultimately a matter of deliberate, careful policy design.

Beyond Surveys: Towards Integrated Data Infrastructures for Adult Education Providers

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Research on adult learning has long relied predominantly on survey-based data collected at the participant level. While such data illuminate demand-side dynamics — who participates, under what conditions, and with what outcomes — they remain structurally blind to the supply side: what providers offer, where, and to whom. Yet participation in adult education is not solely a function of individual motivation or barriers; it is shaped by the provider landscape within which individuals act.



Understanding adult education participation dynamics and learning outcomes therefore requires data on providers, not just participants. At the same time, surveys at both the participant and the provider level have become significantly more costly and difficult to conduct over the past two decades, as response rates decline and data collection burdens grow. Recent developments in data science, such as including automated data extraction, machine learning, and large language models, open new avenues for provider-level data collection that do not depend on survey response, by drawing on the fragmented administrative, textual, and digital trace data that providers already generate.

This presentation proposes a conceptual framework for building integrated data infrastructures for adult education providers and illustrates it with a case study of German adult education centres. The core argument is that meaningful quantitative analysis of adult education supply – its scope, structure, responsiveness to labour market demands, and regional variation – requires linking heterogeneous data sources into a coherent, interoperable infrastructure rather than treating each source in isolation.

The German case draws on publicly funded adult education centres (Volkshochschulen, AECs), the largest provider group of this kind in Germany. Data on AECs currently exist across several disconnected sources: an annual statistics survey providing long-term aggregate time series; a database of semi- and unstructured course announcement texts from approximately half of all AECs; and digitised historical programme data for a selected subset. Beyond these, administrative data held in commercial course management software used by AECs represent a largely untapped source with considerable potential.

Systematically collecting and linking this data would unlock analytical possibilities that none of the sources individually support. Survey data provide the longitudinal institutional backbone; administrative software data contribute nested, episodic records on courses, instructors, and participants; and text corpora allow systematic analysis of programme content at scale using machine learning and large language models. Together, they enable research into thematic trends, regional disparities, qualification demand, instructor employment structures, and course realisation patterns – questions that are currently out of reach given the fragmented data landscape.

The broader contribution of this work is a replicable architecture that other European countries could adapt for their own provider landscapes, and a basis for future cross-national data integration. As European policy increasingly demands fine-grained evidence on adult learning participation and outcomes, the capacity to build and maintain such infrastructures becomes a research priority.

Restricting Temporary Contracts Increases Firm-Provided Training: Evidence from Spain

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We examine whether restricting temporary contracts increases firms' investment in worker training, exploiting Spain's 2022 labour market reform. Using 3.1 million online job postings from 2018 to 2024, we implement a difference-in-differences design that leverages pre-reform variation in reliance on temporary contracts across occupations. More exposed occupations shifted toward permanent hiring and increased advertised training relative to less exposed occupations. Training



rose by 4.3 percentage points, fully closing the pre-reform gap by 2024. These results provide evidence that longer expected employment duration increases firms' investment in training, identifying a channel through which labour market regulation can shape human capital formation.

From Tasks to Qualifications: Advancing Adult Learning Intelligence through Online Job Postings

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This study proposes a novel framework to support adult learning policies by linking occupations and tasks observed in online job postings to formal qualification systems. Starting from labour demand, occupations classified under Lightcast Occupation Taxonomy\ESCO\CP2021 are enriched with task-level information derived from the Lightcast Tasks library, which provides a structured taxonomy of work activities, task-skill relationships, and time-use estimates across roles. This allows moving beyond job titles and skills alone to capture the actual content of work as performed in the labour market.

Using this approach, job postings are first classified into occupations and then decomposed into task profiles, leveraging task-skill linkages and task frequency/intensity measures. Each occupation are subsequently mapped to Areas of Activity (ADA) within the Italian Atlante del Lavoro, enabling a structured connection to national qualification standards (IeFP, ITS, IFTS). In this way, qualifications are analysed not only in terms of declared learning outcomes, but also in relation to the real tasks performed in the labour market.

A key contribution of the paper concerns the explicit use of task-level analysis to assess the impact of technological change, including artificial intelligence. Tasks represent the most granular and operational unit of work and are therefore particularly suited to analyse how automation and AI reshape occupations. By leveraging Lightcast task metrics (e.g. cognitive, analytical, creative dimensions and exposure to automation), it becomes possible to identify which tasks are more susceptible to automation, which are augmented by AI, and which remain human-intensive. This enables a more precise understanding of how job content evolves within occupations and supports the identification of emerging task bundles requiring reskilling or upskilling. Integrating this perspective into adult learning analysis allows policymakers to anticipate not only which skills are needed, but how work itself is changing, providing a stronger basis for designing adaptive and future-proof training systems.

Methodologically, the paper integrates NLP techniques for occupation and skill extraction, task inference models based on Lightcast Tasks, and semantic mapping across occupations, tasks, and qualifications. This enables a task-based skills gap analysis, identifying discrepancies between the activities required by employers and those embedded in adult learning pathways.

The contribution addresses key challenges in adult learning measurement by providing a more granular and operational link between labour demand and training provision. It supports policy development by offering evidence on how adult education systems can better reflect evolving job content, particularly in the context of digital and green transitions. The proposed framework is



scalable and transferable, providing a foundation for comparative and longitudinal analysis across countries and adult learning systems.

Developing Internationally Comparable Questions for Measuring Non-Formal Adult Education: Towards Better Evidence for Policy Making

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As rapid technological change, global economic shifts, and evolving labour markets reshape the demands placed on individuals, adult education is increasingly critical for supporting adaptability, critical citizenship and lifelong employability. Non-formal education forms a vital pillar of lifelong learning, providing adults with flexible opportunities to update and expand their skillsets. In contrast to formal education, non-formal education does not aim at obtaining a formal qualification but is usually intended for a specific and often narrowly defined need for further training. Despite the rising importance of non-formal education, the lack of its consistent and internationally comparable measurement remains a significant challenge for researchers and policymakers.

Unlike formal education, which is measured using robust frameworks such as the International Standard Classification of Education (ISCED), non-formal education lacks standardized and cross-nationally reliable survey tools. The commonly used triadic classification of learning activities (Eurostat, 2016) – categorizing formal, non-formal, and informal learning – has been called into question. Recent work (Kalenda & Boeren, 2025) draws attention to the risks of misclassification and compromised validity in participation data when this rigid distinction is employed. Previous findings (Widany et al., 2019; Babayiğit et al., 2021) have demonstrated that even variations in measurement within a country can produce widely differing results. This lack of consistency complicates the interpretation of data and hinders effective policymaking.

This presentation introduces a conceptual and methodological project aimed at developing internationally comparable survey questions to more accurately measure adult learning activities, particularly non-formal education. Drawing on established frameworks and existing surveys – including the Adult Education Survey, the Labour Force Survey, and the OECD’s Programme for the International Assessment of Adult Competencies (PIAAC) — the presentation outlines a critical review of current measurement practices, highlighting strengths and limitations. It will discuss ambiguities in the boundaries between non-formal and informal learning and the implications for policy monitoring, resource allocation, and research.

The proposed research will focus on:

- Reviewing existing survey instruments and classification systems for adult learning activities.
- Identifying conceptual and practical challenges related to the triadic classification and its impact on data quality.
- Suggesting principles for question development that increase clarity, reduce misclassification, and enable reliable cross-country comparisons.



- Outlining a strategy for engaging stakeholders and improving comparability in future surveys.

The presentation seeks to engage participants in dialogue and exchange, welcoming feedback and critical perspectives that can inform the development of improved survey questions and enhance evidence for effective adult education policy.

This work is highly relevant to the conference's themes of advancing quantitative methods, innovating measurement of adult learning, and supporting evidence-based policymaking. By addressing conceptual and methodological gaps, the project aims to contribute to the development of more responsive and equitable adult education systems across Europe and beyond.

Making Adult Learning Visible: Methodological Lessons from the Human Capital Study (BKL)

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Adult learning practices are changing faster than many survey instruments used to measure them. Adults increasingly develop competencies through courses, short training, workplace instruction, mentoring, seminars, digital resources, and activities related to personal interests. However, they do not always recognise these practices as “education” or “training”, especially when the questions use school-like, abstract or negative connoted terms. This creates a methodological problem with direct policy consequences: without a reliable diagnosis of how adults actually learn, public interventions can underestimate participation, misidentify groups requiring support, and overlook important learning environments.

This paper discusses the methodological approach developed in the Human Capital Study (Bilans Kapitału Ludzkiego, BKL), a long-running national research programme conducted by the Polish Agency for Enterprise Development and Jagiellonian University. BKL was designed as an evidence infrastructure for skills policy: its aim is not only to measure participation in adult learning, but also to diagnose human capital, skills development, and skills mismatch in Poland. The adult learning module therefore asks who learns, in what forms, in which contexts, and which groups remain outside organised opportunities for competence development.

The paper draws on nationally representative BKL surveys conducted between 2010 and 2025, focusing on the redesigned adult learning module introduced in 2017. The BKL approach retains the standard distinction between formal, non-formal, and informal learning, but changes the way participation is elicited. The main innovations include simpler and more respondent-friendly language; avoiding terms that may evoke school-based or negative associations; replacing broad filter questions with concrete lists of activities; distinguishing job-related and non-job-related non-formal learning; identifying mandatory training separately; and including selected forms of workplace learning, such as instruction, mentoring, coaching, job shadowing, and task rotation. The redesign was preceded by desk research, analysis of Polish and international survey instruments, expert review, and cognitive pretesting.



The findings show that the survey design substantially affects adult learning indicators. Earlier BKL waves, using questions closer to LFS- and AES-type formulations, produced much lower participation estimates. After the redesign, participation in formal or non-formal learning increased to 56% in 2017 and remained relatively stable in subsequent waves: 53% in 2019, 51% in 2021 and 54% in 2025. In 2025, non-formal learning was reported by 53% of adults aged 25–64, or 41% when mandatory health and safety training was excluded. Workplace learning was reported by 38%, while overall participation in any form of learning reached 76%. By comparison, AES 2022 and LFS 2024 indicate formal or non-formal learning participation in Poland at around one fifth of adults aged 25–64.

The paper argues that adult learning indicators are shaped by wording, sequencing, recall support, and operational definitions. It also shows how national survey innovation can complement European statistical systems by making non-formal and workplace learning more visible. Improving measurement is therefore a condition for better adult learning policy and more effective public intervention.

Beyond Certification Counts: Rethinking the Measurement of Operational Competence in Adult Learning Systems

Karl Daniel Klee, *Researcher, EDUNAUK*

European adult learning and vocational education systems are increasingly expected to support labour market adaptability, productivity growth and economic competitiveness under conditions of digital transformation, demographic change and evolving workforce demands. At the same time, employers across multiple sectors continue to report persistent skills gaps and insufficient workplace readiness despite rising participation rates, qualification attainment and certification outputs. This raises an important measurement question: do current adult learning indicators sufficiently capture operational competence under real workplace conditions?

This paper explores the possibility of a structural “level gap” between formally certified competence levels and actual operational capability in practice. Current measurement systems in adult learning frequently focus on participation, completion, qualifications, self-assessment measures and standardised learning outcomes. While these indicators provide valuable information on educational attainment and system participation, they may insufficiently capture autonomous task execution, transferability of skills, independent problem-solving and performance under real conditions of responsibility and uncertainty.

The paper critically discusses whether existing quantitative adult learning indicators may unintentionally overestimate operational workforce readiness by relying predominantly on formal educational outputs rather than workplace capability indicators. This issue may become increasingly relevant in digitally transforming work environments where operational adaptability and independent task performance are critical. The paper further examines how such gaps may contribute to employer dissatisfaction, retraining costs, qualification inflation and reduced trust in formal qualification signals despite continued investment in adult learning and upskilling policies.

Methodologically, the paper adopts a conceptual and diagnostic approach with implications for quantitative measurement research. Existing European datasets and indicator systems, including the Adult Education Survey (AES), the Programme for the International Assessment of Adult Competencies (PIAAC), and the European Skills and Jobs Survey (ESJS), are discussed in relation to their ability to capture operational competence dimensions. The paper explores the potential use of proxy-based indicators for identifying possible “operational decoupling” between certification levels and autonomous workplace capability. Potential proxy dimensions include task autonomy, independent problem-solving, supervision dependency, transferability under changing work conditions and perceived workplace readiness.

Rather than proposing a comprehensive new measurement framework, the paper argues for expanding current adult learning measurement discussions toward indicators more closely connected to operational capability and workplace performance realities. Improving the measurement of operational competence may support more effective policy targeting, strengthen employer trust in qualification systems and improve alignment between adult learning investments and workforce productivity outcomes. The paper concludes by identifying areas for future empirical and longitudinal research concerning the relationship between certification, competence and workforce readiness in adult learning and vocational education contexts.

Measuring Adult Learning Beyond Participation: Conceptual, Methodological and Policy Challenges in Lifelong Learning Research

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Adult learning is still most often monitored through binary participation rates in formal or non-formal education and training within a fixed reference period. While these indicators enable cross-national benchmarking, they can also narrow what “counts” as adult learning by treating engagement as attendance and by flattening heterogeneity in learning settings, volumes, motivations, and consequences. Participation-only metrics can obscure inequality (who learns and who is excluded), misrepresent continuity and effort (how much and how steadily people learn), and underplay learning outcomes that matter for employability, resilience, productivity and social inclusion. Recent scholarship has reopened this debate by questioning the comparability of large-scale survey estimates, the one-dimensional treatment of participation, and the limited attention given to learning purpose, intensity, and broader outcomes.

Objectives: The paper (1) synthesises recent peer-reviewed debates on the limits of participation-only indicators; (2) develops an integrated measurement framework spanning five interrelated dimensions—participation, inclusion, intensity, purpose and outcomes; and (3) derives implications for quantitative survey design and policy monitoring that make measurement more equity-sensitive and policy-relevant.

Methodology and data sources: This is a conceptual review and framework-building exercise. It integrates evidence from lifelong learning research, adult education policy studies, and survey methodology, with attention to definitional choices (formal/non-formal/informal learning), reference periods, recall and social-desirability bias, item non-response, and sampling coverage. The discussion



is anchored with illustrative examples from widely used quantitative infrastructures for adult learning monitoring, including the Eurostat Adult Education Survey (AES), EU Labour Force Survey (LFS) ad hoc modules, and OECD PIAAC.

Key arguments and expected contribution: Participation-only measures conflate access with engagement and treat heterogeneous learning episodes as equivalent, thereby understating stratification by education, occupation, age, gender, migration status, health, and employment precarity. The proposed framework specifies: (i) participation as entry into learning opportunities; (ii) inclusion as the distribution of opportunities, barriers, and supports across social groups; (iii) intensity as volume, frequency, and continuity of engagement across time; (iv) purpose as the functions and motivations of learning (for example work-related upskilling, career mobility, civic participation, and personal development); and (v) outcomes as economic, social, civic and personal consequences, recognising that outcomes may be intended or unintended and may unfold over different time horizons. A central claim is that measurement choices are not neutral: they shape which learning is visible, which learners are counted, and which policy levers appear justified.

Relevance: The paper responds to the seminar's focus on advancing and innovating quantitative approaches by proposing candidate survey modules and indicator principles: multi-period participation windows; intensity modules capturing hours and continuity; structured purpose taxonomies; explicit measures of barriers and supports (time, cost, employer support, care responsibilities, information and guidance); outcome follow-ups; and systematic equity-focused disaggregation. Together, these recommendations aim to improve interpretability, make hidden learning visible (including low-intensity and non-credential learning), and strengthen the evidence base for evaluating adult learning policies.

Rethinking Adult Learning in the Age of AI: Digital Competence, Didactic Change and Inclusive Learning Design

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Adult learning systems are entering a new phase of transformation shaped by artificial intelligence, automation, platform-based learning environments, and changing labour-market demands. These developments affect not only what adults need to learn, but also how learning is designed, facilitated, assessed, and supported. The recent update of the European Digital Competence Framework, DigComp 3.0, reflects this shift by integrating AI competence transversally across digital competence areas while maintaining the framework's technology-neutral structure. This creates a timely policy and research challenge: how can adult learning systems capture not only participation in learning, but also the pedagogical and didactic changes required for adults to develop relevant, critical, and inclusive digital competences?

This paper addresses this challenge by proposing a structured analytical approach for examining adult learning design in the context of AI and digital transformation. The study focuses on how adult



educators and trainers translate digital competence priorities into learning activities, and how these activities reflect emerging requirements related to AI literacy, critical evaluation of information, data awareness, learner agency, collaboration, feedback, and inclusion. The paper asks: how is digital competence operationalised in adult learning design; what didactic shifts are visible in the use of digital and AI-related tools; and how can such shifts be captured through measurable indicators?

The analysis draws on empirical data collected through a professional development and curriculum innovation process involving more than 200 adult educators and trainers working in adult, vocational, and non-formal education settings. The dataset includes structured lesson and learning plans, training-cycle outputs, and focus group evidence. The core method is quantitative content analysis of learning plans. A coding framework was developed to classify several dimensions: competence areas addressed; references to AI-related knowledge, skills and attitudes; didactic function of digital tools; forms of learner participation; assessment and feedback strategies; inclusion and adaptation measures; and links to transversal and employability skills. Descriptive statistics are used to identify dominant patterns, while cross-tabulations explore relationships between competence orientation, didactic purpose, technology use, and inclusion strategies. Qualitative focus group data are used to contextualise the quantitative findings.

Preliminary findings suggest that digital technologies are still often used for presentation, information search, communication, and assessment, while more transformative didactic uses — such as learner co-creation, adaptive learning, personalised feedback, collaborative problem-solving, and critical reflection on AI and data — remain less visible. The findings indicate that AI challenges adult learning systems to move beyond access and tool adoption towards intentional learning design, where technology is aligned with competence development, ethical awareness, learner needs, and inclusive participation.

The paper contributes to the seminar by offering a practical way to generate quantitative indicators from pedagogical documentation and connect micro-level learning design to policy questions on AI, digital competence, upskilling, and inclusion. It shows how evidence from learning plans can complement existing statistical sources and help policymakers understand how adult learning systems are adapting to AI-driven change.

Transferable Skills, Personality Traits, and Vocational Interests of Young Adults Under 30: A Quantitative Comparison of NEET and Employed Groups

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In the context of technological change, labor market uncertainty, and the growing demand for lifelong learning, transferable skills are becoming increasingly important for employability, adaptability, and participation in adult education. However, there is still limited quantitative evidence on how young adults who are not in employment, education, or training (NEET) differ from their employed peers in terms of broader psychological characteristics that may support learning, career mobility, and labor market integration. This study aims to fill this gap by comparing NEET young adults and employed individuals under the age of 30 in terms of personality traits, vocational



interests, and a set of characteristics related to transferable skills operationalized through the O*NET framework.

The paper pursues two main objectives. First, it examines differences between NEET youth and employed young adults in personality traits, vocational interests, and transferable skills. Second, based on the identified differences, it seeks to determine the strengths and deficits of NEET youth in terms of transferable skills relevant to adult learning and labour market participation. The ultimate goal is to formulate recommendations for educational and counselling interventions that can support the development of key competencies and improve employability in the context of Industry 5.0.

The study analyses data obtained through the assessment of personality and vocational predispositions conducted within the framework of the national projects “Activation of NEET Youth for the Digital Era” and “Digital Counselor,” [NU1.1] implemented in the Slovak Republic between January 1, 2026, and September 20, 2026. Personality traits were measured using the IPIP-NEO instrument, and vocational interests were assessed using CABIN-NET. By linking IPIP-NEO with the O*NET framework, the study focuses particularly on work styles associated with transferable skills such as analytical thinking, innovativeness, adaptability, intellectual curiosity, cooperation, empathy, self-control, and stress management.

Methodologically, the study employs a quantitative comparative design. The analysis combines descriptive statistics with mean comparisons between groups using independent samples t-tests to identify differences between NEET youth and employed young adults in personality traits, vocational interests, and selected characteristics related to transferable skills.

The expected contribution of the paper is to provide an empirically grounded framework for more precise targeting of activation, counselling, and educational measures for young adults at risk of exclusion from work and learning. From a policy perspective, the findings may support better identification of both barriers and developmental potentials in the areas of adult learning and employability, particularly in an environment where adaptability, analytical thinking, social skills, and a willingness to learn are becoming key prerequisites for long-term participation in the labour market.

The Automation-Training Gap Revisited: A Multi-Regime Replication and Deep-Dive into European Adult Education Systems using New PIAAC Data

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Automation technology continues to reshape global labour markets causing job displacement and a need for reskilling. Research consistently indicates a stratification in occupational automation where those most in need are least likely to participate in adult education and training (AET). This study provides a replication of a key finding in this area using the most recent cycle of the Survey of Adult Skills (PIAAC), analysing whether the negative relationship between automation risk and AET participation remains robust across different welfare regimes. This involves logistic regression models across fourteen European countries, categorized into five distinct welfare regimes: Scandinavian, Southern, Continental, Central-Eastern, and Anglo-Saxon. We examine participation in job-related



AET and unmet demand, controlling for socio-demographic factors including education, age, and employment status. Preliminary expectations suggest that while participation rates vary by regime, the "automation-training gap" persists internationally, driven largely by situational barriers that outweigh institutional constraints. In an extension of this replication, we take a deep-dive into three case studies that represent different welfare regimes or adult learning systems (ALS): Sweden (Scandinavian, state-led ALS with high degree of stakeholder involvement), Germany (Continental, stakeholder-led ALS), and Greece (Southern, state-led ALS). Moving beyond broad regime categories, we investigate the specific institutional configurations and coordination mechanisms such as targeted social policy measures in Sweden versus the fragmented support structures in Southern Europe that shape bounded agency(ies) and influence how workers navigate technological disruption. This dual-method approach aims to provide nuanced policy recommendations for equalizing access to lifelong learning in an increasingly automated economy.

Enhancing Data-Driven Programme Provision in Further Education and Training (FET)

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This study examines the development and implementation of structured data analytics processes within Kilkenny and Carlow Education and Training Board (KCETB), aimed at strengthening evidence-informed decision-making in an Education and Training Board in the Irish Further Education and Training (FET) sector. The work focuses on the transition from fragmented data usage to a coherent, policy-driven approach that supports programme planning, quality assurance, and learner outcomes in line with quality reviews and national policy requirements.

The primary objective of this research is to demonstrate how the establishment of a systematic and integrated framework for the utilisation of quantitative and qualitative data can support the:

- Measurement of participation levels and patterns across a diverse range of FET provision;
- Identification of barriers to, and supports required that influence learner engagement and completion;
- Improvement of programme quality and responsiveness through evidence-based planning;
- Longitudinal and comparative analysis to inform strategic decision-making.
- Alignment of the requirements of QA and National Policy requirements

A mixed-method, FET-wide data analytics approach was adopted. This involved:

- Development and implementation of an ETB Programme Data Analytics Policy (2023) to standardise data collection, analysis, and reporting processes;
- Integration of multiple internal and external datasets, including PLSS (Programme and Learner Support System), QQI certification data, course outcomes, and learner feedback;



- Deployment of Tableau software to support data visualisation, benchmarking, and trend analysis;
- Establishment of biannual centre-level and ETB-wide reporting cycles, with indicators analysed across one-year and three-year timeframes;
- Inclusion of structured learner feedback mechanisms to complement quantitative data.

Data Sources

Key data sources include:

- PLSS learner enrolment, participation, and completion data;
- Early-leaver records and reasons for withdrawal;
- QQI certification and grade distribution datasets;
- Learner and staff feedback surveys;
- Programme Validation, Authentication and Certification outcome data.

Key Findings

1. Quantitative Insights on Participation and Outcomes

Analysis of enrolment, completion, certification, and grade distribution data enabled the identification of participation trends, progression patterns, and outcome disparities across centres and programme types. Early-leaver data provided insight into barriers to participation, while learner feedback illuminated supports and drivers influencing engagement.

2. Enhanced Programme Monitoring and Quality Assurance

The introduction of standardised indicators (e.g. completion rates, certification rates, early-leaver reasons) and benchmarking strengthened internal self-monitoring systems and supported data driven targeted interventions at centre level.

3. Comparative and Longitudinal Evidence

The use of one-year and three-year comparative datasets allowed KCETB to assess from a longitudinal perspective its provision thus meeting the targets set down in the SOLAS (2020) Future FET: Transforming Learning, The National Further Education and Training Strategy for “data driven” decision making.

4. Improved Governance and Decision-Making

Centralisation of data processes and the establishment of a “single source of truth” enhanced organisational data governance thus meeting the requirements of quality reviews and QQI Core Statutory Guidelines.

Relevance to Conference Theme:

This study aligns with the conference theme by demonstrating how systematic quantitative analysis enhances understanding of learner participation, barriers, and outcomes in KCETB. By integrating



longitudinal and comparative evidence, it supports more responsive, data-informed provision and continuous system improvement.

Academic Stress, Cognitive Rumination, and Study Avoidance in Adult Learners

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In the context of rapid technological change, labour market uncertainty, and increasing demands for continuous upskilling, adult learning has become increasingly important for employability, adaptability, and social inclusion. Despite the growing importance of lifelong learning, many adult learners experience difficulties maintaining consistent engagement in learning activities. Psychological factors such as academic stress, repetitive negative thinking, and avoidance behaviours may significantly influence how adult learners maintain engagement in learning activities.

This study examines the relationship between academic stress, cognitive rumination, and study avoidance among adult learners. More specifically, the research explores how stress-related cognitive processes may contribute to disengagement from learning activities. Drawing on theories of stress and coping, cognitive load, and self-regulated learning, the study proposes that elevated academic stress may interfere with attention and working memory processes, increasing repetitive negative thinking and reducing the ability to effectively engage in goal-directed study behaviours. Consequently, individuals may become caught in a cycle in which academic stress contributes to cognitive rumination, increasing emotional exhaustion and avoidance behaviours such as procrastination, delaying academic tasks, and disengagement from study-related responsibilities.

A quantitative cross-sectional survey design will be employed to investigate these relationships among adult learners participating in formal and non-formal education. Data will be collected through validated psychometric scales measuring perceived stress, cognitive rumination, and study avoidance behaviours. Correlation and regression analyses will be used to examine relationships between variables and explore the potential mediating role of cognitive rumination between academic stress and study avoidance.

The study aligns with current discussions surrounding barriers to participation and sustained engagement in adult learning. Existing adult learning research has frequently emphasized structural and socioeconomic barriers to participation, while psychological processes influencing sustained learning engagement have received comparatively less attention. By focusing on stress-related cognitive and behavioural mechanisms, this research contributes to a broader understanding of the internal factors that may affect adult learners' participation and persistence in educational settings.

The findings are expected to contribute to both educational psychology research and adult learning policy discussions by providing insight into the psychological factors associated with learning disengagement. A better understanding of stress-related cognitive and behavioural patterns may help inform interventions aimed at supporting learner well-being, strengthening self-regulation, and promoting sustained participation in adult education. Ultimately, the study aims to contribute to the



development of more responsive and supportive adult learning environments within rapidly changing social and economic contexts.

Invisible Learners: Adult Migrant Illiteracy and Innovative Approaches to Second Language Education

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When we talk about literacy, we refer to the acquisition of reading and writing skills in one's mother tongue and to adults who have not completed—or never begun—this process (UNESCO Institute for Statistics, 2024). In recent decades, however, large-scale migration has brought increasing attention to a different phenomenon: people coming from countries and cultures where writing was marginal or absent and settling in highly literate societies, where illiteracy often leads to social exclusion. Despite the growing relevance of this issue, reliable data and systematic research remain scarce, largely because the literacy needs of adult migrants have received limited attention from both policymakers and scholars.

Starting from the Italian context, this contribution outlines the current scenario and assesses the adequacy of existing educational policies, highlighting the most critical methodological and organizational issues. Within a conceptual framework integrating sociological and psychological approaches to second language learning (Atkinson, 2002), the study examines the actual impact of current teaching practices and the potential of innovative, evidence-based alternatives. The underlying hypothesis is that research in this field may contribute to raising literacy levels not only among migrant adults but also among struggling readers and adults below PIAAC Level 3.

The study takes the form of action research aimed at translating theoretical and methodological insights into classroom practice. It is based on a mixed-method design originating from the institutional monitoring conducted by INDIRE between 2018 and 2021 to evaluate the newly established Italian public adult education system (INDIRE, 2018). Quantitative and qualitative data revealed significant inadequacies in a system originally designed for the lifelong learning of Italian adults but rapidly confronted with the different needs of foreign learners.

Subsequent investigations focused on teacher training and the educational provision of the 130 Adult Education Centres. Data collected through questionnaires and field interviews showed that most teachers lack specific pre-service preparation and that the current educational offer is insufficient to meet existing demand, particularly concentrated in LASLLIAM Levels 1–3, which are only exceptionally available (Cacchione, 2024).

A year-long observation of teaching practices, combined with the testing of an innovative evidence-based method (Peyton & Young-Scholten, 2020), led to the development of a curriculum specifically designed for L1-illiterate learners facing constraints of time, energy, and mindset. As van de Craats et al. (2015) demonstrated, illiterate adults are highly context-dependent and experience particular difficulties with abstract reasoning.

The proposed curriculum aims to develop sufficient decoding competence to achieve a basic level of reading fluency for understanding simple, targeted texts. It combines phonological awareness and sound manipulation techniques within a global/analytic and situated reading methodology. Tested



with a cohort of 20 learners, the curriculum proved highly effective, although broader experimentation is needed for full validation. The rapid progress observed in reading comprehension also suggests possible applications for a wider population, including children and adults with dyslexia and adults with functional illiteracy.

Using verifiable credentials as data for measuring credit-bearing adult learning: insights from issuers for policy and systems

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Despite increasing policy attention, adult learning remains underrepresented in formal credentialing systems when contrasted with vocational education and training (VET) and higher education (Cedefop, 2023). While significant progress has been made in standardising (digital) credentials in these domains, much adult learning still occurs outside credit-bearing frameworks, limiting the recognition, and measurement of learning outcomes (OECD, 2021). From the perspective of credential issuers, this gap underscores the importance of extending credentialisation to adult learning. In this context, digital credentials aligned with EU-wide frameworks, such as the European Digital Credentials for Learning (EDC) and European Skills, Competences and Occupations (ESCO), can enhance the transparency and portability of these outcomes.

This contribution approaches the topic from the viewpoint of institutions issuing credentials (“credential issuers”) and explores how digital credentialing processes can support recognition while simultaneously generating analysable data for the quantitative study of adult learning systems. Drawing on the use of Brevapp (<https://brevapp.web2learn.eu/europass2/edci-issuer/#/home>), an EDC-compatible credential issuing tool that we designed, we explore a dataset of over 700 issued credentials. These credentials include structured information on learning outcomes and associated skills, constituting offering a practice-based data source grounded in real credentialing activity. By using descriptive quantitative methods, we examine selected characteristics of this dataset, including the volume of issued credentials, the representation and frequency of skills, and the extent to which standardised taxonomies, such as ESCO, are used in practice, with a view to assessing their potential for system-level measurement and policy-relevant indicators.

Finally, the contribution argues that for credential issuers, the adoption of EDC-enabled credentialing systems, such as Brevapp, implemented here as a functional prototype, extends beyond compliance to enabling the use of verifiable credentials as structured data for measuring credit-bearing adult learning and supporting system-level analysis, in line with recent EU policy on digital credentials and skills data (cf., European Digital Credentials for Learning (2020b), the European approach to micro-credentials (2022), the European Digital Strategy (2020a), and the Pact for Skills (2020)). By mapping learning outcomes and associated skills to ESCO, issuers can generate standardised, comparable data across programmes. This highlights the potential of verifiable credentials to function not only as instruments of recognition but also as data sources for developing indicators on skill coverage and alignment with recognised taxonomies. Such an approach supports programme design, improves



comparability, and advances quantitative understanding of adult learning systems for policy and monitoring.

A Skills Observatory for the TCLF Sector: A Scalable Quantitative System for Continuous Skills Intelligence and Policy Support

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"Skills anticipation is the backbone of effective adult upskilling, vocational education and training (VET), and workforce development policy. Without reliable, timely intelligence on how labour market demands are evolving, policymakers lack the evidence base needed to design responsive training systems, allocate resources efficiently, or anticipate emerging skill gaps. Yet building or reforming a Labour Market Information System (LMIS) capable of generating such intelligence is a complex undertaking — one that requires a clear understanding of the full landscape of available tools (traditional and emerging), their interactions, and the institutional conditions under which they can be effectively deployed.

This paper pursues two objectives. First, it provides a comprehensive comparative benchmark of LMIS tools and the institutional landscapes that employ them, mapping and characterising the main skills anticipation tools identified across the case studies. This includes differentiating traditional tools (surveys, administrative records, econometric models, occupational taxonomies, sectoral expert panels) from 4.0 innovations (Big Data analytics, natural language processing applied to online vacancy data, machine learning-based nowcasting, and AI-driven occupational classification), and analysing the conditions that render them effective across four dimensions: institutional design, data sources, analytical tools, and dissemination mechanisms. Second, drawing on the comparative findings, it offers guidelines for policymakers seeking to design or reform an LMIS — framing the process as an audit of existing capacities and data sources, identification of gaps, and the gradual integration of existing tools with new ones into a coherent, functional system. To pursue both objectives, the study draws on a structured comparison of eight case studies (Germany, Australia, France, Canada, Colombia, South Korea, England, and Spain), combining systematic desktop research with semi-structured expert interviews with specialists in key fields.

The findings show that 4.0 tools represent a qualitative leap, enabling near-real-time, granular, occupation-level skill-demand tracking that was previously unattainable. However, the effectiveness of 4.0 tools hinges on two critical preconditions. First, they require a digitalized and largely formalized labour market — conditions common across developed economies but a binding constraint in lower-formality contexts. Second, they require deliberate prior system design: data must be pre-structured and drawn from multiple complementary sources so that it can be meaningfully crossed, producing a coherent and interoperable system rather than fragmented outputs. Indeed, traditional tools are not displaced by 4.0 innovations; they provide the structural backbone that makes advanced analytics meaningful. Beyond the tools themselves, translating data into policy advice demands more than good data or sophisticated tools. As the cases of Germany, Canada, and South Korea demonstrate, it requires a clear institutional architecture with defined roles, sustained continuity, and strong cohesion among key actors. Emerging technological tools



substantially expand the potential of LMIS but harnessing that potential is ultimately a matter of deliberate, careful policy design.

Heterogeneous Difference-in-Differences Models for Evaluating Education Policies and Interventions: An Exemplary Study of Online Platforms in German Adult Education Centres

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Evaluating education policies and interventions is often difficult: There are rarely enough resources and funding available for large-scale intervention studies with an experimental design in which the intervention group and the control group can be randomly assigned. More common are scenarios in which conclusions about the effectiveness of an intervention or policy based on (self-)selection mechanisms must be drawn in retrospect. In these cases, difference-in-differences designs can help to draw causal conclusions despite such limitations.

However, in many settings, policies and interventions are implemented at different points in time across entities. Such staggered treatment implementation poses methodological challenges for causal inference. Recently introduced heterogeneous difference-in-differences approaches that explicitly account for staggered treatment adoption provide a way to address these challenges (Callaway & Sant'Anna, 2021). Applying such approaches requires identifying interventions that vary across entities and over time, while accounting for pre-treatment differences between treated and untreated units that may shape outcome trajectories.

We apply such a heterogeneous difference-in-differences estimator to estimate the average treatment effect on the treated of adult education platform implementation on online course participation. Educational platforms are a highly relevant topic in Europe as reflected in the European Union's Digital Education Action Plan, which aims to make digital education more accessible and establish shared European Education Platforms (European Commission, 2020). Against the background of emerging education platforms, three German federal state associations of public adult education centres ("Volkshochschulen") have established platforms called online between 2020 and 2024. One of the goals is to increase participation in online courses by bundling courses across providers, increasing their visibility, and facilitating access.

As the first study to evaluate adult education platforms with respect to online course participation, we estimate average treatment effects on the treated, accounting for staggered implementation across federal states and time. The results indicate that the platforms themselves have no causal effect on participation in online courses. While a model specification without covariates suggests a significant positive average treatment effect on the treated of 465 additional online participations, this is driven by pre-existing regional and organisational differences between that use the platforms and those that do not. In a model specification accounting for the regional and organisational preconditions of the different, no significant effect is found. Overall, our analysis shows that the platforms that were examined reproduce existing disparities in online participation rather than

reducing them. The results indicate to policymakers and education managers that implementing a platform alone is insufficient to increase online course participation.

The study is an example of an evidence-based evaluation of an education policy and can be applied to other cases of education policies and interventions. At the same time, the different results for the various models in the study demonstrate the importance of controlling for observables in difference-in-differences models with non-randomized groups.

Measuring Adult Learning Participation in Kosovo: Methodological Challenges, Data Fragmentation and Policy Interpretation

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Adult learning has become increasingly important in supporting employability, labour market adaptability, social inclusion, and lifelong career development in the context of technological change, digitalisation, demographic shifts, and the green transition. Effective policymaking in this field requires reliable and comparable statistical evidence. However, the measurement of adult learning participation remains methodologically complex, particularly in transition systems characterised by fragmented governance structures and limited integration of education and labour market data. Kosovo represents a relevant case for examining these challenges due to the coexistence of multiple national and international data sources, differing methodological approaches, and evolving adult learning policies.

This paper critically analyses the methodological comparability and policy interpretability of adult learning participation indicators in Kosovo. It aims to examine how differences in definitions, survey methodologies, institutional responsibilities, and reporting practices influence the measurement and interpretation of adult learning participation and, consequently, policy planning and evaluation. Particular attention is given to differences between participation indicators and interpretations presented by various national and international actors, including the Kosovo Agency of Statistics, ETF, OECD, and other organisations engaged in adult learning and skills development.

The study applies a comparative policy and data analysis approach combining secondary analysis of available statistical datasets, policy documents, strategic frameworks, and international monitoring reports related to adult learning and lifelong learning in Kosovo. The analysis compares methodological dimensions including age coverage, definitions of adult learning, treatment of formal and non-formal learning, survey reference periods, and reporting methodologies. In addition, the paper examines governance-related factors affecting data production and interpretation, including fragmented institutional responsibilities and the absence of integrated adult learning information systems.

The analysis suggests that variations in participation indicators and interpretations of adult learning performance may derive not only from statistical methodologies but also from conceptual ambiguities regarding adult learning definitions and limited coordination between institutions responsible for data collection and reporting. The paper further argues that fragmented monitoring systems and limited longitudinal evidence may reduce the capacity for evidence-based policymaking and weaken international comparability.



The paper contributes to theoretical and methodological discussions on the measurement of adult learning by illustrating the challenges faced by small and transition education systems in producing reliable and policy-relevant adult learning indicators. It also proposes recommendations for strengthening adult learning monitoring frameworks through harmonised definitions, improved interinstitutional coordination, and more integrated data systems. The study is particularly relevant to conference themes addressing theoretical considerations on measurements of adult learning and the use of data for policy advice.

From Policy Outcomes to Policy Design: A Reverse-Analytical (Backward-mapping) Framework for Understanding ALMP Effectiveness from a Skills-Based Perspective

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Active Labour Market Policies (ALMPs), including adult learning measures implemented through training, reskilling, and skills-matching interventions, are increasingly central to supporting labour-market adaptability in the context of technological transformation, demographic change, and evolving workforce needs. However, existing approaches to ALMP evaluation continue to focus predominantly on programme outcomes - such as employment rates, participation levels, or training completion - while comparatively less attention has been paid to the policy design architectures, implementation mechanisms, governance arrangements, and contextual conditions that shape these outcomes. As a result, current evaluation approaches often provide limited insight into why similar skills-oriented ALMP instruments generate different results across institutional and labour market contexts.

This paper responds to limitations of predominantly outcome-based and “what works” approaches to ALMP evaluation by introducing a mechanism- and context-oriented analytical perspective. More specifically, the paper aims to develop and demonstrate a reverse-analytical (backward-mapping) framework for explaining how combinations of policy design characteristics and contexts contribute to differing programme outcomes across institutional environments. The framework reconstructs policy configurations and implementation architectures underlying effectiveness.

The paper develops a conceptual-methodological contribution to comparative ALMP evaluation and policy analysis from a skills-based perspective. The approach combines: (i) an analytical framework for understanding labour-market frictions, skills mismatch, and ALMP effectiveness; (ii) a systematic meta-evaluation of 147 ALMP studies examining programme effectiveness across target groups and policy instruments; and (iii) a comparative analysis of ten case studies across five European countries using a Context–Mechanism–Outcome (CMO) perspective.

The framework is developed through a comparative realist-informed synthesis combining meta-evaluation evidence and CMO-based case-study reconstruction. The meta-evaluation draws on a structured review of 147 ALMP evaluation studies published between 1990 and 2025, covering diverse policy instruments, target groups, institutional contexts, and methodological traditions. Using



a systematic coding framework, the analysis examines programme types, implementation features, contextual factors, target-group dynamics, observed effects, and evaluation methodologies. This

includes comparative assessment of quantitative evaluation approaches used across ALMP studies, including quasi-experimental methods, matching techniques, difference-in-difference designs, and economic evaluations. Within the synthesis, the meta-evaluation identifies recurring determinants and contextual conditions associated with policy effectiveness, while the comparative case studies reconstruct governance configurations shaping programme outcomes across institutional contexts.

The synthesis contributes to a reverse-analytical framework for interpreting ALMP effectiveness across labour market contexts. The analysis identifies recurring dimensions shaping policy effectiveness, including targeting mechanisms, governance arrangements, labour-market intelligence, skills anticipation, training architecture, employer involvement, institutional capacity, and contextual conditions. The reverse-analytical perspective suggests that programme effectiveness depends less on isolated interventions than on combinations of contextual, institutional, and implementation factors. The findings further indicate that conventional outcome based evaluations often insufficiently capture the role of governance dynamics and implementation architectures in shaping policy effectiveness.

The proposed framework remains primarily interpretative and comparative rather than predictive in a strict econometric sense, while potentially providing foundations for future AI-supported comparative policy intelligence systems. From a policy perspective, it offers a diagnostic approach for identifying strengths, weaknesses, and contextual limitations in skills-oriented ALMPs and adult learning interventions, supporting more evidence-informed and context-sensitive labour-market governance in Europe.

What happens next? Longitudinal data infrastructures for education, training and socio-economic pathways

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European policies on adult learning, skills development and learning mobility increasingly require evidence on outcomes that extend beyond participation, programme implementation and immediate participant feedback. Existing monitoring systems provide substantial information on who takes part and which activities are delivered, but much less on what follows. In particular, they rarely allow policymakers to examine whether education, training or mobility experiences are associated with later learning, employment, civic participation or wider socio-economic trajectories. This limits both the evaluation of longer-term outcomes and the capacity to understand for whom interventions work, under which conditions and at what point in the life course.

Against this background, the paper asks how longitudinal data infrastructures can be developed to produce credible and policy-relevant evidence on the medium- and long-term outcomes of education, training and learning mobility interventions in Europe.

The paper draws on longitudinal education research, life-course approaches and research on transitions from education to employment. Longitudinal and panel designs make it possible to examine change within individuals over time while accounting for differences between individuals (Troncoso-Ponce, 2018; Tang et al. 2024). They have been widely used to study employment



transitions, wage progression, job mobility and the effects of economic shocks (Rickmeier, 2023), as well as educational attainment, intergenerational mobility and the relationship between early competences, social contexts and later outcomes (Manohar, 2025). They also allow researchers to assess how policy reforms and wider social or economic events affect population groups differently over time (Buchan, 2017). By incorporating time, sequence and change, longitudinal approaches provide a stronger basis for analysing both outcomes and the processes through which education and training experiences shape later pathways (Bernard, 2017)

Methodologically, the study adopts a policy-oriented design and feasibility approach. It combines a review of the relevant methodological literature with an assessment of recent European initiatives mapping or harmonising longitudinal education data, including LINEup, MapIE and LEARN. The work undertaken to date focuses on two complementary applications.

The first concerns the development of possible follow-up arrangements for Erasmus+ learning mobility participants. The aim is to strengthen evidence on the relationship between mobility experiences and later skills development, further education, employability, civic engagement and European added value. The second explores the feasibility of following students who participate in international large-scale assessments supported by the European Commission, including assessments of digital, civic, mathematical and scientific competences. Linking school-based competence measures to later education and labour-market outcomes could provide stronger evidence on how skills developed during compulsory education relate to subsequent transitions and participation.

On this basis, the paper proposes a framework covering six areas: the definition of policy and evaluation questions; the mapping of programme, survey and administrative data; the distinction between competence measures and participation indicators; the feasibility of data linkage under realistic governance and data-protection conditions; the selection of a limited set of outcomes aligned with intervention logics; and the establishment of consent, access and governance arrangements from the outset. It also develops initial implementation scenarios for participant follow-up and national register linkage, while considering attrition, selection bias, cross-border data flows and consent models.

The paper contributes a practical framework for moving from fragmented monitoring towards longitudinal evidence systems capable of supporting more credible evaluation and better-informed European policies on lifelong learning, skills and mobility.

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