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Task-authentic case studies in large-scale asynchronous professional development. Evidence from the INDIRE digital competence training Program for non-teaching school staff

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Abstract: Non-teaching school staff are a little-studied professional group, and evidence on how task-authentic case studies work in large-scale asynchronous professional development is scarce. In Italy, within the National Recovery and Resilience Plan, INDIRE delivered two actions for administrative, technical and auxiliary (ATA) staff in which the case study was a core training methodology: a large-scale training Program, and a pilot experimentation of a model for developing and certifying digital competences that combines static case studies with scenarios generated by a large language model. The paper examines how the case study was operationalised in the two actions and what descriptive data on participation, perceived value, use and experts' views suggest for design. The argument develops in four steps. It frames digital competence, authentic and scaffolded learning, and the European and Italian context of non-teaching staff; it describes the two actions through Herrington and Oliver's elements of authentic learning environments; it presents, separately for each action, a descriptive secondary analysis of data collected by INDIRE; and it compares the two actions to derive preliminary design principles.

Keywords: case study; task authenticity; scaffolding; non-teaching school staff; digital competence.

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1. Introduction

Digital competence is one of the key competences for lifelong learning (Council of the European Union, 2018) and is increasingly understood as a competence for citizenship and for work (Spante et al., 2018). Schools, however, employ not only teaching staff: administrative, technical and auxiliary staff manage documents, relations with families, laboratories and websites, and their digital competence affects the whole service. In Europe this staff is not a uniform category: it is often employed by local authorities, in some systems it is scarce, and structured training aimed at it is explicitly reported in very few countries (European Commission/EACEA/Eurydice, 08-2026). Italy is a distinctive case, because its

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non-teaching staff are state employees and, within the National Recovery and Resilience Plan, under the Integrated Program for the training of ATA staff and newly hired teachers and for the development of a model for certifying digital competences, they have had access to two actions entrusted to the National Institute for Documentation, Innovation and Educational Research (INDIRE): a large-scale training Program, addressed exclusively to ATA staff and aimed at developing digital competences and supporting the processes of technological transition of the school system (hereafter, the Training Program), and a pilot experimentation of a model for certifying the digital competences of school staff, which involved both teaching and ATA staff (hereafter, the Pilot). In both actions the case study was used as a fundamental methodology of the learning design.

The preparation, implementation and data arising from these actions confront us with three questions that remain open in the literature. The first concerns how to develop and document digital competence: self-assessment tools prevail, but they mainly capture perceived competence, whereas scenario-based and performance-based approaches come closer to competence in action (Mattar et al., 2022; López-Núñez et al., 2024). The second concerns whether authentic learning operates through the authenticity designed into tasks or through the authenticity perceived by learners, and how authenticity can be balanced with instructional support (Nachtigall et al., 2022). The third concerns whether scaffolding can be offered at scale with static materials or requires dynamic and adaptive support (Ersani et al., 2021). Very little of this evidence concerns working adults: only one of the 50 experimental studies reviewed by Nachtigall et al. (2022) involved workers.

This paper examines how the case study was operationalised in the two initiatives and what the evidence suggests for the design of large-scale asynchronous professional training for a little-studied professional group. The thesis is that the case study can be kept as a design principle in static and dynamic formats, provided that authenticity, scaffolding and human mediation remain explicit.

2. Theoretical Background and Project Context

2.1. Digital Competence for Citizenship and for School

Digital competence has moved from a computer literacy centred on hardware and software towards a view that integrates technological, cognitive, critical and ethical dimensions (Calvani et al., 2009). The European reference for citizens is the DigComp framework. Its fifth edition, DigComp 3.0, organises 21 competences in five areas (information search, evaluation and management; communication and collaboration; content creation; safety, well-being and responsible use; problem identification and solving) across four proficiency levels, and integrates AI throughout the framework (Cosgrove & Cachia, 2025; see also Vuorikari et al., 2022). The need is documented: in 2023 only 56% of EU adults had at least basic digital skills, against a 2030 target of 80% (Cosgrove & Cachia, 2025). For education professionals, the European Framework for the Digital Competence of Educators (DigCompEdu) describes 22 competences in six areas. Its Area 1, professional engagement, concerns organisational communication, professional collaboration, reflective practice and professional development (Redecker, 2017), and it can serve as a frame for all staff figures, in a whole school approach perspective (UNESCO, 2013). UNESCO has also proposed a framework of AI competences for teachers (Miao & Cukurova, 2024).

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2.2. Developing and Assessing Digital Competence: Open Debates

Turning a construct that evolves with technology into observable evidence is difficult (Gui et al., 2017; Gabbi et al., 2023). The learning outcomes of DigComp 3.0 are not validated performance indicators and need to be contextualised (Cosgrove & Cachia, 2025). Self-report questionnaires are the most widespread format because they are quick and inexpensive, but they capture mainly perceived competence and, used alone, do not provide sufficient evidence to assign proficiency levels (Mattar et al., 2022; De la Calle et al., 2021; Norhagen et al., 2024). Structured tests mainly assess declarative knowledge (Siddiq et al., 2016), whereas scenario-based and performance-based assessments come closer to competence in action: in the former the person decides in a realistic situation, in the latter carries out a digital task (Nickerson & Davidson, 2024; Bartolomé et al., 2022). Multi-method models combine these sources, but how to weigh discordant evidence remains open (Sillat et al., 2021). AI literacy is still being theorised and operationalised (Vuorikari et al., 2022; Cosgrove & Cachia, 2025). The studies cited here concern mainly students, teachers and other professional groups.

2.3. Authentic, Situated and Scaffolded Learning: The Case Study as a Training Device

Situated cognition holds that knowledge is a product of the activity, context and culture in which it is developed and used, and that learning proceeds through enculturation in authentic activity and cognitive apprenticeship (Brown et al., 1989). Herrington and Oliver (2000) translated this view into nine elements of authentic learning environments: authentic context; authentic activities; access to expert performances and modelling of processes; multiple roles and perspectives; collaborative construction of knowledge; reflection; articulation; coaching and scaffolding; and authentic assessment. Reviewing 50 experimental studies, Nachtigall et al. (2022) distinguish the design elements used to create authentic settings from the intentions of authenticity behind them, such as emulating the work of professionals or reflecting everyday life. They note that authentic learning is often only implicitly defined, that only two studies examined learners' perceived authenticity, and that inquiry-based activities, including case-based learning, were the most frequently implemented element. They also describe an "authenticity dilemma": authenticity usually brings high real-world complexity and low instructional structure, so that effective settings may require a balance between the two.

Support is the function of scaffolding, that is, contingent help that is gradually withdrawn so that responsibility passes to the learner (Wood et al., 1976). In online education, scaffolding may be procedural, conceptual, metacognitive or strategic, and static or dynamic; asynchronous settings mostly rely on static, technology-based support (Ersani et al., 2021). Whether static support suffices at scale, and what dynamic support adds, is still open. As for the case study, in education a case is an in-depth, contextualised study of a bounded phenomenon (Merriam, 1998; Yin, 2005). As a training device it offers a professionally recognisable problem situation to analyse or solve, in line with the position that theory can emerge from the case (Rule & John, 2015) and with its use for self-directed learning (Olivieri & Margiotta, 2014).

2.4. Project Context: Non-Teaching Staff in Europe and Italy, and the Two INDIRE Trainings

The national descriptions of staff other than teachers compiled by the Eurydice network (European Commission/EACEA/Eurydice, 08-2026), read against the Italian job descriptions of ATA staff (Di Stasio et al., 2026b, in press), show two features of the

Italian case. The first concerns the type of personnel. Italian ATA staff, who as noted in Section 1 are state employees, belong to the school's statutory staff, are not outsourced and are covered by a national collective agreement. In other systems comparable staff are often employed by local authorities (e.g., Denmark, France, Sweden) or by state district school centres (Hungary), have a mixed status (Greece), are described as very few or not generally present (French Community of Belgium; Ireland), or are not described at all, since the Eurydice sections for Austria, Estonia, Latvia, Luxembourg and Poland list only specialist pedagogical, social or health professionals. The second feature concerns training. Structured training is explicitly specified only in Portugal (Decree-Law 86-A/2016, which extended public-administration vocational training to non-teaching school staff), Romania (minimum initial training requirements for each auxiliary position) and, for "other staff" in pre-school, Croatia, whereas Czechia explicitly exempts non-educational staff from continuing training. For the other countries the source does not address training, which does not mean that no training exists.

In Italy, Ministerial Decree 140/2024 and the National Recovery and Resilience Plan (Mission 4, Component 1, Investment 2.1) established training for ATA staff, with the aim of moving from a culture of compliance to a culture of results. Within the same Integrated Program, INDIRE designed and delivered the two initiatives introduced in Section 1, which are described in Sections 3.2 and 3.3; of the Pilot, only its general design and its ATA strand are considered here.

3. Materials and Methods

3.1. Research Approach and Research Questions

The study is a descriptive secondary analysis of data collected by INDIRE in the two actions and published in two open-access research reports (Di Stasio et al., 2026b, in press; Di Stasio et al., 2026a, in press). The case study is the object of the analysis, as a training methodology, and not the research design. The work presented here is guided by four research questions:

1. RQ1: how was the case study operationalised in the two training initiatives?
2. RQ2: how was it perceived, in comparison with other instructional modalities, by the staff of the four profiles of the Training Program?
3. RQ3: what do usage data and the views of Experts and Équipers show for the Pilot, where static case studies coexist with dynamic ones based on a Large Language Model (LLM)?
4. RQ4: what does the comparison suggest for design? The data of the two actions are kept separate in Sections 3 and 4 and are compared only in the Discussion.

This section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation, as well as the experimental conclusions that can be drawn.

3.2. Training Program: The Program for ATA Staff

The Training Program was delivered fully online and asynchronously on Scuola Futura, a Moodle installation of the Ministry, in two 45-day windows, starting on 15 July 2025 for Operators and Collaborators and on 30 July 2025 for Assistants and Technicians.

Participants were permanent staff selected under Articles 8–10 of Decree 140/2024. Each of the four pathways lasts 20 hours: five hours of theoretical and applied framework, which contextualises the digital transition for the profile and introduces the competence areas, and 15 hours on the 15 competences expected for the profile. The competence architecture combines the five areas of DigComp 2.2 (Vuorikari et al., 2022) with Area 1 of DigCompEdu (Redecker, 2017) as a cross-cutting pillar for non-teaching profiles; for Assistants and Technicians the problem-solving area was extended to interaction with AI. Each pathway has two introductory videos and four thematic areas specific to the profile. Each module includes a video lesson, a glossary, a case study built on the tasks and responsibilities of the profile described in Annex D of the Decree, and a knowledge questionnaire. At the end of each area, participants work on a use case in the format of the DigComp 2.2 employment scenarios, with a self-assessment guide, and complete an area questionnaire. The certificate of attendance required completing all areas, modules, questionnaires and activities.

As illustrated in Section 2.3, in the Training Program the case study is framed as a device for self-directed learning. The Program includes no collaborative activities or coaching. Support is provided by the structure of the materials, in particular the sequence from contextualisation to area introduction, module, self-assessment, use case and area questionnaire, and by a ticket-based help desk for technical, administrative and, at a second level, content-related queries (Di Stasio et al., 2026b, in press).

3.3. Pilot: The Certification Project (ATA Strand)

The Pilot is a research-action project to design, implement and test an integrated model for developing, assessing and certifying the digital competences of school staff, combining self-assessment, peer assessment and expert assessment. The ATA framework was built from DigComp 2.2, read in light of DigComp 3.0, and from the job descriptions of the national collective agreement. In the pilot it covers two areas (information and data literacy; communication and collaboration) and nine competences, each with specific objectives and four mastery levels, from Base/Awareness to Innovation/Leadership. The pilot cohort comprised 392 participants (296 teachers and 96 ATA staff), identified through stratified but not statistically representative procedures. On the platform BRHUNO, developed by INDIRE, the participant first completes three orientation questionnaires (skills review, profiling and positioning). The optional self-training path then offers, for each competence, an introductory video, four static case studies (one per mastery level), a reflection and contextualisation activity for each case, self-assessment of the resulting product against the framework rubrics, and anonymous peer assessment. The dynamic case study consists of scenarios that an LLM generates in real time from the profile, role and context declared by the participant, and that lead through the specific objectives of the competence. The LLM provides personalisation and contextual feedback, but is not an evaluator. The evidence is gathered in a Report per competence and in a Dossier, which Working Groups, each composed of an INDIRE Expert and Équipers of the Regional Training Teams, analyse collegially to formulate level hypotheses and discuss them with participants in an individual feedback meeting (Di Stasio et al., 2026a, in press).

Table 1. Instructional devices of the two training initiatives in relation to the elements of authentic learning environments (Herrington & Oliver, 2000).

Element	Training Program	Pilot (ATA strand)

Authentic context	Profile-specific framing: two introductory videos on the tasks of the profile; modules built on the tasks in Annex D	Scenarios generated on the role and context declared in the profiling questionnaire
Authentic activities	Module case studies; end-of-area use case in the DigComp 2.2 employment-scenario format	Four static case studies per competence (one per level); LLM scenario in which the participant describes the most appropriate operational solution
Expert performances and modelling	Thematic contents and cases developed by selected experts	Introductory video and cases developed by selected Experts/Authors
Multiple roles and perspectives	Not documented	Not documented
Collaborative construction of knowledge	Not included	Optional anonymous peer assessment of reflection products
Reflection	Self-assessment questionnaire per module; self-assessment guide in the use case	Reflection and contextualisation activity for each case; self-assessment against the rubrics
Articulation	Not documented	Participant describes and motivates solutions in dialogue with the LLM
Coaching and scaffolding	No coaching; static scaffolding in the sequence of devices, glossary and questionnaires; ticket-based help desk	Static scaffolding (orientation questionnaires, suggested self-training); dynamic scaffolding (contextual LLM feedback); feedback meeting with the Working Group
Authentic assessment	End-of-area use case and questionnaire	Evidence from the scenario in the Report and Dossier; collegial level hypothesis by the Working Group

Note. Mapping prepared by the authors from the two reports; "not documented" means that the reports do not describe the element.

3.4. Data Sources, Kept Separate by Training

For the Training Program we used platform monitoring data on enrolment and completion and the voluntary end-of-course questionnaire (CAWI), which covered previous training, the judgement on the course and on each instructional modality, and expectations for future training. Items were rated on a four-point scale (1 = not at all; 2 = partially; 3 = fairly; 4 = very much). For the Pilot we used usage data recorded by the platform for the ATA cohort, the logs of the interaction with LLM scenarios, and the qualitative corpus of the focus groups with ATA Experts and Équipers, conducted by the Experts in their Working Groups between 1 and 10 June following a protocol provided by INDIRE. Quotations from the focus groups were translated from Italian by the authors. Table 2 summarises the sources and the available numbers; participation in the Training Program is detailed in Table 3 (Section 4.1).

Table 2. Data sources, by training.

Training	Source	Unit	Available N
Training Program	Platform monitoring data	Enrolled staff	57,771 enrolled; 47,328 completers
Training Program	Voluntary end-of-course questionnaire (CAWI)	Respondents	25,181 (43.6% of enrolled; 53.2% of completers)
Pilot	Platform usage data, ATA cohort	Cohort members	96 (of 392 including teachers)
Pilot	LLM interaction logs, ATA	Scenarios opened	724 (557 completed)
Pilot	Focus groups with Experts and Équipers	Focus groups	9 (ATA-F01 to ATA-F09)

3.5. Analysis

The analysis is descriptive: counts, percentages with declared denominators and mean scores. Completion is computed on enrolled participants for the Training Program and on scenarios opened for the Pilot. For the Training Program, mean scores by modality are shown by profile and as means across profiles weighted by the number of respondents; this procedure reproduces the overall means reported in the source. The focus group transcripts were read by dimension (overall quality, competence frameworks, scenarios and interaction, feedback, orienting function and certifying function), distinguishing strengths, aspects to improve and suggestions. The findings are preliminary and descriptive. They derive from a secondary analysis of data collected by INDIRE; the end-of-course questionnaire of the Training Program was voluntary; the Pilot cohort was identified through stratified but not statistically representative procedures (Section 3.3); and statements about what participants did or felt, made by Experts and Équipers, are second-level data. No inferential statistics or cut-off values are used, the findings do not support causal attribution, and the very small group of Operators (n = 41) is not interpreted separately.

4. Results

Of 57,771 enrolled staff, 47,328 completed the Program (81.9%). Completion was 73.1% for Collaborators and 70.8% for Operators, whose window started on 15 July, and 89.5% for Assistants and 90.5% for Technicians, whose window started on 30 July (Table 3). The questionnaire was answered by 25,181 participants; the response rate relative to enrolled staff ranged from 24.5% for Collaborators to 60.8% for Assistants (Table 3). Perceived quality, aggregating the items on usefulness and ease of use, was positive ("fairly" or "very much") in 84.6% of responses (weighted mean 3.19 out of 4). By profile it was 86.7% for Assistants, 80.9% for Collaborators, 83.5% for Technicians and 87.8% for Operators.

Table 3. Training Program: participation and questionnaire responses by profile.

Profile	Window start	Enrolled	Completed	Completion (%)	Respondents	% of enrolled	% of completers
Collaborators	15 Jul 2025	27,037	19,765	73.1	6,624	24.5	33.5

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Operators	15 Jul 2025	96	68	70.8	41	42.7	60.3
Assistants	30 Jul 2025	22,968	20,556	89.5	13,954	60.8	67.9
Technicians	30 Jul 2025	7,670	6,939	90.5	4,562	59.5	65.7
Total		**57,771**	**47,328**	**81.9**	**25,181**	**43.6**	**53.2**

Note. Percentages computed by the authors from the counts reported by Di Stasio et al. (2026b, in press).

4.2. Part A, Training Program: The Case Study and Other Instructional Modalities

Respondents rated seven instructional modalities for ease of use and usefulness on the four-point scale (Table 4). Almost all means were above 3.0 ("fairly"), the lowest being 2.97. For case studies the weighted means were 3.09 for ease of use and 3.08 for usefulness; by profile they ranged from 3.05 to 3.20 and from 3.00 to 3.29, respectively. Tests, glossary and videos obtained the highest means for ease of use (3.26, 3.25 and 3.25) and glossary and tests for usefulness (3.18 and 3.16). Self-assessment (2.98 for usefulness) and reflection and contextualisation (3.03 for ease of use; 3.01 for usefulness) obtained the lowest means. The ordering of modalities was broadly similar across profiles. When asked which modalities they would like to find again in a future course, respondents chose videos most often (65.9% of Collaborators to 80.5% of Operators), followed by tests (48.2% to 50.0%) and case studies (40.0% of Collaborators to 61.0% of Operators). Respondents who had found a modality easier to use were more likely to choose it again; the difference in mean ease of use was +0.16 for case studies and +0.28 for videos.

Table 4. Training Program: mean ease of use and usefulness of instructional modalities (scale 1-4), by profile and weighted across profiles.

Modality	Ease A	Ease C	Ease T	Ease O	Ease all	Use A	Use C	Use T	Use O	Use all
Video lessons	3.28	3.15	3.27	3.41	3.24	3.16	3.10	3.12	3.27	3.14
Case studies (modules)	3.11	3.05	3.06	3.20	3.09	3.11	3.07	3.00	3.29	3.08
Use-case work proposals	3.08	3.01	3.02	3.15	3.05	3.08	3.04	2.97	3.34	3.05
Glossary	3.30	3.16	3.25	3.32	3.25	3.22	3.12	3.14	3.29	3.18
Tests	3.29	3.20	3.24	3.37	3.26	3.19	3.14	3.10	3.27	3.16
Reflection and contextualisation	3.04	3.01	3.06	3.17	3.04	3.01	3.02	2.99	3.20	3.01
Self-assessment	3.04	3.04	3.08	3.27	3.05	2.97	3.01	2.98	3.17	2.98

Note. A = Assistants (n = 13,954); C = Collaborators (n = 6,624); T = Technicians (n = 4,562); O = Operators (n = 41); Ease = ease of use; Use = usefulness; "all" = mean weighted by respondents, computed by the authors from the profile means. Source: Di Stasio et al. (2026b, in press).

4.3. Part B, Pilot (ATA Strand): Use of the Training Devices

Of the 96 ATA staff in the cohort, 78 (81%) viewed at least one video lesson. Table 5 shows the recorded use of the self-training devices by ATA staff. Case studies were downloaded 901 times and reflection and contextualisation activities were used 903 times; self-assessment was used 539 times and peer assessment 54 times, the least used device. The counts aggregate competences and levels and therefore exceed the size of the cohort. ATA use concentrated on "Navigating, searching and filtering data" (71 video views; 168 case study downloads; 171 reflection activities; 89 self-assessments),

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"Evaluating data, information and digital content" (57; 117; 122; 64) and "Interacting through digital technologies" (58; 106; 98 for the first three devices).

Table 5. Pilot: recorded use of the self-training devices by ATA staff.

Device	Recorded use (ATA)	Unit reported
Video lessons	464	Views (78 of 96 staff viewed at least one)
Case studies	901	Downloads
Reflection and contextualisation	903	Uses (unique users, as reported)
Self-assessment	539	Uses (unique users, as reported)
Peer assessment	54	Uses (unique users, as reported)

Note. Counts aggregate competences and levels. Source: Di Stasio et al. (2026a, in press).

4.4. Part B, Pilot (ATA Strand): LLM-Generated Scenarios

ATA staff opened 724 scenarios and completed 557, a completion rate of 76.9% (Table 6). Completion was 71.2% in Area 1 (information and data literacy; 232 of 326 scenarios) and 81.7% in Area 2 (communication and collaboration; 325 of 398). By competence, the highest rates were for 2.3 "Exercising citizenship through digital technologies" (88.7%) and 2.2 "Sharing information through digital technologies" (83.6%), and the lowest was for 1.1 "Navigating, searching and filtering data" (66.7%), which was also the competence for which most scenarios were opened (147).

Table 6. Pilot: scenarios opened and completed by ATA staff, by area and competence.

Code	Competence	Opened	Completed	Completion (%)
1.1	Navigating, searching and filtering data	147	98	**66.7**
1.2	Evaluating data, information and digital content	96	72	75.0
1.3	Managing and organising data, information and digital content	83	62	74.7
	Area 1 subtotal	**326**	**232**	**71.2**
2.1	Interacting with others through digital technologies	85	69	81.2
2.2	Sharing information through digital technologies	67	56	83.6
2.3	Exercising citizenship through digital technologies	53	47	88.7

2.4	Collaborating through digital technologies	64	47	73.4
2.5	Netiquette	58	47	81.0
2.6	Managing digital identity	71	59	83.1
	Area 2 subtotal	**398**	**325**	**81.7**
	Total ATA	**724**	**557**	**76.9**

Note. Completion = completed/opened × 100. Source: Di Stasio et al. (2026a, in press).

4.5. Part B, Pilot (ATA Strand): Experts' and Équipers' Perspectives

The nine ATA focus groups described the pathway as stimulating reflection on practice and, for ATA staff, as making visible competences that are not always recognised in daily work; one group spoke of "an incentive to work on competences that they did not believe they had" (ATA-F02). The interaction with the LLM was indicated as the most innovative feature (ATA-F06). The main suggestion was to contextualise scenarios on practices "as close as possible to what they actually experience, and not generic and ideal" (ATA-F08), and to distinguish profiles, offices, laboratories and tasks before applying the levels (ATA-F09). Repetitive prompts, uncertain duration and lack of progress indications were reported across the teacher and ATA groups. The feedback meeting was valued as the moment in which level and report are discussed and linked to professional experience: "in the dialogue, in the actual exchange with the evaluators, there was the step of assimilating, of metabolising the platform" (ATA-F09). Participants asked that level and score be accompanied by explicit links to the evidence observed (ATA-F03). On the certifying function, some saw a basis for an argued certification, but this was a possibility discussed, not a shared outcome; reservations concerned the sufficiency of the evidence, and one group proposed separating a scenario-rich phase for self-assessment and training from a more circumscribed certification phase (ATA-F08).

4.6. Summary of the Results

In the Training Program, most enrolled staff completed the Program, perceived quality was positive in all profiles, and case studies were rated at or above 3.0 in all profiles, with reflective modalities rated lowest. In the Pilot, ATA staff used consultative and reflective devices extensively and peer assessment least; three quarters of the scenarios opened were completed, with lower completion on the first competence of the information and data area; and Experts and Équipers valued situated scenarios and the feedback meeting while asking for closer contextualisation.

5. Discussion

5.1. Authenticity

The two actions translate task authenticity into design in different ways (Table 1). The Training Program anchors modules and use cases to the tasks of each profile in Annex D, while the Pilot adapts scenarios to the role and context declared by each participant. According to Herrington and Oliver (2000), both implement authentic context, authentic activities, reflection and authentic assessment. The Training Program, however, includes neither collaborative construction of knowledge nor coaching, which these authors consider central, and should therefore be read as an authentic-task design for individual asynchronous work rather than as a full authentic learning environment.

Following Nachtigall et al. (2022), the trainings pursue the intention of emulating professional work through case-based inquiry, but our data speak to perceived usefulness and ease of use, not to perceived authenticity, which remains unmeasured. The focus groups touch on it indirectly: the request for scenarios that resemble lived practice (Section 4.5) suggests that authenticity is judged by participants and not only designed.

5.2. Scaffolding and Persistence

In the Training Program scaffolding is static and embedded in the sequence of devices; in the Pilot it combines static elements with dynamic ones, namely contextual feedback from the LLM and the human feedback meeting (Table 1). Completion is a descriptive indicator of persistence (Sections 4.1 and 4.4). It does not allow causal attribution to scaffolding, and the completion of the Training Program differed between the two windows (Section 4.1). Two observations point to support needs. In the Training Program the modalities that make the reflective moment explicit, self-assessment and reflection, received the lowest ratings, although above the midpoint (Section 4.2), and the source report recommends strengthening the scaffolding of self-assessment (Di Stasio et al., 2026b, in press). In the Pilot the competence most often opened, 1.1, had the lowest completion (Section 4.4), and focus group participants asked for progress indications and fewer repetitive prompts (Section 4.5). These points concern the contingency of support described by Wood et al. (1976).

5.3. Agency

The asynchronous, self-paced format gives participants control over time and sequence, and in the Pilot the self-training path was optional. ATA staff used the reflective devices extensively, while peer assessment, which requires willingness to exchange with others, was the least used device (Section 4.3). In the Training Program, respondents preferred direct and verifiable formats, such as videos and tests, over reflective ones for future courses (Section 4.2), although case studies were chosen by a substantial share. The source report reads this not as a reason to reduce the reflective component but as a signal that it should be made more legible (Di Stasio et al., 2026b, in press). The focus groups add a further aspect: for ATA staff, the pathway and the feedback meeting also meant recognition of professionalism (Section 4.5). Whether agency was actually enacted cannot be inferred from these data, which describe use and perception only.

5.4. Comparison of the Two Actions

Table 7 compares the two actions. Both rely on the case study as the core device, but in different forms: a static case per module and a use case per area in the Training Program; static cases at four levels plus a dynamic LLM scenario in the Pilot. Read together, the data suggest five design principles, to be tested further: anchor cases in the tasks of each profile; combine static cases, which are widely used and reusable, with dynamic ones, which participants find innovative (Section 4.5); make the reflective moment legible and supported (Sections 5.2 and 5.3); give orientation on progress and duration (Section 5.2); and keep human mediation at the points of judgement, as the feedback meeting was the moment valued most in the focus groups (Section 4.5).

Table 7. Comparison of the two actions.

Dimension	Training Program	Pilot (ATA strand)

Aim	Large-scale digital competence training (20 h)	Develop, assess and certify digital competences (pilot)
Participants in the data	57,771 enrolled, four profiles	96 ATA staff in the cohort
Form of the case study	Static case per module; use case per area	Static cases at four levels (optional self-training); dynamic LLM scenario
Scaffolding	Static, embedded in the sequence	Static and dynamic; human feedback meeting
Collaborative component	None	Optional anonymous peer assessment
Persistence indicator	81.9% of enrolled completed	76.9% of scenarios opened completed; 81% viewed at least one video
Perception data	Questionnaire (25,181 respondents)	Focus groups with Experts and Équipers (second-level data)

Note. Indicators have different denominators and are not directly comparable.

6. Conclusions

As regards RQ1, in both INDIRE actions the case study was operationalised as a task-authentic device: in a static form, anchored in the tasks of each profile, and, in the Pilot, also in a dynamic form generated by an LLM on the participant's role and context. In terms of the elements of authentic learning environments, both actions realise authentic context, authentic activities, reflection and authentic assessment; the Training Program, which includes neither collaborative construction of knowledge nor coaching, is better read as an authentic-task design for individual asynchronous work than as a full authentic learning environment.

As regards RQ2, the case study was positively perceived by the staff of all four profiles of the Training Program and held a mid-range position among the instructional modalities, whereas the modalities that make the reflective moment explicit were the least appreciated. As regards RQ3, in the Pilot the consultative and reflective devices were used more than the collaborative one, and Experts and Équipers valued situated scenarios and the human feedback meeting, while asking for closer contextualisation and for orientation on progress. Taken together, these results suggest that static and dynamic cases may be complementary rather than alternative.

As regards RQ4, for design, the evidence is consistent with keeping the case study as a principle across static and dynamic formats, provided that authenticity, scaffolding and human mediation remain explicit. Practically, it points to making the reflective moment more legible and supported, adding orientation on progress, and calibrating cases on the specific tasks of each profile. These indications remain preliminary (Section 3.5).

Future research should measure perceived authenticity and learning transfer, examine the stability and quality of LLM-generated scenarios, test how static and dynamic scaffolding can be combined and gradually withdrawn, and extend the analysis to the full set of competence areas and to other staff profiles.

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