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## ABSTRACT

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This study analyzes the impact of a hybrid, Universal Design for Learning (UDL)-based professional development (PD) program on the pedagogical instructional practices, awareness, and academic identity of Uzbek academics. Addressing a gap in the literature on Central Asian higher education, the research employs a qualitative-exploratory design grounded in the Teacher Professional Development Research (TPDR) framework. Data were collected from 22 academics at two public Uzbek universities through pre-training, post-training, and delayed post-training semi-structured interviews and focus group discussions across a 144-hour hybrid program delivered in Türkiye and Uzbekistan. Results point out that participants initially framed the program as an institutional requirement for professional renewal rather than a genuine growth opportunity. Post-training and delayed post-training data, however, reveal a meaningful shift toward greater awareness of inclusive pedagogy, flexible instructional design, and student-centred practice aligned with UDL principles, including emerging changes in lesson planning, engagement strategies, and cross-disciplinary usage of digital tools such as artificial intelligence. The program also contributed to a broader reconceptualization of academic identity, fostering a more collaborative, project-oriented, and internationally engaged professional outlook. Furthermore, participants underlined that adapting UDL principles remained context-dependent, shaped by institutional, disciplinary, and structural constraints specific to the Uzbek higher education system. The research concludes that hybrid UDL-based PD can catalyze pedagogical transformation, but sustainable implementation requires systematic institutional support, contextual adaptation, and long-term professional learning structures. These findings extend the global discourse on inclusive education by offering insights from an underrepresented regional context, with implications for policy, practice, and future research.

**Contribution/Originality:** This study is one of the very few studies that have investigated UDL-based professional development among academics in Central Asian higher education. Its originality lies in tracing Uzbek academics' pedagogical development across pre-training, post-training, and delayed post-training phases, revealing how inclusive pedagogy is progressively understood, internalized, and contextually adapted.

## 1. INTRODUCTION

Inclusive education has undergone a fundamental reorientation over recent decades, evolving from a predominantly policy-driven discourse into a transformative pedagogical paradigm committed to equitable access and meaningful participation for all students (Moscato & Pedone, 2024). Within this broader shift, Universal Design for

Learning (UDL) has emerged as a foundational framework, one that challenges the assumption of a homogeneous learner and instead calls for instruction to be designed around the full spectrum of student diversity (Meyer, Rose, & Gordon, 2014). Rooted in cognitive neuroscience, UDL operationalizes this commitment through multiple means of representation, engagement, action, and expression, thereby enabling learners with varying needs, backgrounds, and abilities to access and participate in educational experiences more fully (Espada-Chavarria & Aguilera Zamora, 2026; Rao & Meo, 2016).

Recent scholarship cautions against reducing UDL to a checklist of instructional techniques, emphasizing instead that its implementation requires shifts in teachers' professional identities and epistemological orientations (de la Fuente-González, Menéndez Álvarez-Hevia, & Rodríguez-Martín, 2025; Lambert, McNiff, Schuck, Imm, & Zimmerman, 2023). Teacher professional development (PD) is therefore central to helping educators translate UDL principles into practice; as the following section details, the literature converges on sustained, reflective, and technology-enhanced PD models as more effective than one-off workshops (Donath, Lüke, Graf, Tran, & Götz, 2023; Holmqvist & Lelinge, 2021; Rusconi & Squillaci, 2023; Tuerah, 2025).

Despite this expanding body of research, a striking geographical imbalance persists: the preponderance of empirical studies on UDL-based PD has been conducted in Western contexts, particularly North America and Europe (Margeviča-Grinberga, Kiris, Lanka, & Ābele, 2025). This spatial concentration substantially limits our understanding of how UDL is interpreted, negotiated, and enacted within non-Western educational systems. Particularly absent are empirical accounts of how academics in Central Asian contexts experience UDL-informed instruction and navigate the application of its principles within their specific institutional and disciplinary environments.

A further gap concerns the temporal dimension of pedagogical transformation. Much of the existing literature foregrounds outcomes rather than processes, concentrating on what educators ultimately implement rather than how they reflectively move through phases of encounter, interpretation, and internalization (Lambert et al., 2023). Closing this gap requires a process-oriented lens that attends to both the content of professional learning and the meaning-making practices through which educators situate that learning within their own professional worlds.

This study responds to these twin gaps by examining how Uzbek academics engaged with a hybrid, UDL-based professional development program. Philosophically situated at the intersection of TPDR and UDL, the study conceptualizes professional learning as a reflective and transformative process (Nigris, Cardarello, Losito, & Vannini, 2020). By tracing the arc from pre-program expectations through in-program experience to post-program reflection, the research contributes to a more nuanced understanding of how inclusive pedagogies are negotiated and contextualized across diverse educational settings. The following research questions guide the inquiry.

1. What expectations do Uzbek academics hold prior to participating in a UDL-based professional development program?
2. How does participation in the program influence Uzbek academics' awareness of inclusive pedagogy and UDL principles?
3. What changes emerge in participants' approaches to instructional design and student engagement following the training?
4. How does the UDL-based PD program shape participants' teaching perspectives and their sense of academic identity?
5. How do Uzbek academics evaluate the process of adapting inclusive pedagogies to their own disciplinary and institutional contexts?

Furthermore, the present research study offers one of the first in-depth qualitative accounts of how academics in a Central Asian higher education system engage with UDL-based professional development. Rather than assessing outcomes at a single point in time, it traces participants' pedagogical reflections across pre-training, post-training, and delayed post-training phases, offering a process-oriented account of how inclusive pedagogy is negotiated,

internalized, and adapted to local disciplinary and institutional conditions. In doing so, the study extends the predominantly Western evidence base on UDL-focused PD and provides empirically grounded implications for policy, institutional practice, and future PD design in an underrepresented regional context. Therefore, the research contributes to the field of UDL and PD to a large extent, since its originality comes from its research design and theoretical background.

## 2. LITERATURE REVIEW

It is a known fact that professional development in education includes the structured learning activities through which educators refine their skills and their beliefs, deepen their knowledge, and transform their classroom practices over time. These activities span a wide range of formats, from workshops and formal courses to peer coaching, professional learning communities, and sustained follow-up support, all oriented toward improving teaching quality and enhancing student outcomes in increasingly diverse and inclusive classrooms (Dema, 2025; Donath et al., 2023; Tuerah, 2025). Universal Design for Learning complements this agenda by offering a deliberate, proactive approach to the design of goals, methods, materials, and assessments that are flexible enough to serve all learners. By providing multiple means of representation, action and expression, and engagement, UDL shifts the curricular frame away from the mythical “average student” and toward principled design for the reality of learner variability (Espada-Chavarria & Aguilera Zamora, 2026; Meyer et al., 2014; Moscato & Pedone, 2024; Rao & Meo, 2016).

### 2.1. Place and Importance of PD and UDL in Education

Across K–12 and higher education contexts, UDL-focused professional development is widely recognized as a key lever for advancing inclusive education. UDL equips educators with a framework for designing learning environments that are simultaneously flexible, accessible, and academically rigorous, making it central to equity-oriented educational reform (Bray, Krogh, & Østergaard, 2023; Capp, 2017; Espada-Chavarria & Aguilera Zamora, 2026; Moscato & Pedone, 2024). Professional development serves as the critical bridge through which teachers translate the principles of this framework into everyday classroom action, enabling educational systems to move beyond rhetorical commitments to inclusion toward substantive and observable change (Dema, 2025; Donath et al., 2023; Tuerah, 2025).

### 2.2. Evidence from K–12 and Teacher Education

A systematic review of twelve studies by Rusconi and Squillaci (2023) found that UDL-centred training measurably improves teachers’ appreciation of student diversity, their capacity for accessible lesson planning, and their implementation of inclusive practices in heterogeneous classrooms. Similarly, a structured summer institute produced observable increases in UDL implementation among participating teachers when compared with non-participants, demonstrating that carefully designed PD can produce meaningful shifts in classroom practice (Sun & Zaharudin, 2025). School-based PD programs built explicitly around UDL principles have likewise generated gains in teachers’ knowledge of UDL strategies, their sense of professional agency, and students’ perceptions of inclusion and learner autonomy (Misquitta & Joshi, 2024; Moscato & Pedone, 2024).

A large-scale systematic review of UDL in teacher education encompassing 88 articles reveals a growing integration of UDL into both pre-service and in-service programs, although this integration is often constrained by a narrow framing of UDL as a tool exclusively relevant to students with disabilities. The authors argue compellingly for a reconceptualization of UDL as a standard of quality teaching for all learners, a repositioning essential to unlocking its full transformative potential in teacher preparation and ongoing professional development (de la Fuente-González et al., 2025). Notably, this evidence base remains concentrated in K–12 and pre-service contexts within Western systems, leaving the experiences of in-service academics in non-Western higher education settings, such as those examined in the present study, comparatively underexplored.

### 2.3. Higher Education and International Contexts

A recent systematic review in higher education implies that faculty training in UDL leads to enhanced teaching competence and more inclusive, effective pedagogical practices, with associated gains in student learning, accessibility, and participation (Moriña, Carballo, & Doménech, 2025). Exploratory work in Norway and Australia corroborates these findings, showing that extended UDL-focused PD, accompanied by sustained discussion platforms, enables meaningful integration of UDL into everyday teaching, whereas brief or ad hoc sessions tend to limit long-term impact (Leif, Gigliotti, & McLennan, 2025).

Self-paced and online UDL-based PD modules designed for adult educators have been used effectively to model the accessibility and relevance that UDL advocates, addressing the wide variation in instructors' backgrounds and contexts while improving their readiness to create inclusive learning environments (Evmenova, 2021). In India and China, UDL-centred PD initiatives have strengthened inclusive practices while also identifying specific areas where further targeted support is needed. These cases underscore both the global relevance of UDL and the centrality of PD in non-Western educational systems (Dema, 2025; Misquitta & Joshi, 2024; Sun & Zaharudin, 2025). Yet these accounts remain largely evaluative rather than process-oriented, a gap that reflective design is intended to address.

### 2.4. Cross-Cutting Role of PD

Reviews of UDL implementation across educational settings consistently identify teacher motivation, professional development, and institutional support as the most critical factors determining successful UDL adoption (Capp, 2017; Rusconi & Squillaci, 2023). Crucially, PD that is itself sustained, collaborative, and designed according to UDL principles not only deepens teachers' UDL knowledge and practical skills but also fosters a fundamental shift in professional mindset. This shift in orientation is what sustains and deepens inclusive practice over time (de la Fuente-González et al., 2025; Meyer et al., 2014).

### 2.5. UDL-Focused Professional Development Models

UDL-based PD models are typically conceived as multi-stage, reflective, and technology-enhanced processes. A particularly well-evidenced structure involves three phases organized around needs analysis, core training, and monitoring or coaching cycles. This sequential design has demonstrated effectiveness in supporting in-service teachers to strengthen their inclusive practice through UDL-aligned lesson design and collaborative reflection (Moscato & Pedone, 2024; Rusconi & Squillaci, 2023).

#### 2.5.1. Pre-Training Phase

The pre-training phase typically centres on a systematic needs analysis examining teachers' existing knowledge of inclusive education, their familiarity with UDL, and their technological competencies. This phase also involves clarifying personal and institutional goals and specifying expected outcomes. Approached in this way, UDL is positioned not as a supplementary add-on but as a guiding design principle that shapes the PD process itself from the outset (Moscato & Pedone, 2024).

#### 2.5.2. Training Phase

The core training phase typically blends synchronous and asynchronous online sessions with self-paced modules. Micro-learning activities are designed in accordance with UDL principles of multiple means of representation, engagement, and action and expression, and are frequently integrated with digital technologies (Romero-Tena, Martínez-Navarro, & León-Garrido, 2025). Collaborative tasks enable immediate application of UDL concepts to practice and foster reflective dialogue among colleagues (Moscato & Pedone, 2024; Whinnery, Fogle, Stark, & Whinnery, 2020).

### 2.5.3. Post-Training Phase

In the post-training phase, participants receive ongoing coaching and mentoring, sometimes including virtual or in-person classroom observations, and participate in iterative cycles of assessment and feedback intended to support continuous implementation and refinement. In this way, UDL principles shape not only the content of professional development but also the structure of the learning experience itself, rendering PD more accessible to educators with diverse learning preferences and technological backgrounds (Moscato & Pedone, 2024; Rusconi & Squillaci, 2023).

In higher education and teacher preparation settings, UDL is increasingly positioned as a “signature pedagogy” or program-defining feature. A common model involves faculty or teacher candidates engaging in action research or faculty learning communities to integrate UDL systematically across curricula, sustained by collaborative structures and shared planning processes (Romero-Tena et al., 2025; Whinnery et al., 2020). Within this reconceptualization, PD is no longer a one-off event but a research-informed, longitudinal learning trajectory embedded at the heart of professional life. Reviews of PD for inclusive education within organizational and systemic contexts further emphasize models that align UDL with institutional development, connecting school culture, leadership, and human resource processes with inclusive principles and ongoing staff learning (Holmqvist & Lelinge, 2021; Tuerah, 2025).

### 2.6. Effects on Teacher Competence and Inclusive Practice

Since 2020, the strongest evidence regarding UDL-focused PD consistently points to meaningful changes in teacher competence and classroom practice. Systematic reviews indicate that UDL-aligned instructional approaches are associated with improvements in academic outcomes and more inclusive professional attitudes, while also revealing that many teachers lack sufficient preparation to implement UDL with fidelity, underscoring the ongoing need for structured and sustained PD (Holmqvist & Lelinge, 2021; Rusconi & Squillaci, 2023). Empirical studies with pre-service and in-service teachers document significant gains in UDL knowledge, perceived competence, and appreciation of student diversity following UDL-centred courses, particularly when technology integration is embedded in the learning process (Romero-Tena et al., 2025; Wang & Sitthiworachart, 2025). Much of this evidence, however, derives from short-term post-intervention assessments rather than designs that track whether competence gains are sustained or contextually adapted after training ends, a limitation that the present study’s inclusion of a delayed post-training phase directly addresses.

### 2.7. Changes in Lesson Design and Classroom Practice

Across subject areas and educational levels, the combination of UDL with differentiated instruction, assistive and educational technologies, and collaborative pedagogical strategies is associated with richer lesson designs, more varied assessment approaches, and increased student engagement, including among students with disabilities (Lourenço, Rakaa, Bassiri, & Lotfi, 2025; Marchan, Tenerife-Cañete, Añora, & Pinili, 2025; Moscato & Pedone, 2024; Rusconi & Squillaci, 2023). In early childhood and specialist settings, UDL-informed guidance has also supported more accessible classroom organization, more thoughtful material selection, and more deliberate use of technology to meet the needs of children requiring additional support (Lourenço et al., 2025).

### 2.8. Higher Education and Neurodiversity

Within higher education, UDL-informed course design and diversity-infused professional development are generally received positively by faculty and students alike, with particular appreciation expressed for flexibility in assessment and enhanced access to learning materials (Kim, Kong, & Tirota-Esposito, 2023). Analyses of UDL through the lens of neurodiversity highlight important shifts in teacher beliefs, from treating UDL as a fixed procedural checklist to understanding it as an ongoing, empathetically grounded form of responsive design that fundamentally rejects deficit constructions of disability (Lambert et al., 2023). Teachers who engage in UDL-focused PD consistently report designing more inclusive lesson plans, expanding the range of modes through which students

can demonstrate understanding, and cultivating more inclusive classroom climates overall (Moscato & Pedone, 2024; Romero-Tena et al., 2025; Rusconi & Squillaci, 2023; Wang & Sitthiworachart, 2025).

### *2.9. Barriers, Enablers, and Implementation Contexts*

Recurring barriers to UDL implementation and PD engagement emerge across the literature. Heavy workloads and insufficient time for professional learning limit educators' ability to engage deeply with UDL and to experiment with new instructional strategies (Holmqvist & Lelinge, 2021; Rusconi & Squillaci, 2023; Tuerah, 2025). Rigid curriculum frameworks and high-stakes assessment regimes constrain the flexible, student-centred approaches that UDL advocates (Holmqvist & Lelinge, 2021; Rusconi & Squillaci, 2023). Limited access to assistive technologies, learning supports, and UDL-knowledgeable mentors, particularly acute in low-resource settings and developing-country contexts, further impedes practice change (Marchan et al., 2025; Rafiq-uz-Zaman, Ashraf, Shah, & Farah, 2025; Tuerah, 2025). Additionally, the persistent framing of UDL as relevant exclusively to students with disabilities reduces motivation to participate in UDL-focused PD and encourages only superficial adoption of its principles (Lambert et al., 2023; Rusconi & Squillaci, 2023). Several of these barriers- heavy workloads, rigid curricula, and the persistent framing of UDL as disability-specific- recur directly in the present study's findings discussed in Section 5.4.

### *2.10. Facilitators and Promising Practices*

Institutional and policy-level commitments to inclusive education and UDL are consistently associated with greater continuity of professional development engagement and stronger teacher commitment (Holmqvist & Lelinge, 2021; Rafiq-uz-Zaman et al., 2025; Tuerah, 2025). Collaborative professional structures, including learning communities, faculty learning communities, and action research initiatives, create the sustained spaces necessary for educators to trial UDL strategies, share evidence from practice, and refine their approaches iteratively (Moscato & Pedone, 2024; Whinnery et al., 2020). Technology-enhanced PD and classroom tools, encompassing online modules, collaborative digital platforms, and assistive technologies, give practical expression to UDL's emphasis on multiple means of engagement and representation (Romero-Tena et al., 2025; Wang & Sitthiworachart, 2025). Finally, when UDL is embedded within broader frameworks of social justice, equity, and neurodiversity, it acquires a compelling ethical and political rationale for institutional transformation and ongoing staff development (Lambert et al., 2023; Rafiq-uz-Zaman et al., 2025).

### *2.11. Contextual Diversity*

Recent research in the field of UDL spans a wide range of educational contexts, including K–12, early childhood, special education, higher education, language education, corporate and leadership training, and physical education (Holmqvist & Lelinge, 2021; Lourenço et al., 2025; Marchan et al., 2025; Moscato & Pedone, 2024; Romero-Tena et al., 2025; Rusconi & Squillaci, 2023; Whinnery et al., 2020). In developing-country and Ibero-American contexts, reviews of inclusive pedagogy foreground UDL and continuous teacher education as critical mechanisms for closing the persistent gap between inclusive education rhetoric and authentic classroom practice, while acknowledging that structural and socioeconomic constraints remain formidable (Rafiq-uz-Zaman et al., 2025; Rusconi & Squillaci, 2023). Collectively, the evidence suggests that for UDL-based PD to generate lasting change, educational systems must move beyond short, episodic workshops and invest in sustainable PD ecosystems.

Based on the comprehensive literature review, this body of research establishes UDL-focused PD as a well-evidenced lever for inclusive teaching but also reveals three recurring limitations that the present study addresses directly: a geographic concentration in Western and K–12 contexts, a reliance on short-term or single-point assessments that overlook the temporal unfolding of pedagogical change, and a persistent framing

of UDL primarily as a disability-related accommodation rather than a general design principle for higher education teaching. By tracing Uzbek academics' reflections across pre-training, post-training, and delayed post-training phases, this study responds to each of these gaps.

### 3. METHOD

This research study embarks on a qualitative-exploratory research design, situated within the principles of Teacher Professional Development Research (TPDR). The TPDR framework is distinguished by its self-analytical orientation, its prioritization of participants' training and relational needs, and its commitment to fostering transformative change in teaching practice. The research adopts a pre-test and post-test structure designed to trace the evolution of participants' perspectives, from their initial expectations of the program through to their ultimate evaluations of its outcomes. This design enables systematic comparison of "declared beliefs" with "acted practices," a distinction central to the TPDR approach (Moscato & Pedone, 2024).

#### 3.1. Research Design

The research is set within the compulsory professional development framework governing Uzbek higher education, which requires all academics to renew their professional certification every three years through a 144-hour program. The training examined here was delivered through a hybrid and blended model, a format the literature identifies as particularly conducive to the flexibility and learner autonomy that UDL principles advocate (Kushwaha, Tripathi, Singh, & Yadav, 2024). The program involved an intensive one-month face-to-face component delivered in Türkiye, followed by a structured return to Uzbekistan during which participants completed the remaining hours through synchronous and asynchronous online sessions (Margeviča-Grinberga et al., 2025). The curriculum was designed around key 21st-century competencies, encompassing digitalization in education, technology-integrated instruction, psychological well-being, and drama- and storytelling-integrated pedagogies. This comprehensive curricular scope aimed to build broad teacher capacity by equipping participants with practical, transferable tools for inclusive education.

#### 3.2. Participants and Sampling

The study group comprised 22 academics from Denau Pedagogical University and Tashkent State Medical University in Uzbekistan. Recruiting participants from two distinct institutional and disciplinary contexts enabled the study to examine how UDL principles are understood and negotiated across different academic fields, rather than within a single disciplinary tradition. Participants were identified through cluster sampling. The principal selection criteria were: a demonstrated need for professional development in pedagogical knowledge and instructional design; consistent participation throughout the full 144-hour UDL-based training program; willingness to take part in pre-, post-, and delayed post-training interviews; and existing membership of the academic team. Cluster sampling is considered particularly appropriate in qualitative research designs where the aim is to obtain richly contextual data from informed participants who have encountered, or will encounter, a specific phenomenon of inquiry (Adler, 2022).

In qualitative inquiry, the sufficiency of participant numbers is determined by data saturation and the recurrent emergence of themes, rather than by statistical representativeness. Recent empirical research on saturation indicates that thematic saturation in qualitative interview studies typically occurs within a range of five to twenty-four interviews, though this threshold varies according to sample homogeneity or heterogeneity, interview structure, and analytical strategy (Hennink & Kaiser, 2022). Contemporary methodological guidance further underscores the concept of "approaching saturation," recognizing that beyond a certain threshold, additional interviews yield only marginal new insights, and calling on researchers to document systematically whether saturation has been achieved or approached (Squire, Quataert, & Hopkins, 2025). This study

incorporated 22 participants from two institutions and multiple academic disciplines, facilitating the identification of both intra-institutional and inter-institutional patterns. Preliminary analytic notes maintained throughout data collection were used to monitor levels of thematic repetition and to inform saturation-related decisions (Hennink & Kaiser, 2022; Squire et al., 2025). Consistent with the TPDR principle of attending to operational contexts, the diverse disciplinary composition of the sample was essential for understanding how inclusive principles like UDL are negotiated across different professional fields (Alsalem, 2015; Majumdar, 2025).

### 3.3. Data Collection Process

Data collection was organized across three consecutive phases to document the development of participants' pedagogical perspectives and reflective processes over time. This longitudinal qualitative approach is consistent with recent methodological literature underscoring the importance of tracking change as it unfolds within professional development studies (Hennink & Kaiser, 2022; Squire et al., 2025). During the pre-training phase, focus groups and semi-structured individual interviews were used to explore participants' prior expectations, existing teaching experiences, and current pedagogical practices. Focus groups were particularly valuable for generating interactive data and surfacing shared meanings produced through collective participant engagement (Stahl & King, 2020).

The post-training phase employed semi-structured interviews to capture participants' immediate reflections on the professional development experience, including their perceptions of what they had learned, any shifts in pedagogical awareness, and their intentions regarding future practice. Semi-structured interviews are widely recognized as flexible and productive instruments for recording participants' subjective interpretations while allowing the researcher to probe responses in greater depth (Korstjens & Moser, 2017).

The delayed post-training phase, conducted approximately two months after the conclusion of the program, aimed to investigate the sustainability of pedagogical changes and to examine how, and to what degree, participants had begun to apply UDL principles within their own institutional settings. This phase is methodologically significant, given evidence that short-term post-intervention data frequently fail to capture the longer arc of professional change (Squire et al., 2025).

Throughout all phases of data collection, analytical memos and reflective field notes were systematically maintained alongside interview transcripts. These reflective data sources documented evolving participant perspectives, moments of pedagogical tension, and observable shifts in understanding. The deliberate inclusion of such reflexive data is consistent with methodological recommendations for enhancing the depth, trustworthiness, and interpretive richness of qualitative inquiry (Ahmed, 2024; Stahl & King, 2020). All interviews were conducted in participants' preferred language, English or Turkish, to promote clarity and communicative ease. Ethical protocols, including informed consent, guaranteed confidentiality, and voluntary participation, were strictly observed throughout.

### 3.4. Data Collection Tools and Data Analysis

The primary data collection instruments were semi-structured individual interviews, supplemented by focus group discussions. The semi-structured interview format was chosen for its capacity to allow participants to articulate their experiences, perceptions, and pedagogical reflections in their own terms, while also enabling the researcher to maintain systematic attention to theoretically grounded domains: UDL principles, inclusive pedagogical awareness, instructional design, and academic identity. This method thus balanced theoretical coherence with responsiveness to participant voice. Interview questions were formulated in alignment with the study's theoretical framework and administered across two phases: pre-training (pre-test) and post-training (post-test). Pre-test questions aimed to establish participants' prior knowledge of UDL and their expectations

of the program; post-test questions investigated how participation had shaped pedagogical awareness, instructional design, and academic identity. This comparative structure allowed for the systematic examination of pedagogical transformation across the arc of the program.

The interview protocol was developed primarily from recent scholarship in UDL, inclusive pedagogy, and academic professional development. In constructing the question pool, careful attention was paid to alignment with the study's aims, sub-questions, and theoretical framework, as well as to ensuring that the questions adequately captured the range of academic experiences, perspectives, and teaching reflections under investigation. The draft protocol was reviewed by two independent experts in teacher and academic professional development, who provided feedback on clarity, accuracy, relevance, and alignment with the research purposes. The protocol was subsequently revised in line with this expert input: questions judged too broad or too similar to others were removed, and any phrasing with the potential to introduce bias was reworded in neutral language. This process was intended to strengthen the reliability and validity of the data collection instrument.

Consistent with post-2020 methodological guidance, this study employed the trustworthiness criteria of credibility, transferability, dependability, and confirmability to ensure rigour in qualitative inquiry (Adler, 2022; Ahmed, 2024). To strengthen credibility, three measures were implemented: triangulation across multiple data sources (individual interviews, focus groups, and reflective impressions); contextual adaptation of interview questions and phrasing; and the direct inclusion of participant quotations in the presentation of findings (Adler, 2022; Ahmed, 2024). Thematic analysis was the primary analytical strategy, enabling systematic and interpretive examination of the qualitative data. The analysis proceeded through five stages: familiarization with data through transcription and repeated reading; initial coding of meaningful units related to UDL and professional development; clustering of codes into candidate themes foregrounding cross-disciplinary and institutional patterns; review and definition of themes through comparison of pre- and post-test data; and synthesis of common themes for each participant through expectation–experience–reflection sequences. This approach facilitated the identification of both individual transformation trajectories and community-level patterns of pedagogical meaning-making. Saturation indicators, including reduced generation of new codes or themes and rates of theme recurrence, were monitored and reported throughout the analysis (Hennink & Kaiser, 2022; Squire et al., 2025).

For transferability, detailed descriptions of participant profiles, institutional context, program duration and format, and data collection phases were provided to enable readers to assess the relevance of the findings to their own contexts (Adler, 2022). Dependability was addressed through the maintenance of a comprehensive methodological audit trail, documenting data collection and analysis processes chronologically, including interview recordings, code lists, theme decisions, and revision rationales (Ahmed, 2024; Korstjens & Moser, 2017). Confirmability was supported through researcher reflexivity, with regular notes maintained on potential sources of bias, the researcher's role within the professional development program, and key interpretive decision points. Peer debriefing with an independent researcher was also conducted at selected stages of the coding process (Adler, 2022; Korstjens & Moser, 2017).

#### 4. RESULTS

The interview data were analysed thematically using the five research questions as predetermined codes. The analysis reveals that participants' responses clustered around five interconnected domains: expectations for professional renewal, growing awareness of inclusive and flexible pedagogy, changes in instructional design, shifts in professional self-understanding, and efforts to adapt newly encountered practices to their own disciplinary and institutional contexts. Table 1 presents the distribution of codes across the dataset. Consistent with the exploratory

character of the design, findings are reported below primarily in descriptive terms; fuller interpretation and connection to the wider literature are developed in the discussion section.

**Table 1.** Frequency of pre-determined thematic codes.

| Pre-determined code (Research question)                         | Main focus of the codes                                                                         | Frequency (f) |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------|
| RQ1. Expectations before participation                          | Professional renewal, new methods, digitalization, project learning, international exposure     | 14            |
| RQ2. Awareness of inclusive pedagogy and UDL principles         | Varied teaching methods, assessment, feedback, AI, life skills, student diversity               | 11            |
| RQ3. Changes in instructional design and student engagement     | Lesson planning, activity design, microteaching, feedback practices, drama/Role-play            | 9             |
| RQ4. Influence on teaching understanding and academic identity  | Reframing teaching role, professional confidence, project orientation, broader academic outlook | 8             |
| RQ5. Evaluation of adaptation to disciplinary/Teaching contexts | Transferability, contextual fit, disciplinary relevance, implementation constraints             | 10            |

As Table 1 illustrates, the most frequently occurring codes were related to pre-participation expectations and contextual adaptation, suggesting that participants framed the program primarily through the lens of immediate professional needs and the applicability of new learning to their own institutional and disciplinary environments. These frequencies indicate how many participants raised a given theme and are reported for descriptive transparency only; consistent with conventions in qualitative research, a higher code frequency does not necessarily denote greater conceptual significance, and all codes were treated as substantively meaningful regardless of frequency.

#### 4.1. Prior Steps

Before the program began, participants consistently positioned the professional development activity within a discourse of institutional obligation linked to career continuity. The requirement to renew professional certification every three years shaped the initial framing of participation as compliance rather than choice. At the same time, participants articulated a second, more expansive set of aspirations: exposure to contemporary digital tools, access to globally oriented pedagogical methods, and opportunities for genuine professional renewal.

The mandatory character of participation was expressed plainly by several participants:

*“To continue our job, it is mandatory to renew every three years.”*

Another was more direct.

*“We are obliged... that is why it is necessary.”*

Yet alongside this compliance orientation, participants voiced a clear appetite for modernization, pedagogical innovation, and the integration of digital tools into teaching. One participant articulated this aspiration succinctly.

*“Modernization, innovation, digitalization, and learning new techniques.”*

Another specified a desire to learn.

*“How to assess students, different activities that we can use during the lesson?”*

A third cluster of expectations extended beyond the classroom into the domain of broader academic development. Participants expressed interest in project writing, international networking, and collaboration with foreign universities.

*“We want to learn the place of games in education, the place of new technology, and how projects are written.”*

*“We would like to know how networking is built and how it is increased.”*

These responses point to a dual orientation: an instrumental dimension driven by institutional compliance and a developmental dimension oriented toward genuine professional growth. This duality shaped how participants engaged with the program from the outset.

#### 4.2. Awareness of Inclusive Pedagogy and UDL Principles

Post-training data revealed a markedly expanded understanding of flexible, adaptable teaching aligned with UDL principles. Participants demonstrated growing awareness of learner diversity, multimodal instructional approaches, and inclusive classroom design, even when they did not draw explicitly on formal UDL terminology.

A particularly striking indicator of this shift appeared in reflections on artificial intelligence and technology in education.

*"I have learned that AI is not only for language but also for all disciplines."*

This statement is significant: it signals a movement away from subject-specific conceptions of educational technology toward a broader, more cross-disciplinary understanding of pedagogy. A comparable shift is evident in a participant's observation that:

*"Students and teachers need not only academic success but also life skills."*

The data further suggest that exposure to microteaching, structured feedback, and practical activity design contributed to participants' awareness of more inclusive instructional possibilities. One participant reflected:

*"We learned lesson planning, how to assess students, different activities that we can use during the lesson."*

Another noted that:

*"Microteaching and feedback were informative."*

Reflective accounts also indicate that participants began to question conventional, transmission-oriented teaching models and to consider alternative approaches to student engagement.

These responses suggest the program fostered not only knowledge acquisition but pedagogical reframing—an emerging recognition that instruction can be designed through multiple formats, strategies, and entry points rather than fixed within a single mode of delivery.

#### 4.3. Changes in Instructional Design and Student Engagement

Participants reported emerging developments in their instructional repertoire, particularly in relation to interactive techniques such as drama, role-play, and microteaching. These approaches were valued for their capacity to increase student engagement and to enliven teaching across disciplinary contexts. However, an important qualification must be noted: participants described these changes predominantly as intentions and nascent insights rather than as fully enacted redesigns of their classroom practice.

Drama and role-play were highlighted by several participants as revelatory elements of the program. One recalled:

*"Drama class was amazing. We had the idea that we could use drama and role-play to develop speaking skills."*

This framing, "we have had the idea", captures the early-stage character of pedagogical change: a shift in awareness and intention rather than a completed behavioral transformation. Microteaching similarly reshaped participants' thinking about lesson structure and formative feedback.

*"Micro-teaching and feedback were informative; learning how to give feedback and teach in micro-teaching classes was helpful."*

Another participant recalled learning about:

*"Different activities that we can use during the lesson."*

These responses suggest that the program helped participants begin to move from transmission-oriented teaching toward lesson structures that incorporate rehearsal, interaction, and formative feedback. The changes are real, but their expression in participants' language, "could use," "wanted to apply," "had started to think about", consistently signals that these were emerging orientations rather than established classroom realities at the time of data collection.

#### 4.4. Transformation of Teaching Perspectives and Academic Identity

The findings indicate that participation in the program produced discernible shifts in how participants understood their roles as academics. Engagement with project-based learning and exposure to opportunities for international academic collaboration contributed to an expanding sense of what academic work entails, moving participants' professional self-conception beyond a classroom-centred identity toward one that incorporates research, collaboration, and engagement with transnational academic communities.

This identity shift was most clearly articulated through participants' growing orientation toward academic projects, particularly Erasmus+ opportunities.

*"We talked too much about the projects and started to think seriously about them, mainly the Erasmus Plus projects."*

The deliberateness of the phrase "started to think seriously" suggests that the program opened a new conceptual space for participants, one in which academic work is understood not merely as teaching but as an activity that connects with research, international collaboration, and institutional development. Some responses further indicate a more reflective and comparative stance toward teaching itself. One participant reflected on this shift.

*"My expectation was to review what we were teaching and to have similar models."*

Another expressed curiosity about observing.

*"How it works in Türkiye?"*

These statements point to a process of professional repositioning: Participants were not only evaluating instructional methods but comparing professional cultures and locating themselves within a broader academic community. The program thus appears to have contributed, at least incipiently, to a more outward-looking, internationally engaged, and reflexively grounded sense of academic identity.

#### 4.5. Adaptation to Disciplinary Contexts

While participants broadly affirmed the value of UDL principles encountered during the program, they were also clear that contextual adaptation was not optional but essential. The applicability of specific program elements varied considerably according to disciplinary norms, institutional structures, and individual teaching circumstances. Some components, particularly life skills frameworks and digital technologies, were perceived as broadly portable; others appeared more constrained by disciplinary conventions or institutional requirements.

Several participants referred explicitly to disciplinary transfer as the key test of program relevance.

*"You can reflect on our disciplines."*

The utility of artificial intelligence as a cross-disciplinary resource was similarly recognized.

*"AI is not only for language but also for all disciplines."*

And life skills were framed as universally applicable.

*"Life skills... [are] to be included in all disciplines."*

At the same time, participants articulated real and specific constraints on implementation. One acknowledged the absence of clear pathways for getting started.

*"We did not know where to start or how to be part of it, we wanted to learn it systematically, especially in relation to projects."*

Another cited institutional timing as a barrier.

*"Since it was an exam time, I could not check it fully."*

A third alluded to explicit institutional restrictions.

*"That is the limitation... they did not permit."*

Collectively, these responses make clear that participants did not reject UDL or inclusive pedagogy; rather, they recognized adaptation as feasible but dependent on clearer practical guidance, greater time allocation, and more deliberate institutional support.

#### 4.6. Summary of Findings

Across the dataset, the results suggest that participants entered the program with a dual orientation: institutional compliance on the one hand, and genuine aspirations for professional modernization on the other. Following the program, they reported heightened awareness of flexible teaching approaches, with particular reference to AI integration, life skills, structured feedback, and activity-based instruction. Post-training responses also indicate nascent changes in instructional design and a broadening of professional self-understanding, as participants began to see themselves as academics capable of engaging with projects, international collaboration, and pedagogical renewal. At the same time, the findings clearly show that the transfer of inclusive pedagogies into participants' own contexts remained a work in progress, requiring sustained support, disciplinary tailoring, and practical implementation pathways.

### 5. DISCUSSION AND CONCLUSION

The findings of this study offer a nuanced account of how a hybrid professional development program grounded in UDL principles shaped the pedagogical awareness and professional identity of Uzbek academics. The results reveal a gradual but meaningful transition: participants moved from framing PD as a mandatory institutional compliance exercise toward experiencing it as a catalyst for professional agency and a broader academic outlook.

#### 5.1. From Institutional Compliance to Professional Agency

Perhaps the study's most consequential finding is the shift from viewing professional development as an institutional obligation to recognizing it as an opportunity for genuine professional growth. This trajectory is consistent with prior research demonstrating that sustained, reflective, and practice-oriented professional development can foster teacher agency and deepen ownership over pedagogical change (Misquitta & Joshi, 2024; Moscato & Pedone, 2024). Holmqvist and Lelinge (2021) similarly argue that collaborative, ongoing professional development models are particularly effective in enabling educators to move from passive compliance toward meaningful and purposeful engagement. In this study, participants who initially described PD in purely instrumental terms progressively articulated a more proactive professional stance, especially in relation to international project engagement and cross-institutional collaboration.

However, a significant qualification applies. Unlike participants in studies conducted within more institutionalized PD ecosystems with stronger structural support (Moriña et al., 2025), the academics in this study continued to encounter substantive structural constraints on their professional development. This finding suggests that while PD can initiate change, the depth and durability of that change are ultimately determined by the institutional environment in which it is embedded. Agency, in other words, remains contextually conditioned.

#### 5.2. Expanding UDL Beyond a Disability-Oriented Framework

A second notable finding concerns how participants conceptualized UDL itself. In contrast to prior research consistently documenting a narrow, disability-centred understanding of UDL among educators (de la Fuente-González et al., 2025) this study's participants tended toward a more expansive interpretation. Through their references to digital tools, life skills, and cross-disciplinary engagement strategies, participants increasingly construed UDL as a universal pedagogical approach applicable across contexts and subject areas rather than as a specialized framework for students with specific educational needs. This trajectory aligns with Lambert et al. (2023) argument that UDL should be understood as a "way of thinking" rather than a technical procedure. It also stands in partial tension with findings such as those of Rusconi and Squillaci (2023), who document persistent difficulties among teachers in moving beyond procedural UDL adoption.

Critically, participants in this study did not employ formal UDL terminology, yet their reflections pointed unmistakably toward an emerging conceptual shift in the direction of inclusive and adaptable teaching. This finding

highlights the importance of reflective engagement in PD processes and suggests that conceptual transformation may precede, and perhaps pave the way for, technical expertise.

### *5.3. Pedagogical Change as an Emerging and Non-Linear Process*

The findings also reveal that changes in instructional design and student engagement remained partial and emergent rather than fully realized at the time of data collection. Participants reported heightened awareness of interactive techniques such as drama, role-play, and microteaching, but their language consistently framed these as aspirations, intentions, and nascent ideas rather than as established classroom practices. This pattern is consistent with established theorizations of educational change as an inherently gradual and iterative process (Romero-Tena et al., 2025; Wang & Sitthiworachart, 2025). Donath et al. (2023) similarly contend that the effects of professional development typically manifest first at the level of beliefs and intentions before translating into durable changes in classroom behavior.

The present findings suggest that short-term PD interventions may primarily influence pedagogical awareness and professional orientation rather than producing immediate, observable changes in classroom implementation (Sun & Zaharudin, 2025). This observation carries a clear methodological and design implication: the inclusion of longitudinal follow-up and practice-based components in PD programs is not optional but essential for understanding and ultimately fostering lasting pedagogical change.

### *5.4. Contextual Constraints and the Complexity of Adaptation*

A final cross-cutting theme concerns the complexity of adapting inclusive pedagogical principles to specific disciplinary and institutional contexts. Participants in this study did not view UDL as incompatible with their professional realities, but they were unambiguous about the conditions required for meaningful implementation: clearer practical guidance, protected time for experimentation, and more deliberate institutional support. They experienced disciplinary conventions, rigid assessment frameworks, institutional timing constraints, and outright institutional restrictions as genuine barriers to adaptation.

This finding echoes the broader literature on UDL implementation, which consistently identifies structural and contextual factors as primary mediators of pedagogical change (Holmqvist & Lelling, 2021; Rusconi & Squillaci, 2023; Tuerah, 2025). It also underscores a point made with increasing urgency in recent scholarship: that professional development cannot be designed as context-neutral. For UDL to take root, it must be adapted to the specific cultural, disciplinary, and institutional landscapes in which educators work.

### *5.5. Conclusion*

This study demonstrates that hybrid, UDL-based professional development can function as a meaningful catalyst for pedagogical transformation among academics from Central Asian educational traditions. The program produced a discernible evolution in participants' professional orientations: initial expectations shaped by compliance and institutional obligation gave way, over the course of the program, to a genuine engagement with inclusive pedagogy and pedagogical modernization. Awareness of UDL principles deepened, particularly through the integration of interactive strategies such as drama and AI-assisted instruction, approaches that participants came to understand not as specialized disability-related tools but as markers of quality teaching for all learners. Academic identity also shifted, with participants developing a more outward-looking, project-oriented, and internationally engaged sense of their professional roles.

Similarly, the study is frank about the limits of what a bounded program can achieve. Sustainable pedagogical transformation depends not solely on the quality of professional development experiences but also on the institutional ecosystems that support or constrain educators in applying what they have learned. For UDL to achieve its transformative potential in the Uzbek higher education context, it is suggested that professional development be

accompanied by systematic institutional support, contextually sensitive program design, and long-term professional learning structures.

### 5.6. Implications

The findings underline several concrete implications for educational policy, institutional leadership, and PD program design. At the policy level, Uzbek policymakers are encouraged to transition from a model of mandatory, credit-based certification toward a sustainable PD ecosystem. Since participants initially constructed PD as an “institutional continuity requirement,” policy frameworks should be redesigned to incentivize transformative learning and professional agency over compliance. National frameworks should also actively encourage the reconceptualization of UDL not as a disability-only instrument but as a benchmark for quality teaching for all learners, in direct alignment with the global aspirations of SDG 4 and SDG 10.

At the same time, the findings also highlight that even when academics possess the awareness and intent to implement inclusive pedagogies, they are frequently obstructed by rigid curriculum frameworks and institutional restrictions. For UDL to take root at scale, university leadership should provide systematic support and meaningful pedagogical autonomy: granting educators institutional permission to experiment with flexible lesson designs and alternative assessment approaches; allocating dedicated time for instructional redesign and collaborative reflection; and establishing faculty learning communities or action research initiatives that create sustained professional support for long-term change.

Last but not least, the success of the hybrid delivery model in this research study underlines that the format of PD should mirror the principles it teaches. Future program designers are encouraged to model flexibility by employing hybrid and blended formats that offer educators the same autonomy and choice they are expected to extend to their students. UDL should be approached as a “way of thinking” rather than a fixed checklist: PD should prioritize shifts in teacher beliefs and professional mindset, fostering what might be termed an empathetic and responsive design habitus. The integration of peer feedback, microteaching, and interactive strategies ensures that training is experienced as immediately relevant and practically applicable.

In conclusion, digitalization and AI should be recognized and promoted not as discipline-specific assets but as cross-disciplinary resources capable of operationalizing UDL by providing multiple means of representation and engagement. Academics should be actively encouraged to embed life skills frameworks and interactive activities within their curricula, thereby shifting away from transmission-oriented teaching toward a student-centred, project-oriented academic identity.

### 5.7. Limitations and Future Research

Several limitations of this study must be acknowledged. The small sample size ( $n = 22$ ) and the relatively short interval between pre- and post-test assessments constrain the conclusions that can be drawn about the long-term persistence of pedagogical change.

Future research should employ longitudinal designs to track how participants navigate institutional barriers and sustain or deepen pedagogical transformation over multiple semesters. Further studies could also examine the disciplinary tailoring required to implement UDL effectively across different academic fields, such as the specific adaptations needed in medical versus pedagogical university contexts in Central Asia, thereby providing more granular and actionable guidance for future program design. This study contributes to the global discourse on Sustainable Development Goals (SDG 4 and SDG 10) by giving voice to academics in an underrepresented regional context and by tracing a practical pathway for democratizing educational innovation through transnational communities of practice.

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**Informed Consent Statement:** We confirm that informed verbal consent was obtained from all participants after they were fully informed of the study's objectives and methods, the voluntary nature of participation, and their right to withdraw at any time. Participant privacy and confidentiality were rigorously protected throughout the study.

**Transparency:** The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

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