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A needs analysis study for faculty active learning training in a MOOC professional development environment

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ABSTRACT

Active learning is widely promoted in higher education, yet faculty professional development (PD) often struggles to produce sustainable, observable change in classroom practice, especially when delivered online and asynchronously. Grounded in constructivism and operationalized through Fink's (2003) active learning design, this qualitative case study investigated a micro-learning-based asynchronous PD program supported by an online community of practice (CoP). The training was developed using an online-course instructional design model tailored for asynchronous environments and informed by a multi-phase needs analysis through student evaluations, student open-ended surveys, LMS course review using a grounded active learning inventory, faculty focus groups, field notes, and faculty post-training reflections. Six faculty members completed the program and participated in data collection. Upon needs analysis, four data sources were formed: lesson observations with follow-ups, participant teaching reflections, discussion board artifacts across modules, and three interview sets targeting experiences with the asynchronous micro-learning course, active learning adoption, and CoP participation. To ensure a meaningful shift in faculty practice, a comprehensive needs analysis identified several critical requirements for PD in active learning. First, there was an essential need for training that focused on the constructive alignment of learning outcomes with classroom activities, the expansion of diverse interaction patterns, and the systematic integration of student reflection. While the time constraints of busy academics necessitated the flexibility of asynchronous micro-learning and mobile-accessible content, the analysis highlighted a significant gap in participant self-regulation and peer interaction. Consequently, for PD to be effective, it must move beyond simple content delivery to include structured accountability mechanisms and intentional community facilitation. A successful framework must therefore provide practice-oriented training across low-, moderate-, and high-level active learning strategies, underpinned by strong programmatic coherence to sustain long-term engagement and deepen pedagogical mastery.

Keywords: active learning, higher education, needs analysis, faculty development, MOOC, micro-learning, community of practice

INTRODUCTION

Background and Rationale

A comprehensive needs analysis of higher education teaching quality identifies a critical requirement for professional development (PD) that transitions students from passive reception to meaningful engagement through interaction, application, and reflection (Bulut et al., 2025). Given that active learning is rooted in constructivist theory, there is an essential need for faculty to design environments where learners build understanding through social engagement and authentic tasks (Good & Brophy, 1994; Karanfiloğlu & Bulut, 2025). Specifically, the analysis highlights a need for a practical framework, such as Fink's (2003) design, to help instructors bridge the gap between "adding activities" and creating a purposeful sequence of information, experience, and reflective dialogue. However, because many faculty lack formal pedagogical preparation and face significant structural barriers, including heavy workloads, research responsibilities, and time constraints, there is a distinct need to move away from a "tips and tricks" approach toward a more holistic redesign of lesson structures. Therefore, these institutional realities justify a shift toward flexible, online, and asynchronous PD formats to provide the scalable support necessary for faculty to operationalize effective active learning (Bulut, 2026).

This study is a part of Mehmet Akın Bulut's doctoral thesis (2022).

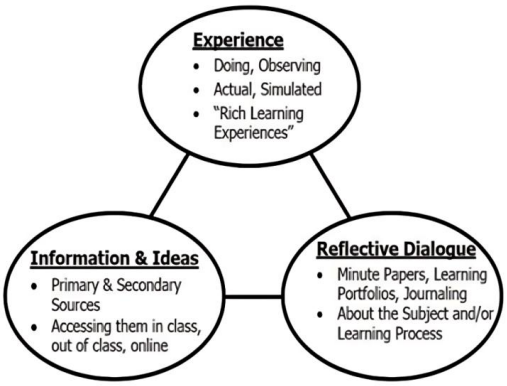

Figure 1. Fink's (2003) active learning model

Micro-Learning and Online Communities of Practice in Faculty Development

A needs analysis of faculty PD identifies a critical requirement for micro-learning, defined as short, single-objective learning units delivered in bite-sized, modular formats (Khan, 2019). This approach is necessary to provide job-embedded, immediately applicable resources that align with the extreme time constraints of modern academics (Buchem & Hamelmann, 2010). However, the analysis also establishes a vital need for carefully engineered coherence and sequencing to mitigate risks of fragmentation, distraction, and cognitive overload. To address the documented weaknesses of traditional, top-down trainings, specifically limited interaction and weak transfer to practice, there is a clear requirement for a community of practice (CoP) framework that enables members to share a domain and deepen their practice through sustained exchange (Lave & Wenger, 2011; Wenger, 2011). Finally, because sustaining such communities in asynchronous environments is difficult, the analysis dictates that any proposed PD must incorporate robust accountability structures and established peer interaction norms to ensure the success of the social learning process.

Research Problem and Gap

A needs analysis of current faculty development literature reveals two persistent gaps that justify the design of this study. First, there is an urgent need to address the lack of observable change in classroom practice following PD (Birgili et al., 2025); many programs result in "activity without alignment" because faculty adopt isolated techniques rather than a full active learning design cycle, encompassing outcomes alignment, strategy/interaction, and reflection. Second, while asynchronous online PD offers scalability and flexibility, a significant empirical need exists to understand how micro-learning and online CoP structures jointly influence faculty learning and implementation in authentic university settings. Despite recognized benefits such as accessibility and risks like low engagement, there is a critical requirement for research that documents how these specific design choices affect both faculty learner experiences and measurable shifts in teaching practice. This study addresses these needs by examining a practice-oriented, asynchronous micro-learning course with integrated CoP elements, evaluating outcomes through triangulated qualitative evidence including lesson observations and follow-ups.

Purpose of the Study

To address these identified gaps, this qualitative case study arises from a practical need to investigate faculty members' experiences with an asynchronous micro-learning PD course and an online CoP structure. Specifically, there is a requirement to examine whether and how such a training design influences the actual adoption and implementation of active learning in real classroom teaching, utilizing Fink's (2003) model as the essential organizing framework for active learning design. Aligned with this need for evidence-based training and triangulated data sources, including interviews, discussion boards, reflections, and lesson observations, the study addresses the following research question (RQ):

RQ. How does the needs analysis-based instructional design model of a faculty development course shape faculty members' adoption of active learning?

Theoretical Background

Active learning is widely linked to constructivism (Brandon & All, 2010; Cooperstein & Kocevr-Weidinger, 2003; Mintzes & Walter, 2020). Good and Brophy (1994) note that constructivism emphasizes learners constructing meaning, building on prior knowledge, learning through social interaction, and engaging in authentic tasks. Consistent with these principles, Fink (2003) proposed an integrated active learning design approach to enhance learning quality. This study therefore used Fink's (2003) model to train faculty members to implement active learning strategies in their teaching.

Fink (2003), as seen in **Figure 1**, argues that active learning is only "complete" when three linked steps are implemented:

(1) information and Ideas (aligned outcomes and content delivery),

(2) experience (goal-aligned active learning with interaction/feedback), and

(3) reflective dialogue (reflection and summary).

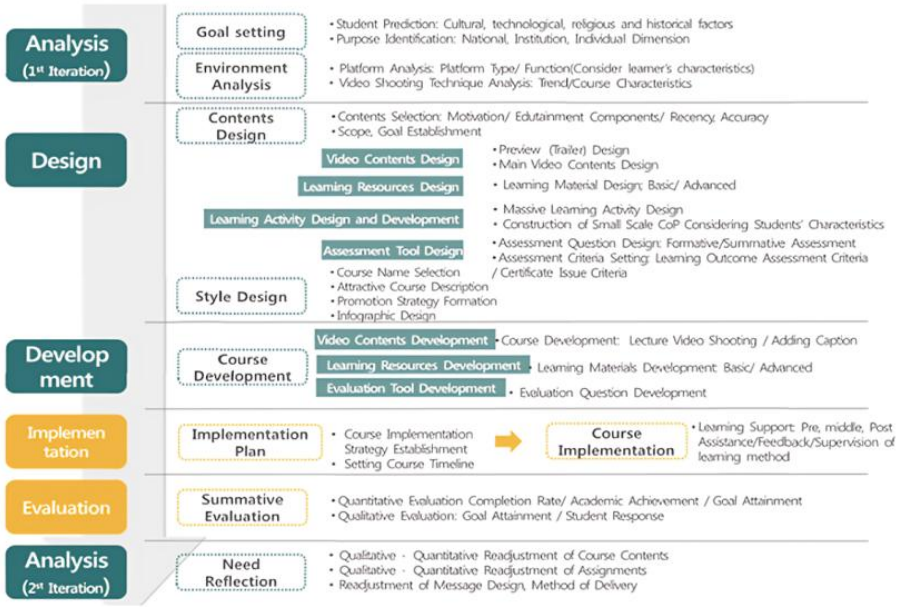

Figure 2. Online course ID (Lee et. al, 2016)

For example, an instructor aligns outcomes and presents content, engages students in an activity such as a before/after two-column learning monitor with peer sharing, and ends with a brief reflection (e.g., a three-word or one-minute summary), again optionally shared with peers.

Recent studies have applied Fink's (2003) model to improve learning. For instance, Ruth et al. (2022) redesigned a cultural anthropology course by shifting from passive, individual ethnography learning to collaborative, community-based active learning with reflection; outcomes included stronger alignment, improved performance, and increased student voice and inclusivity. In this study, Fink's (2003) framework guided the faculty training from outcomes alignment, through strategy use, to reflection-based closure. To examine implementation, the study also drew on Van Amburgh et al.'s (2006) active learning inventory (ALI), which classifies strategies by low-, moderate-, and high-complexity.

After observing nine lectures, researchers identified 13 active-learning episodes per session. Using lecturer interviews and statistical checks (reliability and inter-observer agreement), they developed an ALItory with three levels: low complexity (no prep/setup, brief activities), moderate complexity (some prep/setup, typically 3-5 minutes), and high complexity (requires preparation and longer completion time)

Regarding the micro-learning and active learning, Khan (2019) defines microlearning as a stand-alone, meaningful, interactive, objective-focused learning unit delivered in "bite-sized" snippets, digitally (e.g., computer/mobile) or non-digitally (e.g., flashcards). Designing and evaluating microlearning should follow a framework to meet intended outcomes (Corbeil et al., 2021). Khan (2019) therefore proposes standardization principles so that microlearning is not reduced to random short content: pedagogical, technological, interface design, evaluation, management, resource support, ethical, and institutional.

Because higher education faculty often have heavy research and teaching loads (Buchem & Hamelmann, 2010), committing to lengthy PD can be difficult; microlearning supports flexible, self-paced (asynchronous) participation (Giurgiu, 2017). Khan (2019) distinguishes informational snippets (brief information delivery) from instructional snippets (single-skill/concept learning) and argues microlearning is increasingly popular in training because it enables easy preparation, quick review, spaced repetition, and post-training job aids. The CoP model (Butler et al., 2004; Perry, 1998; Wenger, 2011) is widely used in studies of group learning and faculty development. Lave and Wenger (2011) describe a CoP as a community that shares practices, where ongoing participation and knowledge exchange support learning.

A CoP includes three core components: community (the participating members), domain (the shared subject area), and practice (the application and implementation of what is learned). Although CoPs are well studied in face-to-face settings, research on online/virtual CoPs, especially within faculty PD, remains limited (Butler et al., 2004). This gap matters because many PD models are still largely top-down and trainer-centered (Collins, 1999; Stein et al., 1999). Embedding CoPs in training is expected to promote social learning and a stronger sense of community, which can support improved learning outcomes.

METHODOLOGY

Online Course Instructional Design

Rather than creating or validating a new instructional design (ID) model, this study adopted Lee et al.'s (2016) model as displayed in **Figure 2**, which was designed and validated for asynchronous online courses. This adapted ADDIE framework guided the development of a data-driven PD through the core phases of ID as analysis, design, development, implementation, and evaluation (Dick et al., 2005; Morrison et al., 2001; Peterson, 2003).

Table 1. Top-rated courses content analysis

Best course 1 codes	Best course 1 themes	Best course 2 codes	Best course 2 themes	Researcher's interpretations
Interactivity	Active learning	Interactive	Active learning that aligns learning activity to assessments	Two courses, one before and the other during pandemic are favored because students find them interactive, participatory and test-aligned with learning activities.
Involvement		Enjoyable		
Active		Test-aligned		

Table 2. Open-ended student survey content analysis

Codes	Theme	Researcher's interpretations
Non-engagement (need activity), interactivity	Social and active learning that should include feedback from instructors	20/100 students have responded mostly stating their need for more interactive, collaborative, active learning environments in courses while they complain of lack of or absence of feedback. Active feedback techniques should be added to the PD goals and content for faculty.
Group work, collaboration, participation		
Feedback		

Table 3. 40 university courses on LMS: Content analysis for active learning

ALI tool (total 21 strategies)	Courses (40 courses) at the research site uses 7 out of 21 strategies (33% of all strategies) and rarely, not throughout the semester
Low complexity (10)	3 strategies
Moderate complexity (7)	2 strategies
High complexity (4)	2 strategies

Table 4. Researcher notes content analysis

Faculty initials & code	Sub-themes	Themes
A.K.: (Q1) Student resistance & (Q2) How to give student feedback F.Ç.: (Q1) Problem with traditional teacher-centeredness & (Q2) Asynchronous, 7/24 accessibility, mini-videos Ö.F.: (Q2) Pause the lecture for learning activity every 20 mins	Focus G 1 Overcoming student resistance-asynchronous, online micro-learning-active learning	Active learning via MicroLearning online course Overcoming student resistance to active learning
A.S.: (Q1) Passive teaching same as 80 years ago & (Q2)more interaction needed Ö.K.: (Q1) TA/TF need support for teaching excellence & (Q2) Online mode for pd program, learning outcomes connected to active learning strategies T.C.: (Q2) Asynchronous support	Focus G 2 Active learning-online mode-learning outcomes-alignment	
(TF) A.A.: (Q1) Inexperienced ta/tf, need pedagogy practice & (Q2) Learning tips (Rector) A.A.: (Q1) Passively learning students, student complaints & (Q2) Active learning for faculty	Focus G 3 Active learning	

The ID model was selected because, in online course and MOOC design, practice has outpaced research, leaving relatively few studies that propose course-specific design models. As a result, courses are often built using general frameworks such as ADDIE and the MRK model (Morrison et al., 2004), and the Dick and Carey model (Dick et al., 2001), or simply designers' experience. In this study, however, the intended components such as asynchronous videos, discussion forums, interactive content, and a self-paced structure required design decisions that traditional models did not address in enough detail (e.g., video development, timing, and pacing in asynchronous environments). To meet these needs, the study adopted Lee et al.'s (2016) online course ID model, developed through systematic research on online course principles and development processes (e.g., videos, activities, platform selection, and assessment). The model is built on ADDIE while providing more explicit guidance for innovative asynchronous course design.

Analysis

In ID, analysis involves closely examining the learning context (e.g., environment and learners) to understand the situation and identify needs. Morrison et al. (2011) explain that choosing to attend a training or PD program itself signals a "need," but needs can also be identified through performance analysis (e.g., tests and projects) and data collection methods such as interviews, open-ended discussions, surveys, and questionnaires. Accordingly, to determine training content needs in this study, the researcher, who also served as the faculty trainer and had worked with the institution for five years, conducted multiple phases of data collection to identify faculty needs more rigorously and in depth.

First of all, semester-end student evaluation forms of the two highest-rated courses were examined through content analysis (**Table 1**).

Then, 150 students were sent an open-ended survey as to what they looked for in university courses regarding teaching in particular. Content analysis was conducted (**Table 2**).

In addition, 40 randomly-selected courses on the learning management system were examined in accordance with the ALI prepared by Van Amburgh et al. (2006). Content analysis was conducted (**Table 3**).

Next, the researcher used the field notes and focus group notes he collected while visiting the faculty at the research-site university. They passed through content analysis (**Table 4**).

Finally, open-ended survey completed by the faculty following a university-wide training during COVID-19 was examined through content analysis (**Table 5**).

Table 5. Faculty post-training open-ended responses content analysis

Code	Example excerpt	Sub-themes
Teaching tips	I found practical teaching tips shared by the trainer as the most helpful part.	Applied practice & interaction
Interactivity	I liked the interactivity and discussions the most.	
Participation	The way we participated was the most likable to me.	Active participation, student involvement, & learning retention
Involvement	Strategies to improve student involvement were great.	
All time/online support	Faculty should be supported not once or twice through face to face meetings, but more via online platforms.	Online faculty support platform
Sustainable learning	We should be able to access learning support anytime we need during the semester.	Flexible access for faculty efficient learning

Table 6. The flow of the active learning training

Step	Description
0	Pre-launch and course orientation
1	What is active learning? Aligning learning outcomes with activities
2	Ways to mitigate students' resistance to active learning
3	Low & moderate complexity active learning strategies
4	High complexity active learning strategies
5	Interaction & feedback patterns
Final	Close-up

A peer-debriefing process with one measurement and evaluation expert and two educational technology doctoral researchers supported the content analysis of the needs data. The resulting codes and themes showed a strong need for active learning training and a preference for online delivery over an on-site workshop.

Because context is central to needs analysis (Dick et al., 2014), the study considered the setting: faculty teach both face-to-face and via Zoom; classes are small (about 5-10 students); a typical term is 14 weeks; lessons run 45 minutes with 15-minute breaks. The university uses Canvas for materials, Zoom access, discussions, and assessment, and classrooms include smart boards with Canvas and internet access. Faculty were already proficient with these tools due to prior in-house training.

The study's Center for Innovative Learning and Teaching-Artificial Intelligence is led and staffed by the researcher/author of this paper, whose role includes observations, needs analysis, resource development, and instructional support—making active learning training a natural fit and the researcher's familiarity with participants an advantage.

Following Lee et al. (2016), platform choice was treated as part of needs analysis for asynchronous design. Based on prior institutional experience and literature on usability and popularity, Open edX was selected and implemented with the IT unit. Open edX has also been rated highly for microlearning design across themes such as interactive micro-content, chunked courses, activity-based flow, mobile support, learner focus, social structures, affordability, and stackable lessons/credentials (Jahnke et al., 2019).

Design

The design stage, also called as the blueprinting (Dick & Carey, 1978), follows the needs analysis and informs of learning objectives, tasks, content sequencing, program formation and assessment planning. While designing these components, the process needs to be aligned with the analyzed needs. Otherwise, there would be a misalignment (Biggs, 2001). Misalignment in ID is defined as the mismatch between the emerging needs and learning outcomes design. Thus, considering the faculty and student needs via *faculty teaching evaluation forms by students, open-ended 'student needs' responses, faculty open-ended responses to a previously-held training, researcher's field notes, an examination of 40 courses on LMS,* the researcher was led to design the content of the training as in **Table 6**.

Content sequencing followed Reigeluth's (1982) parts-to-whole model, drawing on Gagné's (1973) work on instructional sequencing. The model emphasizes that content should not be presented randomly because topics are interrelated; instead, instruction should progress in a logical order and move from simpler ideas to more complex ones. Accordingly, this PD sequenced active learning from definition to strategies, then to implementation, and finally to evaluation, and organized strategies from low- to moderate- to high-complexity. Another key design step is specifying objectives, aligned tasks, and assessments (Lee et al., 2016). Objectives define the targeted competencies, tasks are designed to achieve those objectives, and assessments measure attainment.

Development

The development stage involves creating materials (and, when needed, and the platform environment) in line with the design blueprint (Morrison et al., 2001). In this study, development focused on producing microlearning-based active learning content and embedding a CoP so faculty could collaborate and exchange ideas through Open edX discussion boards. Three steps guided development:

(1) video content development,

(2) learning resource development, and

(3) evaluation method/tool development.

Video production began with defining the video scope and trailer, filming the main video, and then adding interactive questions using Web 2.0 tools such as EdPuzzle or H5P. Next, supporting resources like infographics, text, images, PDFs, and external links were created; for example, Canva was used to design infographics summarizing key video points. These parallel materials also increased accessibility for participants who could not reliably stream videos due to device or internet limitations. Finally, evaluation was designed primarily through open-ended discussion activities (rather than quizzes), where participants posted reflections, shared experiences, and submitted lesson plans or required tasks; completion of these discussions served as evidence of module completion. After assembling each module, the researcher published it on Open edX and notified participants so they could complete the module before the following week.

Microlearning consists of short, bite-sized units aligned to a single learning goal and accessible across digital devices (Buchem & Hamelmann, 2010). In this training, it was used to fit faculty members' busy schedules and mobile work patterns (Nilsson, 2021), and content development drew on Khan's (2019) microlearning principles: pedagogical, technological, interface design, evaluation, management, resource support, ethical, and institutional. These principles were applied as the context allowed. Pedagogically, the course supported active learning through multiple formats (e.g., infographics, short videos with embedded questions, discussion boards, mini-games, text, and links). Technologically and in interface design, Open edX and Web 2.0 tools enabled interactive features and multi-device access, with simple page layouts and easy navigation. For evaluation, each micro-unit targeted a single outcome and was trackable by the trainer/admin. Management was supported through flexible module control (e.g., reopening/closing modules). Resource support was provided via end-of-module resources, FAQs, and trainer contact information. Ethically, attention was given to diversity, accessibility, and copyright permissions. Institutionally, the training was supported by Ibn Haldun University through its Open edX extension. Materials included infographics, images, PDFs, web links, text, YouTube videos, and tools such as interactive video platforms, collaborative discussions, Canva-assisted video production, and Nearpod gamified activities. Web 2.0 tools were selected for their interactivity and potential to support self-regulation (Kitsantas & Dabbagh, 2011). Videos were kept brief (about 2-3 minutes), consistent with recommendations for microlearning design (Jahnke et al., 2019).

Implementation

The implementation stage describes participant admission, the program's single live (synchronous) orientation, and implementation procedures. After nine faculty were admitted, a course orientation session, a common practice in online training (Hone & El Said, 2016; Ichimura et al., 2020), was held to explain the program, answer questions, demonstrate site navigation, and share resources, contact information, and FAQs. At the end of the session, participants were asked to log in, open the "course orientation" tab, and post on a discussion board about their prior knowledge and experience with active learning. These posts helped the researcher gauge participants' background and needs. Early posts suggested that most participants either had limited familiarity with active learning or knew isolated strategies without a coherent, outcomes-aligned and reflective design perspective (Biggs, 2001; Fink, 2003).

Procedures

The active learning training included six modules, with module 0 serving as course orientation and introduction (**Table 6** outlines the sequence). Because the course was asynchronous, six modules did not necessarily equal six weeks; participants progressed at their own pace. Before launch, the researcher held a Zoom meeting to introduce the training, clarify expectations for completion, and demonstrate how to navigate the platform (e.g., where to begin and how to use discussion boards). Contact details were shared for support. Participants then registered, completed discussion-board prompts ("introduce yourself" and "What is your knowledge and experience with active learning?"), and a WhatsApp group was created for ongoing communication. Module 1-module 5 each provided microlearning materials (interactive videos/slides, infographics, and questions) and a discussion board focused on:

(1) active learning and aligning outcomes with strategies,

(2) coping with student resistance,

(3) low- and moderate-complexity strategies,

(4) high-complexity strategies, and

(5) interaction and feedback patterns in active learning.

To close, participants were thanked for their contributions and offered a lunch after data collection. They were also asked to support the research through lesson observations, teaching reflections, and individual interviews.

Sampling and participants

This study used convenience sampling, selected based on the study's goals, access to eligible participants, and the project timeline. In convenience sampling, the researcher recruits readily available participants who fit the study purpose until the sample size is judged sufficient for the research.

Participants ranged in age from **32 to 43** and had **5-8 years** of teaching experience. To maintain confidentiality, they are referred to as **P1-P6**.

- **P1** (35, South African; 6 years; sociology PhD): no prior teaching-enhancement training; online teaching since COVID-19; no experience with online courses/platforms.
- **P2** (37, American; 8 years; computer engineering/sociology): no teaching workshops; strong online learning background; highly motivated for PD; interested in innovative teaching and supporting the teaching center.

- **P3** (32, Turkish; 6 years; sociology PhD): interested in educational technology and innovative teaching; no prior teaching workshops; online teaching since COVID-19; interested in supporting the teaching center.
- **P4** (36, French; 5 years; philosophy of religion PhD): no prior teaching-enhancement training; online teaching since COVID-19.
- **P5** (33, Turkish; 5 years; philosophy PhDc): no prior teaching workshops; online teaching for a couple of years; motivated for professional development.
- **P6** (38, Azerbaijani; 8 years; sociology PhDc): attended one short online-teaching workshop; interested in innovative teaching and supporting the teaching center.

In case study research, the emphasis is less on sample size and more on the **quality of research design** and the **depth of data collection and analysis** (Büyüköztürk et al., 2018). Accordingly, this study aimed to generate rich, contextualized accounts of six faculty members' experiences in the active learning training program using multiple data sources, including **interviews, document analysis, lesson observations, and participant reflections.** The participant number also reflects a realistic scale for PD programs, supporting the study's ecological validity.

Data Collection Tools

Based on the needs analysis, data collection tools were determined. In the **evaluation stage**, the study examined whether and to what extent the PD objectives were achieved, using methods aligned with the original objectives. Consistent with needs analysis stage in the ID model by Lee et al. (2016), **interviews and observations** were central, and all instruments were used with permission from their original authors.

Data sources and procedures

Semi-structured interviews explored participants' experiences with the **microlearning-based asynchronous course** (**RQ1**; adapted with consent from Hone & El Said, 2016), the **active learning training** (**RQ2**; adapted with consent from Tharayil et al., 2018), and the **CoP** (**RQ3**; adapted with consent from Wenger, 2011).

Across these sets, questions addressed usability and motivation, barriers/technical issues, perceived learning and transfer, coping with student resistance, and perceived value/benefits and challenges of CoP participation.

Discussion boards (online) served as both a learning activity and an evidence source for **RQ2 (active learning)** and **RQ3 (CoP)**. Each module ended with a board prompt that progressively required participants to

(a) introduce themselves and share prior experience,

(b) articulate entry-level active learning knowledge,

(c) align outcomes with activities and reflection,

(d) design a lesson plan integrating low/moderate/high strategies, and

(e) add interaction and feedback patterns.

All posts and exchanges were **content-analyzed.**

Lesson observations addressed **RQ4** using a validated **active learning lesson observation form** (Palmer et al., 2014), grounded in **Fink's (2003) active learning design** and aligned with the training outcomes (learning outcome alignment, strategy use, interaction/feedback, and student reflection). The form's development and quality were supported through validity and reliability work (Winkelmes et al., 2013), with ratings scored as **0 (low evidence)**, **1 (moderate evidence)**, and **2 (strong evidence)**.

Participant reflections were collected orally or in writing following observations to capture instructors' interpretations of their teaching and perceived changes.

Lesson observation form structure

The instrument included:

(a) course/date/instructor/duration,

(b) learning outcomes and alignment rationale,

(c) active learning strategies (low-moderate-high),

(d) interaction/feedback (self/peer/group),

(e) student reflection (mode and focus),

(f) criteria/rubrics, and

(g) observer notes separated into **descriptive (objective)** and **interpretive (trainer comments)** sections, with satisfactory/moderate/unsatisfactory options and guidance descriptors for each domain.

Participant teaching reflection form

This form mirrored the lesson observation form, except it was completed by faculty to self-report their own active learning implementation. It supported **RQ4** by showing whether and to what extent participants adopted the active learning components emphasized in the training. The reflections also revealed how participants interpreted and transferred what they learned into their teaching and enabled the trainer to compare participants' self-perceptions with observation notes. Reflection is a valuable data

source because it can foster critical thinking (Yang, 2009), support evaluation of classroom experience (Postholm, 2008), help synthesize actions taken during teaching (Fink, 2003), contribute to teacher identity development (Korthagen, 2004), and connect theory with practice (Fazio & Melville, 2008).

Data Analysis

To address the requirement for a rigorous, triangulated evaluation of faculty development, this in-depth qualitative study employs content analysis across multiple data sources, including lesson observation forms, participant reflection forms, interviews with six course completers, and discussion board posts. The analysis follows a systematic need for open, axial, and selective coding to capture the nuances of faculty learning. By analyzing interview data, discussion board contributions, and teaching reflections together, the study fulfills the need for data triangulation to ensure a comprehensive understanding of instructional shifts. Furthermore, the design responds to the need for an ongoing and responsive analysis process by conducting continuous discussion board analysis throughout the training, complemented by post-training interviews and observations. A detailed presentation of these data analysis procedures and the resulting findings is provided later.

The Role of the Researcher

Throughout the study, the researcher acted as trainer, facilitator, and data collector, while also serving as the qualitative "lens" observing the training from start to finish. To support credibility and maintain as much objectivity as possible, three strategies were used:

Peer debriefing

Peer debriefing involves colleagues who challenge the researcher's assumptions and interpretations (Creswell & Miller, 2000; Lincoln & Guba, 1985). Two educational sciences academics were given access to the training platform, video-recorded lesson observations, and the researcher's emerging content-analysis interpretations, and they provided critical, constructive feedback.

Member checking

Member checking asks participants to review the credibility of findings and interpretations (Miles & Huberman, 1994). In this study, four participants reviewed and commented on the researcher's interpretations drawn from lesson observations, interviews, and discussion boards.

Triangulation

Triangulation strengthens credibility by using multiple data sources to corroborate findings (Anzul et al., 2003). Here, evidence was triangulated across interviews, lesson observations, and discussion board analyses.

Limitations of the Study

A needs analysis of the study's findings highlights several environmental and methodological factors that define the scope of the identified requirements. First, because data were drawn from a social-sciences-focused university and a single department, there is a clear need for future research to determine if these PD requirements remain consistent across diverse institutional contexts, such as engineering or the arts. The subjective nature of participant responses and researcher observations also indicates a need for broader, more generalizable data sets to validate these initial findings. Furthermore, because specific contextual variables—including class size, student characteristics, and faculty backgrounds—significantly shaped the outcomes, the analysis identifies a requirement for PD models that are adaptable to unique local conditions. Finally, the absence of a control group suggests a need for future evaluative frameworks to incorporate comparative designs, ensuring that causal links between the PD interventions and shifts in teaching practice can be more definitively established.

FINDINGS AND DISCUSSION

From Needs-Based Intentional Design to Instructional Design

The triangulated results of this needs analysis, derived from a content analysis of top-rated courses, a broad student survey, and an extensive audit of existing LMS sites, reveal a critical disconnect between the pedagogical desires of students and the current instructional realities within the institution. Analysis of the highest-rated courses (**Table 1**) suggests that the "gold standard" for students is an environment characterized by interactivity, high involvement, and a transparent alignment between learning activities and assessments. This demand for a more engaged classroom is echoed in the survey of 150 students (**Table 2**), where respondents explicitly identified a pervasive need for more collaborative and interactive environments while specifically citing the "lack of or absence of feedback" as a significant barrier to their learning. Despite these clear student requirements, the content analysis of 40 randomly selected university courses using the ALI (Van Amburgh et al., 2006) exposes a substantial implementation gap (**Table 3**). Currently, faculty utilize only 7 out of 21 possible active learning strategies, that's, a mere 33% of the available repertoire with a disproportionate reliance on only three low-complexity tactics that are applied sporadically rather than integrated throughout the semester. Collectively, these data points establish an urgent PD requirement: faculty need targeted training in "active feedback techniques" to satisfy student expectations for social learning, alongside a scaffolded design logic that empowers them to move beyond a limited, low-complexity repertoire toward a more comprehensive and test-aligned active learning practice.

Structural Requirement: Mitigation of "Friction Costs"

The data identifies a primary need for PD models that function as "access and motivation support" rather than just content delivery. To ensure faculty do not drop out due to the high "friction costs" of their roles, namely time, bandwidth, and cognitive load, the PD must be modular and bite-sized.

Faculty reflections highlight that short-form content is not a luxury but a functional requirement for engagement. As one participant noted, **"I could complete a unit between meetings / after class because it was short" (P3)**. The specific format of the content also dictates focus; for instance, **"The videos being 2-3 minutes made it easier to stay focused" (P5)**. Furthermore, the analysis reveals a need for parallel resources to accommodate different environments, with one faculty member stating, **"Having infographics/text helped when I couldn't watch the video" (P1)**. Ultimately, for any transfer to teaching to occur, the design must first lower the barrier to entry by fitting into the "busy academic schedule."

Pedagogical Requirement: Transitioning from "Isolated Techniques" to "Design Logic"

A critical gap identified in the needs analysis is the tendency for faculty to view active learning as a collection of fragmented "tips and tricks" rather than a coherent design stance. Early in the process, faculty expressed a clear need for guidance on connectivity, with one participant admitting, **"I use a few activities, but I'm not sure how to connect them to outcomes" (P3)**.

To address this, the PD must provide a structured sequence—moving from definition to strategy to evaluation—that reinforces ID logic. The findings suggest that when this need for coherence is met, faculty undergo a conceptual shift. This is evidenced by participants who began to prioritize alignment: **"I start from the outcome and choose the strategy that fits" (P1)**. Most importantly, the analysis shows that the design must explicitly frame reflection as a structural necessity rather than an elective: **"I realized reflection is part of the design, not an 'extra'" (P6)**. This shift from "doing something interactive" to "designing for learning" is the hallmark of a successful PD intervention.

Logistical Requirement: Differentiated and Scaffolded Adoption Pathways

The findings establish that faculty adoption of active learning is not a binary switch but a progression along a complexity continuum. There is a documented need for a "realistic adoption pathway" that accounts for both pedagogical and logistical risks (e.g., prep time and classroom management).

Faculty initially gravitate toward low-stakes strategies to build confidence: **"I started with quick activities I could run in 3-5 minutes" (P1)**. The analysis identifies that the barrier to high-complexity strategies is often rooted in logistical anxiety rather than a lack of interest: **"The longer activities need more prep and I worried about time" (P4)**. Therefore, a successful PD must provide a scaffolded experience where faculty can achieve "early wins" before moving to more intensive methods. As confidence and planning support increase, faculty naturally move toward growth: **"After trying simpler strategies, I felt ready to plan a longer activity" (P2)**. This confirms that the PD design must move away from "one-size-fits-all" expectations in favor of a scaffolded continuum.

DISCUSSION

This study examined a micro-learning-based asynchronous faculty PD program as a direct response to the identified needs of instructors to strengthen their active learning implementation. By exploring how an embedded online CoP addressed the requirement for social support and accountability, the discussion is organized around an ID lens and an ALI lens. These lenses serve to evaluate how well the training met the functional and pedagogical needs of faculty while retaining the original theoretical anchors: constructivism to address the need for active knowledge building; Fink's (2003) active learning design to fulfill the requirement for a coherent sequence of information, experience, and reflection; micro-learning principles (Bulut et al., 2025; Khan, 2019) to accommodate the need for time-efficiency; and CoP theory (Lave & Wenger, 2011; Wenger, 2011) to support the need for sustained peer exchange. Consequently, the evidence is aligned with the RQs to demonstrate how these specific design choices fulfill the multifaceted needs of faculty in higher education.

Asynchronous Micro-Learning: Meeting the Need for Feasibility vs. the Requirement For Self-Regulation (ID Lens)

A central finding in this needs analysis is the "double effect" of the asynchronous micro-learning design: it successfully addresses the **requirement for feasibility** while simultaneously uncovering a critical **need for enhanced self-regulation**. Participants framed asynchronous access as a direct response to the practical needs imposed by faculty workloads—such as commuting, grading, research, and multi-campus teaching. This confirms core micro-learning expectations that technological accessibility and interface usability are not merely "nice-to-have" features but are essential prerequisites for faculty engagement in PD (Adiguzel et al., 2023a, 2023b; Khan, 2019).

However, the analysis reveals that this same flexibility creates a significant gap in external structure. Faculty described a distinct **need for a "pushing force,"** noting difficulty in initiating learning without the presence of a live instructor or immediate feedback loops. This structural deficit helps explain observed patterns of late posting and declining interaction. From an ID standpoint, these findings indicate that to satisfy the needs of a diverse faculty body—rather than just those with pre-existing strong self-regulated learning routines—self-paced designs must incorporate intentional supports for persistence. Specifically, there is a documented requirement for pacing signals, defined interaction windows, and predictable feedback rhythms to sustain engagement across the cohort.

High Usability, but a Requirement For Coherence to Prevent Fragmentation (Micro-Learning Within ID)

The analysis confirms that micro-learning is a strong fit for practice-oriented PD, directly addressing the faculty need for achievable and revisitable learning units. Participants described micro-units as essential for fitting PD into short breaks, which is consistent with the requirement for single-objective, bite-sized learning (Khan, 2019). Because the PD goal focused on actionable changes, such as outcome alignment and interaction patterns, the micro-learning format met the need for procedural, applied teaching moves supported by short demonstrations and planning tasks.

However, the findings reveal a critical need for structural coherence to mitigate the risks of fragmentation and cognitive overload. Some participants reported feeling distracted by multiple tools or dissatisfied when content became "conceptually dense," indicating a boundary condition for this format. To meet the needs of faculty navigating introductory-to-intermediate pedagogical shifts, the design analysis dictates that micro-learning must be tightly scaffolded. There is a clear requirement for consistent templates, module maps, and recaps to engineer coherence; without these supports, the modular nature of the training may unintentionally increase the cognitive load on the learner.

Pedagogical Change: Addressing the Need For a Shift From "Activities" to "Active Learning Design" (ID and ALI Lens)

The triangulated evidence across interviews, artifacts, and observations identifies a primary pedagogical need for a transition from isolated tactics to a coherent design cycle. Before training, participants' descriptions of active learning as disconnected tactics (e.g., games and Q&A) highlighted a significant gap in conceptual alignment. Post-training data reveals that the PD fulfilled the requirement for constructive alignment, as faculty moved toward explicitly articulating learning outcomes and selecting activities to serve those outcomes. This shift is essential because alignment distinguishes purposeful active learning from "busy work" and satisfies the constructivist need for meaning-making through authentic, socially mediated activity (Fink, 2003; Karanfiloğlu & Bulut, 2025).

Furthermore, the analysis reveals a developmental need for a complexity continuum in strategy adoption. Consistent with inventory frameworks that describe complexity as a practical constraint (Van Amburgh et al., 2006), faculty first required low- and moderate-complexity strategies with minimal setup before moving toward higher-complexity approaches. The PD met this need for design scaffolds, making complex strategies—such as orchestrated interaction and deliberate sequencing—both thinkable and doable. This addresses a critical requirement in an ALI-centered framework: that strategy complexity is not just about time, but about the orchestrated orchestration of interaction and feedback during the "experience" phase (Fink, 2003).

Finally, the findings underscore a specific need for reflective dialogue to complete the ID cycle. The uptake of brief reflection strategies (e.g., 3-word summaries and KWL checks) indicates that faculty required lightweight, formative assessment tools to consolidate learning. By integrating reflection as a routine rather than an "extra," the PD addressed a notable gap in higher education where reflection is often underused. Collectively, fulfilling these needs resulted in meaningful instructional change characterized by increased alignment, broader strategy use across ALI levels, and a more complete enactment of the Fink (2003) cycle.

Community of Practice: Addressing the Need For Social Motivation and the Requirement For Structured Facilitation (ID + CoP Lens)

The analysis of the embedded CoP features highlights a fundamental need for social participation to drive motivation and belonging in asynchronous faculty PD. Participants reported that seeing peers' posts and lesson plans served as essential interpretive models, fulfilling a practical requirement for examples that helped them understand tasks and improve their own ID. This confirms that faculty have a distinct need for learning through participation in a shared domain and practice (Birgili et al., 2025; Lave & Wenger, 2011; Wenger, 2011).

However, the findings reveal that the sustainability of these social benefits is fragile, identifying a critical requirement for intentional community structure. Because participation declined and reciprocity was uneven, the analysis suggests that simply "adding a discussion board" fails to meet the long-term needs of busy academics. In ID terms, there is a documented need for facilitation, established participation norms, and structured interaction windows. These elements are required to maintain "social presence" in voluntary settings where workload pressures often disrupt engagement. Without these interventions, a negative cycle occurs as participation drops, the perceived value of the community diminishes, further reducing engagement. To address this, the needs analysis identifies a requirement for light structure, such as required peer responses and timely facilitation, to interrupt this cycle while preserving the flexibility that faculty require.

Design Recommendations For Faculty Active Learning PD

- **Protect flexibility but add structure:** To address the need for feasibility without sacrificing engagement, programs must maintain asynchronous access while incorporating **"soft pacing."** This includes established interaction windows and predictable feedback cycles to provide the structural support necessary for persistent learning (Khan, 2019).
- **Engineer accountability without a punitive culture:** Recognizing the gap in self-regulation, the design should utilize **completion milestones**, visible progress indicators, and peer commitments. These elements fulfill the requirement for accountability while fostering a supportive environment that recognizes faculty progress.
- **Design for coherence in micro-learning:** To mitigate the risk of cognitive overload, the analysis dictates a requirement for a **consistent learning flow** (from objective to demo to quick task to share to recap). Using module maps is essential to reduce fragmentation and ensure the program remains cohesive (Khan, 2019).

- **Match micro-learning to content type:** PD should prioritize micro-learning for **procedural strategy acquisition** and lesson design practice. For more conceptually dense material, the design must offer optional "deep-dive" pathways to meet the needs of faculty seeking theoretical depth.
- **Facilitate the CoP deliberately:** To sustain the social benefits of a CoP, institutions must move beyond passive discussion boards. There is a clear need to **require peer replies**, use prompts that demand active comparison/feedback, and assign rotating "synthesizer" roles to produce shared pedagogical artifacts (Lave & Wenger, 2011; Wenger, 2011).
- **Use Fink (2003) as the spine; use ALI as the ramp:** The study identifies a non-negotiable requirement to treat **outcome alignment and reflection** as the program's anchors. Simultaneously, the design must support a **staged adoption pathway** using the ALI to transition faculty from low/moderate complexity to higher complexity strategies as their confidence grows (Van Amburgh et al., 2006).

Limitations

Interpretation is shaped by several limitations: convenience sampling in a single institutional and disciplinary context limits generalizability; the researcher's dual role as trainer and data collector introduces potential bias despite peer debriefing, member checking, and triangulation; the study lacks a control group and relies primarily on qualitative evidence; and findings reflect completers more than non-completers, potentially understating early disengagement barriers.

Future Research

Future studies could

(a) replicate the design across multiple departments and institution types,

(b) compare delivery modes (e.g., face-to-face workshop vs. asynchronous micro-learning PD), and

(c) test which accountability features most effectively support persistence without reducing autonomy.

Longer-term follow-up could examine whether alignment and reflection routines endure across semesters and whether student outcomes measurably improve.

CONCLUSION

A micro-learning-based asynchronous PD program can improve faculty active learning implementation when it is anchored in a clear design framework, especially Fink's (2003) active learning cycle, and when faculty are supported to progress along an ALI continuum (Van Amburgh et al., 2006). At the same time, flexibility introduces predictable risks: weaker accountability, fragile community participation, and potential micro-learning fragmentation (Khan, 2019; Lave & Wenger, 2011; Wenger, 2011). Effective online faculty PD therefore depends not only on content quality, but on intentional ID for coherence, motivation, staged complexity, and sustained social participation.

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REFERENCES

Adıgüzel, T., Aşık, G., Bulut, M. A., Kaya, M. H., & Özel, S. (2023a). Teaching self-regulation through role modeling in K-12. *Frontiers in Education, 8*. https://doi.org/10.3389/feduc.2023.1105466

Adiguzel, T., Kaya, M. H., Bulut, M. A., Mete, S. E., & Nalkesen-Akin, Y. (2023b). Integrating cognitive presence strategies: A professional development training for K-12 teachers. *Contemporary Educational Technology, 15*(2), Article ep417. https://doi.org/10.30935/cedtech/12987

Anzul, M., Ely, M., Freidman, T., Garner, D., & McCormack-Steinmetz, A. (2003). *Doing qualitative research: Circles within circles*. Routledge. https://doi.org/10.4324/9780203448502

Biggs, J. (2001). The reflective institution: Assuring and enhancing the quality of teaching and learning. *Higher Education, 41*, 221-238. https://doi.org/10.1023/A:1004181331049

Birgili, B., Bulut, M. A., Gülünay, O., Koçoğlu, M., & Baş, F. R. (2025). Technology-enhanced "GipSci" approach in developing contexts performs well at *interest* and *curiosity*, yet, needs reinforcing at *inquiry* level. *Research in Science & Technological Education*. https://doi.org/10.1080/02635143.2025.2578303

Brandon, A. F., & All, A. C. (2010). Constructivism theory analysis and application to curricula. *Nursing Education Perspectives, 31*(2), 89-92.

Buchem, I., & Hamelmann, H. (2010). Microlearning: A strategy for ongoing professional development. *eLearning Papers, 21*(7), 1-15.

Bulut, M. A. (2026). Reusable instruments for active learning-oriented online faculty development: Design frameworks, inventories and protocols. *Education Science and Sports, 8*(2026), 1-15. https://doi.org/10.70053/esas.1853421

Bulut, M. A., Adıgüzel, T., & Kaya, M. H. (2025). Exploring views and experiences of faculty members' participation in an asynchronous online program: Using a micro-learning format and CoP framework. *Innovations in Education and Teaching International, 63*(2), 649-665. https://doi.org/10.1080/14703297.2025.2532056

Butler, D. L., Novak Lauscher, H., Jarvis-Selinger, S., & Beckingham, B. (2004). Collaboration and self-regulation in teachers' professional development. *Teaching and Teacher Education, 20*, 435-455. https://doi.org/10.1016/j.tate.2004.04.003

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2018). *Eğitimde bilimsel araştırma yöntemleri* [Scientific research methods in education]. Pegem Akademi. https://doi.org/10.14527/9789944919289

Collins, D. (1999). Achieving your vision of professional development: How to assess your needs and get what you want. Hot topics. *ERIC*. https://eric.ed.gov/?id=ED446060

Cooperstein, S. E., & Kocevar-Weidinger, E. (2004). Beyond active learning: A constructivist approach to learning. *Reference Services Review, 32*(2), 141-148. https://doi.org/10.1108/00907320410537658

Corbeil, J. R., Khan, B. H., & Corbeil, M. E. (2021). *Microlearning in the digital age*. Taylor and Francis. https://doi.org/10.4324/9780367821623

Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory Into Practice, 39*(3), 124-130. https://doi.org/10.1207/s15430421tip3903_2

Dick, W., & Carey, L. M. (1978). *The systematic design of instruction* (Editions 1 through 4.) HarperCollins.

Dick, W., Carey, L., & Carey, J. O. (2001). *The systematic design of instruction* (5th ed.). Longmann.

Dick, W., Carey, L., & Carey, J. O. (2005). *The systematic design of instruction* (6th ed.). Pearson.

Dick, W., Carey, L., & Carey, J. O. (2014). *The systematic design of instruction* (8th ed.). Pearson.

Fazio, X., & Melville, W. (2008). Science teacher development through collaborative action research. *Teacher Development, 12*(3), 193-209. https://doi.org/10.1080/13664530802259222

Fink, L. D. (2003). What is significant learning. *Western Carolina University*. https://www.wcu.edu/WebFiles/PDFs/facultycenter_SignificantLearning.pdf

Gagné, R. M. (1973). 1: Learning and instructional sequence. *Review of Research in Education, 1*(1), 3-33. https://doi.org/10.3102/0091732X001001003

Giurgiu, L. (2017). Microlearning an evolving elearning trend. *Scientific Bulletin-Nicolae Balcescu Land Forces Academy, 22*(1), 18-23. https://doi.org/10.1515/bsaft-2017-0003

Good, T., & Brophy, J. (1994). *Looking in classrooms* (6th ed.). HarperCollins Publishers.

Hone, K. S., & El Said, G. R. (2016). Exploring the factors affecting MOOC retention: A survey study. *Computers & Education, 98*, 157-168. https://doi.org/10.1016/j.compedu.2016.03.016

Ichimura, Y., Nakano, H., & Suzuki, K. (2020). Support design for massive open online course (MOOC) learners–Voices from the freshman MOOC learners. In *Proceedings of the International Conference for Media in Education* (pp. 384-390).

Jahnke, I., Lee, Y. M., Pham, M., He, H., & Austin, L. (2020). Unpacking the inherent design principles of mobile microlearning. *Technology, Knowledge and Learning, 25*, 585-619. https://doi.org/10.1007/s10758-019-09413-w

Karanfiloğlu, M., & Bulut, M. A. (2025). Techno-pedagogical communication, ed-tech and media professionals: Crossroads for enhancing instructional quality. *Interactive Learning Environments, 33*(7), 4193-4217. https://doi.org/10.1080/10494820.2025.2459180

Khan, B. H. (2019). Microlearning: Quick and meaningful snippets for training solutions. *International Journal of research in Educational Sciences, 2*(2), 275-284. https://doi.org/10.29009/ijres.2.2.7

Kitsantas, A., & Dabbagh, N. (2011). The role of Web 2.0 technologies in self-regulated learning. *New Directions for Teaching and Learning, 2011*(126), 99-106. https://doi.org/10.1002/tl.448

Korthagen, F. A. (2004). In search of the essence of a good teacher: Towards a more holistic approach in teacher education. *Teaching and Teacher Education, 20*(1), 77-97. https://doi.org/10.1016/j.tate.2003.10.002

Lave, J., & Wenger, E. (2001). Legitimate peripheral participation in communities of practice. In J. Clarke, A. Hanson, R. Harrison, & F. Reeve (Eds.), *Supporting lifelong learning* (pp. 121-136). Routledge. https://doi.org/10.4324/9780203996287-11

Lee, G., Keum, S., Kim, M., Choi, Y., & Rha, I. (2016). A study on the development of a MOOC design model. *Educational Technology International, 17*(1), 1-37.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE. https://doi.org/10.1016/0147-1767(85)90062-8

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. SAGE.

Mintzes, J. J., & Walter, E. M. (Eds.). (2020). *Active learning in college science: The case for evidence-based practice*. Springer. https://doi.org/10.1007/978-3-030-33600-4

Morrison, G. R., Ross, S. J., Morrison, J. R., & Kalman, H. K. (2019). *Designing effective instruction*. John Wiley & Sons.

Nilsson, R. (2021). Designing an interactive micro-learning application: A new way to learn thermography. *DIVA*. https://www.diva-portal.org/smash/get/diva2:1586752/FULLTEXT01.pdf

Palmer, D., Martínez, R. A., Mateus, S. G., & Henderson, K. (2014) Reframing the debate on language separation: toward a vision for translanguaging pedagogies in the dual language classroom. *The Modern Language Journal, 98*(3), 757-772. https://doi.org/10.1111/modl.12121

Perry, N. E. (1998). Young children's self-regulated learning and contexts that support it. *Journal of Educational Psychology, 90*(4), Article 715. https://doi.org/10.1037/0022-0663.90.4.715

Peterson, C. (2003). Bringing ADDIE to life: Instructional design at its best. *Journal of Educational Multimedia and Hypermedia, 12*(3), 227-241.

Postholm, M. B. (2008). Group work as a learning situation: A qualitative study in a university classroom. *Teachers and Teaching: Theory and Practice, 14*(2), 143-155. https://doi.org/10.1080/13540600801965978

Reigeluth C. M. (1982). An investigation on the effect of alternative strategies for sequencing instruction. *ERIC*. https://files.eric.ed.gov/fulltext/ED288512.pdf

Ruth, A., Woolard, K., Sangaramoorthy, T., Brayboy, B. M. J., Beresford, M., Brewis, A., Bernard, H. R., Glegziabher, M. Z., Hardin, J., Harper, K., Mahdavi, P., Snodgrass, J. G., SturtzSreetharan, C., & Wutich, A. (2022). Teaching Ethnographic Methods for Cultural Anthropology: Current Practices and Needed Innovation. *Teaching Anthropology, 11*(2), 59-72. https://doi.org/10.22582/ta.v11i2.634

Stein, M. K., Smith, M. S., & Silver, E. (1999). The development of professional developers: Learning to assist teachers in new settings in new ways. *Harvard Educational Review, 69*(3), 237-270. https://doi.org/10.17763/haer.69.3.h2267130727v6878

Tharayil, S., Borrego, M., Prince, M., Nguyen, K. A., Shekhar, P., Finelli, C. J., & Waters, C. (2018). Strategies to mitigate student resistance to active learning. *International Journal of STEM Education, 5*, Article 7. https://doi.org/10.1186/s40594-018-0102-y

Van Amburgh, J. A., Devlin, J. W., Kirwin, J. L., & Qualters, D. M. (2007). A tool for measuring active learning in the classroom. *American Journal of Pharmaceutical Education, 71*(5), Article 85. https://doi.org/10.5688/aj710585

Wenger, E. (2011). Communities of practice: A brief introduction. *University of Oregon*. https://scholarsbank.uoregon.edu/items/6baf09ba-c319-4949-acef-cb220dc2953a

Winkelmes, M. A., Bernacki, M., Butler, J., Zochowski, M., Golanics, J., & Weavil, K. H. (2016). A teaching intervention that increases underserved college students' success. *Peer Review, 18*(1/2), 31-36.

Yang, S. H. (2009). Using blogs to enhance critical reflection and community of practice. *Journal of Educational Technology & Society, 12*(2), 11-21.