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MOBILE LEARNING AND MICROLEARNING IN THE PROFESSIONAL TRAINING OF FUTURE TEACHERS: METHODOLOGICAL APPROACHES

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Abstract: *The article examines mobile learning and microlearning as distinct methodological resources in the professional training of future teachers. Although mobile devices are a constant presence in students' lives, their use in pedagogical higher education in Uzbekistan tends to be incidental rather than designed. The author proposes a four-stage "micro-cycle" model (activate – practise – check – transfer) and a matrix linking types of micro-units to components of professional competence. Drawing on cognitive load theory, distributed practice and contextual learning, the paper formulates quality criteria for micro-units and outlines conditions for their use during teaching practice.*

Keywords: mobile learning, microlearning, pre-service teachers, professional competence, micro-unit, cognitive load, teaching practice

INTRODUCTION

In many schools the mobile phone is still something to be collected at the classroom door. Yet the same device accompanies a student of a pedagogical university through almost every part of the day: on the bus to the faculty, in the corridor between seminars, during the long pauses at the school where teaching practice takes place. The contrast is more than an everyday curiosity. It exposes an unresolved question for teacher education. If future teachers are expected to work in classrooms where pupils own and use mobile technology, should their own preparation not make deliberate and pedagogically justified use of that technology, rather than either ignoring it or tolerating it as background noise?

At the level of policy the direction in Uzbekistan is reasonably clear. The Law "On Education" adopted in 2020 recognises distance education as one of the legitimate forms

of obtaining education [1], and the "Digital Uzbekistan – 2030" strategy treats the digitalisation of education as one of its lines of action [2]. Translating these documents into the daily methods of a teacher-training department is a different matter. In practice the most common uses of mobile devices in pedagogical faculties are administrative and distributive: lecturers share files through messenger channels, post announcements, and occasionally run short tests through online forms. These practices widen access to materials but seldom change how professional skill is built.

Microlearning is often proposed as the natural partner of mobile learning. The pairing is plausible but misleading: shortness alone is not a didactic quality, and a lecture cut into five-minute pieces remains a lecture. For teacher education the more interesting question is whether short, focused learning episodes delivered through a mobile device can be designed to exercise specific professional actions of a teacher, and how such episodes should connect with lectures, seminars and school practice.

The present article addresses three questions. First, what theoretical grounds justify the use of mobile learning and microlearning in the professional training of future teachers? Second, how should micro-units be designed so that they correspond to identifiable components of professional competence rather than to fragments of subject content? Third, under what conditions can such units support students during teaching practice, when the gap between theory and classroom reality is felt most sharply? The contribution of the paper is methodological: it offers a micro-cycle model for designing micro-units, a matrix connecting unit types to competence components, and a set of quality criteria that a lecturer or a department can apply when building a bank of mobile learning materials.

LITERATURE REVIEW

Early attempts to define mobile learning focused on the device: learning was "mobile" if it happened on a handheld computer or a phone. Kukulska-Hulme and Traxler, in one of the first handbooks addressed to practising educators, already moved the emphasis towards the learner and the situation of learning [6]. Traxler later argued that definitions anchored in hardware date quickly and miss the point, and that mobile learning should be understood through the mobility of learners, of knowledge and of contexts [5]. This shift matters for teacher education because the future teacher is mobile

in a professional sense: he or she moves between the university, the school and the home, and each setting offers different occasions for learning.

Sharples, Taylor and Vavoula developed this line into a theory of learning for the mobile age, describing learning as a process of coming to know through conversations across multiple contexts, among people and with interactive technologies [4]. Their account is useful here because it treats the context not as a backdrop but as part of what is learned. A student who meets a concept of classroom management in a lecture and then encounters an unruly sixth-grade class two days later is, in their terms, engaged in one continuous conversation that the curriculum rarely supports. Park's pedagogical framework adds a practical classification, distinguishing mobile learning activities according to transactional distance and to whether the activity is individual or socialised [9]. The framework is a reminder that mobile learning need not mean isolated individual consumption of content; it can be highly social and closely guided.

International policy documents have tended to stress the conditions for mobile learning rather than its technical form. The UNESCO policy guidelines for mobile learning identify teacher training as a precondition for any meaningful use of mobile technology in education and caution against approaches that merely transfer existing materials onto phones [10]. The European framework for the digital competence of educators, DigCompEdu, does not single out mobile devices, but several of its areas, including digital resources, teaching and learning, assessment and the empowerment of learners, describe exactly the competences a teacher needs in order to design and manage mobile learning [14]. In connectivist terms, learning is distributed across networks of people and resources [12], and the ability to build and maintain such a network is itself part of a teacher's professional repertoire.

Microlearning has a shorter but more conceptually varied history. Hug and his colleagues approached it not simply as content chunking but as a family of didactic arrangements in which small units of activity are related to larger structures of meaning, whether a course, a profession or a community [3]. This view is important because it locates the didactic problem in the relationship between the micro and the macro levels. A micro-unit has value only in so far as the learner can place it within a larger whole.

Cognitive research offers two further supports. Cognitive load theory holds that working memory is limited and that instructional design should avoid loading it with

elements irrelevant to the learning goal [7]. Mayer's research on multimedia learning led to a number of design principles, including the segmenting principle, according to which learners benefit when a complex explanation is presented in learner-paced segments, and the coherence principle, which advises removing extraneous material [11]. Both are directly relevant to the design of material for small screens. The second support comes from research on distributed practice: the review by Cepeda and co-authors showed that spacing study episodes over time generally produces better retention than massing them together [8]. Microlearning, which naturally produces many short episodes, is well suited to planned spacing, although this potential is rarely exploited deliberately.

In the Uzbek pedagogical literature, innovative educational technologies have been described mainly in terms of interactive methods, graphic organisers and the design of lessons [13]. These works created a shared vocabulary for lecturers, but mobile formats did not occupy a central place in them, which is understandable given the technology of the time.

Two gaps emerge from this review. The first is a gap in specificity: most studies of mobile learning and microlearning concern school pupils, corporate training or higher education in general, while teacher education has a peculiar double character. Future teachers learn through technology and at the same time learn how to teach with it, so every design decision in their training also functions as a model of practice. The second gap concerns the link with competence. Existing recommendations describe how to make content short and mobile-friendly, but they rarely explain how a particular type of micro-unit relates to a particular component of a teacher's professional competence. The present study seeks to close this second gap in particular.

RESEARCH METHODOLOGY

The study is theoretical and methodological in character. Its aim was not to measure the effect of an intervention but to construct and justify a design model that can later be tested empirically. Four groups of methods were used.

The first was comparative analysis of theoretical sources on mobile learning, microlearning, cognitive load and distributed practice, together with international competence frameworks for teachers. The analysis looked for design principles that are

supported by more than one tradition, on the assumption that such principles are more robust than those drawn from a single school of thought.

The second was analysis of normative documents of the Republic of Uzbekistan concerning education and digitalisation, and of the typical structure of bachelor's programmes in pedagogical fields, where the professional block usually includes pedagogy, psychology, subject teaching methods and several periods of teaching practice. The purpose of this analysis was to identify the points in the programme at which mobile micro-units could be introduced without disturbing its logic.

The third method was pedagogical modelling. On the basis of the first two analyses, a model of the micro-cycle and a matrix of micro-unit types were constructed. The fourth was the logic of design-based research, which treats an educational design as a working hypothesis to be refined through successive cycles of use and revision in real settings [15]. In this article only the first cycle, the theoretical design, is reported. The plan for empirical verification is outlined in the concluding section; its results will be reported separately once collected.

ANALYSIS AND RESULTS

The first result of the analysis is a working definition. For the purposes of teacher education, a micro-unit is understood here as a self-contained learning episode, usually lasting from one to five minutes, built around a single professional action or concept of teaching, and ending with an observable response from the student. Each of the three elements of this definition excludes something. The focus on a professional action excludes units that merely transmit a slice of subject content. The requirement of self-containment excludes fragments that cannot be understood without the surrounding lecture. The requirement of an observable response excludes passive viewing. A three-minute video of a lecturer reading slides fails on all three counts; a ninety-second classroom clip followed by the question "At which moment should the teacher have intervened, and how?" meets them.

The second result is a matrix that connects types of micro-units to the components of a future teacher's professional competence. In the literature, the components are described in different ways, but most accounts include a cognitive component (psychological and pedagogical knowledge), a methodological or operational

component (planning and conducting lessons), a communicative component, a diagnostic or analytical component, a reflective component and, increasingly, a digital component. The matrix in Table 1 does not claim that each unit type serves only one component; it identifies the component that each type exercises most directly.

Table 1. Matrix of micro-unit types and components of professional competence

Type of micro-unit	Competence component exercised most directly	Mobile format	Example from teacher training
Concept card with check question	Cognitive (pedagogical and psychological knowledge)	Illustrated card in a course channel, followed by one or two quiz questions	Distinguishing formative and summative assessment through two short classroom situations
Video decision point	Analytical and diagnostic	Short classroom clip that stops at a critical moment, with a choice of responses	A lesson in a rural primary class where several pupils have not understood the task
"What would you do?" scenario	Methodological (planning and conducting lessons)	Branching text scenario or poll with justification	Choosing how to open a lesson when the planned demonstration equipment is unavailable
Voice instruction drill	Communicative	Recorded voice message of no more than thirty seconds	Formulating a clear instruction for a group task for fifth-grade pupils in the language of instruction
Spaced retrieval quiz	Cognitive, consolidation of key notions	Automated questions returning at increasing intervals	Revisiting the stages of a lesson and the functions of each stage over several weeks
Peer micro-feedback	Communicative and reflective	Short written or voice comment on a classmate's lesson fragment	Commenting on a peer's two-minute explanation using an agreed feedback frame
Practicum reflection prompt	Reflective	One focused question sent after a school day	"Which decision today would you change, and what would you do instead?"
Tool micro-demonstration	Digital	Screen recording followed by a task to reproduce the action	Creating a short self-check quiz for pupils and sharing it with a class group

The examples were chosen from situations a student in Uzbekistan is likely to meet: classes of mixed preparation, schools with uneven equipment, and instruction in

Uzbek, Russian or Karakalpak depending on the region. Following Sharples and colleagues [4], such context determines whether the learner can carry the unit from the phone into the classroom.

The third result is the micro-cycle model, which describes the internal structure of a well-designed micro-unit and its link with the rest of the course. The model contains four stages.

The first stage, activation, consists of a brief prompt that brings relevant prior knowledge or experience to mind. It may be a single question ("Recall a lesson in which the instructions confused you"), an image or a short statement to agree or disagree with. Its function is to create a cognitive anchor for the new element.

The second stage, practice, is the core of the unit. Here the student performs the professional action the unit is built around: identifies a decision point in a clip, formulates an instruction, chooses a lesson opening and justifies the choice. In line with cognitive load theory [7], everything that does not serve this action is removed.

The third stage, checking, provides immediate feedback. Depending on the type of unit, this may be automated feedback on a quiz item, a model answer for comparison, or a peer's response. The feedback should explain why an answer is better or worse rather than merely mark it.

The fourth stage, transfer, links the unit to an activity outside the phone. The student brings the result to a seminar, uses it in planning a lesson, or tries the action during teaching practice. Without this stage the unit remains closed in on itself, which is precisely the danger Hug's approach warns against [3].

Micro-cycles are not used in isolation but are arranged in a weekly rhythm. Between two face-to-face sessions a student completes several micro-cycles, and the lecturer opens the next seminar with an overview of the responses: which scenario choice was most frequent, which justifications were weakest, which clip divided the group. In this way the mobile component feeds the classroom component and receives questions from it, giving the arrangement a blended character. Spacing is built into the rhythm: key notions reappear in retrieval quizzes after increasing intervals, in accordance with the evidence on distributed practice [8].

The fourth result is a set of quality criteria for micro-units. The criteria are formulated as questions a designer can ask of a draft unit, so that they can be used in departmental review of materials.

Table 2. Quality criteria for micro-units in teacher training

Criterion	Question for the designer	Observable indicator
Single professional focus	Does the unit train one identifiable action or concept of teaching?	The goal can be stated in one sentence beginning with a verb
Cognitive economy	Has everything that does not serve the goal been removed?	No redundant text on screen; narration and visuals do not duplicate each other
Actionability	Does the unit require a response from the student?	Each unit ends with a choice, a short answer, a recording or a task
Contextual relevance	Is the situation recognisable for a student who will teach in a school in Uzbekistan?	The example refers to realistic class sizes, resources, subjects and languages of instruction
Connectivity	Is it clear how the unit relates to the course and to teaching practice?	The unit carries a reference to the relevant topic and a transfer task
Planned return	Will the key element be revisited later?	The unit is assigned to a retrieval schedule
Technical accessibility	Can the unit be used on a modest smartphone with an unstable connection?	Small file size, availability offline or in text form, no dependence on a single paid application
Ethical safety	Does the unit respect the privacy of pupils and teachers shown in it?	Classroom recordings are used only with consent; faces of minors are not shown without permission

Two of these criteria deserve comment because they are often overlooked. Technical accessibility is not a trivial matter in a country where connection quality differs considerably between cities and rural districts, and where students frequently rely on inexpensive devices. A unit that requires streaming high-resolution video will reach some students and exclude others. Ethical safety becomes pressing as soon as material is gathered during teaching practice: a student who records a fragment of a lesson for peer feedback must understand that pupils' images belong to them and their families, not to the course. Teaching this rule through the design of the course itself is part of forming the future teacher's professional ethics.

The fifth result concerns teaching practice, where mobile microlearning has its most specific value. During practice the student is physically separated from the university, and the traditional channels of support, such as the methodologist's visits and

the final report, are infrequent. Micro-units can provide support exactly when it is needed. Before a lesson, a student can review a unit on organising group work; after the lesson, the student can answer a reflection prompt by recording a one-minute voice note; the university supervisor responds asynchronously, and the response is available before the next lesson. Over several weeks these answers form a record of how the student's thinking changes.

The analysis also points to risks. The most serious is fragmentation: a large number of disconnected units can create the illusion of activity while leaving the student without a coherent picture of the profession. The connectivity criterion and the transfer stage of the micro-cycle are intended as safeguards. The second risk is superficiality: short tasks invite short thinking. For this reason the scenario and reflection units require a justification and not only a choice. The third risk is digital fatigue, so units should arrive at predictable times, in modest number, through a channel reserved for the course. The fourth, unequal access, calls for non-mobile versions of essential units.

Finally, designing good micro-units is time-consuming, so a departmental bank of units reviewed against the criteria in Table 2 is more sustainable than individual efforts. Inviting senior students to design units for younger ones turns such a bank into an exercise in the very competence it is meant to develop.

Artificial intelligence changes the economics and the didactics of such a bank in two directions. On the production side, generative AI tools can draft quiz items with distractors, produce transcripts and translations of classroom clips, and suggest scenario branches, which lowers the cost of building units in Uzbek and Karakalpak, languages for which ready-made materials are scarce; every AI-generated draft, however, must pass the same quality criteria as a human-made unit, with particular attention to subject accuracy and contextual relevance, since language models trained mainly on English data are prone to terminological and cultural errors in smaller languages. On the learning side, AI opens new unit types: a conversational agent can act as a practice partner for the voice instruction drill, responding to the student's formulation as a confused pupil might, and spaced retrieval schedules can be adjusted automatically to each student's performance. These possibilities strengthen rather than weaken the case for the micro-cycle model, because activation, practice, checking and transfer remain necessary

whatever generates the content; the model simply gains a new class of materials that must be critically reviewed before entering the departmental bank.

CONCLUSION AND RECOMMENDATIONS

The analysis supports three conclusions. First, mobile learning in teacher education is best understood not through the device but through the mobility of the future teacher between the university, the school and independent study; the methodological task is to connect these settings. Second, microlearning becomes a didactic resource only when each unit is built around a professional action, is self-contained and ends with a response, and when its relation to the larger course is explicit. Third, the specific value of mobile micro-units in teacher training lies in teaching practice, where they can provide timely support and accumulate a record of the student's developing professional reasoning.

The proposed micro-cycle model (activation, practice, checking, transfer), the matrix of unit types and competence components, and the quality criteria together form a methodological framework that can be applied in pedagogical faculties without major investment.

On this basis the following recommendations are made. It would be useful to include the design of micro-units as a practical topic in courses on teaching methods and educational technology, so that students learn both through and about microlearning. Pedagogy departments could establish shared banks of micro-units reviewed against explicit criteria. Teaching practice programmes could include a mobile support component with regular reflection prompts and asynchronous supervisor feedback. Finally, institutional rules on the use of classroom recordings should be agreed in advance to protect pupils' privacy.

The next stage of the research is empirical. It is planned to compare groups of students who study a course with and without the mobile micro-cycle component, using indicators of methodological decision-making, the quality of lesson plans and the depth of written reflection during practice. Only such data can show whether the framework proposed here produces the expected gains, and under which conditions it does not.

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