MECHANISMS FOR DEVELOPING DIGITAL-NEUROPEDAGOGICAL LITERACY OF TEACHING PERSONNEL

Khurramova Bibikhonim Dilshod qizi
Teacher, Department of Pedagogy, Shahrisabz State Pedagogical Institute, Uzbekistan E-mail: xurramovabibixonim@shdpi.uz
ORCID: 0009-0000-0591-7668
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Abstract. This thesis presents a shortened discussion of the mechanisms through which digital-neuropedagogical literacy of teaching personnel can be systematically developed within continuous professional education. The paper is grounded in the conceptual direction of a research project devoted to the formation of neuropedagogical culture among educators operating in digitally saturated learning environments. The central idea is that digital-neuropedagogical literacy is not a spontaneous by-product of technology use, but a structured competence that must be deliberately cultivated through a combination of theoretical training, guided digital practice, diagnostic feedback and reflective self-monitoring.

Keywords: digital-neuropedagogical literacy, teaching personnel, professional development, cognitive processes, digital competence, reflective practice, neuropedagogy.

The intensifying digitalization of education has changed what is expected of a practicing teacher. In earlier decades, professional development was largely associated with updating subject-matter knowledge and mastering new methodological recommendations. Today, however, a teacher is expected to select and apply digital tools in a manner consistent with how learners perceive, process and retain information, rather than simply following technological trends. For this reason, digital competence alone is no longer sufficient. A teacher additionally needs a form of literacy that combines technological skill with an understanding of the neurocognitive mechanisms underlying attention, memory and motivation — a competence that can be defined as digital-neuropedagogical literacy. This is particularly important in continuous teacher education, where every digital instructional decision should be justified by an awareness of its cognitive effect on learners.

The conceptual background of this thesis proceeds from the assumption that digital-neuropedagogical literacy develops effectively only when professional training moves beyond isolated technical instruction. The mere ability to operate a learning platform, an interactive whiteboard or an educational application does not guarantee that a teacher understands why a particular digital tool supports or hinders learning at the level of attention and memory. If digital training is limited to demonstrating software functions, teachers may acquire technical fluency without developing the analytical capacity to evaluate a tool's cognitive appropriateness for a given group of learners. Therefore, the central problem addressed here is not access to digital resources, but the design of professional development mechanisms that transform technical training into neuropedagogically grounded practice. A practicing teacher must learn to move from operating a tool to evaluating its cognitive effect, from following a digital template to adapting it to learners' perceptual and attentional characteristics, and from occasional technology use to a sustained, reflective instructional strategy.

Conceptual mechanism for developing digital-neuropedagogical literacy. Four interconnected components form the basis of the proposed mechanism. The first component is theoretical awareness-building, through which teachers are introduced to fundamental principles of educational neuroscience — such as the limited capacity of working memory, the role of multisensory input in encoding information, and the influence of emotional state on attention and retention — expressed in accessible, classroom-relevant terms rather than specialized clinical language. This component establishes the conceptual foundation without which subsequent digital practice risks remaining purely technical.

The second component is guided digital experimentation, in which teachers apply selected digital tools under structured conditions and directly observe their cognitive effects: for instance, comparing how differently paced multimedia presentations affect learners' sustained attention, or how interactive formative-assessment tools influence engagement compared with static digital worksheets. This experiential stage allows abstract neuropedagogical principles to be tested against classroom-relevant evidence rather than accepted on faith.

The third component is diagnostic feedback, through which teachers receive structured information about the cognitive impact of their digital instructional choices — drawn from learner performance data, engagement indicators, or peer and mentor observation. Feedback of this kind transforms digital practice from routine repetition into an evidence-based adjustment process, allowing teachers to recognize which digital strategies genuinely support cognitive processing and which merely create surface-level engagement.

The fourth component is reflective self-monitoring, in which the teacher regularly evaluates their own digital instructional decisions against neuropedagogical criteria: Did this tool reduce or increase learners' cognitive load? Did it support long-term retention or only short-term novelty interest? How should the activity be modified for learners with different levels of prior knowledge or attentional capacity? This reflective habit is what converts isolated professional development sessions into a sustained developmental trajectory.

Institutional and procedural conditions. The effectiveness of this mechanism depends on several supporting conditions. First, professional development programs should integrate neuroscience-informed content directly into digital-skills training rather than treating them as separate courses, so that technical instruction and cognitive rationale are learned together. Second, institutions should provide structured opportunities for peer exchange, in which teachers share observations about the cognitive effects of specific digital practices within their own subject areas. Third, mentoring and instructional coaching should include explicit attention to the neuropedagogical dimension of digital lesson design, not only its technical execution. Fourth, evaluation systems for teacher digital competence should include indicators related to cognitive appropriateness — such as attention to cognitive load, multisensory balance and learner-adapted pacing — rather than measuring only the frequency or variety of digital tool use.

The development of digital-neuropedagogical literacy can be evaluated through several indicators: the ability to justify a digital tool's selection with reference to its expected cognitive effect; the capacity to identify signs of excessive cognitive load or disengagement during a digitally supported lesson; the ability to modify a digital activity in response to observed learner difficulties; and reflective awareness of the relationship between one's own instructional choices and learners' attentional and memory processes. These indicators may be arranged across basic, developing and advanced levels, where the advanced level is characterized by a teacher's consistent, evidence-based adaptation of digital practice according to learners' cognitive needs.

In Conclusion, digital-neuropedagogical literacy cannot be developed through technical training alone, nor through theoretical instruction in educational neuroscience in isolation. It requires an integrated mechanism combining conceptual awareness, guided digital experimentation, diagnostic feedback and structured reflection, supported by institutional conditions that treat cognitive appropriateness as a core criterion of digital teaching quality. Such a mechanism enables teaching personnel to move beyond the routine operation of digital tools toward their purposeful, cognitively informed application, thereby strengthening the overall neuropedagogical culture of the teaching profession.

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