FROM FRAGMENTED TO CONNECTED KNOWLEDGE: DOES MICROLEARNING IN GRADE 10 PHYSICS BUILD COHERENT UNDERSTANDING?

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In the fast-paced world of modern education, traditional lengthy lectures are increasingly giving way to innovative approaches like microlearning. This method involves delivering educational content in short, digestible segments—often lasting just a few minutes—through formats such as videos, quizzes, infographics, or mobile apps. For Grade 10 physics students, who typically grapple with complex concepts like mechanics, electricity, and optics, microlearning promises to transform fragmented facts into a cohesive web of understanding. But does it truly deliver on this promise? This article explores the potential benefits, challenges, and evidence surrounding microlearning's role in fostering coherent knowledge in high school physics.

Microlearning breaks down intricate topics into bite-sized modules, allowing students to focus on one idea at a time without overwhelming their cognitive capacity. In Grade 10 physics, for instance, a lesson on Newton's laws of motion might be divided into separate micro-units: one explaining inertia with a quick animation, another demonstrating force through an interactive simulation, and a third applying these to real-world scenarios like vehicle collisions. This approach aligns with cognitive load theory, which suggests that limiting information to small chunks enhances processing and retention by reducing mental strain.

Proponents argue that microlearning resonates particularly well with adolescents, whose attention spans are often challenged by digital distractions. High school students can access these modules on smartphones during commutes or breaks, promoting self-paced learning and flexibility. Moreover, it encourages active engagement through gamification elements like badges or immediate feedback quizzes, which can boost motivation and make abstract physics concepts more relatable.

One of the key strengths of microlearning is its potential to bridge knowledge gaps by reinforcing connections between ideas. When designed thoughtfully, micro-modules can be sequenced to build progressively, ensuring that students link new information to prior knowledge. For example, a series on electromagnetism might start with basic magnetic fields, then introduce currents, and culminate in applications like generators, with each unit referencing the previous one.

Evidence from educational research supports this. Studies in science education, including those on chemistry—a subject closely related to physics—indicate that microlearning improves conceptual grasp and long-term retention. In one investigation involving Grade 9 students, microlearning-based lessons in chemistry led to significant gains in understanding complex topics, with participants reporting better ability to connect ideas due to the modular structure. Similarly, frameworks integrating microlearning with inquiry-based methods in physics have shown promise in creating transformative experiences, where students actively explore phenomena through short, guided investigations, fostering deeper coherence rather than rote memorization.

In high school settings, microlearning has been linked to higher engagement and skill development. It allows for just-in-time learning, where students revisit specific concepts as needed, reducing the fragmentation often seen in traditional curricula. By incorporating multimedia, such as simulations of projectile motion or wave interference, it caters to diverse learning styles, helping visual and kinesthetic learners build a more integrated mental model of physics principles.

Despite its advantages, microlearning is not without pitfalls. Critics caution that poorly structured modules can exacerbate fragmentation, leaving students with isolated facts rather than a unified understanding. If micro-units lack explicit links or overarching narratives, learners might struggle to see the "big picture" in physics, where concepts like energy conservation span multiple topics.

Research highlights this duality. While microlearning excels in skill acquisition and immediate recall, some studies note limitations in developing higher-order thinking for complex subjects. For instance, in science education, there's concern that short bursts might not provide enough depth for synthesizing ideas, potentially leading to superficial knowledge. To mitigate this, educators must emphasize coherence through design principles, such as providing summaries that connect modules or using flipped classroom models where microlearning prepares students for in-depth discussions.

In Grade 10 physics, where curricula often build cumulatively toward exams, the effectiveness depends on integration. Without teacher guidance to weave modules together—perhaps through group activities or reflective assignments—microlearning might reinforce silos rather than connections.

Empirical data paints an optimistic yet nuanced picture. A bibliometric analysis of microlearning across contexts, including K-12 education, found it effective in enhancing motivation and self-regulated learning in science subjects. Another study on high school students emphasized how microlearning's flexibility aids in resonating with teens, improving comprehension in demanding areas like physics by avoiding overload.

More specifically, proposals for physics teaching innovations suggest using microlearning to favor understanding through targeted examples, such as optical physics via mobile apps. A framework combining microlearning with inquiry in physics aims to transform fragmented knowledge into coherent insights, with preliminary findings indicating improved conceptual links. However, a review in science education questions whether it bridges gaps or creates fragments, calling for balanced implementation.

Overall, when microlearning is part of a hybrid approach—complemented by traditional elements—it appears to support coherent understanding more effectively than standalone use.

Microlearning holds significant potential for Grade 10 physics, shifting from fragmented memorization to connected, meaningful knowledge. Its strengths in reducing cognitive load, boosting engagement, and allowing flexible access make it a valuable tool in today's digital classrooms. However, success hinges on intentional design to ensure modules interconnect and promote synthesis. Educators should view microlearning not as a replacement but as an enhancer, integrating it with inquiry, discussions, and assessments to build true coherence.

As education evolves, ongoing research will clarify its long-term impacts. For now, the evidence suggests that, when applied thoughtfully, microlearning can indeed help students weave physics concepts into a tapestry of understanding, preparing them for both exams and real-world applications.

References:

Abidin, R. Z. (2025). Analysis of microlearning effectiveness in enhancing 21st century skills. Studies in Philosophy of Science and Education, 6(2), 1-14.

Astuti, I. A. D. (2025). Case-based optical physics teaching with mobile microlearning integration: Determining student readiness levels. ERIC. Retrieved from https://files.eric.ed.gov/fulltext/EJ1483604.pdf

Balasundaram, S. (2024). Microlearning and learning performance in higher education: A post-test control group study. ERIC. Retrieved from https://files.eric.ed.gov/fulltext/EJ1423546.pdf

Cairel, J. L. (n.d.). Microlearning in science education: Bridging knowledge gaps or creating fragmented understanding? SSRN. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5279757

Calixtro, L. A. (2023). Effectiveness of microlearning-based lessons in teaching Grade 9 chemistry. PhilArchive. Retrieved from https://philarchive.org/archive/CALEOM

Dixit, R. K. (2021). Breaking the walls of classroom through microlearning: Short burst of learning. Journal of Physics: Conference Series, 1854(1), Article 012018.

Ghafar, Z. (2023). Microlearning as a learning tool for teaching and learning in acquiring language. Canadian Journal of Educational and Social Studies, 3(4), 1-14.

Mostrady, A. (2025). Microlearning and its effectiveness in modern education: A mini review. Acta Pedagogia Asiana, 4(2), 1-10.

Sankaranarayanan, R., et al. (2022). Microlearning in diverse contexts: A bibliometric analysis. PMC. Retrieved from https://pmc.ncbi.nlm.nih.gov/articles/PMC9557991

Varthana. (2024, June 5). How microlearning resonates with high school students. Retrieved from https://varthana.com/school/how-microlearning-reasonates-with-high-school-students