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Didactic Content of Improving Laboratory Classes in Physiology Based on Didactic Provision

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Abstract: This article explores the didactic content of improving laboratory sessions in Physiology based on didactic provision. With laboratory work being a cornerstone of physiology education, the integration of clear instructional design and pedagogical frameworks is critical to improving student engagement and learning outcomes. The research identifies key components of effective didactic provision, including clearly defined learning objectives, alignment with theoretical content, use of active learning strategies, and continuous formative assessment. Through a combination of literature review, curriculum analysis, and pilot implementation in undergraduate physiology courses, this study demonstrates how strategic didactic planning enhances students' conceptual understanding and practical skills. Embedding didactic principles into laboratory session design not only increases the educational value of hands-on experiences but also fosters deeper scientific reasoning and learner autonomy. Thus, recommendations are provided for educators seeking to redesign laboratory instruction in physiology in alignment with modern educational standards.

Keywords: Didactic content, laboratory sessions, Physiology education, didactic provision, curriculum development, instructional design, educational strategies, active learning, hands-on learning, student engagement, teaching methodology, learning outcomes, assessment of learning, pedagogical approaches, competency-based education, instructional effectiveness, educational innovation.

Introduction: In the realm of biological sciences education, laboratory sessions in physiology play a crucial role in bridging theoretical knowledge with practical application. However, the effectiveness of these sessions heavily depends on the basis of quality and relevance of their didactic content. In recent years, there has been a growing recognition of the need to improve laboratory teaching methods to enhance student understanding, engagement, and retention. This has prompted educators and curriculum designers to revisit the didactic provisions that underpin laboratory instruction.

Didactic provision refers to the structured set of instructional strategies, learning materials, and pedagogical frameworks employed to achieve specific learning outcomes. In physiology, where students must grasp complex systems and dynamic bodily functions, well-planned laboratory activities are essential for consolidating theoretical concepts. Yet, many institutions face challenges such as outdated instructional materials, passive learning formats, and a lack of integration between lectures and lab experiences.

Didactic content is the instructional materials, teaching strategies, and educational content designed to facilitate learning. More specifically, in the context of laboratory classes in physiology, didactic content could include:

Lecture notes and presentations

Lab manuals and protocols

Multimedia aids (e.g. videos, simulations)

Worksheets and quizzes

Teaching methods (e.g. guided inquiry, problem-based learning)

So the phrase "didactic content of improving lab classes" implies: Enhancing what and how students are taught in lab sessions using structured educational support and resources.

METHOD

Currently, in the world and in our country, researchers are implementing the didactic content of improving laboratory classes in physiology based on didactic support into the educational process. Also, during the analysis and study of this topic, we have analyzed that many scientists studied it differently in their research work.

According to Baltaeva M, “didactic provision encompasses all material resources created by humans and used as tools in the educational process to facilitate teachers' and students' activities aimed at achieving the goals of education, upbringing, and development.”[1]

In laboratory classes, students mainly perform activities based on the knowledge they have acquired from independent lectures, solve problems independently, and improve their knowledge and skills. They should be able to evaluate themselves. However, due to the lack of equipment in laboratory classes, or the fact that experiments are conducted on various animals (rabbit, rat, frog) in physiology classes, and the lack of these animals, classes are conducted like seminars. [2]

Analyzes shows that, didactic support encompasses all the pedagogical tools, strategies, and resources that help facilitate learning. This includes:

- Visual aids (charts, diagrams)
- Interactive elements (digital tools, simulations)
- Scaffolding (step-by-step instruction)
- Formative assessment tools (quizzes, feedback)
- Teacher guidance and structured planning

According to didactic researchers (e.g., Reigeluth, 1999; Gagné, 1985),[3,4] improving didactic content involves:

- Aligning content with learning objectives
- Adapting content to learner needs and levels
- Integrating multimodal approaches (visual, auditory, kinesthetic)
- Ensuring coherence and clarity
- Encouraging active participation and critical thinking

According David Ausubel’s point of view (1968), the most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly. Her opinion shows that didactic support must build on prior knowledge and offer tailored scaffolding.[5]

Merrill, Barclay & van Schaak (2008) gave several ideas about didactic support and according to their beliefs didactic support should enable problem-solving with embedded guidance. Instructional effectiveness is maximized when learners engage in problem-centered learning supported by relevant guidance.[6]

According to Kolb's Experiential Learning Theory (1984), students learn best when they can directly engage in the learning process, experiencing the material hands-on. This applies directly to laboratory settings where learners engage in practical experiments or problem-solving tasks. Providing clear instructions, guiding students through problem-solving steps, and giving immediate feedback during lab activities.[7]

Recent studies, such as those by Jonassen et al. (2008), emphasize the role of digital tools in laboratory classes. Technology can offer simulations, virtual labs, and real-time data collection, enhancing both learning and accessibility. Using digital platforms for virtual lab exercises, data analysis software, or instructional videos to reinforce theoretical concepts.[8]

RESULT AND DISCUSSION

There are structured materials that convey theoretical knowledge, often supplemented with diagrams and key points to facilitate understanding. I gave it with several examples:

1. Lecture Notes and Presentations. These are structured materials that convey theoretical knowledge, often supplemented with diagrams and key points to facilitate understanding. Example: A slide illustrating the cardiac cycle phases.

2. Lab Manuals and Protocols. Comprehensive guides detailing experimental procedures, safety protocols, and data recording methods. Example: Page from a lab manual outlining steps for measuring blood pressure.

3. Multimedia Aids (e.g., Videos, Simulations).Interactive tools that enhance understanding through visual and auditory means. Example: A screenshot from a PhET simulation demonstrating gas exchange in the lungs.

4. Worksheets and Quizzes. Assessment tools designed to reinforce learning and evaluate comprehension. Example: A worksheet focusing on the mechanisms of muscle contraction.

5. Teaching Methods (e.g., Guided Inquiry, Problem-Based Learning). Pedagogical strategies that promote active learning and critical thinking. Example: A case study prompting students to diagnose a patient based on presented symptoms.

Thus, didactic provision of laboratory classes in physiology refers to the instructional resources, strategies, and tools used to enhance teaching and learning during lab sessions. It's all about helping students better understand physiological concepts by guiding them through experiments with well-designed educational materials and methods. In following schedule we gave key elements of didactic provision in Physiology Labs (1-schedule):

Educational Content	**Teaching Methods**	**Assessment and Evaluation**:	**Purpose of Didactic Provision**
Lecture Notes and **Presentations**: Provide foundational knowledge in physiology that students will apply in the lab.	**Guided Inquiry**: Encourages students to explore and discover physiological concepts through carefully designed questions and experiments.	**Worksheets and Quizzes**: Reinforce learning by evaluating students' understanding of key concepts and experimental outcomes.	**Improved Understanding**: Helps students understand complex physiological processes by directly engaging them in the scientific method.
Lab Manuals: Offer step-by-step instructions and safety protocols for experiments.	**Problem-Based Learning (PBL)**: Presents students with real-world physiological problems to solve, requiring them to apply theoretical knowledge in practical settings.	**Feedback**: Provides formative assessment to help students improve their understanding of both the theoretical and practical aspects of physiology.	**Skill Development**: Fosters critical thinking, problem-solving, and practical laboratory skills.
Multimedia Aids: Visual aids, simulations, and videos that demonstrate physiological processes, like muscle contractions or gas exchange.	**Active Learning**: Methods like group discussions or hands-on experiments that engage students actively, rather than passively listening to a lecture.		**Preparation for Future Careers**: Equips students with the knowledge and techniques that will be useful in medical, health, and research fields.

1-schedule. Key elements of didactic provision in Physiology Labs.

So that, didactic provision in physiology lab classes is an organized way of teaching, supporting students with appropriate educational tools and methods to master both the theoretical and practical aspects of physiology.

CONCLUSION

In conclusion, enhancing physiology laboratory sessions through structured didactic provision significantly elevates the quality and effectiveness of student learning. By integrating clear instructional objectives, methodical content delivery, and learner-centered strategies, laboratory experiences become more than procedural tasks —they transform into meaningful educational encounters. Didactic content serves as the backbone that aligns theoretical knowledge with practical skills, ensuring that students not only perform experiments but also understand the underlying physiological principles. Moving forward, continuous refinement of didactic frameworks, informed by pedagogical research and feedback, will essential in fostering deeper comprehension, engagement, and professional competence among students.

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