The 2nd European Conference on Biomedical Laboratory Sciences Education

Conference program

Bergen 27th of November 2025

Western Norway University of Applied Sciences

BLS ACADEMY
BIOMEDICAL LIFE SCIENCE ACADEMY

Content

Program

Part I: Harmonization of BLS Education in Europe

08:30 **Registration and coffee, Auditorium 15 (F117)**

09:00 **Conference opening**

Anne-Grethe Naustdal, Pro-Rector for Education, Western Norway University of Applied Sciences, Norway

09:15 **Key note lecture:**

Biomedical Laboratory Sciences - the sky Is (not) the limit

Fernando Mendes, President European Association of Biomedical Scientists (EPBS), Belgium

10:00 **World café workshop (Groups numbered 1-12):**

BLS education in Europe

Host: **Mário Maia-Matos,** Lisbon School of Health Technology, Politécnico de Lisboa (IPL), Portugal

11:00 **Panel discussion:**

Harmonization of BLS Education in Europe
Host: **Mário Maia-Matos,** Lisbon School of Health Technology, Politécnico de Lisboa (IPL), Portugal
Panelists:

Fernando Mendes, President EPBS, Belgium
Inger-Lise Neslein, Associate Professor, University of Agder, Norway
Johanne Lind Aasen, Assistant Director, Department of Laboratory Medicine and Pathology, Haukeland University Hospital, Norway
Michaela Hassler, Senior Lecturer, University of Applied Sciences Campus Vienna, Austria

11:50 **Morning summary**

Mário Maia-Matos, Lisbon School of Health Technology, Politécnico de Lisboa (IPL), Portugal

12:00 **LUNCH**

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Part II: Collaboration for the future BLS Education

13:00 **European Student Mobility Network. An example from Radiography**

Nina Dalen Seime, Department of Health and Functioning, Western Norway University of Applied Sciences, Norway

13:15 **BLS Academy initiative for increased collaborations on research and innovation**

Line Wergeland, Department of Safety, Chemistry and Biomedical Laboratory Science, Western Norway University of Applied Sciences, Norway

13:30 **Oral presentations (5 minutes per presentation, questions during the poster session):**

Developing BLS education for the future:

- *Scientific Competencies Framework for Biomedical Laboratory Diagnostics: First Draft for Discussion «PEAC-ACT»*
  Katharina Übelhör, ZHAW – Zurich University of Applied Sciences, Switzerland
- *Establishment and experiences from a student clinic for skill training in phlebotomy on patients*
  Anette Christensen Lie-Jensen, Østfold University College, Fredrikstad, Norway.
- *Bridging the Gap: A Virtual Laboratory for Biomedical Laboratory Science Education*
  Camilla Hesse, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden
- *From Classroom to Clinic: Simulation in Biomedical Science Education*
  Jasmin Hammerler, University of Applied Sciences Campus Wien, Austria
- *Making Blended Intensive Programs Work: Practical Insights from Four Editions at Erasmus Brussels University of Applied Sciences and Arts*
  Sofie Geeraerts, Erasmus Brussels University of Applied Sciences and Arts, School of Health and Environment, Belgium

13:55 **Poster presentations**

14:30 **Design Thinking Workshop (Groups numbered A-L):**

Future skills of the BLS profession

16:00 **Panel discussion**

How to increase collaborations on mobility, research and innovation?
Host: **Gry Sjøholt**, Western Norway University of Applied Sciences, Norway
Panelists:

Mário Maia-Matos, Biomedical Laboratory Sciences Programme Director, Lisbon School of Health Technology, Politécnico de Lisboa (IPL), Portugal
Brecht Gryson, Anchor person Internationalisation Biomedical Laboratory Technology, Odisee University of Applied Sciences, Ghent, Belgium
Gro Vatne Røsland, Professor in Biomedical Laboratory Science, Western Norway University of Applied Sciences, Norway
Elisabeth Ersvær, Associate Professor in Biomedical Laboratory Science, University of Inland Norway, Norway

16:30 **Conluding remarks**

Sofie Geeraerts, Erasmus Brussels University of Applied Sciences and Arts and **Lise Bjørkhaug Gundersen**, Western Norway University of Applied Sciences

Foto: Nils Olav Mevatne

Oral presentations

Scientific Competencies Framework for Biomedical Laboratory Diagnostics: First Draft for Discussion «PEAC-ACT»

Katharina Übelhör, Sylvia Kaap-Fröhlich

Bachelor's Degree Biomedical Laboratory Diagnostics, ZHAW – Zurich University of Applied Sciences, Wädenswil, Switzerland

Introduction: As the first bachelor's degree programme in Biomedical Laboratory Diagnostics (BMLD) in Switzerland, our objective is to provide a solid academic and scientific education. A structured framework for scientific competencies is helpful to ensure comprehensive training. To ensure comprehensive training, a structured framework for scientific competencies is essential. This work presents an initial draft of such a framework, entitled "PEAC-ACT."

Methods: A two-tiered literature search, BMLD-specific and exploratory, was conducted using PubMed and other sources, such as WISAR (1), were gathered to identify existing competency frameworks for scientific skills in BMLD and other non- and health study programmes. Both, BMLD-specific and exploratory, PubMed searches yielded limited results. Subsequently, expert consultations were employed to adapt and extend the WISAR framework – created for scientific writing – to meet the needs of BMLD. This adaptation incorporated theoretical knowledge, practical and writing skills and was piloted in a lecture on Self and Near Patient Testing (2).

Results: No existing competency frameworks specific to BMLD were found. Based on the WISAR model and experts' input, a new framework was developed: PEAC-ACT. The framework consists of four dimensions: **P**lanning, **E**xecution, **A**ssessment, **C**ommunication. These dimensions are grounded in two overarching domains – **A**cademic Working Principles and **C**ritical **T**hinking – which were taken over directly from WISAR (1). The framework now also emphasizes ethics, sound judgement, and practical laboratory expertise. The planned integration in a pilot lecture on Self and Near Patient Testing will be presented.

Discussion: The «PEAC-ACT» framework provides a structured and adaptable basis for developing scientific competencies in BMLD education. Its design allows for integration into diverse curricula and scientific contexts within the degree programme. This first draft is intended to stimulate dialogue and foster further refinement, with the goal of ensuring effective implementation and long-term sustainability in BMLD training.

Literature:

1. Referenzrahmen WISAR [Internet]. PARWIN. 2024 [zitiert 8. August 2025]. Verfügbar unter: https://parw-in.de/referenzrahmen-wisar/
2. Übelhör K, Moretti D, Kaap-Fröhlich S. Kontinuierliche Glukoseüberwachung In Der Lehre: Ein Pilotprojekt Zum Erwerb Wissenschaftlicher Kompetenzen In Den Gesundheitsberufen. Aktuelle Ernährungsmedizin. April 2025;50(02):e20–e20.

Establishment and experiences from a student clinic for skill training in phlebotomy on patients

Maria Dung Cao[1], Bente Marie Jacobsen[1], Anette Christensen Lie-Jensen[1], Anne K Palacios Karlsen[2], Rita Lystad[2], Herman Sundet Ruud[2], Linda Syversen[1]

[1]Bachelor Biomedical Laboratory Scientist, Østfold University College, Fredrikstad, Norway. [2]Østfold Hospital, Norway.

Good teaching methodologies and close follow-up of training are crucial to ensuring the core competency in phlebotomy of newly graduated biomedical laboratory scientist students. A student clinic has been established through collaboration between Østfold Hospital and Østfold University College to enhance skill training in phlebotomy on patients. This study aims to investigate patient experiences with the phlebotomy procedure, focusing on communication, patient safety, and the overall blood sampling situation, as well as to evaluate student experiences and learning outcomes at the student clinic.

Descriptive statistical analyses were conducted on data from two surveys targeting patients and biomedical laboratory scientist students. The results indicate that most patients are satisfied with students as phlebotomists, expressing high confidence in the professional competence of the phlebotomist, whether the procedure was performed by a student or a biomedical laboratory scientist/mentor. The student clinic provides students with extensive practice in phlebotomy and patient communication within a safe learning environment accompanied by good professional guidance. Consequently, the majority of students recommend the integration of this training program into the phlebotomy training for future students.

Foto: Medielab, HVL

Bridging the Gap: A Virtual Laboratory for Biomedical Laboratory Science Education

Camilla Hesse, Ruth Wickelgren, Gunnel Hellgren

Institute for Biomedicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

Clinical supervisors in biomedical laboratory science education often report that students are insufficiently prepared for clinical placements, struggling to connect theoretical knowledge with practical application. To address this challenge, we initiated a pedagogical project to develop a virtual laboratory aimed at bridging the gap between pre-clinical and clinical training.

The virtual laboratory is designed as an interactive digital learning environment, initially envisioned as a virtual house with clickable windows leading to different laboratory units. Using the Articulate 360 platform we created a pilot version, “Virtual Laboratory 1.0,” embedded within the Canvas learning management system. Despite limitations in interactivity and flexibility compared to our original vision, the pilot includes multimedia content such as 360° camera tours, instructional videos, quizzes, interviews, and case-based learning activities.

The content currently covers three laboratory units, guiding students from sample arrival through analysis to result validation. A student survey conducted during clinical training revealed positive feedback: students found the material helpful for understanding laboratory workflows, preparing for exams, and recognizing clinical environments. They expressed a desire for more units and broader integration of such tools throughout their education.

Future development aims to expand the virtual laboratory to include additional disciplines and incorporate work-life elements such as interprofessional communication, social interactions, and language support. Lessons learned include the underestimated time and technical challenges involved, as well as the importance of maintaining strong relationships with clinical departments.

This project highlights the potential of virtual learning environments to enhance student preparedness and engagement in biomedical laboratory science education, while also raising questions about the balance between simplicity and effectiveness in digital pedagogy.

From Classroom to Clinic: Simulation in Biomedical Science Education

Jasmin Hammerler

University of Applied Sciences Campus Wien, Austria

Introduction: Simulation can be found in several medical disciplines and professions. In 2025, the University of Applied Sciences Campus Vienna opened its new simulation centre, intended for teaching purposes in various healthcare study programs.

Design of the study: Second semester students experience a realistic simulation in which they take on the role of biomedical scientists. A capillary blood sample is analysed via point-of-care-testing (POCT). Afterwards, the results are interpreted and explained to a patient.

Methodology: First, there is a briefing. The participants (biomedical scientists, patients) receive a specific briefing in a private setting, with information that is withheld from the other participants. These premeditated situations might occur during the simulation and cause a twist in the events. The simulation itself takes place in a replica of an emergency room and is broadcasted to an adjoining room. There, the students who do not actively participate, observe the simulation and take notes. Notes include comments on both professional and social behaviour of the students acting as biomedical scientists. Once the simulation is completed, there is a debriefing, where we discuss feelings and observations during the simulation, the meaning for the students' future professional lives, possible mistakes, risks and alternative approaches to certain situations.

Findings: The feedback is mostly positive and the benefits for the students' future careers are clear. By the end of summer, the students will have completed a questionnaire to assess the simulation itself and note potential benefits for their future professional lives. The evaluation will be carried out using descriptive statistics.

Summary and conclusions: The opportunities of using simulation for training biomedical science students are almost endless; even without special technical equipment, interesting situations may arise, be observed and reflected upon. We are excited to learn and benefit from future simulations – for the patients' sake.

Making Blended Intensive Programs Work: Practical Insights from Four Editions at Erasmus Brussels University of Applied Sciences and Arts

Sofie Geeraerts

Erasmus Brussels University of Applied Sciences and Arts, School of Health and Environment, Belgium

Organising a Blended Intensive Program (BIP) under Erasmus+ can be a rewarding yet complex process that requires careful coordination, planning, and communication. At the Erasmus Brussels University of Applied Sciences and Arts (EhB), the Biomedical Laboratory Sciences programme has hosted and participated in several BIPs in collaboration with international partners. These experiences have provided valuable lessons on how to successfully navigate the administrative, academic, and logistical dimensions of such initiatives.

This presentation offers a concise overview of best practices and practical tips for colleagues interested in setting up or refining their own BIPs. Drawing from four successfully implemented editions, it highlights essential steps from the early planning phase to post-programme evaluation. Key aspects include the importance of starting preparations well in advance, establishing clear agreements with partner institutions, designing a balanced blended learning format, and ensuring transparent communication with all stakeholders.

Special attention is given to managing budgets effectively, embedding the BIP into the existing curriculum, supporting both incoming and local students, and involving teaching staff in meaningful ways. The presentation also discusses common pitfalls and provides examples of efficient solutions in areas such as scheduling, accommodation, and digital collaboration.

By sharing these insights, the aim is to support educators and coordinators in developing sustainable and high-quality BIPs that foster international collaboration and enriching learning experiences for students and staff alike.


Foto: Nils Olav Mevatne

Poster presentations

Virtual Reality in Anatomy Education: Bridging the Gap Between Theory and Practice

Marie Kristine Fossbakk Birketvedt-Jones, Paal Borge, Trond Brattelid

Department of Safety, Chemistry and Biomedical laboratory sciences, Western Norway University of Applied Sciences, Bergen, Norway

Virtual Reality (VR) technology is emerging as a transformative tool in anatomy education, providing immersive learning environments that enhance understanding and engagement. This study investigates the use of VR glasses in anatomy education through a laboratory exercise aimed at improving comprehension of human anatomy.

Evaluation results indicated that students felt the VR exercise significantly improved their understanding of anatomical concepts and increased their overall engagement. They reported VR as an effective learning tool for visualizing intricate structures. Despite encountering some challenges during setup and initial use, students showcased strong collaboration when working in pairs, enhancing their learning experience. These findings suggest that while VR offers substantial educational benefits, addressing technical challenges is crucial for optimizing its incorporation in anatomy education. This project highlights the importance of integrating innovative technologies like VR into academic curricula to create effective learning environments that cater to diverse learning styles.

The integration of VR in anatomy education marks a significant advancement in teaching methodologies. Students' positive feedback regarding their improved understanding and engagement reflects the potential of immersive learning experiences. The accessibility of VR is underscored by the majority of students' limited prior experience; despite initial technical challenges, they demonstrated solid cooperation in pairs, indicating that collaborative learning thrives in VR settings. Future work should focus on refining the technical aspects of VR to enhance usability and minimize barriers. Research into long-term knowledge retention and the efficacy of VR across different demographics will be vital for optimizing educational strategies. Overall, the findings advocate for continued exploration and implementation of VR technology in anatomical studies, aiming to achieve better educational outcomes and foster student engagement.

Visualizing Anatomy and Physiology: The Impact of Dissection and Multimedia Resources in Medical Laboratory Training

Paal Borge[1], Marie Kristine Fossbakk Birketvedt-Jones[1], Per Øystein Sakariassen[2], Trond Brattelid[1]

[1]Department of Safety, Chemistry and Biomedical laboratory sciences, [2]Department of Health and Functioning, Western Norway University of Applied Sciences, Bergen, Norway

Dissection is a pivotal component of anatomy education, offering students in Medical Laboratory Medicine a unique opportunity to grasp complex physiological concepts through hands-on experience. This study explores how the impact of supplementary educational tools, specifically a preparatory movie documenting the dissection process enhances students' understanding of anatomy and physiology. A survey conducted following the dissection sessions revealed that the students found the movie clear and informative, describing it as having high quality and being easy to follow. Importantly, students reported that viewing the movie contributed significantly to their understanding of anatomical structures and physiological functions.

Moreover, students indicated that watching the movie alleviated pre-dissection anxiety, feeling more confident and prepared for the hands-on experience. This increased confidence translated to improved performance during the actual dissections, as evidenced by identifying key anatomical features.

The results indicate a strong correlation between the use of multimedia resources and enhanced educational outcomes in dissection practices. Students articulated that the movie provided valuable contextual information, enhancing their ability to connect theoretical knowledge with practical application. This study highlights the effectiveness of integrating multimedia tools in anatomy education, suggesting that they can significantly improve students' understanding and confidence in dissecting complex anatomical structures.

Clinical Placement Duration and Its Impact on Learning and Assessment: A Comparative Survey Study

Guro Martinussen Fagernes, Camilla H. Nundal, Line Wergeland, Anita Ryningen, Gry Sjøholt

Department of Safety, Chemistry and Biomedical laboratory sciences, Western Norway University of Applied Sciences, Bergen, Norway

Background: In in 2020, a major revision of the curriculum was implemented in the biomedical laboratory science bachelor program at Western Norway University of Applied Sciences (HVL). The structure of external clinical placements was changed from multiple short periods at various laboratories to longer, continuous placements at a single location. Prior to the revision, students in their second and third years completed a total of nine weeks of external practice, distributed across several short periods ranging from two days to four weeks. From 2022 onward, the placement structure was extended to a total of twelve weeks, with four periods consisting of three consecutive weeks at one clinical site.

The rationale behind introducing this change was the assumption that shorter placements made it difficult to adequately assess students' competence and professional suitability. Also, longer practice periods were expected to give deeper learning among students. To evaluate the impact of this restructuring, a survey was conducted to gather feedback from both students and clinical supervisors regarding their experiences following the implementation.

Methods: This cross-sectional study examined the experiences of clinical supervisors and students following the completion of practice placements. Structured questionnaires were distributed at the end of each placement period in 2018 and 2024, enabling a comparative analysis across cohorts. The instruments included Likert-scale items and open-ended comment fields to capture both quantitative and qualitative data. Quantitative responses were analyzed statistically, while qualitative comments were thematically categorized. The analysis focused on identifying recurring themes in student feedback and assessing changes in perceptions of clinical practice over time.

Results: Results revealed that neither students nor supervisors favoured longer periods of external clinical practice, both before and after changes in the length of continuous practice periods. Despite this, in 2018, students commented that short placements involved too much information in too little time, an issue not reported by students in 2024. In 2024, students also reported slightly higher learning outcomes and felt more integrated into the biomedical laboratory community. Supervisors in 2018 felt that short placements limited their ability to assess the students and that assessment criteria were unclear. In 2024, with longer continuous practice periods, supervisors had greater insight into the assessment criteria, especially regarding professional suitability.

Conclusion: Longer continuous external clinical practice appears to have positive effects, as students seem to have higher learning outcomes and are more integrated into the biomedical laboratory community, as well as supervisors finding it easier to assess students' knowledge, skills, and professional suitability.

Embedding Internationalisation in the Biomedical Laboratory Sciences Curriculum: From Short-Term Projects to Long-Term Mobility

Sofie Geeraerts

Erasmus Brussels University of Applied Sciences and Arts, School of Health and Environment, Laarbeeklaan 121, 1090 Jette, Belgium

Background: Internationalisation is a key driver in harmonising Biomedical Laboratory Sciences (BLS) education across Europe. Beyond strengthening scientific expertise, it fosters intercultural competence, adaptability, and employability of future professionals. To ensure that all students benefit, our institution has systematically embedded internationalisation throughout the curriculum.

Aim: This contribution presents a structured approach to integrating internationalisation in BLS education, showing how short- and long-term opportunities are combined to maximise student participation and support harmonisation of competences at a European level.

Methods: Internationalisation is implemented through multiple layers. From the first year, all students engage in International Projects, either at our institution—taught in English with participation of incoming students and lecturers—or at a partner institution abroad during one intensive week. This short-term mobility lowers barriers and motivates students towards longer exchanges. In the final year, students can complete an international internship for in-depth immersion.
Our programme has also organised four and participated in three Blended Intensive Programmes, offers annual international workshops (e.g., forensic CSI workshops), and is developing Collaborative Online International Learning and Short International Programmes with South African partners. Biennial International Days further connect students with incoming staff through guest lectures and research presentations. Currently, we are developing an English-taught semester to facilitate incoming mobility and further strengthen internationalisation in the curriculum.

Results: This integrated model ensures that every student encounters internationalisation. Student feedback indicates increased motivation, reduced barriers, and enhanced intercultural awareness. Challenges remain: aligning calendars, language barriers in clinical labs, workload linked to evaluating short-term mobility, mismatches in internship duration, and securing sufficient placements. A further limitation is that expectations regarding internships are sometimes misinterpreted by partner institutions, leading to discrepancies in

Conclusion: By embedding internationalisation across all study phases, we provide inclusive, scalable opportunities that prepare students for a globalised professional field and contribute to harmonising BLS education across Europe..

The Foundational Role of Digital Pathology in Advancing Biomedical Laboratory Sciences Education Over the Next Decade

Diana Martins[1,2,3,4] , Fernando Mendes[1,2,3,4,5]

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The education of Biomedical Laboratory Sciences (BLS) professionals is rapidly evolving to meet the demands of the modern, digitized clinical laboratory. This abstract explores the transformative and expanding role of digital pathology (DP) as a core pedagogical tool set for BLS curricula over the next decade. Central to this shift is the widespread adoption of Whole Slide Imaging (WSI), which converts traditional glass slides into high-resolution, platform-agnostic digital assets.

For BLS education, this transition moves beyond convenience to solve fundamental pedagogical challenges. It provides unparalleled accessibility and standardization, allowing entire cohorts simultaneous access to curated digital libraries of classic and rare cases in histology, hematology, and cytology. This eliminates the limitations of physical slide collections and microscope availability, enabling robust remote learning and asynchronous study.

Furthermore, Digital Pathology platforms facilitate new modalities of objective assessment by allowing for standardized annotations and quantifiable evaluation of morphological identification skills. Looking forward, the most significant impact over the next decade will be Digital Pathology's role as a gateway to integrating artificial intelligence (AI) and computational pathology into the BLS curriculum. Students will transition from passive observation to active engagement with image analysis algorithms, preparing them for future workflows where AI tools are routine.

In conclusion, digital pathology will be a supplemental technology and will become a foundational pillar of BLS education. It is essential for developing a new generation of biomedical laboratory scientists who are not only proficient in traditional morphology but are also adept at navigating the data-driven, digitized, and AI-augmented diagnostic landscape of the future.

Implementation of Laboratory Informatics System in Biomedical Laboratory Science Education

Camilla H. Nundal, Sindre H. Hauan, Paal H. Borge, Karl A. Brokstad, Gry Sjøholt

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Background: Laboratory Information Systems (LIS) are essential in modern medical laboratories, facilitating sample handling, analysis, and communication between instruments, biomedical laboratory scientists (BLS), and requisitioners. According to RETHOS, the national framework for health and social education in Norway, biomedical laboratory scientist (BLS) is expected to demonstrate competence in LIS upon graduation. However, students currently receive limited practical training during external practice at laboratory hospitals, where capacity constraints often hinder such instruction. At Western Norway University of Applied Sciences (HVL), we aim to address this gap by integrating LIS training in our education to ensure that all students receive training and develop skills to use LIS.

Methods: HVL has bought and implemented the Swisslab LIS system (Nexus/AG), which is connected to our automated clinical chemistry instruments (2 × Cobas C111 (Roche); 2 × ABX Pentra C400 (Horiba)). The system is linked via a cloud-based server shared with OsloMet. In Swisslab, requisitions are entered digitally or manually. BLS students retrieve orders, print labels, and collect patient samples. The samples are analyzed on automated instruments that query Swisslab for test instructions. When analysis is completed, results are returned to Swisslab, where BLS students validate them, checking for flags, preanalytical and analytical errors, and performing reruns if needed. Validated results are finally released to the requisitioner. This workflow enables students to understand sample processing, error management, and validation of results as practiced in professional laboratories.

Results: During the autumn semester of 2025, BLS students in BIO303 – Clinical Chemistry used the system through four clinical cases. Early challenges involved label handling, distinguishing between technical and medical validation, and a high demand for individual guidance. As the course progressed, protocol adjustments clarified workflows and improved students' understanding of the validation process.

Future Perspectives: We plan to expand the system to include quality controls and strengthen the understanding of LIS and instrument communication. We also aim to integrate LIS with computational tools for data analysis. To assess students' learning outcomes, surveys and interviews will be conducted.

Assessment to investigate if practical laboratory training will increase knowledge in gene expression theory, in a first class Cell Biology course

Maria Omsland, Line Wergeland, Camilla Nundal, Gry Sjøholt

Department of Safety, Chemistry and Biomedical laboratory sciences, Western Norway University of Applied Sciences, Bergen, Norway

Background: At the Biomedical Laboratory Science education at Western Norway University of Applied Sciences, we teach Cellular Biology during the 2nd semester of their Bachelor of Science degree. In this course, the students are introduced to the basic cellular concepts, including definitions of eukaryote, prokaryote, DNA-replication, translation, cellular signaling, cell cycle, genetics and gene expression. Among the topics included in the course, gene expression seem to be one of the most difficult to learn. To make a practical approach in learning this theory, we implemented a laboratory training kit provided from BIO-RAD, called pGLO. The students are transforming bacteria with pGLO-vector which are under the control of an arabinose operon. They grow the transformed bacteria in different culture media, with and without arabinose, which will turn on the operon. If the operon is turned on, the bacteria colonies will be expressing green fluorescent protein (GFP) and the colonies will be green under exposure to UV-light. Next, the students are culturing the bacteria with successful transformation and increase the GFP-production and finally extract GFP protein with column chromatography.

Methods: To investigate the learning effect of the laboratory training, we provided a questionnaire which was answered anonymously including a pre-questionnaire given after the theoretical introduction in the laboratory course, but before the practical training. The same test was given after the practical training, in form of a post-questionnaire. We compared the answers from the questionnaires and also looked at the exam results.

Results: Results from the multiple choice questions (4 in total) showed that 2 out of 4 questions were increased in correct answers in the post-test, 1 was unchanged and one was having a decrease in correct answers in the post-test. Of the free text questions, we observed an increase in correct answers in 3 out of 3 questions in the post-test. We are currently investigating the effect of the laboratory course on the long time effect by investigating the frequency of correct answers on gene expression related questions on exams prior and after the introduction of the practical laboratory exercise.

Conclusion: Practical laboratory exercises might have a good effect in understanding hard-to understand topics for students in Cell Biology class.

Simulation as an educational methodology within the Biomedical Laboratory Technology program, and the opportunities it presents for the development of a European project: VR SimLab

Charlotte Persijn[1], Niko Thoen[1], Brecht Gryson[1], Anniina Friman[2], Gry Sjøholt[3]

[1]Odisee University of Applied Sciences, Ghent, Belgium, [2]Turku University of Applied Sciences, Turku, Finland, [3]Western Norway University of Applied Sciences, Bergen, Norway

In the Biomedical Laboratory Technology program of Odisee, simulation-based education has been implemented over recent years to expose students to high-pressure and crisis scenarios reflective of real-world clinical environments. These simulations create a safe learning space that encourages students to develop critical soft skills such as teamwork and communication, while offering educators the opportunity to guide reflective learning processes and enhance skill acquisition. Building on positive student feedback and the evident educational value, the program has initiated a collaborative European project: VR-SimLab, under the Erasmus+ framework.

The project revolutionizes laboratory technologist education by integrating Augmented Reality (AR) and Virtual Reality (VR) technologies. In an era of rapid healthcare advancements, this project is a game-changer, empowering professionals with immersive training that bridges the gap between theoretical knowledge and real-world practice. Through international collaboration, the project creates innovative AR/VR scenarios that not only enhance technical abilities but also foster essential nontechnical skills like problem-solving, critical thinking, communication and teamwork, which are crucial for modern healthcare settings.

By offering virtual simulations, VR-SimLab ensures that laboratory technologists can practice complex procedures safely and repeatedly, significantly boosting patient safety. It also promotes collaboration across disciplines, paving the way for more cohesive healthcare teams. This project doesn't just prepare technologists for today's challenges; it future-proofs their training for tomorrow's evolving healthcare landscape.

The development of a European training module (OPO) serves as the foundation for this innovative approach. It allows for the evaluation and optimization of AR/VR education, ensuring the technology's real-world impact. As the healthcare sector demands cutting-edge professionals, VR-SimLab equips them with the skills needed to thrive in an increasingly globalized and digital world.

The project contributes to sustainable growth, quality employment, and innovation in healthcare education while fostering European cooperation and strengthening European identity.

This project is a step toward transforming healthcare education across Europe, driving innovation, and contributing to a future where patient care is more efficient, safe, and collaborative.

Hello, this is the lab speaking - Simulated Scenarios and Self-Reflection in Communication Skills Training

Rigassi L., Bärlocher A., Huber M

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Objectives: The bachelor study program in Biomedical Laboratory Diagnostics at ZHAW comprises two communication modules in the third year with the aim to train students in communication expertise. While Communication-1 covers important theoretical aspects, Communication-2 should be developed focusing on practical training.

Question: What communication forms and skills are essential for biomedical sciences? Which knowledge structure supports the module's objectives achievement to practically train the students? What are exemplary suggestions for contents and didactic methods?

Material and methods: Relevant communication forms, skills and theoretical contents from Communication-1 were selected and complemented by additional tools for practical information transfer. The module structure and didactical methods were developed by means of needs-oriented approaches to align learning objectives and competencies to be achieved. The module was conducted in collaboration with laboratory sciences professionals and the simulation rooms of ZHAW Health Institute's Therapy, Training and Consulting Center. Evaluation was based on a student feedback loop.

Results: The module was developed as a combination of theoretical inputs, group works and practical skills training in phone communication. Initial lectures revisited and deepened Communication-1 content. Teamwork and collaboration were practiced and reflected in groups based on a Lego serious play. As a practical skill training each student answered at least one phone call from biomedical scientists and was confronted with challenging cases out of different professions and communication issues. Each call was filmed and the groups submitted reflections on the calls linking difficulties and breakthrough to communication theories as part of the performance record.

Discussion/Conclusion: The communication skills training was very successful. Students highly valued the phone call training as a real-work-life-scenario and the experience of a consciously reflected group work. The module also intensifies the collaboration with the practice partners in educating the future biomedical sciences professionals.

E-Textbook of Bioanalytical Research Methods: From Laboratory Guidelines to a Comprehensive Learning Resource

Deivi Roomets, Eerik Jõgi, Triin Markus, Aivar Orav, Anneli Raave-Sepp, Marika Külm, Mare Remm

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This study aims to examine the transformation of a collection of research methods and instructional films into a structured e-textbook. The development of laboratory guidelines commenced in 2014, and over the course of eleven years, this initiative has culminated in creating an electronic learning resource (https://bioanalyytikaopik.ee/).

The e-textbook encompasses five disciplinary domains:

- Pathology (6 guidelines, one handbook)
- Microbiology (4 guidelines, two instructional films)
- Haematology (6 guidelines, three instructional films, 1 photo collection/instructional film)
- Molecular Diagnostics (2 guidelines)
- Clinical Chemistry (2 guidelines)

A substantial proportion of the guidelines originated within the framework of students' graduation theses. In this process, students prepared preliminary versions of guidelines or instructional films, which were evaluated by expert panels consisting of students and/or practising biomedical laboratory scientists. Feedback was collected using a questionnaire based on the LORI (Learning Object Review Instrument) model. Following expert assessment, the recommended revisions were incorporated into the final versions of the guidelines, instructional films, or handbooks. This approach has provided students with valuable professional experience in preparing and refining laboratory instructional materials.

Although the initial plan envisioned the publication of the research methods textbook in print, the project ultimately materialised as an e-textbook. The principal advantage of the electronic format lies in its flexibility, allowing for the addition or removal of methodological content over time.

The integration of the e-textbook into teaching practice has been heterogeneous. In specific disciplines—most notably haematology and microbiology—it is actively employed, whereas in others, such as pathology and molecular diagnostics, its use has been more limited.

In summary, the e-textbook has demonstrated its value by simultaneously supporting students in preparing graduation theses and contributing to developing discipline-specific teaching resources.

Engaging Students in Theoretical Molecular Biology Classes: A Case Study in Biomedical Laboratory Sciences Program

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Educational Context and Rationale: Molecular Biology education in Biomedical Laboratory Sciences (BLSC) faces a critical pedagogical challenge: preparing students for personalized healthcare technologies while addressing declining engagement with complex theoretical content. This case study examines a comprehensive shift from traditional lecture-based instruction to active, collaborative learning, revealing both opportunities and challenges in contemporary higher education.

Problem Statement: BLSC students demonstrated decreasing motivation to engage with molecular mechanisms, signalling pathways, and diagnostic technologies. Students struggled to establish interdisciplinary connections and showed limited curiosity despite the clinical relevance of content. Traditional expository methods, even with interactive questioning, proved inadequate for developing the critical thinking and problem-solving skills essential for professional practice.

Pedagogical Innovation: We implemented a structured question-based learning framework for theoretical and practical classes. Student groups collaboratively addressed course-aligned questions with explicit learning objectives and curated resources (articles, videos, chapters, web resources). While AI tools were permitted, independent research was encouraged. Professors facilitated in-class work, providing guidance and clarifying complex concepts. Groups delivered rotating oral presentations, and all written responses received formative feedback. A traditional exam option remained available for non-participants.

Critical Findings: Initial engagement and assessment performance improved significantly. However, sustained implementation revealed concerning patterns: uncritical dependence on AI-generated content, superficial memorization replacing conceptual understanding, and student resistance to "mandatory" participation despite optional attendance. While overall grades increased, final exam performance on application-based problems revealed limited transfer of knowledge, suggesting grade inflation rather than authentic learning gains.

Pedagogical Implications: This experience illuminates essential considerations for active learning implementation: explicitly connecting pedagogical methods to professional competencies beyond grades; fostering academic integrity and critical AI literacy; addressing first-year students' developmental readiness for self-directed learning; and cultivating intrinsic motivation in assessment-driven cultures. Future iterations require strategic scaffolding that progressively develops students' capacity for independent inquiry, critical evaluation, and knowledge application in professional contexts.

Integrating Hematology Education for Biomedical Laboratory Science Students: From Bachelor to Lifelong Learning

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Over 90% of Norwegian hospital laboratories use Sysmex hematology analysers for routine complete blood counts. At the Western Norway University of Applied Sciences, the Biomedical Laboratory Science (BLS) bachelor program integrates these technologies into its curriculum, ensuring students receive training that is directly relevant to clinical practice. The recent inclusion of the Sysmex analysers and the CellaVision Classroom initiative has strengthened the program's alignment with current laboratory standards. Students receives training in blood cell morphology without the need of expensive equipment and they get hands-on experience using analysers with the same technology as in the clinical laboratories.

Throughout the three-year bachelor program, many students gain hands-on experience in hematology through clinical internships. Recognizing the need for continued professional development in this field, a 10-credit master's level course in hematology has been developed and offered three times since its launch in spring 2022. The course was created through inter-institutional collaboration involving two universities and two university hospitals.

Designed as a flexible and decentralized learning opportunity, the course is delivered online and structured into modules. It includes interactive video lectures, case-based assignments using CellaVision Proficiency, quizzes, and both individual and group tasks. The course includes one in-person seminar and three half-day digital seminars. Evaluations were conducted at multiple stages to ensure continuous improvement. Since the start of the course in 2022 more than 70 biomedical laboratory scientists from all over Norway have increased their knowledge in clinical hematology.

Since 2024 this course has been one of the elective courses in the newly established Master of Medical Laboratory Science at Western Norway University of Applied Science.

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