

CONFERENCE ABSTRACTS

European Association of Faculties of Pharmacy Annual Conference Abstracts 2026

Tartu, Estonia

Oral presentations

Designing agility within regulatory constraints: Reforming pharmacy education in Iceland

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Background: The pharmacy curriculum (BSc and MSc) at the University of Iceland required updating, further reinforced by recent amendments to the EU Directive (2024/7827/EU). This study describes the redesign of the programmes to align with updated requirements while enhancing professional readiness and curricular flexibility.

Methods: Pharmacy programs across the Nordic countries and Utrecht University were compared, and the findings, together with mapping the directive requirements, were used to prioritise core competencies and guide the development of integrated disease-based modules and greater curricular flexibility. The redesign followed an iterative process led by a curriculum committee with stakeholder consultations. An online survey on the current and proposed curriculum was distributed via the Icelandic Association of Pharmacists (n=49; 9% response rate), including respondents from clinical settings (41%) and industry (33%).

Results: Benchmarking and directive mapping identified areas for reduction (e.g. mathematics, natural products chemistry, and selected practical courses) to prioritise core competencies. Integrated, disease-based teaching combining medicinal chemistry, pathophysiology, and pharmacology was introduced. Greater emphasis was placed on pharmacy practice at the undergraduate level and clinical pharmacy at the graduate level.

Survey findings supported these changes: Clinical pharmacy and pharmacy practice were consistently ranked most important across pharmacy/hospital- and industry settings. Industry respondents prioritised data science and regulatory

competencies, whereas pharmacy/hospital respondents prioritised communication, management, and health economics. Leadership, policy, and AI-related skills were identified as gaps, while sustainability received minimal attention. The need for increased specialisation was addressed through expanded elective options. Recent advances in pharmacy were integrated across multiple courses to enhance curricular agility. Overall, 92% of pharmacists supported the proposed curriculum.

Conclusion: The new curriculum, implemented in autumn 2025, demonstrates a competency-driven, flexible approach developed through structured stakeholder engagement. Implementation was achieved within existing ECTS and programme resources. Ongoing evaluation will include cohort comparisons of graduate preparedness using Likert-scale assessments.

Study of selected screening examinations

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Background: Screening tests carried out in public pharmacies have a positive benefit for the prevention of selected diseases. The skills, knowledge and professional interpretation of individual measurements are acquired by the pharmacy students already during their undergraduate studies.

Methods: The first aim of the study was to compare the range of simple screening tests that are offered in community pharmacies between Bulgaria, Malta, Netherlands and Slovakia. The second aim was to compare curricula with focus on teaching these points of care tests and the interpretation of results in undergraduate education.

Results: The range of screening tests offered in public pharmacies varies. In these countries, there is no central system to record results, but they can be recorded locally. Most tests are paid by patients, in Netherlands there are some exceptions. In all countries walk-ins are available for some tests, others by appointment. Ministry of Health of the Slovak Republic published Guidelines for pharmacists. The Bulgarian Pharmaceutical Union has supported initiatives to expand pharmacy roles. In Malta pharmacists received training only during undergraduate studies. Curricula of compared countries contain theoretical and practical training and interpreting results in different years of studies. All countries offer basic parameters (blood pressure, blood glucose level, cholesterol, BMI, etc.), but the Netherlands, for example, offers vaccinations, Bulgaria offers bone density testing, basic hearing testing, allergy screening, measurement of carbon monoxide content with the Smokerlyzer device, spirometry. Malta offers microbiome testing, urinalysis, COVID 19 testing, allergy testing and Slovakia offers memory disorder testing, dermatological counselling, determination of uric acid level and presence of *Helicobacter pylori* in stool.

Conclusion: A comparison of the range of simple screening tests and curricula in undergraduate education lead to make recommendations to expand the curricula of other countries.

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Stress and mental wellbeing in pharmacy students: Research findings to inform educational policy and student support

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Background: Pharmacy students face high academic demands and multiple stressors that may affect mental health and performance. This study examined perceived stressors, coping strategies, and help-seeking behaviours among Pharmacy students at the University of Nicosia (UNIC), Nicosia campus.

Methods: An anonymous cross-sectional survey was conducted at UNIC (November 2023–May 2024) via Moodle. The 33-item questionnaire included Likert-scale, multiple-choice, and demographic items, incorporating the Perceived Stress Scale (PSS). All enrolled students (~550) were invited; 303 responded (response rate 55.1%), defining the sampling frame as the full programme population. PSS scores were calculated using standard methods (0–40), with internal consistency confirmed (Cronbach's $\alpha=0.86$). Selected items aligned with validated constructs (e.g., GAD-7 domains). Inferential analyses (chi-square, logistic regression) explored associations between stress and demographic/academic variables. Objective outcomes (progression, self-reported grades, counselling uptake) were examined. Ethical approval was obtained.

Results: Most participants were female (65.7%) aged 19–23 (84.5%); 68.6% were MPharm students. Stress was widely perceived to affect academic performance (94.7%). Key stressors included workload (88.5%), grade pressure (89.5%), and exams (76.9%). Poor sleep affected mental health (87.4%), and 76.2% reported reduced quality of life. High anxiety was reported by 53.5%, and 5.3% indicated suicidal thoughts.

Higher PSS scores were significantly associated with female gender, higher study year, and employment ($p<0.05$). Higher stress was linked to lower academic performance and increased likelihood of delayed progression (OR=1.85, 95% CI 1.10–3.12), while counselling uptake remained low among high-stress students ($p<0.05$). Regarding support, 19.8% had consulted a mental health professional, while 86.2% had not accessed university services. Common coping strategies included music (34.7%), social support (32.0%), and exercise

(21.8%). Financial difficulties were reported by 31.0%, and 22.0% worked alongside studies.

Conclusion: To our knowledge, this is the first study among Pharmacy students in a Greek-speaking university. The central finding is that students perceive high stress linked to academic demands, while professional help-seeking remains limited. These results highlight the importance of strengthening proactive wellbeing strategies to promote student mental health and academic success. Data-driven interventions include embedding wellbeing training, early stress screening (PSS), peer-support schemes, and improved access to counselling. Multi-institutional replication using standardised tools is recommended to support benchmarking and policy development. Limitations include the single-institution design and reliance on self-reported data, which may affect generalisability

Written reflection following exam review – A strategy for deeper learning

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Background: In the Advanced Pharmacotherapy course at Uppsala University, an exam review session has long been conducted immediately after the written examination to provide feedback and promote learning, in line with principles emphasising dialogue and timely feedback. Over time, discussions have focused on further developing this component by integrating elements of collaborative learning, inspired by two-stage exams, as well as self-assessment. The importance of varied feedback formats and students' self-assessment is also highlighted in Uppsala University's pedagogical programme. The aim of this project was to enhance student learning during the exam review session by incorporating peer feedback and self-assessment.

Method: Before the spring semester of 2023, the exam review was redesigned to include group discussions (approximately 20 minutes per case), a whole-class review, and an individual written reflection. Students identified themselves using examination codes to preserve anonymity. Reflections were considered in the final assessment and could influence the final grade in borderline cases between fail/pass or pass/pass with distinction.

Results and Discussion: To date, written reflections have clearly influenced the final grade for 14 students and partially influenced outcomes for an additional 17 students. In an analysis of all reflections, they were categorised as high, satisfactory, or insufficient quality. Among students who passed the examination, 91% submitted reflections of high or satisfactory quality, compared with 62% among those who failed. Analysis of the reflections indicates that many students

gained new knowledge and insights during the session, supporting its role as a learning activity. Allowing reflections to influence exam outcomes reduced the need for reexaminations and resulted in time savings for teachers. Student evaluations show high overall satisfaction, with students particularly valuing the opportunity to influence their examination result.

FPD-include: Transforming pharmacy education through transnational coil and a European toolkit for inclusion and global engagement

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Background: The increasing cultural diversity in European societies poses new challenges for pharmacy education, requiring more inclusive and culturally responsive teaching approaches. However, many pharmacy educators lack specific training in Diversity, Equity and Inclusion (DEI), limiting their ability to create equitable learning environments.

Methods: A mixed-methods design was implemented within the Erasmus+ KA220 project FPD-Include (2023–2026), funded by the European Commission and led by the University of Bergen in partnership with the universities CEU San Pablo, Helsinki, and Utrecht. A cross-institutional needs assessment survey involving Pharmacy students and faculty from the 4 universities was conducted to identify key DEI priorities. Based on these findings, an international COIL (Collaborative Online International Learning) programme was developed using a “train-the-trainers” approach. Faculty participants were organised into international teams addressing specific DEI topics. The programme combined synchronous sessions (introductory session, masterclasses and a conference), collaborative teamwork guided by facilitators, and reflective activities. Data collection included survey responses, post-conference satisfaction questionnaires and materials co-created by the teams.

Results: The needs assessment involved 528 students and 145 faculty members, enabling the identification of five key thematic areas: inclusive collaboration, intercultural communication, inclusive assessment, inclusive STEM teaching, and classroom trust-building. 44 educators, supported by 4 facilitators and 7 international

experts, participated in the COIL programme. Outcomes were presented at an international hybrid conference with 140 participants from 19 countries. As a key output, an open-access digital toolkit was co-created to support inclusive teaching practices, providing practical strategies and adaptable resources (<https://www.fpdinclude.com/>). Post-event evaluation showed strong impact: 100% of participants reported increased awareness of inclusive teaching, and 98% expressed intention to implement DEI strategies.

Conclusions: The FPD-Include model demonstrates the effectiveness of combining needs assessment, international collaboration and faculty development to foster inclusive pharmacy education, with strong evidence of impact and high potential for scalability and transferability.

Assessing universal accessibility in community pharmacies through the lens of people with intellectual disabilities

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Background: Universal Design seeks to create environments usable by all people without adaptation, addressing physical, cognitive, communicative, and emotional accessibility. Community pharmacies are key settings for inclusive healthcare, yet assessments often overlook user experience, particularly that of people with intellectual disabilities. This project integrates inclusive education and service learning by involving students with intellectual disabilities as “Universal Accessibility Support Consultants” who collaborate with pharmacy students to evaluate community pharmacies. The program was co-organised by the School of Pharmacy and the School of Technology of Universidad CEU San Pablo (Madrid, Spain), and accessibility experts, within a broader initiative funded by Fundación ONCE and the European Social Fund (European Commission).

Methods: This pilot cross-sectional service-learning study involved visits to three community pharmacies in Madrid, coordinated with the Official Association of Pharmacists of Madrid. Participants included 11 students with intellectual disabilities, 3 pharmacy interns, 4 pharmacists, and academic staff. After prior training in accessibility, teams used a 24-item checklist assessing physical accessibility, staff communication, and user experience. Data were collected through structured observation and standardised responses, and pharmacies received feedback reports. All participants provided informed consent. Analysis was descriptive.

Results: Overall accessibility and experience were rated positively. Most participants (77%) reported easy access to sales areas. Communication was highly effective, with 100% reporting clear explanations and understandable language. Emotional responses were mainly positive, and the overall experience scored 4.85/5. Strengths included supportive environments, while suggested improvements involved signage and layout. The activity also increased pharmacy students’ awareness of inclusive care.

Conclusions: As a pilot study, findings are exploratory and limited by the small number of sites. However, involving people with intellectual disabilities as evaluators provides insights beyond physical barriers, emphasising communication and emotional comfort. Community pharmacies can serve as learning environments for training future pharmacists in inclusive, person-centred care while improving service quality.

Immersive learning experience for the professional orientation of students at the School of Pharmacy, Universidad de Sevilla

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Background: Within the University of Seville’s *IV Plan Propio de Docencia* (Ref.

221B), *FarmaEscape: ¡Perdidos!* was developed as an immersive gamified strategy to enhance professional orientation and transversal competencies in Pharmacy students by integrating curricular knowledge with vocational reflection.

Methods: An escape room-based activity was structured around three professional pathways: Pharmaceutical Care, Pharmaceutical and Food Industry, and Research/Teaching/Dissemination. Twelve multidisciplinary teams (n=60 participants), including undergraduate and PhD students, technical staff, and early-career faculty, completed discipline-integrated challenges across three themed rooms within 60 minutes. Outcomes were assessed through an *ad hoc* questionnaire designed for this intervention, administered via Microsoft Forms using 5- and 10-point Likert scales. The instrument was aligned with key competency domains described in Pharmacy education frameworks, including teamwork, knowledge integration, professional role awareness, and reflective career decision-making. All participants provided informed consent before participation.

Results: All participants completed the questionnaire (response rate: 100%). The mean completion time was 57 minutes, with 66.7% of teams successfully finishing within the allotted time. Satisfaction scores were high across pathways (9.47–9.9/10), with maximum ratings for organisation and originality (5/5). Participants reported strong perceived development in teamwork (4.93/5), learning environment (5/5), knowledge reinforcement (4.97/5), professional competency awareness (4.77/5), and career reflection (4.7/5). Perceived difficulty was moderate (3.7/5). Activity required low-cost, reusable materials and coordinated staff support, indicating good feasibility and scalability to other cohorts and health-related programmes.

Conclusion: This immersive gamified approach represents a feasible, scalable, and transferable strategy to promote competency development, professional awareness, and vocational reflection in Pharmacy education.

Sharing across borders: Integrating competency-based approaches from Norway into German pharmacy curriculum to meet revised EU training requirements for pharmacists

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Background: The Delegated Directive (EU) 2024/782 introduces expanded minimum training requirements, e.g. social pharmacy as a course, knowledge about interprofessional collaboration and communication for pharmacists that are not yet fully addressed in the German pharmacy curriculum. To support alignment with the revised EU training requirements, innovative curricular competency-based elements from social (1st year) and clinical pharmacy (4th year) of the University of Bergen pharmacy curriculum were adapted for integration into a 7-hour clinical pharmacy seminar at the Freie Universität Berlin for pharmacy students in their 4th year. Taught elements included communication, creativity, innovation, critical thinking and collaboration. Learning activities were reflection notes, creative tasks, debate and patient-oriented case work. Pre-questionnaires contained open-ended questions to reflect on prior participation in an interprofessional education project with medical students as a pre-course activity.

Methods: Post-questionnaire was used to evaluate the students' perception of the seminar. It contained open-ended-questions to reflect on taught elements of the seminar and an open-ended-feedback question. Qualitative content analysis was conducted.

Results: Within two rounds 77 students participated. The feedback-question was answered by 46 students (60% response rate). The seminar was well received by the students. One student wrote "of all the seminars throughout my studies, this one will remain particularly memorable for me". Some students suggesting putting the seminar into the 1st year. A few students perceived the debate as not helpful, suggesting giving more time to prepare the debate. General feedback was that the seminar should be earlier in the semester to avoid exam collisions.

Conclusions: Integrating Norwegian competency-based approaches into the German pharmacy curriculum proved feasible and was well-received. Sharing teaching practices across borders functioned as an efficient catalyst for curriculum change. However, to meet the revised EU training requirements nationwide, the German pharmacy licensing regulations must be revised to support broader curricular adaptation.

Enhancing curriculum and learning opportunities through interprofessional education

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Interprofessional education (IPE) occurs when two or more professions learn about, from and with each other. It enables effective collaboration and mutual understanding of professional roles and responsibilities in multidisciplinary care and expands professional self-identity. Indeed, because interprofessional collaboration among qualified professionals improves clinical outcomes, calls have been made to increase funding for interprofessional educational initiatives.

We initiated IPE between undergraduate medical and pharmacy students to clarify the applicability of IPE and identify challenges and limitations associated with its implementation.

In preparation for the IPE session, medical students used a novel prescribing program, Student eScript, to prescribe for case studies. To mirror real-world, pharmacy students then received additional information about these cases. Students then met and, in faculty-led discussions, made amendments where necessary to the original prescriptions, based upon the additional information that was provided to the pharmacy students. We assessed student perception of Student eScript and the IPE session using pre- and post-

surveys adapted from several previously published questionnaires (approvals 369/T-3, 389M-2_1, 405T-10).

Users (N=14 responders, 33% response rate) of Student eScript agreed that it illustrated real-life applications (65% of responders). 78% of students found Student eScript useful, and 79% of students agreed they were more confident in prescribing after using it. 72% agreed they were more aware of where prescribing errors can occur. Nevertheless, 78% agreed that they needed more prescribing practice. With respect to the IPE session, 72% of responders agreed that IPE helped appreciate the importance of communication with the pharmacist. 85% agreed that the IPE session should continue to be offered.

These data demonstrate 1) a positive impact of digital prescribing tools on learner prescribers and 2) the benefit of IPE to undergraduate medical students. Our data support the implementation of these methods, which is in line with current University of Tartu curriculum development plans.

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Changes in the field of pharmacy as a driver for the restructuring of the pharmacy study programme at the Lithuanian University of Health Sciences

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Background: Adapting to the evolving professional landscape is vital for pharmacists. Recent regulatory changes in Lithuania, including legislation on immunoprophylaxis through the approval of medical standard 170:20201 "Pharmacist With Extended Practice" and advanced pharmaceutical care services (as the amendment of the regulations governing the provision of pharmaceutical care services related to the continuous dispensing of prescription medications, 2024-073732, date of entry 2026-12-14), require continuous adaptation of pharmacy education. These changes act as key drivers for restructuring the Pharmacy Study Programme at the Lithuanian University of Health Sciences (LSMU).

Methods: The programme revisions were based on a mixed-methods approach, including analysis of national regulatory documents, review of recommendations from international experts, systematic student feedback (through "Quality Thermometer" surveys, final-year evaluations, and periodic meetings), and targeted input from social partners. The evaluation framework adhered to national quality assurance guidelines and institutional programme review procedures. Triangulation of the data verifies the modifications from multiple perspectives.

Results: The Pharmacy Study Programme Committee implemented modifications to the curriculum structure. A new subject, "Immunology and immunoprophylaxis" was introduced in response to regulatory changes and aligned with Directive 2005/36/EC. The "Pharmaceutical Care" module was revised to strengthen interprofessional collaboration. The "Disease Management" module was expanded by introducing "Clinical Pharmacology", addressing the need to enhance pharmacological competencies. Additionally, "Introduction to Pharmacy" was introduced in the first semester and the "Basics of Social Sciences and Humanities" module was restructured to support professional thinking and communication skills. The implementation of objective structured clinical examination (OSCE) - type assessments enhanced the evaluation of practical competencies in a real-world context.

Conclusion: The revised LSMU study programme "Pharmacy" reflects current professional and regulatory developments and strengthens competency-based education. These changes enhance the alignment of pharmacy education with evolving patient care needs and improve the overall quality and relevance of the programme.

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Poster presentations

Experience in developing an AI pharmacist agent as a tool for flexible and personalised student training

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Background: Digitalisation and the rapid integration of artificial intelligence (AI) into pharmaceutical education have created new opportunities for flexible, personalised learning. Intelligent systems based on large language models (LLMs) can simulate professional tasks, support self-directed learning, and enhance the development of clinical and pharmaceutical competencies. This study aimed to develop and pilot test an AI pharmacist agent designed to support individualised learning, simulate professional decision-making scenarios, and assist pharmacy students in acquiring practice-relevant skills.

Methods: A pilot study was conducted within a digital educational platform at the Asfendiyarov Kazakh National Medical University. The AI pharmacist agent was developed using LLM-based architectures adapted to pharmaceutical and medical terminology and enhanced through retrieval-augmented generation (RAG) to ensure reliability and evidence-based responses. The system was integrated via an application programming interface (API), enabling interaction through dialogue, intelligent search, drug-analogue selection, and automated generation of situational clinical cases. The knowledge base included drug information leaflets, educational materials, regulatory documents, and task banks used in pharmacy training. Effectiveness was evaluated through multiple data sources:

- (1) performance on situational tasks,
- (2) test score patterns,

(3) automated analysis of interaction logs,

(4) student surveys assessing usability, perceived learning benefits, and engagement.

Results: Pilot implementation demonstrated that the AI agent was able to adjust the level and depth of explanations based on student performance and query patterns. Students showed improved accuracy in completing situational tasks, fewer typical errors in medication selection, and higher independence in navigating educational materials. Interaction logs indicated increased engagement, with students using the tool to clarify complex concepts and explore clinical-pharmaceutical scenarios. The intelligent drug-selection module effectively simulated real-world decision-making processes.

Conclusion: The AI pharmacist agent represents a promising approach to personalised and flexible pharmacy education. Pilot results support its potential for wider adoption and further development to enhance professional training and clinical reasoning skills.

Comparative analysis of pharmacy curricula in Bulgaria and international context: Implications for curriculum innovation

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Background: Curriculum innovation in pharmacy education requires systematic benchmarking against national and

international standards to ensure alignment with evolving professional expectations. This study presents a comparative analysis of the Master of Pharmacy curriculum at Sofia University "St. Kliment Ohridski" (SU) in relation to Bulgarian medical universities and global pharmacy programmes, with a focus on total workload, disciplinary distribution, and compliance with the requirements of the European Directive on Professional Qualifications. The aim of the analysis was to evaluate structural differences in curriculum hours, ECTS distribution, and disciplinary balance to identify strengths and opportunities for modernisation.

Methods: The study synthesises data from three sources: comparison of mandatory ECTS across Bulgarian institutions, comparison of total contact hours across Bulgarian curricula, and international benchmarking following the PHARMINE methodology. According to national comparison tables, SU allocates 272 ECTS in mandatory coursework, compared with 318 at MU-Sofia and 269–270 at other institutions. Total contact hours at SU amount to 3495, higher than MU-Pleven (3120) and MU-Varna (3150), and equal to MU-Sofia and MU-Plovdiv (3495 each). Internationally, SU reports a total workload of 4860 hours, exceeding the global sample mean of 3639 hours and positioning the programme above the median for annual instructional load (972 hours/year, compared with a global average of 728). Cluster analysis shows that SU emphasises practical training (28.16%, 1365 hours) and chemical sciences (23.8%, 1155 hours), while maintaining balanced representation of medical (18.2%) and pharmaceutical technology (12.7%) disciplines. Compared with international programmes, SU's cluster distribution aligns closely with European patterns, particularly in the ratio CHEM:MATH:PRAC (24:4:29).

Conclusions: The findings highlight that the SU curriculum is comparatively intensive, practice-oriented, and structurally aligned with European frameworks. These results support ongoing curriculum innovation efforts, demonstrating areas where workload harmonisation, cluster rebalancing, or modular restructuring may further enhance curricular agility and international comparability.

Innovation the pharmacognosy curriculum through digitalisation: Low-barrier tools to enhance laboratory-based learning

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Background: Digitalisation presents new opportunities for strengthening experiential laboratory learning in Pharmacognosy. This work evaluates the implementation of a structured digital toolset designed to modernise workflow,

improve accessibility to course materials and support learning. The objective was to develop, integrate and assess a collection of cost-effective, low-barrier digital tools and determine their pedagogical value through student feedback.

Methods: The ADDIE model guided the analysis, design, development and implementation of digital resources within the Moodle platform. The digitalisation process produced a herbal substance database containing 441 entries, a glossary of 292 Pharmacognostic terms with integrated photographic material, and a digitised herbarium comprising 280 specimens supported by 177 images. Additional materials included an inventory of 95 reagents and the installation of 20 NFC tags throughout the laboratory, enabling immediate access to digital content. A total of 105 curated 3D photogrammetric models were embedded, and ten interactive PDF laboratory report forms were created, supporting structured practical work. Student perceptions were collected from respondents using a ten-item Likert-scale questionnaire.

Results: Student response was highly positive, yielding an average rating of 4.17 out of 5. Interactive forms received the highest rating at 5.0, followed by ease of digital navigation and perceived usefulness of 3D models (4.9 each). The lowest rating, 2.6, related to the quality of 3D models, reflecting the challenge of sourcing and producing high-fidelity photogrammetric content. Development of photographic repositories and digital inventories required more than 600 labour hours but substantially improved accessibility and organisation of course materials.

Conclusion: Targeted digitalisation aligned with curricular needs can drive meaningful curriculum innovation. Tools that directly support laboratory tasks, particularly interactive report forms and structured digital repositories, offer the greatest educational benefit, while refinement of 3D model creation remains necessary. The findings demonstrate that low-cost digital tools can enhance engagement, efficiency and learning outcomes.

Operationalising agile curriculum elements in pharmacy training: A practice-oriented model from Sofia University

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Background: Implementing agile curriculum elements within a regulated pharmacy programme requires targeted pedagogical and organisational strategies. This study presents evidence-based agile practices from the pharmacy curriculum at Sofia University, highlighting innovations in

practical training, digitalisation, and interdisciplinary instruction. Our goal is to describe and quantify the programme's agile practices that enhance flexibility, personalisation, and readiness for contemporary pharmacy roles.

Methods: Evidence was drawn from the 2021–2023 accreditation self-evaluation, analysing curriculum structure, elective uptake, practical components, digital tools, and performance indicators. Both quantitative metrics (e.g., employability, survey participation) and structural changes were examined.

Results: Agility is reflected in expanded hands-on learning: increased laboratory hours, refined clinical exposure, and the introduction of a distinct Production Practice in Pharmaceutical Technology after the 8th semester—unique among Bulgarian pharmacy programmes. Interdisciplinary teaching integrates faculty expertise across chemistry, medicine, biology, and physics. Elective offerings grew in clinically oriented subjects, with strong student uptake in “Clinical Medicine for Pharmacists.” Digital transformation accelerated through e-courses, electronic assessments, and platforms such as e-student, e-lecturer, and e-library. Student engagement serves as a core agility mechanism, with 100% participation in course evaluations and 1289 surveys processed in 2022/2023. These inputs led to immediate refinements in teaching methods, scheduling, and competencies emphasised in health IT and AI. Outcomes validate the effectiveness of agile elements: the programme rose to 2nd in the national rankings, graduates achieved 88.64% employment, and infrastructure enhancements increased accessibility and modernisation.

Conclusion: The Sofia University model demonstrates that agile curriculum components—practice expansion, digitalisation, electives, and stakeholder-driven refinement—can be successfully implemented in regulated pharmacy programmes. These elements strengthen student preparedness, enhance programme flexibility, and align education with emerging professional and technological demands.

Integrating English-language presentation skills into final degree projects: The English-TFE innovation at the University of Seville

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Background: Within the University of Seville's IV Plan Propio de Docencia (Ref. 221C), the “English-TFE (Final Project)” initiative was created to support the internationalisation strategy of the Faculty of Pharmacy. The Final Degree Project requires students to develop new competencies, including literature searching, scientific writing, presenting, and defending their work. Experimental projects additionally demand familiarity with research methods, ethics, teamwork, and data interpretation. To strengthen students' English communication skills and enhance international visibility, an optional English-language presentation format was introduced.

Objective: To evaluate whether presenting the Final Degree Project in English improves students' communication competencies and contributes to the faculty's internationalisation efforts.

Methods: Fifth-year students preparing their Final Degree Project (2024/2025) were surveyed regarding their English level and interest in participating. Students from the Bachelor's Degree in Pharmacy, the Bachelor's Degree in Optics and Optometry, and the Double Degree were informed via the Virtual Teaching platform about the opportunity to deliver an additional 5–10-minute in-class English presentation of their completed project. Participation data, teacher involvement, and qualitative feedback from teachers and students were collected. Earlier editions included structured rubric-based evaluation; later editions prioritised fluency and discussion to encourage participation.

Results: Across recent editions, 8–10 students and 15–20 faculty members participated annually. Presentations were delivered in English during a dedicated conference opened by the project coordinator. Teachers from all degree programmes attended, fostering interdisciplinary exchange. Students reported improved confidence in presenting and debating scientific content in English. Teachers noted clearer evidence of communicative progress when the emphasis shifted from rigid assessment to interactive discussion. The conference also served as a platform for collective reflection on strategies to strengthen the faculty's international profile.

Conclusion: The English-TFE project enhances students' English communication abilities, promotes internationalisation, and encourages faculty collaboration. By shifting from strict evaluation to a supportive, discussion-based format, student engagement increased and the project became a valued innovative initiative within the Faculty of Pharmacy.

Mooc as a sustainable tool for public pharmacy education: Lessons from an 8-year experience

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Background: Public understanding of rational medicine use is critical for health outcomes and aligns with contemporary pharmacy education goals centred on societal impact and lifelong learning. MOOCs offer an opportunity to deliver structured pharmacy education to large, diverse audiences while maintaining academic resources, but often face low completion rates. In 2019, the Institute of Pharmacy at the University of Tartu launched "Medicines Down to Earth," a six-week MOOC for the general public and university students to address gaps in pharmacy knowledge and support informed medicine use.

Methods: A retrospective descriptive analysis was conducted covering 28 course runs from 2019 to 2025. Enrolment and completion data were obtained from the course platform. Completion was defined as passing all six module tests. Participation and completion rates were analysed separately for public participants and university students. In addition, qualitative learner feedback was reviewed.

Results: During the study period, 6,100 learners enrolled in the course (n=3,000 public participants; n=3,100 students). Overall, 83% (n=5,100) completed the course. The completion rate among university students was 97% (n=3,000), while 69% (n=2,100) of public participants completed all required assessments. For comparison, the average completion rate of University of Tartu MOOCs in 2024 was 42%. Enrolment numbers remained stable across the analysed period. Qualitative feedback highlighted flexibility in pacing, diversity of learning materials (videos, texts, and practice tests), and the relevance of foundational knowledge about medicines. Public learners frequently recommended the course for broader audiences, including school students, underscoring its role in improving health literacy.

Conclusion: Over eight years, the course has consistently maintained high enrolment and completion rates, particularly in comparison with institutional MOOC averages. The results indicate that a structured, assessment-based online course can effectively provide medicine related education to both university students and the general public. Sustained implementation

requires efficient course administration and ongoing pedagogical support.

Design and development of a weekly monitoring logbook for the supervision and assessment of pharmacy students during hospital pharmacy placements

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Supervised training placements are an integral part of the academic curriculum of pharmacy students. Within the Pharmacy Degree at the University of Seville, students may opt for placement in Hospital Pharmacy. To optimise periodic supervision and standardise the mentoring process within these hospital settings, a virtual weekly monitoring logbook was developed. This tool aims to track the acquisition of competencies and ensure consistent evaluation by tutors.

Method: This pilot study is being conducted during the 2025/26 academic year and includes 93 Pharmacy Degree students (15 and 78 students in each semester, respectively) who are undertaking their training placements in Hospital Pharmacy. Given the inherent differences among various hospital pharmacy departments, the monitoring logbook was designed to include 12 activities common to the majority of these settings. These include, for instance, conducting literature searches in databases and clinical guidelines, as well as providing pharmacotherapeutic information to healthcare professionals and patients. For each activity, three levels of development were proposed: i) observation, ii) under supervision throughout the process and iii) Independent performance with supervision afterwards. The logbook is completed weekly and requires validation from professional tutors. Students upload these signed documents to the University's virtual platform to be reviewed and assessed by their academic tutors.

Results: The pilot implementation of this logbook is currently underway. It is expected that this tool will enable the organised and systematic collection of relevant information regarding student performance, achievement levels, and the specific competencies acquired during the mentoring

process. This monitoring tool is anticipated to provide valuable data to improve processes, identify training needs, and optimise communication and coordination among all participants involved in the teaching-learning process, including both professional and academic tutors.

Conclusion: The implementation of a weekly monitoring logbook is expected to enhance the follow-up and evaluation of pharmacy students during Hospital Pharmacy placements.

Aligning advanced therapy medicinal products in pharmacy curricula

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Background: Advanced therapy medicinal products (ATMPs), including CAR-T therapy, gene therapy, and the use of radionuclides, are transforming therapeutic paradigms. From a pharmaceutical perspective, pharmacists are involved to support innovation in therapeutic protocols whilst ensuring safety, quality, and access. The aims were to gather insight into regulatory and clinical contributions expected from the pharmacy workforce to support the use of the advanced therapeutic technologies and to identify educational pathways to support pharmacy graduates.

Method: Stakeholder meetings with healthcare service providers and clinical leads were held to capture developments in clinical use. Pharmaceutical regulatory discussions and market access at the European Union level were used to bring the context of current challenges in access and patient safety. Subsequently, student projects were developed to provide the opportunity for pharmacy students to reflect on practical contributions that are relevant to pharmacy graduates.

Results: Stakeholder discussions identified competences related to pharmacoeconomic evaluations and technology assessment, interprofessional collaborative practice within clinical and regulatory teams that extends beyond the local network, and understanding of applied biochemistry principles to the science underlying different examples of ATMPs. Student projects consisted of either bibliographic or healthcare setting fieldwork. Through the projects, the students identified supply vulnerabilities and the need for regional collaboration in radiopharmaceutical services, the expanding clinical oversight and pharmacovigilance responsibilities of pharmacists in CAR-T therapy, logistic special requirements such as ultra-cold storage and cost barriers.

Conclusion: The experience from this initiative has provided an informed approach, which includes student perspectives, on relevant aspects to be elaborated in pharmacy curricula to align with innovations in therapeutics through ATMPs and therapeutic radionuclides. The next phase is to elaborate the context within the Applied Pharmaceutical Biochemistry study unit so as to support competence development in the therapeutic and clinical pharmacy study units to enable a future-ready workforce. The changes proposed are highlighting the special manufacturing conditions and requirements for ensuring stability related to CAR-T and gene therapy as well as the pharmaceutical interventions required to support patients receiving these treatments including patient monitoring and pharmacovigilance activities.

Game-based learning as an agile strategy for future ready pharmacy education

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Background: Rapid advances in artificial intelligence (AI) and digital health demand agile, future-ready pharmacy curricula. An urgent need has emerged to transform learning environments to better support student engagement, long-term knowledge retention, and preparedness for complex clinical decision-making. Traditional didactic formats often contribute to cognitive overload and short-term memorisation, limiting sustainable knowledge application. Game-Based Learning (GBL) offers an innovative, active learning approach aligned with agile curriculum principles and the development of future-ready competences. This study evaluated the impact of a GBL intervention in respiratory system pharmacology.

Methods: A custom-designed educational board game integrating clinical scenarios and pharmacological decision-making was implemented with 17 second-year pharmacy students. Knowledge tests were completed immediately after gameplay and again after two weeks. Pre- and post-intervention surveys assessed attitudes, engagement, perceived preparedness, and learning experience. Data were analysed descriptively using frequencies, means, and percentage change.

Results: Student knowledge increased significantly after the GBL activity and remained stable over time (74% immediately post-game vs. 73% after 14 days), indicating strong retention with minimal decline. All students reported improved understanding and viewed GBL as an effective learning method; 100% evaluated the activity positively, and 82% stated they would recommend its integration into future courses. Students described high engagement, reduced stress, and increased confidence. GBL was perceived as

particularly valuable for reinforcing knowledge, supporting conceptual integration, and strengthening teamwork skills.

Conclusion: The findings support incorporating GBL as part of an agile, innovative curriculum strategy in pharmacy education. In the AI era, where digital tools reshape

learning and professional practice, a shift is needed from passive information delivery to experiential, interactive methods that enhance retention, critical thinking, and learner autonomy. Expanding these approaches is crucial to developing a pharmacy workforce that is future-ready and responsive to change

Exploring the needs for developing educational materials to strengthen inclusive care for lgbtqia+ individuals in community pharmacies

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Background: Growing population diversity, including increased recognition of LGBTQIA+ communities, places new demands on healthcare systems. In Denmark, research on LGBTQIA+ individuals' healthcare experiences remains limited, particularly regarding pharmaceutical care. Additionally, Danish pharmacy programs lack structured education and guidance on communicating with and supporting LGBTQIA+ individuals. This study examines experiences, practices, and knowledge gaps among LGBTQIA+ individuals, pharmacy students, and community pharmacy staff to inform the development of educational materials and practical guidance for more inclusive pharmacy practice.

Methods: The Design Thinking model guides the development of innovative educational initiatives, emphasising Empathise, Define, and Ideate phases. In the Empathise phase, qualitative interviews with six LGBTQIA+ individuals explored experiences and needs related to pharmaceutical care. In the Define phase, two focus groups with pharmacy students and professionals will examine their perspectives, preparedness, and challenges when interacting with LGBTQIA+ individuals. In the Ideate phase, students, professionals, and LGBTQIA+ individuals will participate in a co-creation workshop to generate ideas to enhance pharmacists' education and support more inclusive pharmacy practice.

Results: Interviewed LGBTQIA+ individuals viewed Denmark's public healthcare as accessible, though experiences with doctors' competence, preparedness, and understanding of transition-related needs varied. Pharmacy services were viewed positively, but pharmacists' knowledge about transition procedures and treatments was perceived as outdated. Key challenges stemmed from institutional rigidity:

binary classification systems and lengthy evaluation procedures, prompting some to seek care abroad. In pharmacies, limited privacy during dispensing and counter-based counselling was noted as problematic. Participants

emphasized the need for improved education, empathy, and practical diversity competence training, particularly concerning inclusive and sensitive language. The results of the focus groups and co-creation workshop will be presented at the conference.

Conclusions: The findings so far indicate a need for enhanced provider competence, inclusive communication, and structural improvements to ensure pharmaceutical care meets the needs of LGBTQIA+ individuals.

From hospital to home: Extending the safe medication management and use process game to outpatient settings

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Background: Medication management is a multistage, interprofessional process vulnerable to safety risks. Care transitions, particularly hospital discharge, are a critical risk point. Gamification offers an engaging pedagogical approach promoting active participation and collaborative problem-solving. The Safe Medication Management and Use Process game, developed by the Finnish Centre for Client and Patient Safety, has proven effective for learning about medication safety in institutional settings. This project extends the game to the outpatient setting.

Methods: An outpatient extension is being developed by pharmacy students supervised by educators from the University of Eastern Finland and the Finnish Centre for Client and Patient Safety. The game begins with a patient discharge scenario, and players navigate through a pharmacy, home, and primary healthcare centre, identifying their functions, associated risks, and safety barriers. Development follows two piloting phases: first with educators, then with two groups of 3–6 interprofessional students from medicine, pharmacy, and nursing. Participants complete an electronic questionnaire after the game. Perceptions are assessed using a 4-point Likert scale (1=strongly disagree, 4=strongly agree, with an additional "cannot say" option). Quantitative methods will be used for scaled items; open-ended responses will be analysed using qualitative content analysis.

Results: All educators (n=3) agreed or strongly agreed that the game helped them identify risks and safety barriers in the

outpatient medication process. All participants strongly agreed that interaction was successful, that it was safe to express their views, and that the game increased their confidence in medication safety competence. In open responses, educators suggested clearer terminology introduction and additional interactive elements to activate players. Student piloting results will be presented.

Conclusion: The outpatient medication process game extends gamified medication safety education to care transitions and community settings, suitable for interprofessional health sciences education. Future research will evaluate its impact on learning outcomes and interprofessional collaboration.

Integrating regulatory affairs into sustainable pharmacy education

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Background: Sustainability is increasingly positioned as a strategic priority for future pharmacy practice, yet it can only be implemented through binding regulatory requirements governing the full medicines life-cycle. Recent amendments to the EU minimum training requirements strengthen expectations that graduates can operate in clinical, public-health, interprofessional, and digital practice environments. However, in many pharmacy programmes, education on regulations governing medicinal products remains limited, fragmented, or embedded narrowly under “legislation/ethics,” resulting in variable readiness to translate sustainability priorities into actionable practice. We argue that Regulatory Affairs (RA) should become an explicit and compulsory competency thread in pharmacy education. We aim to align RA learning outcomes with amended minimum training outcomes, demonstrate how core RA tasks operationalise the environmental, economic, and social pillars of sustainable pharmacy, and propose an implementable curriculum model within course structures.

Methods: We use a structured, outcomes-based approach: targeted textual analysis of amended EU training outcomes; benchmarking of publicly available curricula; and competency mapping linking RA tasks to sustainability pillars and to amended outcomes. The output is a curriculum integration blueprint with learning activities and assessment suggestions.

Results: Mapping shows RA as the practical mechanism for sustainability:

Environmental: environmental risk assessment concepts, lifecycle stewardship, and medicine return/disposal pathways.

Economic: regulatory pathways influencing time-to-access, competition, and affordability;

Social: frameworks supporting access for underserved populations (paediatric/orphans) plus medicines availability through shortage preparedness.

A feasible model is proposed using case-based learning (SmPC/label evaluation, shortage table-tops), skills training in digital regulatory-information workflows, targeted workshops/seminars, and exposure to competent authorities.

Conclusion: To meet EU training expectations and make sustainability teaching operational, RA should be explicit and compulsory within pharmacy curricula, moving beyond a narrow interpretation of “legislation/ethics.” Strengthened RA education will enable graduates to interpret regulatory texts, participate in policy and interprofessional decision-making, and support greener, fairer, and more resilient medicines systems.

Agility in pharmacy curricula to meet relevance in pharmacy education

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Background: Pharmacy education leaders and institutions are responsible for supporting agility in pharmacy curricula design and delivery that embraces evolution in pharmacy practice and pharmaceutical sciences. Such agility relies on the ability to identify educational needs that support skills, competencies, attitudes and behaviours of graduates that are relevant to emerging and futuristic needs of the profession and society. Within the International Pharmaceutical Federation (FIP) Academic Institutional Membership (AIM) Advisory Committee, the AIM area of concentration Working Group (2025) was tasked with identifying the diverse approaches adopted by schools of pharmacy across the world that promote relevant pharmaceutical education for practice and science.

Methods: Following a call for volunteers from leadership teams of FIP-AIM pharmacy schools, a Working Group consisting of 21 academic leaders from 14 different countries across the six WHO regions was established. The Working

Group met monthly to identify key priorities which support actions that improve relevance in pharmacy education. The priorities were classified into three domains. For each domain, priorities were characterised into sub-themes, reflections and case-examples were drawn up.

Results: The three domains are: curriculum evolution and delivery; future-ready competencies; and curriculum strategies. For curriculum evolution and delivery, sub-themes identified were curriculum alignment and integration of clinical, scientific and industrial components and experiential learning and simulation. Future-ready competencies covers digital health and artificial intelligence, interprofessional collaboration, and leadership and innovation. For curriculum strategies, sub-themes are practice-ready graduates and integration of clinical learning and practice.

Conclusions: Findings were compiled in a handbook¹ published by FIP-AIM, which is intended to serve as a resource to support agility in pharmacy education by spearheading alignment of pharmacy curricula with current and emerging pharmaceutical priorities shaped by local and global needs.

Preparing future-ready pharmacists through a redesigned 3+2 curriculum at the University of Tartu, Estonia

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Background: Pharmacy curriculum reform at the University of Tartu was driven by Estonia's evolving healthcare system and labour market. Policy priorities to strengthen primary care and scale digital health require pharmacists with advanced clinical, communication and data competencies, alongside stronger collaboration across care settings. At the same time, community pharmacies deliver extended services and quality-assured counselling. The medicines market has grown steadily, signalling sustained demand for competent staff not only in patient-facing roles but also in hospital, regulatory, and pharmaceutical-industry positions (e.g. manufacturing, quality, regulatory affairs, pharmacovigilance, market access).

Described developments, evidenced by national system reviews and pharmacy statistics, motivated the shift from a 5-year integrated programme to a Bologna-aligned 3+2 structure that better supports workforce flexibility and mobility.

Methods: A multi-stage design combined stakeholder consultations (students, faculty, employers, professional

bodies), international benchmarking, and constructive-alignment workshops. Competency frameworks from the International Pharmaceutical Federation (FIP) and the Association of Faculties of Pharmacy (EAFP) were used as reference points. Within the 3+2 curriculum, the courses were vertically and horizontally integrated. Assessment has designed toward performance-based demonstrations (e.g. OSCEs, workplace-based assessment).

Results: The 3-year Bachelor curriculum emphasises foundations in medical and pharmaceutical sciences, public health, communication, and practice skills in labs/placements. The 2-year Master curriculum strengthens clinical decision-making, therapeutics, research methods, leadership, pharmaceutical development and quality systems, culminating in a Master thesis. The Master's curriculum is also open to graduates from natural and medical sciences, who graduate as drug developers, enabling careers in pharmaceutical industry, whole-sales, regulation and research. Stakeholders reported stronger relevance to Estonia's service mix and broader employment pathways.

Conclusion: The University of Tartu's 3+2 curriculum modernises pharmacy education for Estonia's needs by uniting competency-based design with tighter integration and expanded practice readiness, preparing graduates for roles across care delivery, regulation, and the national pharmaceutical industry while enhancing international comparability.

Practicing at full competence? A cross-national qualitative study of community pharmacists in Norway and Spain

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Background: Pharmacists play a central role in today's health care system. Whether European pharmacists feel the same way or not has not yet been investigated. European Community Pharmacists stated in 2024 that there is a community pharmacist shortage across Europe, due to a retention issue rather than a supply issue.

Methods: The study aimed to address the following issue: What enables community pharmacists to exercise their competence? This is a qualitative study with semi-structured interviews, which were analysed using thematic analysis. The pharmacists were asked about what limitations and facilitators they experience in their work life.

Results: Sixteen interviews were conducted (8 per country). Preliminary results indicate that across both contexts, time and staffing emerged as core prerequisites for exercising professional competence. Personal factors such as motivation, passion for the profession and involvement were crucial for high quality performance, but not necessary for fulfilling the pharmacist role. Pharmacists expressed professional satisfaction when feeling helpful and trusted by patients, highlighting the importance of public recognition of their role as healthcare professionals. However, differences in how pharmacy practice is structured across countries appear to influence societal understanding of the pharmacist's role.

Conclusion: Time and staffing are shared enablers, but differences in system integration shape pharmacists' roles. Feeling helpful and trusted is central to professional value, and may be influenced by how pharmacy practice is organised and recognised across contexts. This study opens further research to deepen the understanding of the pharmacist's role in the Norwegian and Spanish society.

Generative artificial intelligence in pharmacy education

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Background: Generative artificial intelligence (Gen-AI) is rapidly influencing processes within healthcare and education. Potential opportunities of adopting Gen-AI within pharmacy education are being put forward to improve learning outcomes and enhance competency development. In parallel, dilemmas and challenges present which require addressing. The aim was to analyse evidence in literature and assess practitioners' views on the use of Gen-AI in pharmacy education.

Methods: Using the PRISMA framework, a systematic literature review was conducted from open access journal resources published between 2021 and 2025 on Google Scholar, ResearchGate and PubMed. A thematic analysis was undertaken. A focus group discussion was organised with pharmacists and academics (n=4) to identify their perspectives and compare with the literature findings.

Results: Literature review resulted in 250 articles, which were screened and led to 73 articles that were included in the thematic assessment. The themes identified (occurrence in articles) were: academic support required (53%), ethical considerations (47%), assessment design and exam preparation (33%), educator preparedness (27%), equity of access and fairness (19%). The focus group discussion agreed with the themes identified and provided a stronger insight on 1) the ethical aspects, particularly related to confidentiality of data included in Gen-AI software and the concern that students and users require awareness of ethical use 2) need to support users (students and academics) to use Gen-AI as a tool to generate powerful outcomes whilst retaining the critical thinking competence development.

Conclusions: The findings expose opportunities for the application of Gen-AI in pharmacy education whilst highlighting reflections about concerns and limitations. Developing policy frameworks and guidelines supports institutional readiness so as to support the development of pharmacy graduates who are ready to leverage opportunities of Gen-AI within ethical and purposeful contexts.

Aligning pharmacy education with evolving community practice: A comparative study of Europe and Mauritius

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Background: Community pharmacy practice in Europe has evolved from a dispensing-focused model to a clinically oriented, patient-centred profession supported by structured competency frameworks, experiential education and integration within primary care systems. In Mauritius, community pharmacy remains largely product-focused, with limited formal recognition of pharmacist-led clinical services. This study explores how differences in regulatory and organisational frameworks influence professional roles and examines the implications for pharmacy education and curriculum development.

Methods: A systematic review of peer-reviewed literature published between January 2014 and December 2025 was conducted in accordance with PRISMA guidelines. Searches were undertaken in PubMed/Medline, Google Scholar, professional sources, and relevant Mauritian documents using keywords related to community pharmacy practice, regulation, competencies, and healthcare integration. Of 418 records identified, 30 studies met the inclusion criteria. Data were extracted using a standardised form and synthesised through thematic and narrative analysis. Study quality was assessed based on design, sample size, and data collection methods.

Results: European countries support pharmacist-led clinical services through clear legislation, remuneration mechanisms, competency standards, and structured clinical training pathways. Pharmacy education increasingly incorporates patient-centred care, experiential learning, interprofessional education, and competency-based assessment aligned with expanded scopes of practice. In Mauritius, older product-oriented legislation, limited access to structured clinical training, and weak integration with primary care constrain both practice advancement and curriculum development.

Conclusion: The findings highlight significant opportunities for curriculum reform in Mauritius, including integration of clinical skills training, structured experiential placements, competency-based frameworks, and stronger academic-practice partnerships. Aligning pharmacy education with evolving models of care is essential to enable expanded pharmacist roles in chronic disease management, public health, and medicines optimisation, and may support collaboration between European faculties and Mauritian faculties.

A comparative analysis of pharmacy education in the Philippines using the FIP Global Competency Framework

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Background: Globally, pharmacy education is transitioning from a product-oriented model to competency-based, as outlined in frameworks such as the International Pharmaceutical Federation (FIP) Global Competency Framework (GbCF). In the Philippines, reforms driven by the Philippine Pharmacy Act of 2016 and the Commission on Higher Education mandated outcomes-based education. This study evaluated the alignment of Philippine pharmacy education with European and international frameworks.

Methods: A comparative research design integrating systematic literature review (2015-2025) and document-based curriculum mapping was employed. Twenty Bachelor of Science (BS) Pharmacy curricula (from 112 accredited institutions in the Philippines) were mapped against the four domains of the FIP GbCF: Pharmaceutical Public Health, Pharmaceutical Care, Organization-Management, and Professional-Personal. Percentage coverage per domain and total FIP alignment were calculated and classified. The curriculum layout was compared to the EU Directive governing pharmacy education.

Results: Aggregated curriculum mapping with the FIP GbCF revealed strong alignment in Pharmaceutical Care (mean

33%), moderate alignment in Professional/Personal (18%), and gaps in Pharmaceutical Public Health (11%) and Organization-Management (13%). Total FIP alignment ranged from 68% to 81%. The Philippine BS Pharmacy is predominantly a 4-year, with 1,200 internship hours, compared to the 5-year academic programme including at least 6 months of internship required in the EU.

Conclusion: Further alignment of Philippine pharmacy education should consider the elaboration of clinically and system-level content, structured experiential accreditation and potentially transitioning to a 5-year program to enhance global comparability and workforce readiness.

Postgraduate pharmacy education contribution to community pharmacists' confidence in disease management

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Background: Pharmacy programmes are increasingly looking towards establishing a patient-centric approach. Postgraduate education designed to develop advanced clinical pharmacy skills supports evolution of direct patient pharmacist services. At the Department of Pharmacy, University of Malta, the Doctorate in Pharmacy (PharmD) degree (EQF level 8) focuses on developing advanced clinical pharmacy skills, supporting professional innovation, and embedding pharmaceutical leadership and entrepreneurship. This study examined whether pharmacy education level was associated with community pharmacists' self-reported confidence in managing patient conditions, using inflammatory bowel disease (IBD) as a case study.

Methods: A self-administered questionnaire was developed, reviewed by an interprofessional expert panel and tested for reliability. From 201 community pharmacies in Malta, 100 were selected by stratified random sampling; 20 pharmacies from each of Malta's five statistical districts. Questionnaires were hand-delivered with self-addressed return envelopes. Confidence items were rated on a 5-point Likert scale and summarised as mean scores. Non-parametric analyses examined associations between confidence and demographic variables ($p < 0.05$ statistically significant). The study was registered with the University of Malta Faculty of Medicine and Surgery Research Ethics Committee (MED-2023-00138).

Results: Ninety-four pharmacists responded (94% response rate); female ($n=65$), >5 years practicing in community pharmacy ($n=56$), worked full-time ($n=39$). Highest pharmacy qualification was BPharm (entry-level degree until 2011) ($n=25$), MPharm (entry-level degree) ($n=47$), PharmD ($n=22$). Pharmacists with a PharmD reported significantly higher

confidence in understanding IBD management, recognising symptoms, counselling on pharmacotherapy and vitamin/mineral supplementation, addressing extraintestinal manifestations, vaccine counselling, pregnancy-related considerations, and locating evidence-based information resources ($p < 0.05$). Gender, years of experience and practice hours were not significantly associated with confidence ($p > 0.05$).

Conclusion: The PharmD programme contributes to confidence in the provision of advanced clinical pharmacy services in community pharmacy which serves as a means how education supports transformation of services. Further research should assess objective competencies and patient care outcomes.

A twostep national approach to curriculum renewal for Dutch pharmacists and pharmaceutical scientists

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Background: Pharmacy and Pharmaceutical Sciences are fields that require educational programmes to anticipate scientific, societal and technological developments. In the Netherlands, four universities jointly initiated a renewal of learning outcomes for bachelor's and master's programmes in both fields. The resulting document will replace the 2016 Pharmacist Competency Framework & Domain-specific Frame of Reference (DSRF), and for the first time, integrate the Pharmacy and Pharmaceutical Sciences domains into a single national reference document.

Methods: The renewal is organised in two steps. Step 1: In 2025, a national writing group mandated by all participating universities developed an integrated DSRF. The group reviewed stakeholder vision documents, European regulatory requirements, and existing competency frameworks, synthesising them into a unified framework. Preliminary results were discussed at a national pharmacy education conference, and professional bodies representing community, hospital, industrial, and social pharmacy were consulted before finalisation in December 2025.

Step 2: In 2026, three faculty writing groups will establish national learning outcomes for (1) the Bachelor in Pharmacy & Pharmaceutical Sciences, (2) the Master in Pharmacy, and (3) the Master in Pharmaceutical Sciences, drawing on the new DSRF. Faculty experiences will be collected and thematically analysed to inform revisions. Governance is shared by the programme directors of the participating universities,

including the those responsible for postgraduate specialisations, with consultation of professional bodies.

Results: The 2025 DSRF provides a contemporary and future-proof foundation for curriculum development. It articulates five central pillars—Body, Medicines, Patient & Society, Professional Development and Research & Innovation—and highlights key developments, including AI, sustainability, personalised medicine, and interprofessional collaboration. Preliminary results of the nationally aligned learning outcomes will be presented at the conference.

Conclusion: This coordinated national approach strengthens alignment and future readiness across programmes, and supports the development of a pharmaceutical workforce equipped to address emerging challenges.

“Virtual patient” – An innovative AI-driven platform for interactive education in pharmaceutical care

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Background: The implementation of virtual patients as an educational tool within pharmaceutical curricula enables students to engage in realistic case-based scenarios, thereby enhancing their understanding of rational medicine use and strengthening their communication skills. The objective of this study was to develop and evaluate a web-based educational platform for training in Pharmaceutical Care, focusing on self-medication, identification of drug-related problems and communication competencies.

Methods: A total of ten case scenarios were developed, encompassing different patient populations, including geriatric and paediatric patients, individuals with chronic conditions, patients with rare diseases, as well as pregnant and breastfeeding women. The OpenAI GPT4o model was employed to generate the virtual patient's responses during the simulations. **Results:** The case scenarios are available in both Bulgarian and English, and all medicinal products

integrated into the platform have been selected from those authorised in Bulgaria. The software is fully aligned with the specific characteristics of Bulgarian pharmaceutical legislation and regulatory requirements. The platform reflects real-world pharmacist–patient interactions and is fully consistent with the professional scope of practice and legal competencies of Master of Pharmacy graduates in Bulgaria. During the simulation, the student is required to counsel the patient and, based on the collected information, propose an appropriate non-prescription medicine or identify different drug-related problems. Upon completion, the system automatically evaluates whether all predefined assessment criteria have been met and generates a summary report of the student's performance, which is subsequently verified by an academic supervisor.

Conclusion: The integration of web-based virtual patient platforms into conventional pharmacy education represents an innovative approach to enhancing the training experience of students. Future developments will focus on expanding the case library and incorporating feedback mechanisms to further optimise the educational impact of the virtual patient platform.

Management of Gestational Diabetes Mellitus (GDM)

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Background: GDM is defined as hyperglycemia that develops during pregnancy. Diabetes during pregnancy poses maternal and fetal risks related to hyperglycemia, chronic complications and comorbidities. Clinical factors associated with a risk of developing GDM include increased BMI, decreased physical activity, a first-degree relative with DM, polycystic ovarian syndrome (PCOS), HbA1C >5.7%, and an abnormal OGTT. GDM is identified through screening tests during pregnancy. The aim of this retrospective study is to analyse the therapy and risk factors in patients diagnosed with GDM.

Methods: Data were extracted from the medical records of patients diagnosed with GDM at a diabetes clinic.

Results: **Patient 1:** A 29-year-old female with a history of PCOS. GDM screening results at 24 weeks of gestation: OGTT (fasting: 4.9 mmol/L, 1-h: 12.3 mmol/L, 2-h: 7.8 mmol/L), HbA1c: 5%, BMI: 41.8, and total cholesterol (TCh): 6.7 mmol/L. The patient was prescribed non-pharmacological therapy and glucose monitoring. Normoglycemia was maintained through diet and exercise.

Patient 2: A 31-year-old female with a positive family history of DM. GDM screening results at 26 weeks of gestation: OGTT

(fasting: 5.6 mmol/L, 1-h: 10.9 mmol/L, 2-h: 9.4 mmol/L), HbA1c: 6%, TCh: 6.4 mmol/L, and BMI: 23.4. As non-pharmacological treatment was inadequate, pharmacotherapy (metformin) was initiated due to persistent hyperglycemia. BP and proteinuria were monitored due to concurrent preeclampsia.

Patient 3: A 32-year-old female with hypothyroidism, a positive family history of DM, and a BMI of 27.6. GDM screening results at 24 weeks of pregnancy: OGTT: fasting 5.8 mmol/L, 1-h 11.3 mmol/L, 2-h 11.1 mmol/L; HbA1c: 6.0%; TCh: 6.6 mmol/L. Therapy included non-pharmacological interventions, Euthyrox 50 µg, Metformin 500 mg, and insulin glargine.

Conclusion: The management of GDM requires an interprofessional team. Pharmacists contribute through medication management, ensuring accurate dosing of antihyperglycemic agents and reconciling medications.

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A support framework for integrating sustainability education within the Faculty of Pharmaceutical Sciences at the University of Iceland

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Background: Sustainability education has become an integral component of higher education curricula. As part of a comprehensive curriculum revision implemented in 2025, the Faculty of Pharmaceutical Sciences at the University of Iceland aimed to systematically integrate sustainability education throughout the study programme. The aim of this study was to develop a practical support framework for teachers to facilitate the integration of sustainability concepts into diverse courses.

Methods: A qualitative research design was employed, using semi-structured interviews with academic staff at the Faculty of Pharmaceutical Sciences (n = 13). Interviews explored teachers' experiences, challenges, and support needs related to sustainability education in their courses. Data were transcribed verbatim and analysed using inductive thematic analysis. The findings were used in the development of an instructional guide designed to support course-level implementation of sustainability education.

Results: The analysis identified key themes related to the need for practical examples and clearer links to the United Nations Sustainable Development Goals and core competencies for sustainable development. Based on these

findings, an instructional guide was successfully developed and implemented. The resource includes background information on sustainability, pedagogical strategies, teaching examples, and guidance on aligning learning outcomes and course content with sustainability frameworks.

Conclusion: The study demonstrates that a collaboratively developed instructional guide for teachers is an effective and practical tool for supporting the integration of sustainability into higher education curricula. The resource contributes to more coherent and purposeful integration of sustainability into pharmacy education and has transferability potential to other programmes within the School of Health Sciences at the University of Iceland.

Pharmacists' attitudes towards providing mental health services in Norwegian community pharmacies

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Background: Mental Health challenges are increasingly prevalent among young people in Norway. Community pharmacists are highly accessible healthcare professionals and may often serve as the first point of contact for the public. International studies show that pharmacists in several countries already engage in mental health-related services in community pharmacies. The International Pharmaceutical Federation (FIP) also emphasises that pharmacists have potential contributions to mental health care. In Norway, however, there are no structured pharmacist-led mental health services and research on the role of community pharmacies in mental health support remains limited. A need was identified for further investigation into pharmacists' attitudes towards providing mental health services in Norwegian community pharmacies and how such services may be implemented.

Methods: The study applies qualitative methods. Community pharmacists (n=10) participated in semi structured interviews based on voluntary consent. They were asked about their willingness and perception towards providing mental health services in pharmacies, training needs, feasibilities and barriers, and which services can be realized in the Norwegian context. The data was analysed using reflexive thematic analysis.

Results: Pharmacists were motivated to provide mental health services. Several participants emphasised that pharmacists are equipped to contribute to medication-related services. However, pharmacists expressed the

necessity for more training on mental disorders and communication skills, as well as clearly defined service delivery framework and improved staffing to enable implementation.

Conclusion: The findings indicate that pharmacists are positive and willing to offer mental health services in community pharmacies. However, there is a need for a more clearly defined structure in service delivery and pharmacy operations. This also requires the involvement of relevant stakeholders and policymakers. These insights will inform the development of models for mental health support in Norwegian pharmacies in further phases of the project "Pharmacies as partners on the road to better mental health".

Does team-based learning align with academic outcomes? Evidence from pharmacy education

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Introduction: Team-Based Learning (TBL) is a structured student-centred approach designed to promote active engagement, accountability, and application of course concepts. TBL was integrated into three undergraduate pharmacy courses at the University of Iceland in 2022. While TBL requires consistent pre-class preparation and may increase perceived study demands, it is intended to strengthen academic engagement and learning outcomes. This study examined the association between TBL readiness performance and final exam scores, as well as student perceptions of engagement and workload.

Methods: For each student, individual readiness assurance test (iRAT) scores and final examination scores were averaged across three BS-level courses to create student-level summary measures. Associations were assessed using Pearson correlation and linear regression. In addition, annual course evaluation data, from one of the three TBL courses, were analysed to compare student perceptions before and after TBL implementation. Five-point Likert-scale survey data were available from 39 students prior to TBL and 24 students following implementation.

Results: A positive association was observed between mean iRAT performance and mean final examination scores ($r = 0.79$, 95% CI 0.61–0.89, $n = 35$, $p < 0.001$), with iRAT performance accounting for approximately 63% of the variance in final exam outcomes. Following TBL implementation, student-reported class preparedness and overall course preparation increased (3.7 vs 4.7 and 3.9 vs 4.5, respectively). Perceived learning gains also increased (4.1 vs

4.5), while reported workload remained stable or slightly decreased (3.5 vs 3.2).

Conclusion: Together, these results suggest that structured TBL aligns well with academic outcomes and supports student engagement, without evidence of increased perceived workload.

Pilot integration of pharmacogenomics in undergraduate pharmacy education: Preparing pharmacists for precision paediatric care

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Background: Pharmacogenomics (PGx) is a core component of precision medicine, enabling the interpretation of genetic variability in relation to drug efficacy, safety, and optimal dosing. Its relevance is particularly pronounced in paediatric populations, where developmental pharmacokinetics and physiological variability render dose individualisation clinically critical. Despite expanding clinical implementation, structured training in pharmacogenomic data interpretation—especially in paediatric therapeutic contexts—remains limited in many undergraduate pharmacy curricula. There is a clear educational need to equip future pharmacists with competencies to translate genomic information into safe, personalised therapeutic decisions.

Methods: A pilot educational implementation was conducted within an undergraduate thesis project under academic supervision. The PharmGKB platform was used to explore clinically validated gene–drug interactions in paediatric conditions, including asthma, ADHD, and anxiety disorders.

Key polymorphisms (e.g., ADRB2 variants affecting bronchodilator response, CYP2D6 variability influencing atomoxetine exposure, and CYP2C19 polymorphisms impacting SSRI therapy) were analysed in relation to therapeutic response and dosing considerations. Findings were incorporated into structured case-based scenarios linking pharmacogenomic evidence with clinical reasoning. The project concluded with formal presentation and academic evaluation.

Results: The pilot demonstrated the feasibility of integrating pharmacogenomic database utilisation into undergraduate training. Guided case analysis enabled the development of skills in interpreting genotype–phenotype associations, recognising dose variability in paediatric patients, and justifying personalised therapeutic strategies. Academic assessment confirmed the scientific robustness and educational value of the approach.

Conclusion: This pilot experience supports the integration of pharmacogenomics into undergraduate pharmacy education through structured case-based learning and the use of validated digital platforms. Given the importance of dose optimisation and safety in paediatric patients, such initiatives contribute meaningfully to preparing future pharmacists for an expanded role in personalised medicine and interdisciplinary therapeutic decision-making.

Strengthening interprofessional education in the pharmacy game: Joint clinical learning for pharmacy students and nurse practitioner trainees

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Background: Effective interprofessional collaboration is essential for optimising pharmacotherapy in patients with psychiatric comorbidity and complex polypharmacy. However, structured collaboration between pharmacy students and nurse practitioner trainees is limited in undergraduate curricula. We developed and implemented a novel interprofessional educational activity embedded within the Pharmacy Game¹, integrating pharmacy students at the University of Groningen with nurse practitioner trainees at Hanze University of Applied Sciences in a joint multidisciplinary medication review in mental health care.

Methods: The activity consisted of three structured sessions involving 45 students working in small interprofessional groups (4–5 nurse practitioner trainees and 4 pharmacy students per group). Prior to the session, participants received a written case describing a patient residing in a mental health institution with complex polypharmacy, along with preparatory materials outlining the roles and expertise of the other profession. During the session, groups collaboratively conducted a multidisciplinary medication review, identifying medication-related problems, assessing risks, and formulating evidence-based optimisation strategies. Constructive information asymmetry was introduced to stimulate exchange of perspectives and clinical reasoning. The activity concluded with guided reflection on collaboration and professional identity. Collaboration was assessed through reciprocal peer evaluation, while the clinical quality of the medication review received formative feedback.

Results: Participants reported increased understanding of complementary professional roles. Nurse practitioner trainees contributed contextual and clinical experience, whereas pharmacy students emphasised

pharmacotherapeutic analysis. The case-based discussion and shared decision-making were perceived as realistic and valuable. Peer evaluations reflected strong appreciation of the collaborative process. Suggested improvements included clearer procedural guidance, enhanced preparation, improved logistics, and additional time for in-depth discussion.

Conclusion: Embedding a structured interprofessional medication review within the Pharmacy Game offers an authentic, scalable model for interprofessional education in complex mental health pharmacotherapy and supports the development of collaborative competencies for safe medication management.

A century of student leadership

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Background: The Lithuanian Pharmacy Students' Association (SFD) marks its 100th anniversary, representing pharmacy students in Lithuania. Student-led organisations play an important role in complementing formal pharmacy education. The aim was to evaluate the contribution of SFD to the development of professional, leadership, and organisational competencies, and its role in advancing pharmacy education and practice.

Methods: A descriptive historical analysis of the Lithuanian Pharmacy Students' Association (SFD) was conducted using internal organisational records covering the period 1926–2026, including membership records, annual activity reports, archival documents, and information on the organisation's development. The growth of the organisation was examined from its establishment with a 5-member commission in 1926 to its current structure of 101 active members and an 18-member executive committee. Activities were categorised into four domains: professional competency development, internationalisation, leadership development, and professional networking. In addition, semiannual motivational interviews conducted in 2026 were reviewed to explore members' perceived personal and professional development and their engagement in the organisation. Because SFD is a voluntary student organisation, competency development was not formally measured using validated assessment tools. Instead, outcomes were evaluated descriptively based on members' self-reported perceptions obtained during semiannual motivational interviews, increasing participation in activities over time, and the scope and continuity of initiatives.

Results: The association engages approximately 30% of pharmacy students at the faculty, demonstrating high student involvement. Participation in educational initiatives

was associated with improved competencies in data analysis, scientific information retrieval, and evidence-based decision-making. Involvement in international activities (IPSF, EPSA, BPSS) increased students' exposure to global pharmacy practices and facilitated participation in knowledge exchange and professional networking beyond the national level. Engagement in leadership structures, including an 18-member executive committee and specialised working groups, supported the development of project management, teamwork, and organisational skills. Additionally, collaboration with academic and industry stakeholders through events such as the Pharmacy Day conference strengthened students' professional networking and career orientation.

Conclusions: SFD significantly complements formal pharmacy education by fostering essential competencies and supporting the development of a skilled, socially responsible, and globally engaged pharmacy workforce.

Case-based learning and AI literacy in pharmaceutical nanotechnology

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Introduction: Pharmacy curricula are required to address an expanding body of knowledge, as reflected in recent updates to the EU Directive (2024/7827). However, increased emphasis on content coverage may limit opportunities for deep learning and the development of higher-order competencies. Simultaneously, educators must support students in the responsible and critical use of artificial intelligence (AI) tools, which are increasingly integrated into academic work. Designing learning environments that balance curricular alignment, conceptual depth, and ethical digital competence is therefore a key educational challenge. This study explored students' perceptions of in-depth analysis of nanoformulations and the role of AI tools in a third-year BSc course in Pharmaceutical Nanotechnology at the University of Iceland.

Methods: Student groups selected a nanoformulation and completed a structured case-based assignment. They compared their own analyses with AI-generated responses (ChatGPT) and evaluated the validity of the AI output. At course completion, students completed an anonymous voluntary survey using a five-point Likert scale (response rate 64.7%, $n = 11$).

Results: All respondents (100%) agreed that the assignment strengthened their ability to connect general nanomedicine knowledge to a specific formulation, and 90.9% reported actively applying course concepts to complete the task.

Similarly, 90.9% expressed confidence in addressing future nanoformulation tasks. AI was most frequently used to clarify complex concepts (45.5%), while an equal proportion reported no additional AI use beyond generating predefined answers. 63.7% reported being able to critically evaluate the quality and validity of AI-generated responses.

Conclusion: Case-based assignments that require application of general knowledge to specific formulations appear to support deeper conceptual understanding. However, students may benefit from additional guidance to critically assess AI-generated content and use AI tools with greater confidence.

Student engagement with extracurricular academic activities

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Introduction: Extracurricular academic activities play a significant role in enriching students' learning experiences and supporting their professional development. Free elective disciplines (FED), research projects, and internships offer opportunities to broaden knowledge, apply theoretical concepts in practice, and explore potential career opportunities. Understanding students' engagement in these activities, along with the motivations and perceived benefits that drive participation, is essential for improving academic possibilities and promoting reasonable educational involvement.

Methods: A cross-sectional anonymous survey was offered to students, yielding more than 120 completed responses.

Results: Participation in FEDs was exceptionally high, where students reporting involvement, most commonly in one or two disciplines. Students primarily enrolled to broaden knowledge, enhance their learning during studies, and gain additional academic credits. In contrast, engagement in internships was modest, and participation in research activities was limited. Motivations for these activities included deepening disciplinary understanding, acquiring

further experience, and improving future competitiveness. Across all extracurricular options, students reported considerable educational benefits, particularly expanded subject knowledge and improved soft skills. The majority of participants indicated that involvement in such activities would positively influence their future career decisions.

Conclusion: Extracurricular academic activities provide meaningful educational and personal benefits, and build students' confidence in their abilities. Importantly, participation in these activities also supports students in clarifying and shaping their future career choices.

Fact-based versus situation-based learning: Evidence from test performance in pharmacognosy

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Background: The *Pharmacognosy (I–III)* courses in the pharmacy curriculum at the University of Tartu are highly fact-intensive. Although mastery of factual knowledge is essential for solving practical problems, an excessive focus on memorisation may hinder the development of applied competence. This study examined differences in learning outcomes between fact-based and situation-based assessments and explored how well performance on fact-based tests predicts success in more complex, application-oriented tasks.

Methods: The study involved 33 pharmacy learners enrolled in the Pharmacognosy II course: third-year master's students (n=24) and micro-credential students (n=9). Students completed five written assessments: two mid-term fact-based tests (A and B), a fact-based final examination (C), an unannounced situation-based test (D), and a pre-announced situation-based test (E). Scores were expressed as percentages of the maximum possible score (100%), and relationships between tests were analysed using Pearson correlation with two-tailed p-values.

Results: Performance on the combined mid-term tests (A+B) significantly predicted examination success (C) ($p = 0.011$). Overall academic performance across fact-based assessments (A+B+C) also predicted performance on the situation-based tests (D+E). However, students, on average, achieved 25% fewer correct answers on situation-based tests than on fact-based assessments. Using a 60% pass threshold, approximately one-third of students who passed all fact-based tests failed when assessed with situation-based tasks. Prior notification of the situation-based test (E) did not improve performance relative to the unannounced test (D). No statistically significant difference in learning outcomes

was found between master's students and micro-credential students.

Conclusion: Situation-based tests measure student competencies that are fundamentally more complex than those assessed through fact-based examinations and cannot be considered a direct extension of factual performance. Developing the ability to apply knowledge effectively requires structured and continuous practice rather than reliance on fact memorisation alone.

From primary school to the faculty of pharmacy: Career day as a strategic tool for a future-proof pharmacy profession

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Background: Career Day is a popular school initiative focused on exploring career paths and professions. It aims to inspire youth to think about their future and discover the diversity of professions. Through this interactive activity, pharmacy faculties also have the opportunity to promote interest in education and career growth in the field of pharmacy.

Methods: Pharmacists deliver lectures and demonstrations on their daily work or host workplace visits. During these sessions, students participate in hands-on tasks, such as dressing in white coats and testing essential pharmacy skills: preparing solutions, mixing ointments, and filling gelatine capsules.

Results: Career Day delivers key learning outcomes, equipping students with essential knowledge and skills while shaping positive attitudes. Students acquire understanding of pharmaceutical technology (dosage forms), pharmacognosy (medicinal plants and fungi), pharmacology (drug effects), pharmacy management, and safe medicine handling. Interactive simulations develop practical skills like patience, responsibility, and precision. The program inspires career interest by presenting pharmacy as a blend of science, patient care, and problem-solving. It also fosters societal awareness of pharmacists' roles in prevention, diagnostics, counselling, and therapy, enhancing early public health comprehension.

Conclusion: These activities enable children and youth to discover core scientific disciplines underpinning drug development, production, mechanisms of action, and safety. They orient participants within the healthcare system, spark interest in natural sciences, and counter the misconception of

pharmacists as mere sales assistants. Ultimately, the program sustains the profession's attractiveness and value.

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Sustainability competencies in pharmacy education: A cross-sectional evaluation of student perspectives

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Introduction: Pharmaceutical sustainability poses a growing environmental and public health challenge. Pharmaceutical residues and the release of active pharmaceutical ingredients (APIs) into ecosystems contribute to ecological damage and long-term risks. Pharmacists influence the environmental footprint of medicines across their life cycle—from distribution to patient counselling and disposal. Education plays a crucial role in preparing health professionals for sustainable practices, but evidence of future pharmacist readiness remains limited.

In this study, we aimed to assess sustainability-related awareness, educational exposure, knowledge of medicine disposal, and perceptions of professional responsibility among pharmacy students in Bulgaria, and to identify factors associated with sustainability-related competencies.

Methods: We conducted a cross-sectional survey between May and July 2025 among undergraduate pharmacy students from three Faculties of Pharmacy in Bulgaria (n = 274). Participants completed an anonymous online questionnaire assessing awareness of pharmaceutical sustainability, exposure to relevant training, knowledge of safe medication disposal, and attitudes toward professional engagement. We summarised the data using descriptive statistics and examined associations with chi-square tests. We applied the Mann–Whitney U test and the Kruskal–Wallis test to compare attitudes across groups and used binary logistic regression to identify predictors of disposal knowledge.

Results: Only 31.1% of students reported full awareness of pharmaceutical sustainability, 37.8% indicated partial awareness, and 29.7% reported no prior familiarity. Fewer than one in five students (18.9%) participated in sustainability-related training. Students who had received training demonstrated significantly higher familiarity with

the concept ($\chi^2 = 18.225$, $p < 0.001$). Overall, 58.1% correctly identified appropriate disposal practices. Year of study significantly predicted disposal knowledge ($p = 0.015$). Across all cohorts, students rated the commitment of pharmacists to sustainability as important (mean >4.0), with trained students expressing stronger support ($p = 0.029$).

Conclusion: Future pharmacists value pharmaceutical sustainability but lack structured educational exposure to it. The integration of sustainability content into the curriculum could strengthen the knowledge and skills needed for pharmacists to function as sustainability supporters.

Agile pharmacy curricula: Integrating ESG principles and evidence-based updates in pharmacology education

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Background: The integration of Environmental, Social, and Governance (ESG) principles into higher education quality assurance frameworks reflects the increasing responsibility of universities to ensure sustainability, social relevance, and institutional accountability. In pharmacy education, this requires curricula that are continuously aligned with advances in pharmaceutical science, regulatory developments, and evolving healthcare needs. Agile curriculum management is therefore essential for preparing future pharmacists to perform patient-centred roles in a rapidly changing professional environment.

Methods: At the Faculty of Pharmacy, Medical University of Plovdiv, annual external quality assurance procedures, aligned with Société Générale de Surveillance (SGS) standards, include a systematic evaluation of curriculum relevance and learning materials. This process functions as a cyclical and responsive curriculum review mechanism, ensuring timely adaptation to scientific and regulatory change. In 2025, the Department of Pharmacology, Toxicology and Pharmacotherapy conducted a comprehensive review of its teaching resources. A key educational resource in Pharmacology teaching is the Pharmacology handbook, which includes classifications of drug classes, multiple-choice questions, and prescription

tasks. Classifications of drug classes were updated in accordance with the official register of authorised medicinal products published by the Bulgarian Drug Agency. Newly authorised medicines were incorporated, while discontinued or withdrawn products were removed. Additionally, structured literature searches were conducted in PubMed, Scopus, and Web of Science databases. Priority was given to European and American clinical guidelines, as well as systematic reviews and meta-analyses of clinical trials, to ensure consistency with current principles of evidence-based pharmacotherapy.

Results: The review resulted in fully updated pharmacological classifications and teaching content that are consistent with the current national regulatory framework and the latest scientific evidence. Outdated information was removed, and recent therapeutic advances were integrated into the curriculum, enhancing its clinical relevance.

Conclusion: Embedding ESG-driven quality assurance mechanisms into curriculum management supports agile, transparent, and future-oriented pharmacy education. Continuous integration of regulatory updates and high-level clinical evidence ensures that pharmacy graduates are well prepared to meet the expectations of healthcare systems, employers, and patients in a dynamic healthcare landscape.

Quiz as support for learning: A project on implementing formative assessment

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Background: In the Advanced Pharmacotherapy course at Uppsala University, one learning outcome concerns drug-related problems (DRPs). Students work with this topic during a mandatory workshop and are later assessed in a written examination. Many students find DRPs challenging and fail to meet the learning outcome. We have therefore explored ways to strengthen learning throughout the course.

Research shows that active retrieval of information, e.g. through testing, enhances learning, and that formative assessments like short quizzes with multiple-choice questions (MCQs) can improve performance in summative examinations.

The aim of this project was to strengthen student learning related to a specific intended learning outcome by introducing formative assessment in the form of a quiz.

Method: An eight-question MCQ quiz with four response options (one correct) was developed, primarily targeting analysis and evaluation skills. The quiz was reviewed by the teaching team and revised to reduce ambiguity. Students completed the quiz individually at the end of the DRP

workshop. Quiz results were analysed in relation to examination performance and compared with outcomes from previous semesters.

Results and Discussion: Twenty of 37 students achieved at least six correct answers, the predetermined threshold for pass. The proportion of correct responses per question ranged from 32% to 91%, indicating varying levels of difficulty. Among students who passed the quiz, 61% passed the examination overall and 85% passed the targeted learning outcome, compared with 21% and 59%, respectively, among those who failed the quiz. The proportion of students failing the DRP learning outcome decreased to 13%, compared with over 30% in the two preceding semesters, suggesting improved learning. Quiz analysis also enabled targeted group-level feedback addressing misconceptions and areas needing further work.

Analysing population-returned pharmaceutical waste: Insights for educational interventions

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Background: Accumulation of unused medicines due to irrational use and poor adherence creates significant waste and unnecessary costs. This waste highlights persisting knowledge gaps and the need for improved educational strategies in community pharmacy practice. The aim of this study was to analyse pharmaceutical waste returned by the population to community pharmacies to identify key themes for educational interventions targeting both pharmacy professionals and the public.

Methods: The study was conducted in 10 community pharmacies over a two-week period between 09.05.2024–30.04.2025. The analysis included human medicinal products with a valid marketing authorisation that were returned by the public to these pharmacies.

Results: A total of 618 medicines pharmaceutical items were registered. Approximately three-quarters of the returned pharmaceutical waste consisted of solid dosage forms, most of which were tablets. Nearly one-third of the returned medicines 'waste were unopened packages with a valid expiry date. The most frequently returned packages (31.9%) contained more than 90% of their contents unused. Expired pharmaceuticals had exceeded their expiry date by an average of approximately three years (1,037 days). Among the returned items, the most common active substances were analgesics and antipyretics—particularly paracetamol and ibuprofen—which aligns with national DPD data.

Conclusion: These patterns indicate potential gaps in patient understanding, medication management, and adherence. The findings underscore the need for targeted educational interventions in pharmacy education and practice to support more rational medicine use and reduce avoidable pharmaceutical waste.

Towards safer pharmacy practice: occupational hazard exposure and educational needs in pharmacy training

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Background: Pharmacy work environments contain a broad range of occupational hazards, including chemical, biological, ergonomic, psychological, and organisational risks. These hazards can influence pharmacists' well-being, operational efficiency, and the overall quality and safety of pharmaceutical services. This study examines the types and frequency of occupational hazards encountered in pharmacy settings. It explores pharmacists' training experiences to support evidence-based improvements in professional education and targeted interventions that contribute to safer pharmacy work environments.

Methods: Data were collected through a validated web-based questionnaire administered to community pharmacists (N=1550) in March–April 2026. This survey systematically assesses patterns of hazard exposure, safety practices, and training experiences among participants. Descriptive statistics were used for data analysis.

Results: Preliminary results indicate that pharmacists frequently encounter chemical and ergonomic hazards (e.g., excessively high shelves), and their confidence in managing these risks varies according to the quality and regularity of safety training. Respondents reported frequent engagement in medication preparation and contact with pharmaceuticals, with some also encountering blood while providing extended services, highlighting the urgent need for improved instruction on chemical and biological safety. Additionally, psychological stressors were prevalent, resulting from high workloads, inadequate staffing, and an increasing number of customers with complex needs and aggressive behaviour. The latter underscores the necessity of installing mandatory SOS buttons in community pharmacies. Some participants pointed out deficiencies in organisational culture, such as a lack of team support and inconsistent communication regarding safety priorities, as well as not receiving an appropriate salary. Furthermore, they stressed the need for improved continuous professional development to enhance work environment safety competencies.

Conclusion: Enhancing educational components, particularly in chemical risk management, ergonomic principles, psychosocial safety, and biological hazard preparedness, can significantly bolster the safety and sustainability of pharmacy practice. This study underscores the importance of tailored training programs in mitigating occupational hazards and improving overall pharmacists' well-being.

Integrating pharmacotherapy knowledge and counselling competence in assistant pharmacy education

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Background: Applying pharmacotherapy knowledge in authentic patient encounters remains challenging in pharmacy education. Assistant pharmacists require not only theoretical knowledge but also clinical reasoning, communication, and multilingual counselling competence. To strengthen the link between theory and practice, two courses – Clinical Pharmacy and Pharmacotherapy I and Pharmacy Counselling I – were integrated into a competency-based learning sequence.

Methods: Integration followed a constructive alignment approach: identical disease areas were first addressed from a pharmacotherapeutic perspective and subsequently practised through counselling simulations. Teaching activities included lectures, seminars, case analyses, role plays, and simulations, including bilingual (Estonian/English) sessions to prepare students for multicultural practice environments. Intermediate feedback was collected from 19 students using a structured questionnaire comprising Likert-scale items (5-point scale from strongly disagree to strongly agree) and open-ended questions. Quantitative data were analysed using descriptive statistics, and qualitative responses were examined using thematic content analysis.

Results: Among the 19 respondents, 84.2% agreed that addressing the same disease areas in both courses improved transfer of pharmacotherapy knowledge to counselling situations, including 36.1% who strongly agreed. Additionally, 73.7% reported increased confidence prior to their first pharmacy practice. Simulation-based counselling was rated "very useful" by 31.6%, while 89.5% considered bilingual simulations beneficial for communication skills development. Twelve students provided written comments. Thematic analysis identified three main benefits: improved integration of theory and practice (n = 10), enhanced clinical reasoning (n = 5), and increased communication confidence (n = 7). Reported challenges included the intensive learning pace (8.3%) and cognitive load associated with bilingual instruction (16.7%).

Conclusion: Integrating pharmacotherapy and counselling education may support the development of clinical reasoning, communication competence, and multilingual readiness in assistant pharmacist training. The approach shows potential for broader application in patient-centred health professions curricula.

Developing assistant pharmacists' counselling skills through integrated learning in health indicator measurement and nutrition education

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Background: Pharmacists and assistant pharmacists are increasingly involved in preventive health services and lifestyle counselling. Effective patient support requires not only technical skills in measuring health indicators but also the ability to interpret results and provide individualised recommendations. In many pharmacy curricula, these competencies are taught separately, which may limit students' preparedness to deliver patient-centred care. The aim is to describe and evaluate an integrated educational approach that combines health outcome measurement and nutrition education to strengthen pharmacy students' competency in lifestyle counselling.

Methods: An integrated module was implemented for second-year assistant pharmacy students at Tallinn Health University of Applied Sciences combining content from the courses *Measuring and Interpreting Health Indicators* and *Nutrition*. The module included simulation-based training in measuring blood glucose, cholesterol, haemoglobin, vitamin D, blood pressure, and body composition, alongside instruction in dietary assessment and individualised nutrition planning.

Students practice linking biomarker results with nutrition-related risk factors and formulating lifestyle recommendations. Competence is assessed through OSCE-style stations using standardised checklists assessing measurement accuracy, interpretation, communication, and safety. Pre- and post-module performance data and student feedback will be analysed to evaluate educational impact.

Results: Although full data analysis is not yet completed, initial observations indicate that the integrated module is feasible to implement within the existing curriculum and well-received by students. Early formative assessments suggest that students engage actively with the combined measurement-and-nutrition approach and recognise its relevance for future counselling practice. Data collection for pre- and post-module competence evaluation is ongoing, and expected outcomes include improved confidence and more consistent integration of measurement results into lifestyle recommendations.

Conclusion: Integrating health indicator measurement with nutrition education may enhance assistant pharmacists' readiness to contribute to preventive care and health promotion in primary care settings. This model offers a scalable approach for pharmacy education programs aiming to strengthen patient-centred counselling competencies.