

MATERIALS SCIENCE MA(S)TERS

developing a new master's degree

STUDY VISITS

IN THE MATERIALS SCIENCE MA(S)TERS PROJECT
PRACTICAL GUIDE WITH RECOMMENDATIONS



Co-funded by
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Study Visits in Practice

Study visits are widely regarded as one of the most effective mechanisms for fostering international cooperation and facilitating knowledge exchange among educational, scientific, and research institutions. They provide participants valuable opportunities to gain hands-on experience, learn about innovative working methods, and establish enduring professional relationships. However, organising such initiatives demands careful planning and preparation to ensure the achievement of intended goals and to create an environment that fosters meaningful skills development.

This report is the result of the collaborative efforts of the "Materials Science Masters" project team, which, drawing on experience gained through conducting study visits, has developed a set of recommendations and best practices. By examining the stages of planning, logistics management, and partner coordination, we have established guidelines that support a comprehensive approach to implementing study visits. To illustrate the practical application of these principles, we include descriptions of sample visits conducted as part of our project.

The guide covers essential stages in organising study visits, from defining objectives and selecting appropriate partners to create schedules, ensuring logistical support, developing content programmes, and conducting post-visit evaluations. Each step is grounded in proven practices that have been effective in our work, offering valuable support to institutions aiming to conduct successful study visits.

Our set of guidelines enables institutions to plan study visits step-by-step, with a strong emphasis on quality, intercultural exchange, and long-term collaboration. This comprehensive approach not only facilitates the achievement of substantive goals but also fosters stronger relationships among partners, potentially leading to collaborative research projects and innovative initiatives in the future.

We invite you to explore the outlined stages of study visit planning. We hope this report will serve as a valuable organisational tool and an inspiration for establishing lasting international relationships and advancing knowledge and expertise in the dynamic fields of science and technology.

The International Project Team of "Materials Science Ma(s)ters"

Study Visits – Stages of Organisation and Recommendations

Each study visit comprises essential stages critical to its successful execution. Through a structured approach to planning, efficient logistical management, and effective collaboration with partners, it is possible to offer participants valuable experiences and to foster enduring relationships with collaborating entities. The following sections of this report outline each stage in the form of detailed steps and checklists, streamlining the study visit organisation process.

1. Defining the objectives of the visit

A successful study visit begins with clearly defined objectives. Setting precise goals helps to focus on the key aspects of the event, select suitable partners, and tailor the programme to meet participants' needs.

Checklist:

- Define the primary objectives of the visit (e.g., knowledge exchange, development of teaching competencies).
- Outline expected outcomes (e.g., new skills, establishment of collaborative relationships).
- Clarify expectations for all involved parties.
- Communicate the objectives to participants to ensure they are fully informed of what to expect.

2. Developing the Programme Content

The programme content is the foundation of any study visit. Well-structured workshops, lectures, and practical sessions provide participants with valuable skills and deepen their knowledge.

Checklist:

- Design workshops and training sessions aligned with the visit's objectives.
- Select topics for lectures and presentations and identify suitable speakers.
- Plan visits to laboratories and tours of relevant facilities.
- Prepare educational materials for each section of the programme.

3. Selecting Partners and Planning Collaboration

Choosing the right partners is crucial to enriching the visit's programme. Collaboration with institutions that specialise in the relevant fields adds substantial value to the visit and helps build long-term relationships.

Checklist:

- Identify key partners (universities, companies, institutions).
- Contact partners to discuss collaboration details.
- Define each partner's roles and responsibilities.
- Ensure partners understand the visit's objectives and expectations.

4. Scheduling and Setting the Visit Timeline

A detailed schedule is essential to smoothly conduct all planned activities. Setting a date that suits participants and partners, along with a daily plan, allows for optimal time management.

Checklist:

- Choose a visit date that works for all parties.
- Develop a detailed schedule, including time for workshops, lectures, and networking sessions.
- Allow for contingency time to manage potential delays.
- Share the schedule with participants and partners.

5. Organising Logistics and Reservations

Securing appropriate venues, transport, accommodation, and catering is vital for participant comfort. A well-prepared logistics plan minimises issues and allows focus on the event's substantive value.

Checklist:

- Reserve conference rooms, laboratories, and other meeting venues.
- Arrange transport to visit sites (e.g., industrial facilities).
- Secure accommodation for participants (if required).
- Organise catering for the duration of the visit.

6. Preparing Materials and Information for Participants

Providing participants with all necessary information and materials enables them to prepare thoroughly and make the most of the programme. Professionally prepared resources support participants throughout the event.

Checklist:

- Create an informational brochure or welcome pack.
- Prepare educational materials required for workshops.
- Ensure the availability of technical resources (projectors, computers).
- Share all relevant information with participants before the visit.

7. Facilitating Cultural Exchange and Integration

Study visits offer an excellent opportunity for cultural exchange and relationship-building. Time dedicated to integration and learning about the host culture enhances participants' experiences and supports the formation of lasting connections.

Checklist:

- Organise visits to cultural sites (e.g., museums, landmarks).
- Set aside time for networking and informal meetings.
- Arrange integration events or dinners.

8. Preparing Contingency Plans

Preparing for contingencies helps to reduce stress and ensures the continuity of the visit even in unforeseen circumstances. Being ready for changes in the programme or logistical issues is essential to ensure participant safety and comfort.

Checklist:

- Develop a contingency plan in case of schedule changes.
- Assign a person responsible for managing emergency situations.
- Collect contact information for all participants and partners.

9. Conducting Evaluation and Reflection Post-Visit

Following the conclusion of a study visit, it is beneficial to carry out an evaluation and a Q&A session. This approach provides valuable feedback from participants and helps identify areas for improvement in future events. Evaluation is essential for continually enhancing the quality of study visits.

Checklist:

- Prepare evaluation surveys for participants.
- Organise a Q&A session to discuss impressions and takeaways.
- Draft a final report summarising the visit and its outcomes.

10. Documenting and Disseminating Visit Outcomes

Thorough documentation of the study visit enables the broader dissemination of its outcomes and supports the ongoing use of its results. Photographs, reports, and presentations help share insights gained and encourage other institutions to organise similar events.

Checklist:

- Gather photos and recordings documenting the visit.
- Develop brochures, presentations, and reports.
- Coordinate with the PR department to promote the visit's outcomes.

11. Sustaining Long-Term Collaboration

A study visit can serve as the foundation for sustained, long-term collaboration. Keeping in touch with partners and planning future initiatives, such as research projects, student exchanges, and industrial placements, helps to further develop relationships and mutual benefits.

Checklist:

- Thank partners and discuss possibilities for ongoing collaboration.
- Based on the visit experience, plan subsequent initiatives.
- Share the summary report with participants and partners to encourage further cooperation.

Materials Science Masters: Strengthening Inter-Institutional Collaboration and Educational Innovation Through Study Visits

The primary objective of the study visits was to foster and enhance collaboration between partner institutions at both the academic and research levels. These visits aim to lay the groundwork for long-term partnerships, ultimately leading to the joint execution of scientific and educational projects. By encouraging interaction and knowledge exchange, the visits succeeded in deepening ties between the universities and strengthening cooperative efforts.

During the study visits, academic staff from the participating institutions actively engaged in laboratory sessions, workshops, and lectures hosted by their partner universities. This hands-on participation promoted mutual understanding of diverse teaching methodologies and provided a platform for sharing cutting-edge research practices and educational techniques. Additionally, participants have an opportunity to attend specialized workshops focusing on blended learning strategies, giving them modern approaches to course delivery that combine both traditional and online elements.

The experiences and insights gained from these study visits were systematically integrated into the educational methodology developed as part of the project's Intellectual Output 3 (IO3). This refined methodology can serve as a blueprint for future educational initiatives, incorporating best practices and innovative strategies identified during the study visits.

Furthermore, in alignment with the project's specific goals, the participating academic staff enhanced their teaching qualifications. By acquiring new skills and broadening their pedagogical expertise, they became better equipped to meet the evolving demands of higher education and contributed to advancing the institutions involved in the collaborative project.

Study Visit at the University of Silesia in Katowice, Poland

Date: 20-24.11.2023



From November 20 to 24, a study visit was conducted as part of the 'Materials Science Ma(s)ters – developing a new master's degree' project co-financed by the European Union. This five-day visit enabled project members to engage in various activities. During workshops, they explored a range of artificial intelligence tools, collaborated, and delved into diverse teaching methodologies and their application in education. The workshops' discussions also provided an invaluable opportunity for the international exchange of best practices in the field of materials science education.

The visit included an introduction to SPIN-LAB, a state-of-the-art research infrastructure center dedicated to microscopic research. The center's advanced facilities and resources were highlighted, providing insights into the latest developments in the field.

Additionally, the visit featured a comprehensive exploration of The Scientific Information Center and Academic Library (CINIBA). This segment focused on how CINIBA enhances education quality and offers the academic community and other users access to the latest information sources and documents supporting science and education. Special attention was given to the development of IT infrastructure, modern library systems, the use of new technologies, and the importance of access to professional search tools.

The program also included a series of presentations by academic teachers, each showcasing innovative student education techniques. These educators emphasized the integration of blended learning, which combines online digital media with traditional classroom methods to enhance learning. Moreover, participants had the opportunity to visit modern laboratories, where students actively engaged in hands-on tasks during classes, demonstrating the practical application of theoretical knowledge.

First day

The first day of the study visit at the University of Silesia commenced with a warm welcome extended to the participants by the Dean of the Faculty of Science and Technology, Prof. dr hab. Danuta Stróż. In her opening address, she expressed her enthusiasm for hosting international guests and emphasized the importance of such visits for fostering collaboration and knowledge exchange. Following the welcome, the project coordinator, dr Joanna Maszybrocka, prof. UŚ, presented an overview of the main objectives and scope of the Study Visit Program. This presentation outlined the key goals of the visit, including knowledge sharing, strengthening international partnerships, and deepening the understanding of ongoing research projects.



The morning session was dedicated to introducing the participants to the University of Silesia and its Faculty of Science and Technology. The University of Silesia, one of the largest universities in Poland, is known for its interdisciplinary, solid approach and commitment to cutting-edge research. The Faculty of Science and Technology, in particular, is a hub of scientific innovation, offering programs across various fields, including physics, chemistry, and material science. The faculty is also home to several specialized research institutes, such as the Institute of Material Engineering, which is recognized for its research in advanced materials, nanotechnology, and renewable energy sources. The participants of the study visit were provided with detailed information about local and international collaborations, partnering with institutions across Europe and beyond, and had the chance to explore the university's research environment during a guided visit to the Institute of Material Engineering. This visit offered a closer look at the state-of-the-art laboratories and research projects, enabling participants to witness firsthand the innovative work being conducted in fields such as materials science engineering. In addition to these academic activities, all participants were given informational materials

about the university, including specialized resources designed for the workshops in the following days.



The afternoon program took a more cultural turn as the group travelled to the “Silesia Uprisings Museum” in Świętochłowice. This museum is dedicated to the Silesian Uprisings, a series of three uprisings between 1919 and 1921 that played a pivotal role in shaping the region’s history and identity. The museum, noted for its modern and interactive approach to historical presentation, provided the participants with a deep dive into the socio-political landscape of Upper Silesia in the early 20th century.

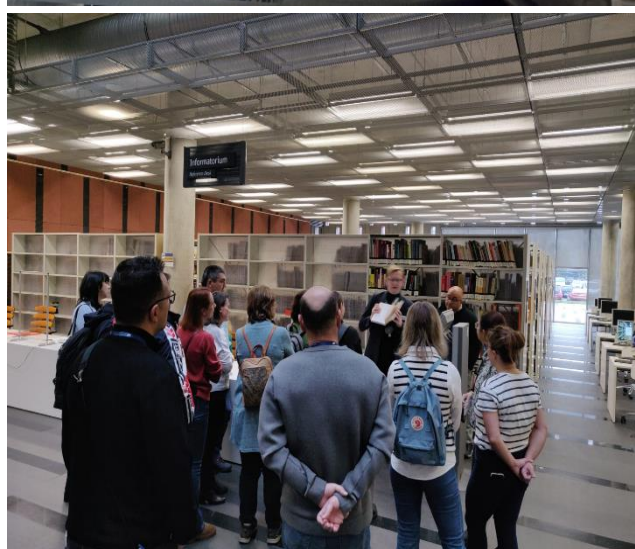
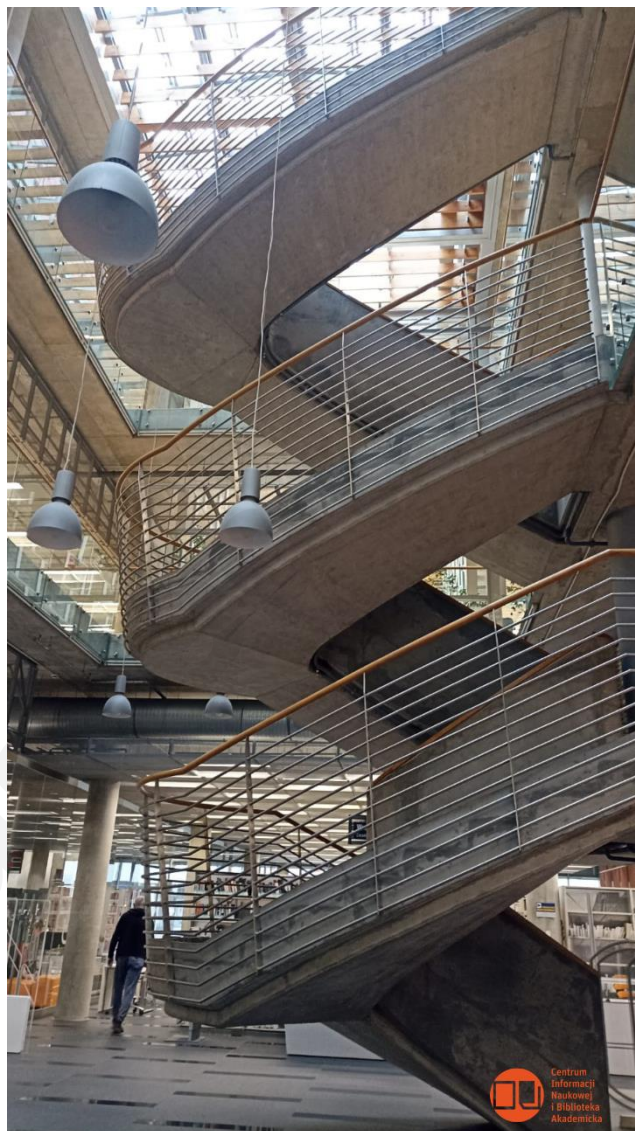
The visit to the museum was an immersive experience, as the participants explored multimedia exhibits that vividly recreated the atmosphere of the Silesian Uprisings. Through interactive displays and narrative storytelling, the group gained a profound understanding of the hardships and aspirations of the people of Silesia during that period. The museum’s use of technology to create an engaging and educational experience left a strong impression on the participants, enriching their knowledge of the region’s historical and cultural background.

The first day of the study visit effectively combined academic activities with cultural experiences. Participants gained a better understanding of the research and educational work at the University of Silesia and learned more about the region's history. This set a solid foundation for the rest of the visit, promoting further learning and exchange throughout the program.

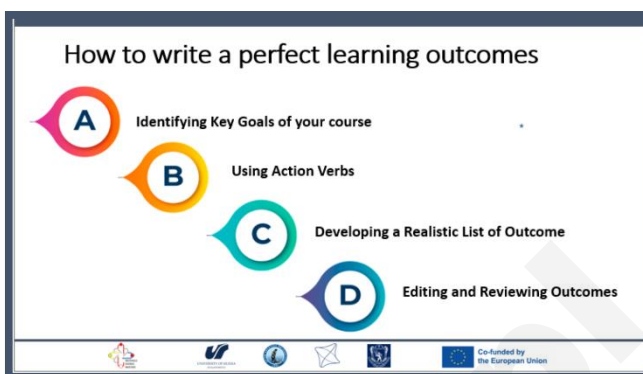


Second day

On the second day of the study visit, participants started with a visit to the Scientific Information Center and Academic Library (CINiBA), a modern facility that serves both the University of Silesia and the University of Economics in Katowice. The group had the opportunity to explore the library's advanced resources, which support academic research and student learning. They were introduced to its cutting-edge digital databases, open-access resources, and collaborative learning spaces, highlighting the library's role in enhancing research and academic work across disciplines. Participants were given an in-depth look at how CINiBA enhances the quality of education by providing access to the latest information sources and documents that support both science and education. The visit also highlighted the library's advanced IT infrastructure, modern library systems, and the use of new technologies. Special attention was paid to the importance of access to professional search tools and how these resources benefit the academic community.

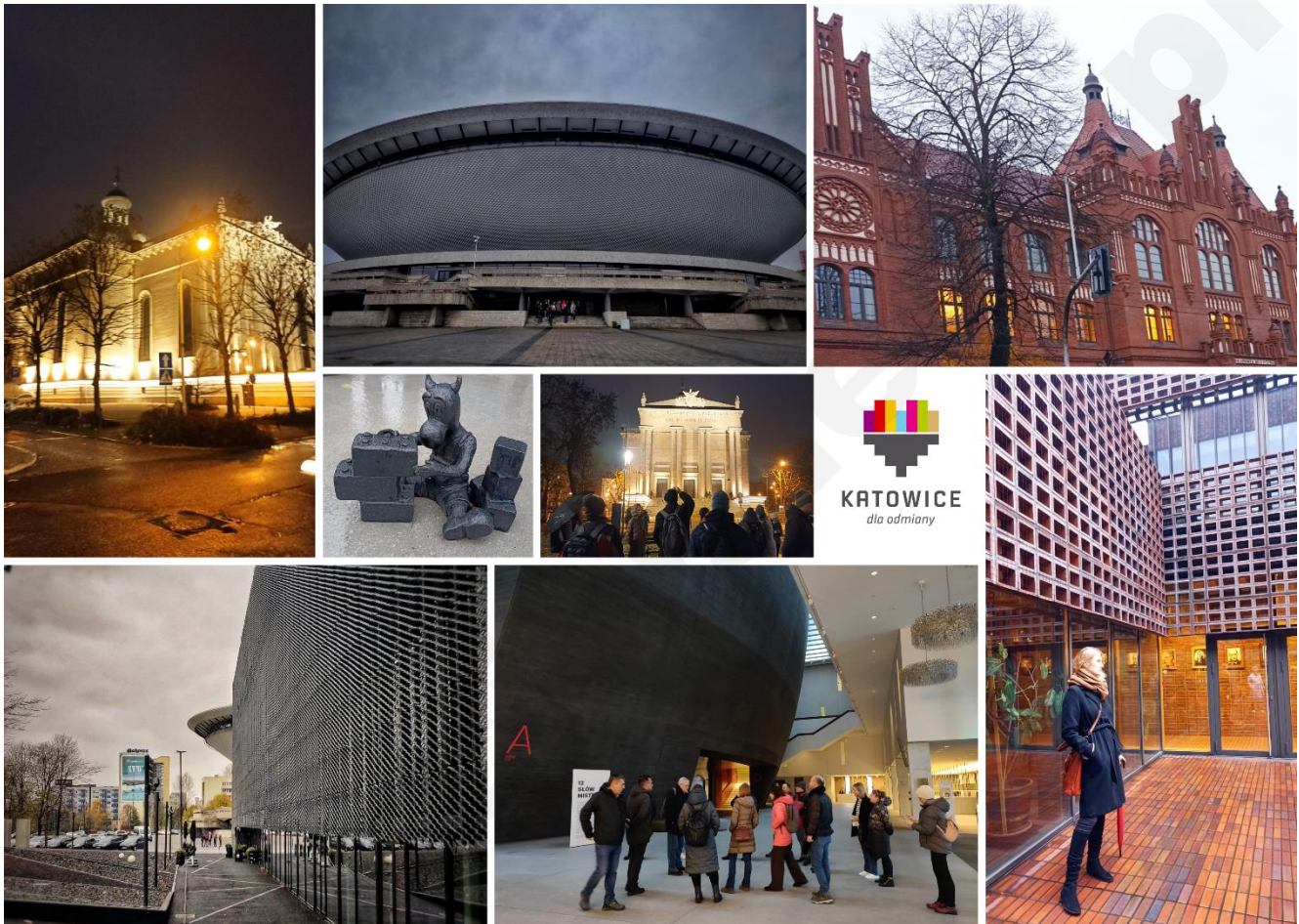


After the library tour, participants attended a workshop on **Brainstorming Development of Study Programmes Oriented on Learning Outcomes: International Exchange of Best Didactic Practices**. The workshop focused on how to design educational programs that prioritize learning outcomes and meet international standards. During the workshop, participants were taught how to effectively design learning outcomes that are clear, measurable, and aligned with both course objectives and international educational standards. They learned best practices for defining outcomes that focus on the skills and knowledge students should acquire, ensuring that these outcomes guide curriculum development and assessment methods. Participants gained valuable skills in collaborative brainstorming, curriculum design, and integrating best practices from different educational systems. The session encouraged the exchange of ideas and fostered creativity in developing study programs that are student-centred and outcomes-focused. In particular, they worked on designing learning outcomes for the Materials Science Ma(s)ters program, ensuring that the outcomes meet academic standards and align with industry demands, preparing graduates for success in the evolving field of materials science.



In the afternoon, participants took a walking tour of Katowice, exploring its most interesting architectural landmarks. We started with the city's iconic symbol, the Spodek, a distinctive, saucer-shaped arena that hosts major concerts and sporting events.

Next, they visited the NOSPR (National Polish Radio Symphony Orchestra), renowned for its world-class acoustics and hosting performances by famous artists. Tomasz Konior designed the building, and Yasuhisa Toyota designed the acoustics of the Great Concert Hall from Nagata Acoustics. NOSPR stands as a modern masterpiece of cultural architecture.



After visiting NOSPR, they toured the Faculty of Radio and Television at the University of Silesia, another architectural gem. This building, designed by BAAS Architektura, Grupa 5 Architekci, and Małecy Biuro Projektowe, has received numerous awards for its unique blend of modern design with traditional brickwork, reflecting the industrial heritage of the region. The structure stands out for its innovative use of space and materials, creating a perfect environment for creative and academic work. Its bold yet harmonious design has garnered international recognition, making it one of Katowice's most celebrated modern buildings.

They also toured the Karol Szymanowski Academy of Music, an institution that has produced many outstanding musicians and conductors. The Academy's building, while modest in size, boasts a unique architectural style with elements of modernism and functionality. It was constructed in the 20th century to support the education of young musicians. Inside, the Academy houses state-of-the-art music education, performance, and research facilities. Its concert hall is well-regarded for its excellent acoustics, providing a professional environment for students and visiting musicians.

After visiting the Academy of Music, participants explored the Cathedral of Christ the King. This monumental structure is the largest cathedral in Poland and a stunning example of 20th-century neoclassical architecture. Its grand dome and classical columns dominate the skyline of Katowice, symbolizing the city's spiritual heart. The cathedral's construction began in 1927 and was interrupted by World War II, but it was eventually completed in 1955. The cathedral's simple yet majestic design reflects the region's historical and cultural significance.

They also toured other architectural gems from Katowice, many of which date back to the 1920s, reflecting the city's rich historical legacy.

It is also worth mentioning that during the tour of Katowice, participants came across "Beboki" – small, mischievous figures scattered around the city. Beboki is rooted in Silesian folklore, where they were once believed to be mischievous creatures used to scare children into good behaviour. Over time, they have become a charming part of local culture, with modern statues representing their playful spirit now found throughout the streets of Katowice.

Third day

Participants started with a workshop on the third day of the study visit. Workshops on the topic "Digital Technologies for Educational Content Development: Practical Training" were held, focusing on the importance of digital technologies in teaching materials engineering. Participants were introduced to the concept and significance of digital tools and their role in modern education.



They explored the potential of artificial intelligence (AI), gaining insight into its numerous benefits, such as enhanced personalization of learning, automation of administrative tasks, and the ability to analyze vast amounts of data to improve educational outcomes.

In addition to the benefits, participants were also made aware of the potential risks and concerns associated with AI, including data privacy issues, the ethical implications of automated decision-making, and the threat of over-reliance on technology, which could reduce critical thinking.

The workshops demonstrated how AI can assist in developing educational content, from generating lesson materials to automating assessment tools. Participants were given the opportunity to engage in hands-on exercises, exploring the creative possibilities of AI in graphic design, video and voice generation, and text-based content. They also experimented with other digital technologies, discovering how these tools can be used to enhance the quality and interactivity of teaching materials.

Participants of the study visit had the opportunity to visit the **Center for Microscopic Study of Matter, SPIN-Lab (CMBM SPIN-Lab)**, which serves as an impressive example of modern laboratories tailored to the requirements of state-of-the-art electron and atomic force microscopes.



During the visit, participants familiarized themselves with the Objectives of the SPIN-Lab project, which encompass comprehensive consolidation and integration of research and development capabilities in the field of microscopic studies within the new centre at the University of Silesia in Katowice. This place stands out not only for its exceptional research infrastructure but also for its modern organizational structure and integrated research and educational programs that involve business partners and collaborating research units.

The Centre for Microscopic Study of Matter, SPIN-Lab, aims to consolidate the microscopic potential and expertise within the research centre of the University of Silesia in Katowice. Research conducted at CMBM SPIN-Lab covers all aspects of microscopy, especially the correlated characterization of “soft” matter. The activities of CMBM SPIN-Lab align with the intense scientific and economic development resulting from microscopic research in various scientific fields, such as natural and exact sciences, engineering, medical sciences, and health sciences. The ability to image matter at the molecular scale, even under cryogenic conditions, correlated with spectroscopic imaging, allows for a comprehensive understanding of the properties of materials and processes arising from atomic structures.

Furthermore, CMBM SPIN-Lab is committed to providing education at the highest global level and facilitating international cooperation through the establishment of a teaching centre equipped with state-of-the-art research infrastructure. This enables students to acquire knowledge and experience at the highest level, contributing to the development of the scientific and educational potential of this outstanding research centre.

By visiting CMBM SPIN-Lab, participants had the opportunity to delve into the fascinating world of microscopy and “soft” materials, opening new perspectives in scientific research and technological development. This is a place where science, innovation, and education converge, contributing to achieving new achievements in the field of material research.

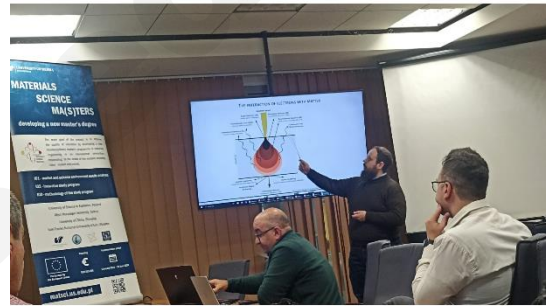
Fourth day

On the fourth day, participants conducted workshops on Blended Learning in Practice: A Case Study. During the session, selected lessons from the blended learning module Material Testing and Characterization were presented. The course structure was explained, consisting of a theoretical part that students can independently access and study. This includes lectures, demonstration videos, and instructional materials. The presenters discussed the theoretical components of these lessons, emphasizing how they can be delivered online and later supplemented with practical, hands-on laboratory sessions. This blended approach provides flexibility for students, combining self-paced learning with experiential, in-person instruction.

During the workshops, participants were presented with expert lessons on topics such as **Sample Preparation for Metallography, Introduction to Scanning Electron Microscopy (SEM), The Use of Infrared Spectroscopy in the Qualitative and Quantitative Analysis of Materials, and Surface Characterization by X-ray Photoelectron Spectroscopy.** The presenters, highly experienced academic teachers, demonstrated exceptional knowledge and skill. Their extensive teaching experience and expertise in the subject matter contributed to the professional delivery of complex concepts. The combination of theoretical insights and practical demonstrations further emphasized their comprehensive understanding of the topics, making the sessions highly informative and valuable for all participants.

During the workshops, participants not only gained a deeper understanding of these advanced topics but also received valuable guidance on effectively teaching these subjects within the context of Materials Engineering.

The academic instructors shared pedagogical strategies tailored to technical disciplines, emphasizing balancing theoretical knowledge with hands-on practical experience. They highlighted methods for engaging students in laboratory environments, how to make complex material accessible, and how to leverage modern digital tools and technologies to enhance learning outcomes. Participants learned the significance of applying case-based learning, which ties real-world material engineering problems to classroom





content. They were encouraged to foster critical thinking by challenging students with open-ended, research-driven tasks. These insights provided invaluable perspectives on how to elevate the teaching of Materials Engineering in a way that not only imparts knowledge but inspires innovation and curiosity among students.

At the end of the day, a wrap-up discussion was held about the workshop on blended learning. The discussion covered the pros and cons of this teaching method, explored new ideas, and examined how they could be implemented in materials engineering education in the future.

Fifth day

On the fifth day, participants had the opportunity to engage in a practical demonstration of a blended learning lesson. They visited the laboratory facilities and conducted exercises independently, gaining hands-on experience. During the session, they received several tips on effectively delivering knowledge to students, focusing on strategies to enhance student engagement and comprehension in a blended learning environment.

The lessons covered various advanced topics, including **"Sample Preparation for Metallography,"** where participants learned the steps necessary to prepare materials for microscopic examination. They also explored **"Introduction to Scanning Electron Microscopy (SEM),"** gaining insights into using SEM for detailed imaging and analysis of material surfaces. Another session focused on **"The Use of Infrared Spectroscopy in the Qualitative and Quantitative Analysis of Materials,"** demonstrating how this technique can be applied to identify chemical compounds and analyse material compositions. Finally, participants delved into **"Surface Characterization by X-ray Photoelectron Spectroscopy,"** learning how to use XPS for analysing the elemental composition and chemical states of surfaces.

These hands-on experiences, combined with the guidance on teaching methods, equipped participants with both the technical skills and pedagogical strategies necessary for integrating blended learning into materials engineering education.

A concluding meeting was held in the afternoon to summarize the study visit. The session provided an opportunity to review the progress made in the project and discuss the next steps moving forward. Participants reflected on the key takeaways from the

visit, highlighting how the knowledge and skills gained could be applied in their respective areas of expertise.

The conversation also focused on identifying potential areas for further collaboration and refining the strategies needed to achieve the project's long-term goals. Future tasks were outlined, and a clear plan was established to ensure continued progress.

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Study visit at the University of Žilina, Slovakia

15.1. 2024 - 19.1. 2024



From January 15 to 19, 2024, a second study visit took place at the University of Žilina in Slovakia. Together with partner universities – the University of Silesia in Katowice (Poland), Afyon Kocatepe Üniversitesi (Türkiye) and Ivan Franko National University of Lviv (Ukraine) – they had the opportunity to explore the educational approaches used at the University of Žilina, as well as their close collaboration with the industry. This provided valuable insights into how academic and industrial partnerships can enhance teaching and practical application.

First day

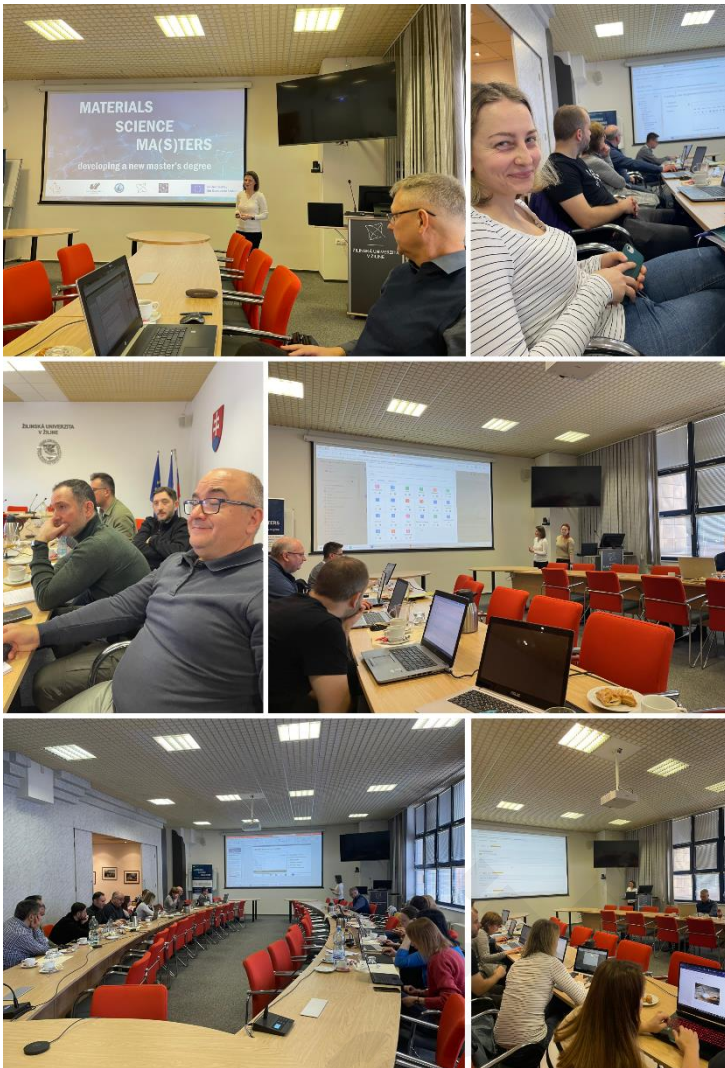
On the first day of the study visit, participants began with a welcoming presentation outlining the main objectives and scope of the visit. This was followed by an introduction to the University of Žilina, during which we learned about the university's educational goals and its approach to fostering student development.

After the introductory session, they began a brainstorming discussion focused on the project outputs, specifically the development of syllabuses and teacher guides. The group engaged in an in-depth conversation about potential improvements and refinements, identifying which subjects are fundamental concerning industry needs.

They also reviewed the progress made on the project so far, discussing how the work aligns with the overall goals and how best to continue moving forward. This collaborative exchange of ideas provided a solid foundation for refining educational materials and ensuring they meet academic and industrial requirements.



Second day



On the second day of the study visit, the focus shifted to e-learning, starting with an introductory session on Moodle, a popular online learning platform. Participants were introduced to the basic functions of Moodle, learning how to navigate the system and use its core features effectively for educational purposes. The session was designed to provide a strong foundation for those who were new to the platform.

Following the introduction, a brainstorming session was held to discuss the practical applications of Moodle. Participants shared their experiences with the platform, offering insights into its strengths and areas where improvements could be made. Real-world examples of Moodle's use in different educational settings were examined, sparking a lively exchange of ideas about optimising its application in various teaching contexts.

Later in the day, participants worked hands-on with their laptops, creating courses directly on the Moodle platform. This allowed them to apply what they had learned,

experimenting with the platform's tools and settings. The session also covered different types of resources and how to add them to Moodle courses, including files, links, videos, quizzes, and assignments. Each step was explained in detail, ensuring that everyone left with a clear understanding of how to build and manage a course from start to finish.

By the end of the day, participants had gained theoretical knowledge and practical skills, equipping them with the tools needed to implement Moodle in their own teaching environments.

In the second part of the day, they had the privilege of experiencing the interactive exhibition on wave processes at the "Land of Waves," guided by Assoc. Prof. Ing. Norbert Tajányi, PhD. This fascinating display, hosted at the University of Žilina, provided a deep dive into wave phenomena's complex and captivating world. The exhibition allowed them to explore various waves in an immersive and hands-on environment, including sound, light, and seismic waves. Assoc. Prof. Tajányi led them through the science behind these wave processes, offering them a deeper appreciation for the fundamental principles that govern them.

The visit to the exhibition was a highlight of the day, blending theoretical knowledge with engaging practical demonstrations. The interactive nature of the display sparked

curiosity and encouraged a lively exchange of ideas among participants. Participants discussed how these phenomena could be applied to materials science, adding a new dimension to our understanding.



Third day

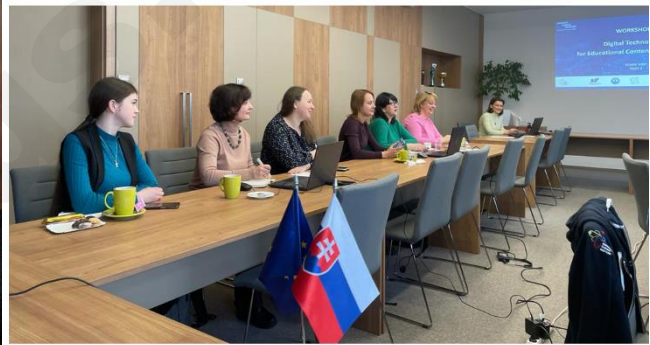
On the third day, the morning session was dedicated to continuing the "Digital Technologies for Education Content Development" workshop, which followed up on the groundwork laid during the previous study visit in Katowice. This session was mainly focused on how modern digital tools, especially AI-powered technologies, can enhance educational content development.

Participants explored a range of AI tools designed to assist educators in creating more dynamic, interactive, and engaging learning materials. This involved hands-on activities where attendees learned how AI can streamline tasks like generating content, organizing lesson plans, and even personalizing educational materials to meet the diverse needs of students. AI-driven platforms for creating quizzes, videos, and interactive simulations were introduced, highlighting how these technologies can significantly reduce the time required to prepare high-quality teaching resources while boosting creativity and effectiveness.

A vital element of the workshop was the preparation of presentations using AI tools. Participants were shown how to leverage AI to generate presentation outlines, suggest content enhancements, and even design visually appealing slides. The aim was to demonstrate that AI can serve as a valuable assistant in the creative process, making it easier for educators to focus on delivering content that resonates with their audience.

There were also discussions on the ethical and practical aspects of incorporating AI into education. Participants raised questions about the balance between human input and machine assistance, exploring how AI can complement rather than replace traditional teaching methods. This led to a deeper understanding of how digital technologies, when used wisely, can empower educators to create more tailored and impactful learning experiences.

By the end of the session, participants had gained technical skills in working with AI tools and insights into how these technologies can be integrated into their daily teaching practices, offering new opportunities to innovate in educational content development.



As part of the day's excursion, participants also had the opportunity to visit the KIA Motors plant in Slovakia, where we were given a real-world glimpse into the operations of modern automotive industry and how theoretical knowledge of materials science is practically applied.



During the visit, they were immersed in the dynamic automotive manufacturing world. The state-of-the-art KIA facility provided valuable insights into their sustainable production practices, showcasing advanced robotics and cutting-edge technologies. One particularly striking fact was that a fully assembled car rolls off the production line every minute, highlighting the plant's incredible efficiency.

For security reasons, participants were not permitted to take photos during the visit, and their phones were carefully secured to protect the confidentiality of the plant's processes. Despite this, the experience was thoroughly engaging and informative.

KIA Slovakia's involvement in the educational development of future specialists is equally impressive. The company actively participates in training professionals in the automotive industry, beginning at the high school level. Additionally, KIA collaborates

closely with universities, contributing to students' education in automotive engineering and production fields.

This excursion was a fascinating look into modern industrial practices and a testament to the strong ties between industry and academia, ensuring that students and professionals benefit from real-world applications of their studies.

Fourth day

On the fourth day of the study visit at the University of Žilina, partners from Ukraine presented the results of the Quality Surveys, providing valuable insights into the progress and feedback gathered from the project. The day also included participation in lectures and laboratory sessions, focusing on the non-destructive testing laboratory.

The visit offered a platform for sharing teaching methodologies, showcasing advanced equipment, and discussing the unique opportunities available within each laboratory. Attendees gained valuable insights into the University of Žilina's teaching approach and the capabilities and resources offered by the laboratories. This hands-on experience allowed participants to understand better how theoretical knowledge is applied in practical settings, highlighting the strength of the university's infrastructure and expertise.

In the afternoon, workshops were held on the discussion of the blended learning modulus. Partners gave presentations, followed by an open discussion centred on the module's structure and content. A key point of the conversation was determining the appropriate number of ECTS credits for the module, ensuring that the workload and learning outcomes are appropriately aligned.

Further discussions addressed the methodology and implementation of the study program, exploring how it could be effectively integrated across the participating universities. The exchange of ideas provided a clear path forward for adapting the program to meet each institution's specific needs and capacities, ensuring a consistent and high-quality learning experience for students across all partner universities.



Fifth day



On the fifth day, participants had the opportunity to explore the teaching methodologies and facilities within the electrochemical and corrosion laboratories at the University of Žilina. These laboratories offered an in-depth look into the practical aspects of chemical and corrosion science, providing hands-on experiences with advanced techniques used to study and prevent material degradation. The sessions highlighted the importance of corrosion testing in materials engineering, particularly in industrial applications where the durability and longevity of materials are critical. They observed how students at the university are trained in these areas, gaining valuable practical skills alongside their theoretical studies. The laboratories were equipped with cutting-edge technology, showcasing the university's commitment to integrating high-level research with education.

The visit concluded with a formal wrap-up session, where we reflected on the key takeaways from the entire study visit. The discussions revisited the various topics covered throughout the week, from blended learning modules to the detailed exploration of laboratory practices. We also evaluated the progress made on the project goals and identified areas for future work.

This study visit to the University of Žilina was an enriching experience, fostering a solid exchange of ideas and best practices between all participating partners. It provided valuable insights into the intersection of academic education and industry needs, particularly in the field of materials science. Exposure to innovative teaching methods, high-tech laboratories, and the university's approach to combining theory with hands-on practice will undoubtedly contribute to refining and implementing our shared educational goals.

The study visit at the University of Žilina has come to a successful close, marking an enriching chapter in our pursuit of educational excellence in materials engineering. Participants from diverse backgrounds, including Ukraine, Poland, and Türkiye, gathered to explore innovative teaching methodologies and exchange valuable insights.



Study Visit at the Afyon Kocatepe University, Türkiye

4.03-8.03.2024



The study visit at Afyon Kocatepe University in Türkiye provided participants with a unique blend of professional, technical, and cultural experiences. The visit, which included representatives from various institutions, aimed to strengthen collaborative efforts in the field of materials science while enhancing participants' understanding of Türkiye's industrial and educational landscape. Over five days, attendees engaged in hands-on learning sessions, facility tours, and strategic discussions, all designed to support project goals while facilitating cross-cultural exchange.

First day

The study visit in Türkiye at Afyon Kocatepe University commenced with a warm Welcome Meeting held at the Erasmus Café, where participants from various institutions had the opportunity to meet and exchange introductions in an informal setting. This opening session set a collaborative tone for the visit, facilitating mutual acquaintance and initial discussions on the objectives of the project.

Following the welcome session, the group visited the International Office, where the focus shifted to project management and administrative issues. This meeting allowed participants to share information on ongoing management practices, discuss organizational frameworks, and ensure smooth coordination of the project across partner institutions. It was a valuable opportunity to align strategies and expectations, ensuring that all partners were well-prepared for the tasks ahead.

After these discussions, we were given the opportunity to tour some of the university's key laboratories and facilities. These included specialized labs focused on metal sintering and casting, where advanced techniques in the production and study of metallic materials were showcased. Additionally, we visited a facility dedicated to the encapsulation of particles in polymers, a cutting-edge area of research with significant applications in materials science. The labs not only highlighted the university's state-of-the-art equipment but also demonstrated their commitment to integrating practical, research-based learning into their educational programs. This tour provided valuable insights into the resources and methodologies employed by the institution to train materials engineering students.

In the afternoon, the focus shifted to academic content, with an in-depth session on syllabuses and teaching guides. Building on earlier discussions, participants reviewed the structure of the educational programs, ensuring that the syllabuses were aligned with industry needs and reflected the latest advancements in the field of materials



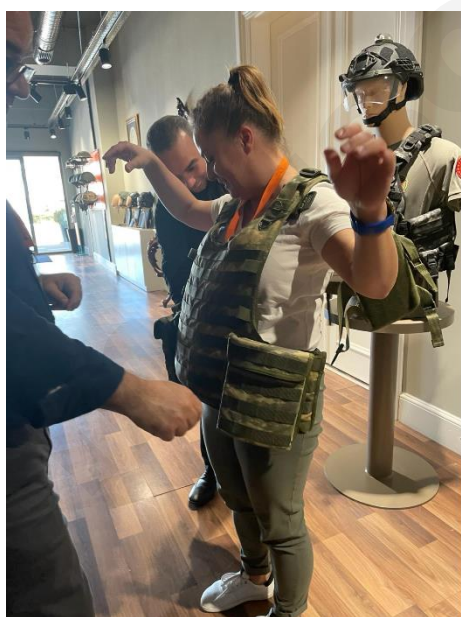
science. The teaching guides were also evaluated to ensure they provided educators with the flexibility to adapt their teaching methods while maintaining consistency in learning outcomes across all partner institutions.

The first day concluded with a strategic discussion on the broader goals of the study visit, establishing a clear plan for the coming days. This laid a solid foundation for collaboration, with participants eager to continue their exploration of innovative teaching and research practices.

Second day

On the second day of the study visit to Türkiye, we had the privilege of traveling to Yozgat to visit the **Garanti Composites Ballistics Lab**, where the participants were introduced to the fascinating process of producing protective garments for military personnel. The day began with a lecture on ballistics and protective equipment, providing an in-depth overview of the specialized composite materials used in the production of items such as helmets and body armour. These materials are meticulously designed to offer both lightweight properties and high durability, ensuring optimal protection without compromising on mobility or comfort.

During the visit, participants were taken through the various stages of production, gaining insights into how these cutting-edge materials are transformed into essential protective gear for soldiers. They also had the chance to observe quality control techniques, where rigorous testing processes are applied to ensure that each product meets the highest standards of safety and durability. A particularly notable part of the tour was the demonstration of the ballistic testing chamber. This facility allows for real-life simulation of impacts, ensuring that the materials can withstand the extreme conditions they are designed for. The level of precision and attention to detail in both the manufacturing and testing phases was impressive, reflecting the critical importance of these materials in ensuring the safety of those who rely on them in the field.



In the afternoon, participants continued their journey to Ankara to visit the Boron Institute and its Hydrogen Technology Laboratory. The Boron Institute is at the forefront of research on boron compounds and their applications in energy storage and other

advanced technologies. At the laboratory, they attended a lecture on hydrogen storage using boron-based compounds, an area of research that holds significant potential for revolutionizing the way hydrogen is stored and utilized as a clean energy source.

During the tour of the institute, they learned about the unique properties of boron that make it an ideal candidate for hydrogen storage, including its ability to bond with hydrogen in a stable and efficient manner. This technology is critical in the development of hydrogen fuel cells and other sustainable energy systems, which have the potential to play a major role in reducing carbon emissions and promoting energy independence. The facility itself was equipped with advanced research tools and experimental setups, allowing scientists to explore new methods of hydrogen storage and conversion.

The visit provided a deep understanding of how Türkiye is contributing to global advancements in both military-grade composite materials and sustainable energy solutions. It was an inspiring day, filled with innovative ideas and a clear vision of how science and technology can intersect to address some of the world's most pressing challenges.

Third day

On the third day of the study visit at Afyon Kocatepe University, participants focused on key elements of the educational framework. The day began with an in-depth session discussing the Syllabus and Teacher's Guide statistics, alongside an evaluation of the project methodology aimed at enhancing its overall effectiveness.

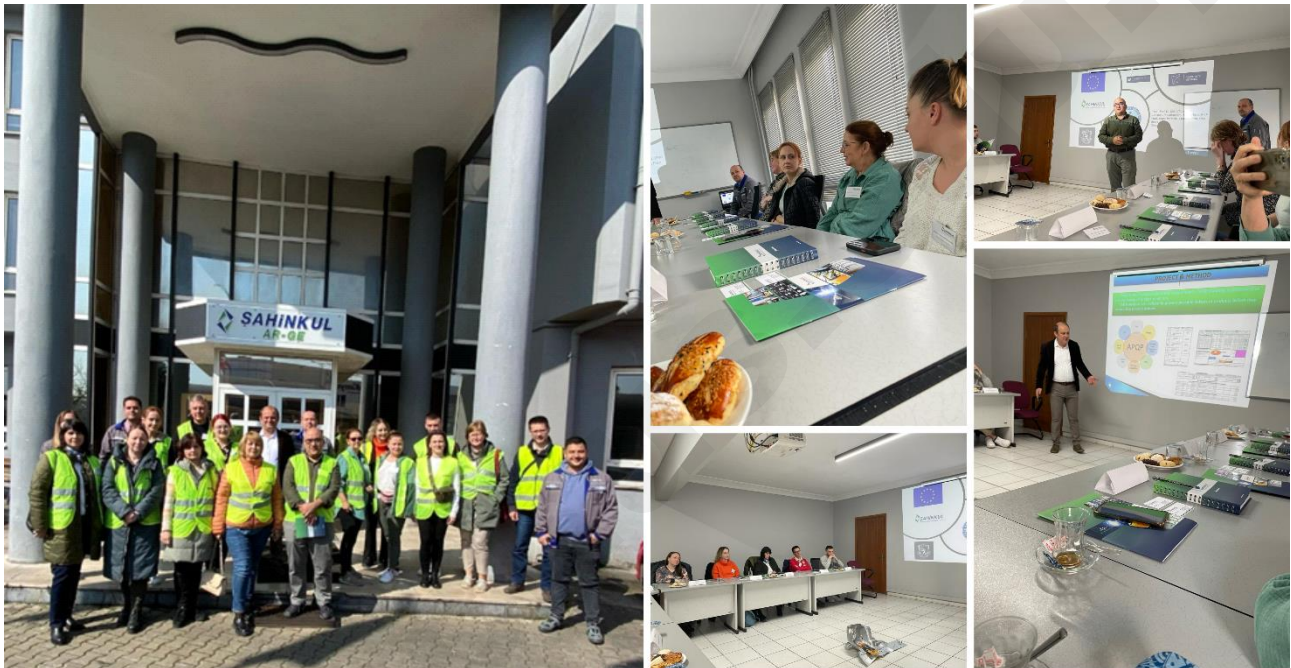
After a brief break, participants explored the cultural heritage of the region, starting with a visit to Afyon Castle. They then embarked on a Phrygia walking tour, which was followed by a visit to the Museum of Afyon. These activities provided participants with a deeper understanding of the area's rich historical and cultural background.

Later in the day, the group reconvened for a final meeting, which extended into the evening. This session allowed for further discussion, strategic planning, and strengthened collaboration between the visiting institutions, ensuring a productive exchange of ideas and innovative approaches for the ongoing project.

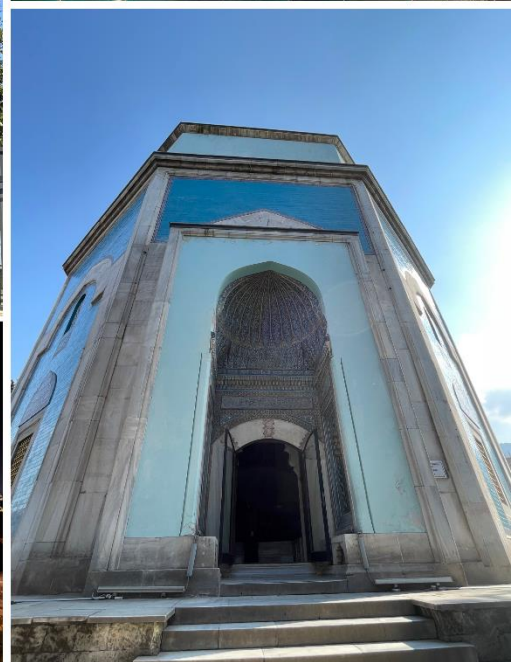


Fourth day

On the fourth day of the study visit, participants journeyed to Bursa, where the focus was on exploring the city's industrial and cultural heritage. The visit started at the Şahinkul Automotive Parts Manufacturing Factory, one of the notable suppliers in Türkiye's dynamic automotive sector. At this facility, participants gained insight into the company's operations, including manufacturing high-precision automotive components for local and international markets. Şahinkul's approach exemplifies Türkiye's growing focus on automotive excellence, including advanced R&D and a strong export orientation, aligning with Türkiye's position as a significant automotive manufacturing hub in Europe. Participants also learned about the company's role in supporting the region's economy through advanced R&D and international exports.



Following the technical visit, attendees were welcomed by the Bursa Municipality for an immersive city tour through Bursa's cultural and historical landmarks. The tour began at the Panorama 1326 Conquest Museum, an immersive space that highlights the city's pivotal history, particularly its capture by the Ottomans in 1326. This visit provided participants with a deeper appreciation for Bursa's role as a foundation of the Ottoman Empire's expansion. Next, the group explored the Yeşil Camii (Green Mosque), an architectural gem of early Ottoman design renowned for its intricate tiles and calligraphy. This experience underscored Bursa's historical importance as a former Ottoman capital, where artistry and religious architecture flourished. Participants then proceeded to the Tophane Clock Tower, where they were introduced to its historical significance and enjoyed a panoramic view of Bursa, providing a unique perspective on the city's strategic and geographical prominence. The tour continued to the Grand Mosque (Ulu Cami), one of Bursa's most iconic landmarks, celebrated for its impressive Ottoman design and spacious interiors. Additionally, the visit to Koza Han, Bursa's historic silk market, offered insight into the city's trading legacy and its central role in the historic Silk Road. The day concluded with a traditional Turkish dinner, allowing participants to reflect on their experiences, exchange insights, and connect with one another in an atmosphere of cultural appreciation and professional camaraderie.



Fifth day

On the final day of the study visit, participants reconvened at Afyon Kocatepe University to reflect on the project's progress and plan for the future. The day began with a comprehensive evaluation of the project's achievements and prospects. Participants reviewed the outcomes of the recent project meeting and conference, discussing key insights and lessons learned throughout the visit. After a brief intermission, the focus shifted to the future objectives of the collaboration. Attendees engaged in lively discussions regarding the organization of upcoming conferences, emphasizing the importance of maintaining momentum in their joint efforts. Strategies to enhance collaborative initiatives were explored, ensuring that the project continues to thrive and meet its goals. This concluding session not only provided a platform for reflection but also strengthened the network among participants, paving the way for ongoing collaboration and innovation in their respective fields. The visit culminated in a shared commitment to advancing their work together, fostering a spirit of partnership that would extend beyond the program itself.



Virtual Study Visit to Ivan Franko National University of Lviv, Ukraine

22.04 – 26.04.2024

From April 22 to April 26, 2024, participants in the "Materials Science Ma(s)ters" project gathered for a virtual study visit hosted by Ivan Franko National University of Lviv (IFNUL). Held via Microsoft Teams, this online event provided an interactive platform for exploring the university's academic, research, and cultural initiatives, particularly focusing on innovations in materials science. Over five days, participants engaged in presentations, discussions, and virtual tours, gaining a comprehensive view of IFNUL's achievements in academic programming, international collaboration, and community engagement. This visit allowed project partners to exchange insights, assess project progress, and identify strategic goals for future collaboration, all while strengthening ties across institutions.

The decision to hold the study visit online, rather than in-person in Ukraine, was made with careful consideration of current conditions within the country. Given the ongoing conflict, it was essential to prioritize the safety of all participants while respecting the university's commitment to international collaboration. Conducting the visit virtually enabled project partners to engage in meaningful dialogue and knowledge exchange without compromising personal safety. This approach reflects the resilience of Ukrainian institutions like IFNUL, which continue to advance their educational and research missions despite challenging circumstances, demonstrating their dedication to maintaining international partnerships and academic development.

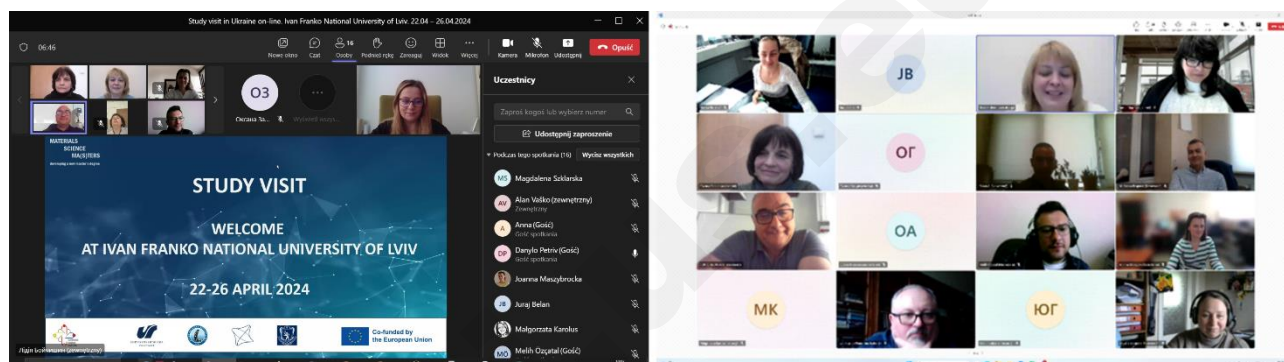
First day

On April 22, 2024, project partners had an engaging virtual study visit to Ivan Franko National University of Lviv (IFNUL) via MS Teams. The session started with a warm welcome speech from the Vice-Rector for Research, Teaching, and International Cooperation, which set a positive tone for the following discussions.

The International Relations Department at IFNUL introduced participants to the Erasmus program, highlighting the university's global partnerships and the various opportunities for students to study abroad. It was great to see how dedicated the university is to expanding its international connections.

A standout moment was Olga Stoliaryk's presentation on "Strengthening the Resilience of Local Communities: The Experience of IFNUL." She shared her insights on how the university actively supports local communities, reflecting IFNUL's commitment to positively impacting society. Learning about their initiatives aimed at community engagement and resilience-building was inspiring.

Overall, the first day of the online visit was not only informative but also showcased IFNUL's dedication to global collaboration and local empowerment. It was a stimulating experience that provided valuable insights into the university's efforts internationally and within the community.



Second day

The second day of the virtual study visit to Ivan Franko National University of Lviv was focused on the institution's cultural and academic heritage. The day commenced with a presentation by the university's Scientific Secretary, who provided an overview of the Vasy Stefanyk National Scientific Library of Ukraine. The presentation underscored the significance of preserving cultural heritage, particularly during times of conflict. It also offered fascinating insights into the historical context of Turkish sultans, prompting an engaging discussion about the challenges and strategies involved in safeguarding cultural artefacts in wartime.

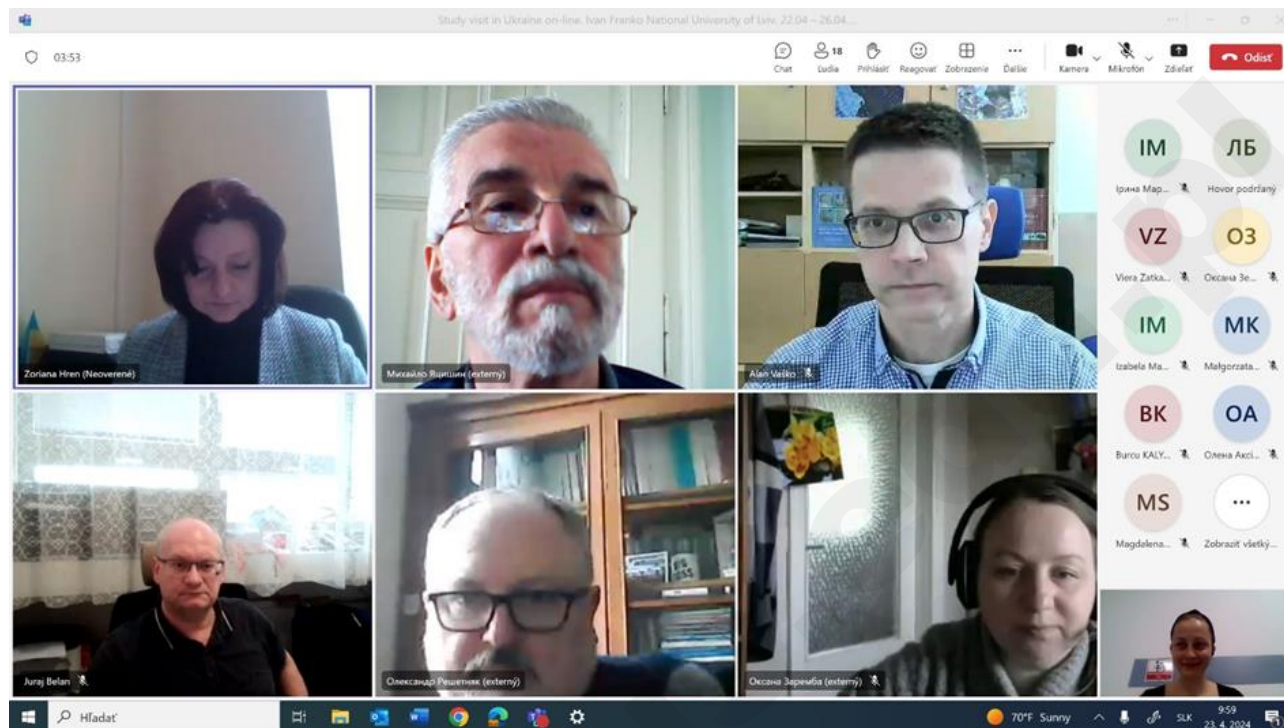
Following this presentation, the Vice-Dean of the Faculty of Chemistry introduced participants to current research and innovations in chemistry at Lviv University. This session highlighted the cutting-edge work being conducted within the department and fostered an exchange of ideas, emphasising the importance of academic exploration and cultural preservation.

After a brief intermission, the Head of the Department of Physical and Colloidal Chemistry presented an overview of the department's research, teaching activities, and ongoing projects. This session illustrated the university's commitment to academic excellence and research innovation.

To conclude the day's activities, participants enjoyed a virtual tour titled "Ukraine before the War – The 10 Most Beautiful Places in Ukraine," which showcased the

country's rich history and stunning landscapes, enhancing the understanding of Ukraine's cultural context.

Overall, the second day of the online study visit provided valuable insights into Lviv's academic endeavours and cultural heritage, reinforcing the university's dedication to community engagement and international collaboration.



Third day

The third day of the virtual study visit to Ivan Franko National University of Lviv, conducted via Microsoft Teams, was filled with enriching presentations and discussions centered around inclusive education and modern teaching methodologies.

The day began with a focus on inclusive education, where participants explored various strategies and approaches aimed at ensuring educational accessibility for all students, irrespective of their abilities or backgrounds. This session highlighted the importance of cultivating inclusive learning environments and adapting teaching methods to address the diverse needs of students.

Following the discussions on inclusive education, the emphasis shifted to modern teaching methods. Professors shared innovative approaches designed to engage students and enhance learning outcomes. The presentations included insights into interactive online lectures and project-based learning, emphasizing the incorporation of technology and active learning strategies into teaching practices.

A significant highlight of the day was the virtual tours of laboratories at leading chemical and pharmaceutical enterprises, Yenamine and Arterium. Participants were given exclusive access to observe advanced research and development processes. Experts from these companies showcased state-of-the-art equipment and detailed various stages of pharmaceutical production. At Yenamine, insights into the synthesis and analysis of organic compounds were provided, shedding light on drug discovery and development. The tour of Arterium offered a comprehensive look at pharmaceutical

manufacturing processes, including quality control measures and regulatory compliance.

The day's agenda also included a workshop on blended learning modules, which focused on practical applications and analysis of teaching methodologies. This workshop complemented the earlier discussions and provided further tools for educators to enhance their teaching practices.

The session on intersectoral cooperation in the context of European integration featured insights from the head of the Office of Regional Development and European Integration of the Lviv Regional Development Agency. This discussion emphasized the importance of collaboration between academia and industry in fostering innovation and knowledge exchange.

The day concluded with a virtual tour titled "Lviv – City of Legends – Ukrainian Cultural Centre with Medieval Architecture," offering participants a glimpse into the rich cultural history and architectural heritage of Lviv.

Overall, the third day of the online study visit was highly informative and engaging, showcasing the university's commitment to inclusive education, innovative teaching methods, and strong ties with the industry.



Fourth day

The fourth day of our virtual study visit to Ivan Franko National University of Lviv offered an insightful blend of advanced scientific research and cultural heritage exploration. Held via Microsoft Teams, the day's agenda included presentations from key university partners and a deep dive into innovative research fields and museum collections.

The day began with a presentation from Halychpharm Pharmaceutical Company on career development and collaboration with universities, led by the Head of Training and Development. This session focused on the significance of fostering professional growth in tandem with academic partnerships. Halychpharm shared its approach to skill-building and hands-on training opportunities, illustrating the company's role in bridging theoretical knowledge with real-world pharmaceutical practices. This exchange underscored the benefits of industry-academic collaboration in enhancing career readiness and fostering talent development.

Next, a session led by Professor Boichyshyn addressed quality management issues relevant to university settings, particularly in the context of academic meetings and study visits. This segment highlighted the university's commitment to maintaining high

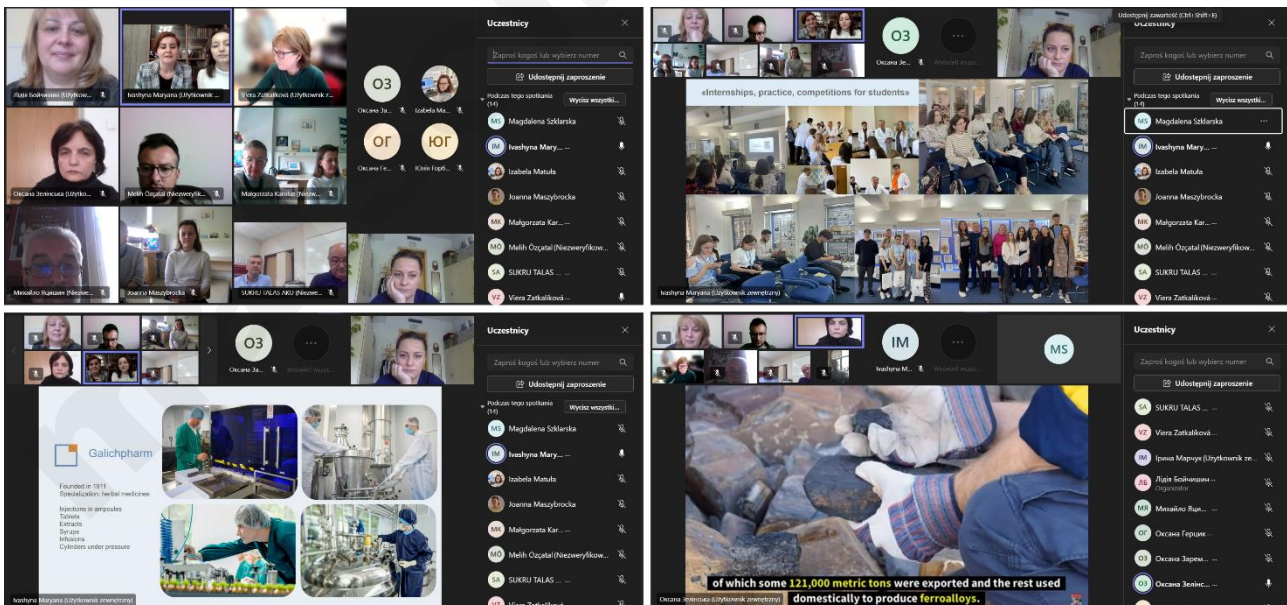
academic standards across collaborative and research initiatives. Professor Boichyshyn outlined best practices and quality assurance measures, which sparked a productive dialogue on ensuring consistent quality in institutional partnerships and academic exchanges.

Following a short break, attendees were introduced to cutting-edge work in hydrogen technology at the Institute of Physics and Mechanics. This research-focused segment provided an overview of advancements in hydrogen-based technology, with particular emphasis on sustainable energy solutions. Researchers discussed the role of hydrogen in alternative energy production, storage, and its potential impact on global energy markets. The session served as a glimpse into the university's role in promoting sustainable technology, presenting participants with the latest research in a rapidly growing field.

The day continued with a look at Ukrainian natural resources through the lens of material science. This presentation underscored Ukraine's abundant natural resources, exploring their applications across various scientific domains. The session offered valuable insights into resource utilization and the role of material science in sustainable development, showcasing Ukraine's potential within the international research community.

To conclude, the focus shifted to the university museum fund and Lviv's museum collections. The presentation showcased a range of items from Lviv's history, art, and scientific achievements. These collections are essential for preserving regional culture and history, reflecting the depth of Lviv's heritage and its academic institutions' commitment to cultural preservation. This session provided a unique perspective on Lviv's art, history, and scientific progress, giving participants a deeper understanding of the cultural context surrounding the university.

The fourth day's presentations and discussions highlighted Ivan Franko National University of Lviv's dedication to integrating academic innovation with industry collaboration and cultural stewardship, adding valuable perspectives to our study visit experience.



Fifth day

The concluding day of the virtual study visit to Ivan Franko National University of Lviv, held on April 26, 2024, focused on evaluating project achievements, identifying

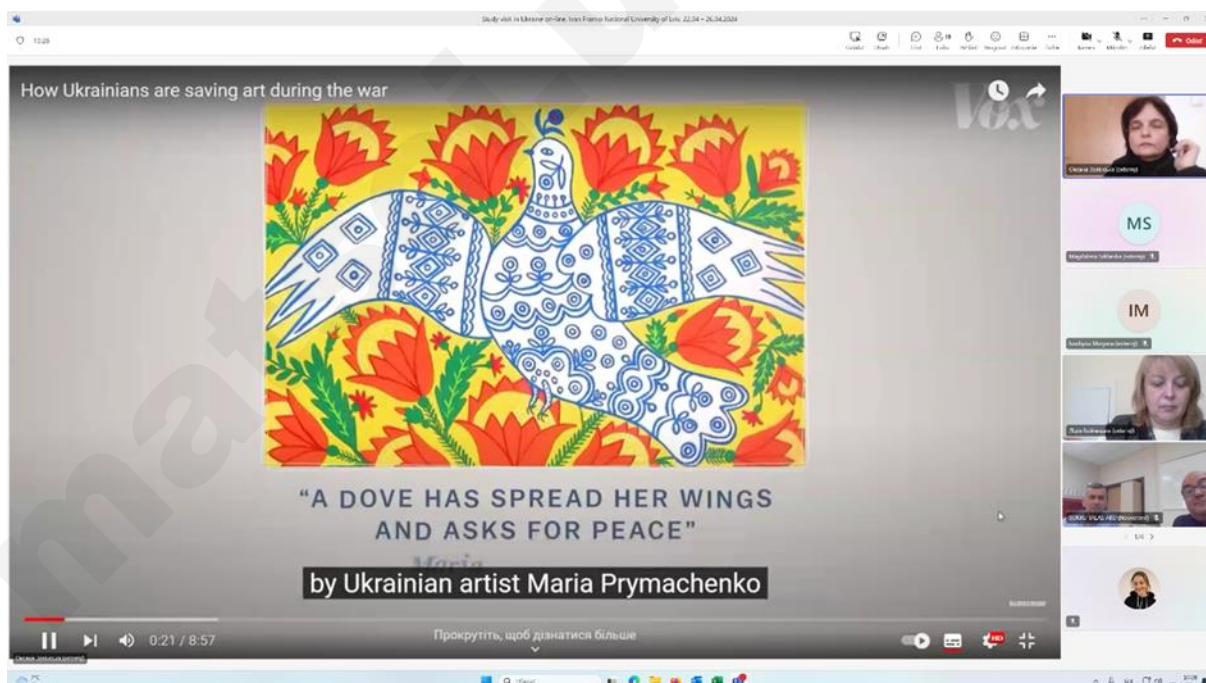
challenges, and setting a strategic course for the project's future phases. Conducted via Microsoft Teams, this session provided participants with a comprehensive analysis of the outcomes of the "Materials Science Ma(s)ters – developing a new master's degree" project, funded in part by the European Union.

The day commenced with an in-depth review of the project's progress, highlighting notable achievements across several key areas. Participants reflected on curriculum advancements, research initiatives, and student engagement strategies developed during the project. These discussions allowed for a celebration of the project's milestones and successful implementations, underscoring the collaborative efforts that made these achievements possible.

Following a brief intermission, the focus shifted to identifying and addressing challenges encountered over the course of the project. Participants openly discussed obstacles and shared insights gained from these experiences. This exchange of perspectives was essential in identifying areas for improvement and in devising practical strategies to overcome similar challenges moving forward.

The final session involved a summary of best practices observed during the project and the development of recommendations for optimizing future teaching programs. Participants compiled these insights into actionable recommendations aimed at enhancing curriculum design, incorporating innovative teaching methods, and reinforcing student-centered approaches. This dialogue laid the groundwork for continued collaboration, as participants set objectives for the next project phase and outlined potential agendas for future meetings.

In concluding the virtual study visit, participants left with a reinforced understanding of the project's impact, along with a renewed commitment to advancing its goals. The insights gained during these sessions informed the project's ongoing development, guiding its growth and success in the future.



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