Virtual Student Interaction

Concepts for the Integration of Internationalization at Home Into Project-Based Courses

[Project StudyATHome Internationally]

City of Vienna | Economic Affairs, Labour and Statistics

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Abstract

Digital competences of employees are essential for the modern workplace. In addition, the ability for virtual collaboration in teams with intercultural background is highly demanded by employers all over the globe. In order for that, Higher Education Institutions (HEIs) offer their students the ability to study abroad to gain intercultural competences. *Higher Education Institutions* (HEIs) offer their students visits to other universities with physical exchange programmes to gain such competencies.

In recent years, a rising number of HEIs have embedded virtual exchange modules in their courses, enabling students to collaborate internationally and work together on projects with students from other universities, even when not able to leave their home countries for longer periods. However, when embedding virtual, collaborative modules between two or more courses of different HEIs, lecturers face different incompatibilities and obstacles, often preventing collaboration in the first place.

This work presents two concepts for virtual exchange (peer consulting, expert consulting) and describes how lecturers can embed collaborative modules with students from partner universities in their courses, avoiding or at least limiting mentioned incompatibilities and obstacles, with lessened coupling and interdependencies within the students' projects.

The concluding section provides experience reports of practical applications of these two concepts and will be continually updated.

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State of the Art

Students need the exposition to practical problems and experiences encountered within international or multinational and geographically dispersed corporations, where teams are primarily working on open-ended and team-based problems and more and more likely to communicate with each other and with managers solely via electronic means (e.g. e-mail, videoconferencing, e-file sharing, etc.) [1, p. 86].

Although students can apply to physical exchange and visit other HEIs (*Higher Education Institutions*), for instance via the Erasmus+ programme, to gain required communicative competencies and acquire first practical experience before embarking on their professional careers, many students choose not to, for a variety of reasons. A survey conducted during the winter semester of 2016/17 within the bachelor and master programmes of the Department Electronic Engineering of the UAS Technikum Wien (UAS TW, Vienna) revealed strong interest of students in studying abroad to gain such competencies (cf. Figure 1). However, none of the students of these programmes applied for a physical exchange programme.

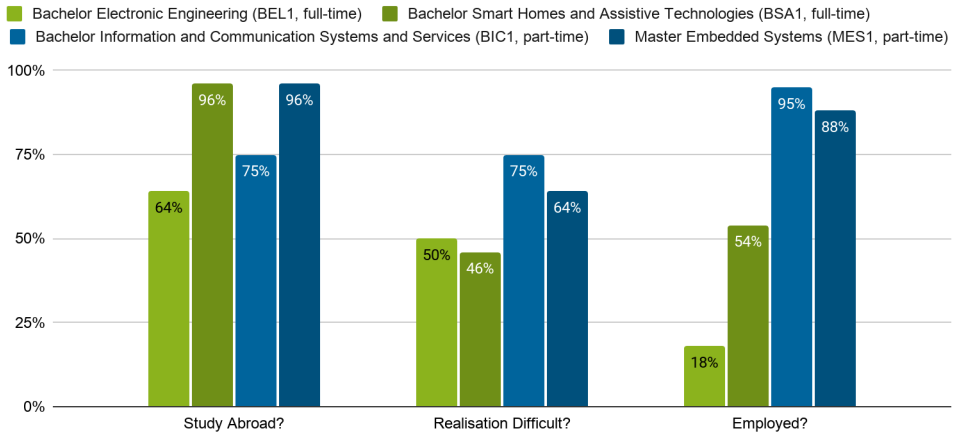

Figure 1: Results of a survey on the interest and difficulty of exchange programmes at the UAS Technikum Wien (green - full-time, blue - part-time)

The students showed a high interest in applying to international exchange programmes (64-96%) but stated that traveling abroad was not feasible or possible at all (46-75%). The survey also showed additional barriers for students of part-time degree programmes (BIC1) and master degree programmes (MES1) because of employment (18-95%), making it more difficult or impossible for those students to travel to other countries for longer periods.

As an alternative to international exchange programmes, many HEIs offer students the opportunity to attend virtual exchange based projects with students of other HEIs to gain experience in international communication, cooperation and awareness [5, p. 6808f].

Collaborative Online International Learning

In recent years, many HEIs have embedded ‘virtual mobility’ experiences into their formal curriculum, often referred to as COIL (*Collaborative Online International Learning*). The Coventry University in the UK, for instance, offers students to interact with peers at international universities and professionals, so they can develop intercultural competences and digital skills while working together on subject-specific learning tasks or activities [2].

COIL is a term originally used by the COIL Center of the State University of New York (SUNY). The university engages in connecting faculties, students and classes at HEIs on an international level to enable discussions, exploration and collaborative project work. They have been promoting and professionalizing the practice of Collaborative Online International Learning and Virtual Exchange for more than 15 years. The use of the registered COIL service mark is permitted by adhering to certain conditions, mainly following the COIL pedagogical approach and course design guides [6].

According to these guidelines, COIL modules can be created for any discipline, including interdisciplinary collaboration and encourage active student learning and teamwork. The modules should include an emphasis on cross-cultural interactions and understanding and participants may use any technology tools that serve the purpose of achieving the learning goals. Additionally, the activities should be part of the grading and last for about 5-15 weeks.

Effective COIL collaboration progresses through four specific phases (cf. Figure 2). After starting with a team building phase that includes introductions and icebreakers, to get to know and feel comfortable working with one another online, students are required to engage in comparative discussions and in organizing the projects and teams of peers that will be working on them in a second phase. The third phase is focused on the main activity and collaboration. The fourth and last phase involves the presentation of the project, including reflection on both, the content of the module and the intercultural aspect of the collaboration.

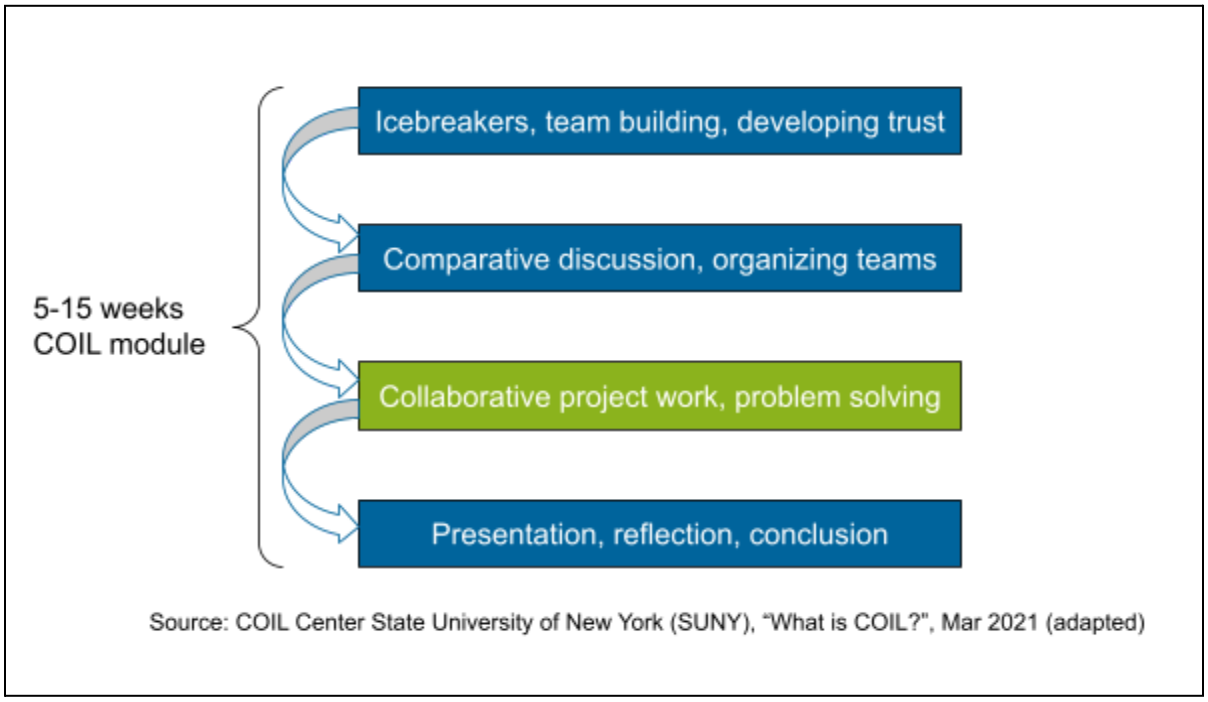

Figure 2: Progression of a COIL module

COIL modules do not only enable students to collaborate, but lecturers and professors alike. In fact, collaboration between lecturers stands at the beginning of the design of a COIL module. Teachers need to collaborate when defining the students' learning goals, determining the length of the interactions, designing comparative and collaborative activities, selecting methodology and technology tools and monitoring and evaluating the student work and learning.

Although not prescribing a rigid model for course design, COIL modules require a considerable amount of effort for both lecturers and students alike and, in practice, several, mainly administrative, hurdles need to be surpassed, before collaboration between two courses is possible. Especially, when focusing on project-based interaction between students, finding a suitable combination of courses to collaborate is rather a tedious endeavor. The international collaboration of both courses has to be supported, funded by, and aligned with the current goals of the program directors and management at both partner HEIs, at the same time.

For instance, when embedding virtual project-based collaboration between two courses of two HEIs, lecturers need to find a sensible combination of two courses where different expertise of the students can be joined to implement a coherent project idea. Although finding two suitable courses is difficult enough on its own, the two courses need to comply with certain requirements in addition, without which the collaboration would simply be not possible.

Challenges and Obstacles

Most importantly, the two courses need to take place at the same time. Issues arise not only by connecting two courses between distant time zones. If one finds a suitable combination, but one course is held during winter semester and the other during summer semester, there is no possible way two combine those courses and allow students to work together on a project. Especially with project-based courses, it is quite common that project related work takes place at certain time slots within a course during the semester. Most often at the end of a course. Typically, a project phase follows an initial theoretical part, where students gain or deepen required knowledge and skills, enabling them to complete their tasks. As a result, collaboration is oftentimes impeded by varying time frames between both courses, requiring both lecturers to adapt and align their schedules. Unfortunately, changing schedules is oftentimes difficult or not possible at all.

Another incompatibility typically arises from differing credits received by the students for completing the course or project. The credits the students are required to accumulate stand typically firm and are often deeply embedded within the overall study program. Lecturers need to balance differing credits and eventually assign students' tasks to match the credits they are required to earn during their study program. However, severe discrepancies in earned credits are likely to make collaboration between both courses impossible.

Designing and monitoring collaborative online courses adequately requires a considerable amount of time and effort by both lecturers. It is not always a given that internationalization of programs is a priority within program direction or management or it may be already provided through other means or projects. Occasionally, courses are subject to ongoing change processes within the study program or the study program itself, where time-consuming efforts and prolonged collaboration may be halted or deferred for a specific period. Thus, getting additional funding for the design of COIL modules may not be always within reach for one or both parties involved.

Considerable effort must not only be dedicated by the lectures, but by students alike. Lecturers need to design collaborative tasks and projects which can only be solved by the students when working together. Interdependencies between all parties are essential in enhancing cultural exchange and can be intensified with awarding the outcome with the same grade [3, 4]. Yet, a lot of attention must be paid to the progress of the projects and the involvement of all parties in the collaborative project efforts. In practice, students may get frustrated if collaboration is impeded by their counterparts. They may feel treated unjustly if their team members are not committed just as they are, fail to provide their part on time, as agreed upon or at all. They may just likely completely go into hiding or drop out of the course or study program. Those situations may be especially burdensome and some students may feel helpless. Addressing conflicts is more difficult in virtual space than in real life and students are likely to struggle resolving those

issues online. Assessing the involvement of students is frequently only possible at later project phases and more difficult to resolve with progressing time.

Heterogeneity is not only required in terms of commitment and effort by all students, but also in terms of education and training. Students are expected to help and learn from one another, requiring similar levels of academic education, which would enable them to support each other. However, it is difficult if not impossible to establish the same standards with different universities around the world. Lecturers need to pay careful attention in matching differing levels of standards between universities and between bachelor and master programs, in general. Even within a bachelor program, for instance, more advanced semesters cannot be matched with earlier semesters, easily. Successful collaboration and cooperation is only possible if the students can benefit and learn from each other. Yet, a good match in one year, does not guarantee another one in the following years.

All of the mentioned intricacies result in notable effort and problems for the students. Sensible and reasonable collaboration requires and will only become fully effective with longer project durations. At the same time, the design and monitoring of the COIL modules requires a considerable amount of time and effort by the lectures too. Consequently, COIL-based collaboration is only possible with longer project-based courses, where students have a similar level of education and where the courses are held at the same time during a semester. The intensive effort invested by the lecturers during course design will only be justified by longer lasting collaboration between those courses. Integrating virtual collaboration and interaction between two courses of different HEIs to the required extent is often not possible due to the amount of effort and commitment required from all parties involved.

Concept

Peer and *expert consulting* are developed to enable experiences and virtual collaboration similar to COIL modules, but with lesser or leaner interdependence between student projects and schedules of courses between two or more HEIs.

These concepts enable virtual interaction between courses of different HEIs, where COIL modules between courses cannot be established. The goal of these concepts is to promote virtual interaction of students, by integrating tasks into regular courses, designed to develop and foster skills required for virtual communication in today's working environment (cf. Figure 3).

Objectives

During a course, students are required to consult each other mutually in solving their individual tasks and project goals. The students can work independently on their project implementation, a coupling of the courses is only necessary for the consulting and review element. The virtual interaction of students enables them to practice their writing and speaking skills in English. At

the same time, collaborating students have to take on two different roles. While students are receiving consultancy by their peers or experts, they are in the role of the expert and have to impart knowledge to others too. Successful collaboration and communication in an international environment is only possible, if students find a way to solve all upcoming problems. To this end, both students can gain valuable insights when experiencing consultancy from both sides and need to understand cultural dynamics and differences, enabling them to communicate and overcome barriers effectively.

By participating in virtual exchange, based on peer or expert consulting, students are expected to gain the necessary experience and competencies in using and working with digital means of communication, as they are required to use available tools effectively and as required for the task at hand. Students need to choose between different tools that are better suited to complete a given task and depending on the expected outcome, such as finding appointments, monitoring project progress or exchanging ideas and resources. Successful collaboration calls for both phases of divergence, where students work and prepare their tasks individually, and phases of convergence, where students meet up to discuss and exchange ideas and insights to develop a shared understanding of the project and arising problems. The students have to learn how to communicate clearly and effectively in an intercultural and international environment to solve their tasks appropriately.

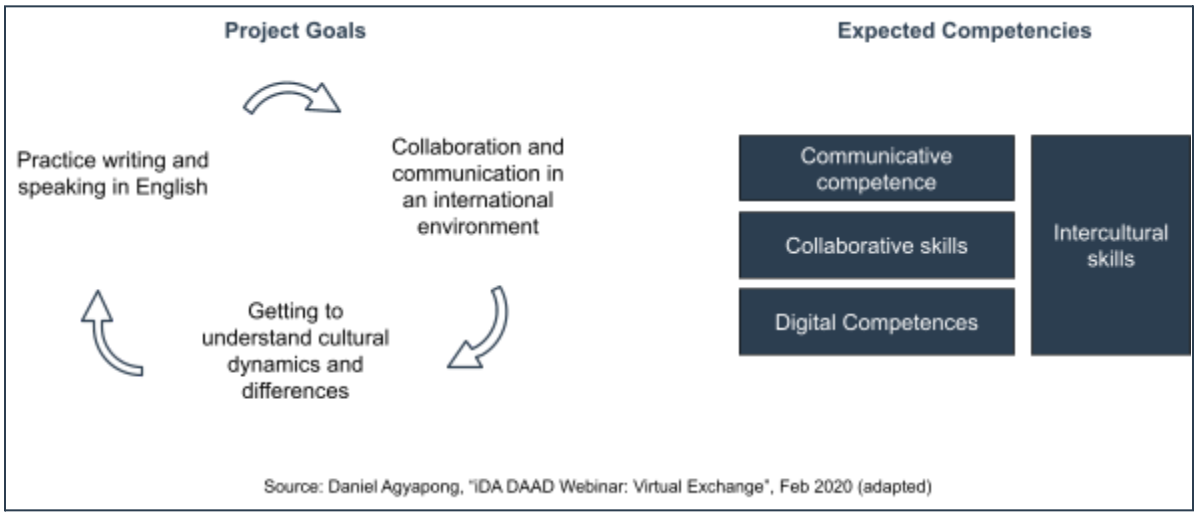

Figure 3: Virtual Interaction - Goals and Competencies

Peer and expert consulting can be integrated more easily in available curricula and may serve as a pre-qualification for students who are interested in exchange, be it virtual or physical. Students can take part in virtual interaction to gather first experience on studying at other HEIs, helping them to decide on future applications to exchange programs at those universities. Additionally, study programs could require students to take part in virtual exchange, thereby avoiding or at least limiting issues and problems arising with project-based collaboration for longer periods, just as those mentioned when embedding COIL modules in courses.

Peer Consulting

Peer consulting is the term used for project-based virtual collaboration, where students have to team up in groups, composed of two students each (cf. Figure 4). Each student has to present their project ideas and expected outcome, but also to consult the other and contribute their own expertise in a field unknown to their peers.

Figure 4: Peer Consulting

The collaboration starts with a mutual introductory presentation. Both students have to introduce themselves and present their project idea to their peers. Additionally, both students need to prepare a presentation individually, where they provide an overview and a first introduction to a subject they have expertise in. Before cooperative and collaborative consultation is possible, the students need to agree on how to reach out to each other, what tools to use, their expectations and the general time frame of both projects and courses.

The mutual introductions are a prerequisite for independent work by both students. Each one has to work independently on their tasks to realize their project, but may contact their peers when facing serious problems or issues preventing progress for a longer period. During the consultancy phase, students have to develop a sense of responsibility and find ways to help each other and understand the problems of their peers. At the same time, they may have problems on their own with the newly acquired skills, requiring them to ask their peers for help and expertise.

In the final phase, the students have to prepare a second presentation after completing their projects and reflect on their experiences during collaboration and consultancy with their peers.

The lecturers designing the peer consulting modules for their courses need to identify a practical combination of two (or more) disciplines which has the potential to be applied in or solve real-world problems. As an example, a promising combination could consist of a course covering assistive technologies and another one that deals with AI (*artificial intelligence*). The students of one university could use methods and algorithms utilizing AI with the help of their peers to solve issues or enhance existing approaches for people using assistive technologies. The students of the other university could be introduced by their peers to the needs and everyday problems faced by people with disabilities or limitations of current solutions, enabling them to explore and solve problems in another domain with their expertise.

Expert Consulting

Expert consulting is the term used for project-based virtual collaboration, where a professional or a lecturer from another HEI provides expertise and consultancy to students instead of peers or other students (cf. Figure 5). Expert consulting was developed as an alternative to peer consulting, where it is not possible for whatever reason. Such as differing course schedules, interesting combinations of different academic fields, or to offer additional measures for internationalization in study programs.

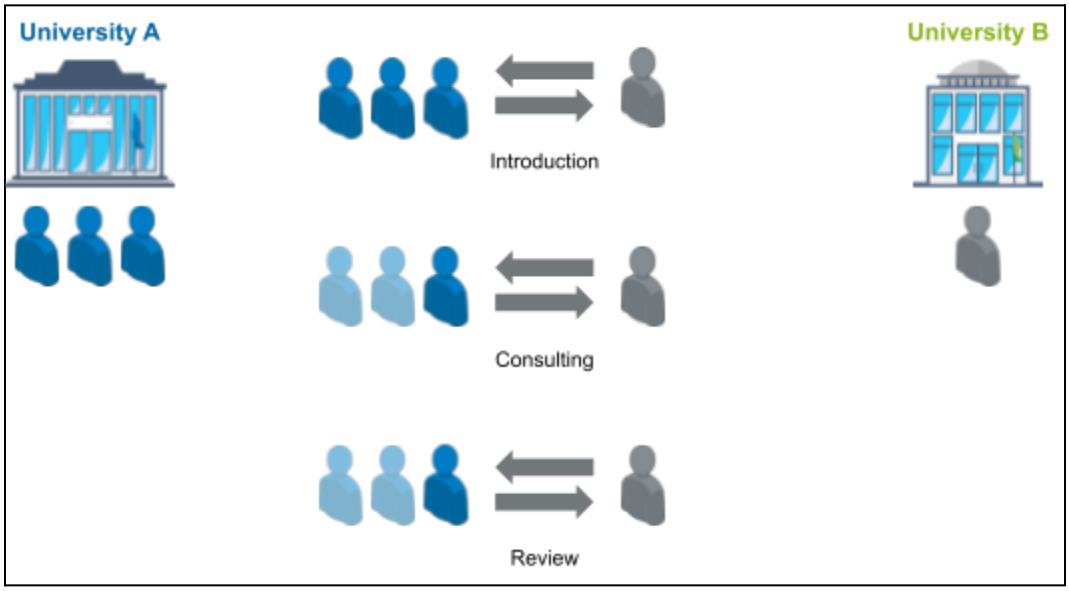

Figure 5: Expert Consulting

The initial phase starts with the expert providing an overview and introduction in a new topic to students. The expert has to prepare a brief primer for the students, enabling them to learn, expand their knowledge in topics related or applicable to the contents of the course at their home university and to work on their tasks, independently. Afterwards, students need to prepare

a presentation on their individual project ideas and show and discuss potential intersections with the new field of expertise.

The introduction is followed by a consultancy phase where students and experts meet together, individually or in groups. Students can utilize those meetings to share current problems and issues and reflect together with the expert on the current progression of the design and discuss their ideas and thoughts.

At the end of the expert consulting, students have to prepare a presentation and show the outcomes of their project to the expert, with a focus on the new subject introduced initially. The experts review the students' work and their assignments and provide their feedback and recommendation to the lecturer at the home university.

Lecturers need to find two (or more) diverse fields of expertise, where a sensible combination is valuable and potentially applicable to real-world problems. For instance, a combination of building automation and IoT (*Internet of Things*) security could enable students to understand general methods and best practices related to security for their projects in fields of building automation or smart homes. Conversely, the students could apply their security knowledge and know-how to a practical application example in building automation, depending on the area of specialization of the expert or lecturer from the partner university.

Discussion & Conclusion

The presented concepts aim not only to reduce problems and incompatibilities encountered with collaboration between courses of partner universities based on COIL and similar approaches, but to enable them in the first place.

The consulting sessions between individual students or with experts and the entire group, allow for less interdependencies between the students projects. Collaboration is less likely to be hindered by differing schedules of both universities. The students can, moreover, agree and ask for consultancy as required by their given schedules and continue working on their project individually, without being over-depending on the support of the other.

With less interdependencies between the projects, students can work separately on their tasks. Their motivation, involvement and availability will impact only the outcome of their own project and grade and not interfere with others in serious ways. Differing credits received by the students for their individual projects will play a less significant role.

However, additional efforts required from both lecturers when embedding and monitoring peer and expert consulting modules in their courses, still need funding and support by the study program, faculty and university management. Differing standards and levels of education between the students are still going to play an important role. In unbalanced groups, one

student will receive excessive advantages, while the other won't benefit from the consultancy by their peers at all.

Obviously, open collaboration, as introduced by peer and expert consulting, comes at the expense of the more profound collaborative and cooperative experience and skills gained by students during longer lasting projects with strong interdependencies.

Testimonials

The concluding section provides testimonials of peer and expert consulting modules embedded in lectures in course of the StudyATHome Internationally project and will be updated regularly.

Web App Security

With the collaboration of the partner university *Czech Technical University Prague*, a virtual guest lecture was given during the winter semester 2020, on the subject of "Web Application Security" by Eng. Deniz Özdemir, MSc. (OSCP[1] , GPEN[2]). The expert consulting module was integrated in the course Full Stack Web Development of *UAS Technikum Wien* (cf. Figure 6).

Expert Consulting

Eight students gained insight into research and an overview in the fields of security in web development and they had the opportunity to become familiar with the OWASP[3] Top 10.

IT security terminology as well as the foundations of a layered security and defense-in-depth techniques were introduced to enable students not only to brainstorm on their technical and analytical perspectives as modern application developers, but also expand their innovative thinking further to creatively discover the mindset of protecting against the ever-growing application vulnerabilities of the Internet, in a responsible and ethical fashion. Furthermore, the students learned how to use the OWASP WebGoat[4] platform to get an interactive introduction of the 10 most common security threats employing exemplary practise applications.

[1] Offensive Security Certified Professional
[2] GIAC Penetration Tester
[3] Open Web Application Security Project
[4] https://owasp.org/www-project-webgoat/

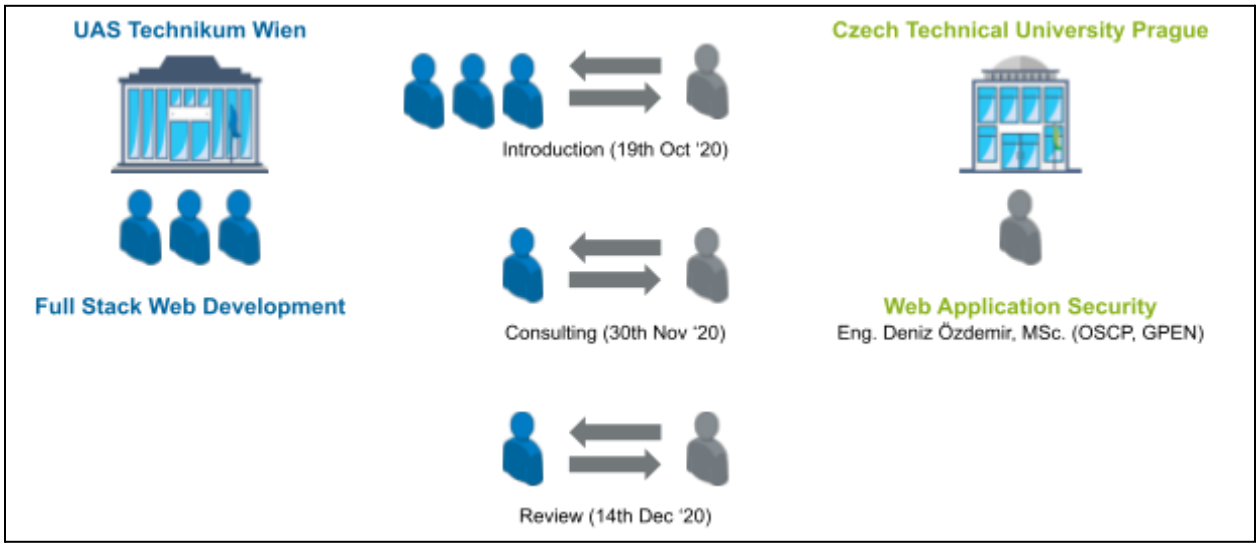

Figure 6: Expert Consulting on Web Application Security

The students had to present their project ideas in a first virtual meeting and had to derive, report and discuss possible security attacks for their web application, based on the most common threats. This enabled the students to gain digital competencies in a practice-oriented setting and gave an opportunity to foster collaboration and communication skills in an international, English-speaking environment.

Results & Lessons Learned

A follow-up survey of the students showed a high contentment with the tasks carried out and expressed a heightened interest in further content from the fields of web security. Additionally, the students were informed about new opportunities to indulge into learning and improving their knowledge on the cyber security concepts even further e.g. through participation in some well selected citizen science projects. One of such projects is CSI-COP 7 supported by Horizon2020.

Voluntary participation in this project during their free time would help them to expand their knowledge about web cookies, dangers they can cause, learn how to escape them and participate in the design of preventive measures. Hence, the participating students will be able to indulge into learning and improving their knowledge on the cyber security concepts even further.

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