COLIBRI MODULE O16: Teacher Guidelines (Year 3)

This material is developed as a part of the Erasmus+ Strategic Partnership Colibri: Collaboration and Innovation for Better, Personalized and IT-Supported Teaching.

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You can learn more about the Colibri project on www.erasmus-colibri.eu, and also find additional teaching materials, guidelines and reports.
Preface
During 2014 - 2017 the project COLIBRI (Collaboration and Innovation for Better, Personalised and IT-Supported Teaching) was carried out between seven European Universities, two companies, and a national documentation center. The aim was to develop and try out new and innovative teaching methods. You can read more about the project at www.erasmus-colibri.eu.

In this short document we summarize our recommendations, in a way that is meant to be useful for university teachers at all levels: We cover modules given in a blended (virtual/physical) setting as well as project work based on real-world problems. In our case everything was tried out in an international and multidisciplinary setting, but the results can also be used in more traditional university settings.

All results and materials we have developed can be accessed from the project website, and you are welcome to reuse or adapt any of the materials we have made. There you can also find our final experience report.

The project is supported by Erasmus+ as Strategic Partnership

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Overview of the course
The course was carried out once per year for three years, and for each year improved and adjusted to previous experiences. The structure was the same each year, with minor adjustments. The figure below gives an overview of the course during the last year. Each year the course was taken by around four students from each of the seven universities in the consortium.

The virtual kick-off meeting in February marks the formal start of the project. Students and teachers “meet” each other for the first time, everyone is introduced to both the COLIBRI project and the course, and some virtual team building is organised for the students (e.g. taking a quiz together with students from other universities).

This is followed by a period of module work, where the students have selected modules to work on. 10 different modules are offered, and each can be taken at introductory, basic or advanced level. The modules are mainly taken online and mainly individual, but we also implemented learning activities with interaction such as peer tasks and discussion fora.

At the end of the module work, a 5-day midway seminar is organised with participation from all students as well as teachers/supervisors. The purpose of this seminar is to finalize the modules and introduce all students to the project work.

The midway seminar roughly consists of the three following elements:
1. team building/group work introduction
2. finishing of course modules
3. introduction to the projects
Finishing the modules: It is recommended to run this session in a conference-like fashion, where each student presents work from an advanced module of his/her choice. To ensure more freedom you could also organize one session per module. This would make it possible for even more students to follow their favorite discussions. Moreover, parallel sessions encourage active sessions with discussions (suggested if there are more than 15 students at a time).

The project work starts at the midway seminar, runs through a virtual period, and is finalized during the project seminar where also the examinations take place (three months after the midway seminar). The projects (and student backgrounds) cover social, business and technical aspects of Future Internet Opportunities. The physical activities should ideally:

- Activate the students and ensure interaction both among students and between students and teachers.
- Train the students problem-solving skills, in a way where they need to apply their knowledge gained.

Course organisation

As for learning platforms, we used Moodle as the core platform. Every year we changed the structure and added plugins based on experiences from the previous years and so improved the learning experiences of the students. The first two years we used Facebook for general communication. During the last year we introduced a platform called Humhub for communication during the seminars and for tasks in the advanced modules. When working in groups online, students made use of a variety of different collaboration tools, as well as materials we made available to them.

In the following we will present guidelines and recommendations based on our experiences. We have tried to keep it short, but the project website contains additional information and links to publications focusing on specific aspects.

While our module materials have been used mainly in an online setting, we believe the same type of materials can be also used in a variety of ways in many different course settings: Integrated in lectures, integrated in problem solving sessions, as preparation to classical lectures and much more.

Some general recommendations when making course modules available fully or partly online:

- It must be very clear for the students what they are supposed to do. This is challenging especially when not all students are expected to do do the same at the same time (in different modules).
- It should be clearly defined when a task is done. If a course is divided into multiple blocks or modules, it should be clear when each block/module is done.
We also recommend to have a clear and explicitly described line between learning objectives, learning activities, and criteria for finalizing/passing. This becomes even more important when there is no scheduled interaction between teachers and students.

**Individualized learning paths**

An advantage of virtual learning platforms is that content can be adjusted to the need of learners. In our case this was particularly useful because:

- Students come from seven different universities and even more different study directions. So their backgrounds and starting points were different.
- All students were following different modules, and expected to play different roles in their groups. So their learning objectives were also different.

The COLIBRI model was that students took all 10 modules at introductory level and then make a pre-module test before starting the chosen modules at the basic level. Depending on the results, different pre-study materials were provided.

**Recommendations:**

- It is important to be very precise in formulating pre-course tests, and it is recommended to ask very specific questions. Vague formulations such as “knowledge about SDN” is too general to assess students’ knowledge.
- If students come with VERY different backgrounds, pre-course tests can potentially lead to many different learning paths. It is important to consider whether it is manageable to create and maintain these. It is a lot of work to create unique learning paths for all unique answers to an elaborate test.
- Our students suggested a pragmatic approach: Make all videos available in a way so you can browse through the slides, and only follow the parts you need. Based on our experiences, this is a good idea that does not require too much additional work.
- It can be considered to also provide personalization in terms of learning styles, so students are offered different media (e.g. video or text) depending on preferences. However, this requires that both elements are implemented so there are parallel elements in each course. Unless this is explicitly supported by the Learning Management Systems this makes the experience much more complex for the students, and also requires much additional efforts from the teachers.
- Our learning platform (Moodle) did not support personalization at course level. So when each student (in principle) has to do different activities, there is no automatic way of presenting this to him/her. While it might be possible for a student to keep track of this for one course, it quickly becomes difficult to maintain an overview when he/she follows multiple courses/modules. We recommend to think about this in the course organisation and setup: Making it possible for students to subscribe only to relevant parts.
- This is rather an observation than a recommendation: When learning activities are assigned a specific number of ECTS or credit points, this often implicitly assumes that all students come with similar backgrounds. When students come with different backgrounds (e.g. business students and engineering students), and need to complete different tasks (e.g. pre-study material) they will be spending very different
amounts of time in order to achieve the same learning objectives. It is recommended to keep this in mind when designing such learning activities.

**Completion tracking**
Moodle and other LMS systems offer different ways for students and teachers to track progression of students, for example by allowing students to mark activities as completed, or to do marking automatically based on e.g. if materials have been accessed, quizzes finished etc. Moreover, this can be used for controlling access to other learning activities. For example, it might be a requirement to finish a quiz with satisfactory results before moving on to the next.

Generally, completion tracking is recommended as it helps students to maintain an overview of which tasks have been finished, and which need completion. There is a number of factors to be aware of, though:

- Be careful of when to use automatic and manual marking of activities. If e.g. reading material is marked as completed as soon as it is accessed, this may not be very helpful for the student who needs to know what tasks are left to do.
- When using manual marking (and in some cases also automatic) be aware that students can easily trigger these: The marks do not say anything about what the student has actually done.
- Be careful in selecting completion criteria for automatic marking, e.g. for quizzes: A tough criteria for completion might make the student behave differently than if it is used solely for students’ self-assessment.
- Be aware that activities requiring interaction from teachers or other students might not be marked as completed before appropriate action is taken from the teachers. This is particularly important to note when implementing access control.

**Access control**
Access control can be used to ensure that students follow a desired path (e.g. that certain activities are completed before new activities are commenced). This in turn can help the teacher to get an overview of the progression in class (since everyone reaching a certain milestone has also reached all previous milestones). However, some advices are important to keep in mind when it is implemented:

- Some students prefer to check out all materials in the beginning of a course - either because it gives them an overview of what to do, or because they need to download the materials for offline access. Restricting access to content can make this impossible.
- Students might be stuck in one activity, needing advice from a teacher before completing it. This situation can prevent the student from progressing further before contacting the teacher.
- Double check access conditions in order to avoid unintentionally blocking students from being able to continue their course!

**Alignment of expectations**
When teaching something that mainly takes place online (such as the Modules in Colibri), we found it very important to be explicit about learning objectives, and to explain how the
learning activities support these objectives. In our experience this alignment of expectations often happens through discussions in the classroom, which are hard to do online.

A number of recommendations to further align the expectations:

- Provide a systematic overview of the learning objectives of the course, and state how these are evaluated and how the exam is conducted.
- Provide a systematic breakdown of how much time the student is expected to spend on the different activities (even if this will always be with individual differences).
- For each learning activity, be explicit about which learning objectives it supports.
- For videos and quizzes (as described below) it is recommended to break down the learning objectives into smaller parts that each fit a video. Then first design the quizzes for that video (to reflect the learning objectives), and afterwards design and record the video (so it fits with both quizzes and learning objectives).

Teaching methods used: Modules

Videos and quizzes
For the online part, especially a combination of short videos and interactive quizzes works well: it engages and activates the student, it provides immediate feedback (the student can go back and study again if necessary) and it allows for collection of data analytics that can be very valuable for the teacher as a channel of feedback to learn i.e. what was particularly difficult for the students. When used as part of an online learning activity it has the advantage that no synchronisation between student activities is required, so students can study according to their own schedules.

- Videos should be short, ideally 5 - 10 minutes each.
- Using quizzes integrated through the Learning Management System (e.g. Moodle) offers the advantage that the results of each student can be tracked. However, it is recommendable to differentiate between quizzes each student takes to test his/her own understanding, and quizzes that come with a purpose of testing/grading.
- Depending on the form and content of the lectures, it is also possible to use plugins that directly integrate quizzes into the videos, e.g. supported by the H5P tool. While the integration is nice, the flipside is that there are fewer quiz options and less possibilities to collect data for learning analytics.
- It is important to be aware that the closer the content is integrated with the platform, the harder it is to move content to other platforms (e.g. quiz types and formats might not be supported), but it can also be harder to provide public access to materials. That being said, moving content between different Moodle based systems works smoothly.
- Youtube can be a very good source for publishing the videos, as it helps to increase accessibility for students using different hardware and operating systems. Moreover, if videos are made publicly available it increases visibility. Be aware when uploading the videos, that there are different licenses (e.g. Creative Commons, which allows others to reuse materials).
Visibility in Youtube can be increased by using good titles and keywords: Having many views has a self-perpetuating effect. Also be aware that if a video is replaced, it is essential to create a new video, so reputation, comments and views have to build up from scratch.

- It is important to remember not to let format dictate content: Especially multiple choice quizzes are not suitable for all fields and topics.
- It is our experience that if it is desired to use the same videos in multiple different courses, it requires a very careful design to ensure modularity and avoid interdependencies between different videos.

While in some cases it is recommended to make high quality videos that can be used for a long period of time and in multiple contexts, there are also cases where expensive productions are not needed: Short 3-6 minutes videos can be taken by an iPad, iPhone or similar, retaken as often as needed, and easily adjusted by lecturer on their computer. The videos will probably have a short life before a need to adjust occur. The most important things are that 1. sound must be good (additional microphone preferred), 2. focus on figures, blackboard etc must be clear, and 3. light sources must be correctly placed so important face, figures etc do not get too dark or bright.

**Literature studies**

Literature studies are an important part of most academic studies, and often students are required to read books or scientific papers as part of their preparation for a lecture.

- When included as part of an online course it should be clearly described how the literature fits into the learning objectives of the course.
- Moreover, consider how the literature can be integrated into other study activities such as quizzes, assignments or peer learning exercises.

**Peer learning activities**

Peer learning activities can take multiple forms: For example students can be asked to solve a problem together, or each student can solve individual exercises and review the work of each other. During Colibri we experimented with both forms, and based on our experiences we give the following recommendations:

**Collaborative exercises:**

- When asking students who do not know each other well to collaborate online, it is important to give very precise instructions, so no one is in doubt about exactly what they should do (for example: telling that the students should form groups on their own is a no-go).
- Consider what happens if one student in a group does not participate, or is difficult to get hold on. Consider setting up milestones in addition to a final deadline, to identify problems early. Otherwise a single student can delay a whole group who is hesitant to proceed without having everyone involved.

**Peer learning exercises:**
- Make sure that both the assignment and the procedure for peer review (e.g. assessment criteria and grading scales) are well defined. It is also important that both are well motivational and fit with the learning objectives.
- Be aware that not all (if any) students are used to this way of working, and may be reluctant to give critical comments and grades to other students - especially in a setting where they do not know neither teachers nor the other students.
- If integrated in the Learning Management System, make sure that everything is setup correctly.
- Have a plan for what happens if some students do not submit on time: One way to handle this is to let students submitting late review the work of other students who submit late, but it takes time to handle these cases manually.

Teaching methods used: Projects

The project work in COLIBRI was based on real-world cases from companies. They were distributed to the students during the midway seminar, and the students worked in groups of around 4 students from different institutions and with different backgrounds. The project work was concluded at the final project seminar, where also exams were held. Each group had to submit a presentation (e.g. in powerpoint format) and a short learning report before the examination, which consisted of an oral presentation and discussion of the project work and results. The assessment was individual and based on pass/fail.

The project work was what received the most positive comments from students throughout the three years: They especially appreciated the opportunity to work on real problems in an international and multidisciplinary setting. It is also an important extra motivation for them to know that their results will be made available to the company.

The guideline is split into two segments, referring to different steps in the process from project proposal development to the final projects. Seminars and examinations are covered in the section below giving guidelines for seminars.

Defining the case studies and problems.
- Ideally the case studies should be real-life problems provided by companies, chosen and described so it fits the overall learning objectives of the course.
- It is important to be aware of the trade-off between problems being real, and the fit to the learning objectives of the course (and potentially to supportive learning activities such as course modules).
- The case study should be developed jointly by company representatives and teachers - the teachers know a lot about the taught content and learning objectives, whereas the company representative is aware of companies´ problems and challenges.
- The case study has to be of an adequate scope - depending on the length of the course it has to have sufficient tasks to solve for three to four students. Depending on the background of the student the difficulty of tasks can vary. If it is not clear whether the students have enough background knowledge it is essential to provide it to them.
• The tasks should not be too flat/boring and not something that could easily be googled, but students are supposed to apply their knowledge from the taught modules.
• It is important to emphasize the aim of the case study (what should be solved/investigated) and what is sought.
• The problem based approach implies that the students need to analyse the problem, and choose relevant tools and methods depending on what is required to find a solution. This makes it more open, and sometimes more challenging to supervise, as the steps to be taken are not known on beforehand but decided based on the problem. Supervisors should be prepared for this.
• When multiple supervisors are involved, their roles and positions have to be coordinated between them. On one hand, different opinions and perspectives can challenge the students, on the other hand it can also make it hard for them to develop a joint understanding of the tasks and move forward.

**Group formation and project distribution**

• It is important to consider how groups are formed. In a case like ours where students don’t know each other, and where the time they spent together is so short, you should form the groups on beforehand. We created the groups to be diverse in terms of academic backgrounds, geography and gender.
• It is also important to consider when groups are formed. It is highly recommendable to form the groups early. It makes it easier to collaborate, choose the right modules, and “get to know each other” before starting the project work.
• It is important to consider also how projects are distributed. Questions that need to be considered are: do the students choose themselves by creating a prioritized list? Or are they assigned, and based on which criteria? There are pros and cons, so our main advice is to carefully choose the right approach for a given scenario. We opted for distributing the projects (either randomly, or based on fit between module choices and project requirements). Giving the students a choice can create more enthusiasm and ownership, but also an increased risk of conflicts in the groups (if they don’t agree), or disappointed students if they don’t get to work with their first priorities. It is also worth considering if multiple groups can work on the same project, and if all projects need to be chosen.

**Virtual collaboration**

• Even if students are free to choose their own collaboration tools, suitable tools for project management, time planning, document sharing, and virtual meetings should be introduced.
• Working together virtually is a challenge, especially in a setting where the students don’t know each other well on beforehand, and where not all students are familiar with working on problems that are quite open. Therefore, the supervisors should be aware of their roles and consider to be more proactive in their supervision approach than in other circumstances.
• When students from different institutions (and programs) work together, it is important to be aware of their other commitments, and to help the students plan their work taking this into account.
• Be more-than-usually aware of the students progression. It can happen that “everyone is waiting for everyone”, so just one single student postponing tasks or meetings can delay the whole group.
• To ensure progression, consider to set up milestones in collaboration with the students and to follow up on these during the virtual phase: It can for example be small progress reports with fixed intervals, or more substantial deliverables. This helps the supervisor to be proactive in case a group is experiencing problems.
• Supervision and supervisor meetings, even if virtual, are crucial. The supervisor should be aware of his/her role, and which kind of supervision is needed at different stages of the project (e.g. process supervision, product supervision, control supervision). Ideally the supervision would cover both process and product, and the supervisor should be able to support the group in resolving the situation if not all group members participate actively, or if there is a lack of progress for any other reason.

More recommendations related to the project work are given during the description of seminars below.

Teaching methods used: Seminars

The virtual kick-off meeting
In COLIBRI the kick-off meeting marked the start of the course, a medium for communicating to everyone the objectives of the course, and an opportunity for everyone to “meet” each other. All students and teachers participated in the seminar, meaning that there were around 45 participants across 10 different locations.

Our guidelines concern such joint virtual seminars in general:
• It is important to be aware of beforehand that meetings like these are technically challenging. Prepare for what to do when something goes wrong and the connection to (at least) one locality does not work in an optimal way.
  ○ Prepare for activities that can work even in case of technical challenges.
  ○ Use some chat function in case someone loses the sound
  ○ Tell everyone that the material will be distributed per e-mail after the meeting, so nobody loses information
  ○ Leave the option to postpone certain activities
• It sounds trivial: But make sure everyone is using head seats with microphone, or that some other measures are taken to avoid sound problems. Echoes can be destructive for any kind of meeting.
• One recommendation can be to pre-record presentations, so they could be watched on Youtube for better quality.
• Another good option to prevent bad quality of video conferencing systems is to make live streaming on Youtube. This can be easily done using e.g. Google Hangouts. It comes with additional benefits: In case of technical problems it can be resumed from any point in time, and it is available afterwards for offline viewing.
● If discussions are in the format of questions to a presenter, it can be recommended to have the questions in a chat, but replies on the video.
● Interactivity between all participants is challenging, but offers the opportunity for the students to get to know each other. One option is to make a team exercise, for example a Kahoot quiz, where students need to collaborate in groups and communicate between each other. It is important though to set aside enough time for these groups to establish communication channels (chat, video, audio).
● If the project groups are formed already at this stage, use these groups for the team exercises.
● Consider mixing online aspects (e.g. video meetings and chats) with joint offline activities (such as pre-recorded videos). Another example of using pre-recorded videos was for student presentations the first year, where each student made a 30-second video presentations, and we cut it all together to one video.

Midway seminar:
The recommendations for midway and project seminars are based on our COLIBRI experiences, but extend also into other setting where virtual and physical mobilities are combined. This includes also courses given with a flipped classroom approach.

The guidelines are split into seminars in general, and the way the seminars support the project work.

Seminars in general:
● Design both content and form with the learner in mind: It is too easy to be innovative on the virtual part, but “fall back” to traditional lectures in the physical parts. Plan for active learning and engagement of students.
● Spend time on relevant team building exercises to get the students to get to know each other, and create a good atmosphere for learning. Ask students to reflect on such exercises and what they learnt.
● One way of activating the students is to include student presentations: If there are many students (+20) it is not recommendable to let everyone present in front of the whole group but to set up a conference form in 2 - 3 tracks, split into 1-hour sessions, where students can choose to attend the sessions of their interest.
● Another way of activating students and bringing all the teachers expertise into play are panel discussions. It has to fit into the other learning activities of the students. For example, students can be asked to come up with 1 - 2 relevant discussion topics from their projects. When the context is clear the panel discussions can become a big success.
● Especially if the examination involves giving presentations in front of an audience, presentation techniques should be trained. Using video training in particular, throughout even the first seminar is helpful for the students. For example recording pitch presentations, recording trial presentations, etc. and providing students with individual and group feedback. These activities received consistently high ratings from the students, and we observed big improvements in the performance, and a much more relaxed attitude to the presentations. This was especially the case among
those students who have no previous experience in presenting for a larger audience, let alone doing so in a language that is not their mother tongue.

- On the practical side, the seminars should be organised with joint accommodation for everyone, and a full-week program with meals and social/cultural events. This makes it much easier to create a “group” feeling and more interaction between the participating students (and teachers).
- Strive for a balanced gender distribution of participating students and teachers, as this tends to improve both academic and social life during the seminars.
- Apply a zero tolerance for not participating in academic events or being (more than 5 minutes) late.
- To ensure that all quality issues are taken care of on-the-spot it is recommended to ask the students to appoint representatives for a Quality Committee that can meet with representatives for teachers/organisers e.g. every second day.
- A final small recommendation is regarding getting students to mix between them: For every event, try to mix students in new ways and create interaction. For example through randomized seatings in the class, randomized groups for problem solving, combined with 1-minute personal presentations and/or discussions of questions during class sessions.

Recommendations specifically related to the project work

- It is highly recommended to introduce the student projects during a physical seminar, where the students can discuss the problems between themselves, with their supervisor, and with their company contact. The value of this should not be underestimated.
- It is highly recommended also to facilitate that not only the supervisor and company contacts are involved. The seminars with experts in many different fields is a unique opportunity for the students to get good advices. However, it needs to be facilitated. It can be simple: Walk around between the groups and discuss their project, or initiate discussions during panel discussions.
- Introduce the students to tools and methods for project planning, project management, intercultural communication, and conflict handling during the midway seminar. These issues are much easier to discuss and especially train when being physically present. Again, it is important to plan learning activities that engage and activates the students.
- It is easy to agree that at the end of the midway seminar, each group should have a common understanding of the problem and tasks to be carried out, as well as a time plan for the virtual collaboration period. This should be done in a very structured way, to avoid that students/teachers THINK they have reached a common understanding and plan, but that it turns out to be too vague to be operational. Providing templates for timeplan and templates for task description may be helpful.

Project seminar:

- It is recommendable asking students to perform their preliminary presentations in front of other students, supervisors, and company contacts during the first day (organised in tracks), so they get a broad spectrum of feedback.
• If the exam is carried out as in the COLIBRI project (each group presented their project in front of other students and teachers, followed by questions/discussions), we have a few observations/recommendations to be aware of:
  o Not all students are familiar with this kind of examination, and it is important to prepare them e.g. through presentation training as previously mentioned.
  o It is important to plan how the assessment is done and the practicalities around it (Do the students leave the room? When are the results announced?)
  o It is important to allocate enough time for switching between groups, discussing the assessments, technical problems, nervous students, etc. We found that running the exams in parallel session was necessary to complete the examinations in one day without a feeling of rush.

• Even if most days in the final seminar are reserved for group work, joint opening and closing sessions should be set up. An opening session can for example include going through the program of this day, and closing sessions to include a pitch presentation from each group, and evaluation of the day (oral discussion and written evaluation sheets).

• Too many excursions or cultural activities should not be planned close to the exam, as the students should have the time needed for preparing everything.
Guidelines for use of Open Educational Resources (OER)

Introduction
The COLIBRI project has produced an innovative set of educational resources for Masters students on various ICT domains concerning the future internet but also on more business-related topics such as enterprise architecture and entrepreneurship. They are free and open to use according to the provisions of the Creative Commons Attribution Share Alike 4.0 International License. Public and private educational institutions, teachers and other educators can download and use them for online and offline activities. They can also modify and redistribute them under the same licence.

These guidelines outline how the creators of teaching materials - such as the modules of COLIBRI - can ensure that their educational resources meet the requirements necessary to be made ‘Open’. They are effectively the same steps that users of these resources must abide by in order to ensure that they, and their derivative works, remain open.

Definition:
Open Educational Resources (OERs) are defined as the technology-enabled, open provision of educational resources for consultation, use and adaptation by a community of users for non-commercial purposes. They are typically made freely available over the Web or the Internet. They are mainly used by teachers and educational institutions to facilitate course development but they can also be used directly by the students themselves. OERs include learning objects such as lecture material, references and readings, simulations, experiments and demonstrations, as well as syllabuses, curricula, and teachers’ guides.

As a critical feature of OERs is that they are open to use, revise and redistribute.

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- 3D objects and works of art. These objects consist of 3 dimensions (LxWxH) such as sculptures, coins and other 3-D works of art or their imitations, machines, clothing, toys, handicrafts, etc. They also include natural objects such as microscope specimens or other samples that are mounted for viewing e.g. in museums or exhibitions. Recommended file formats are 2-D graphical types such as JPEG, JPEG2000, TIFF, PNG.
- Musical Scores. This refers to music written and produced for mass consumption. It can be written for different instrumental or vocal parts or for a single one. It includes sheet music for dance, choreography. Recommended file formats are JPEG, JPEG2000, TIFF, PNG and text formats PDF, ODT, RTF, HTML and XML.
- Data sets. This material consists of data and/or electronic computer programs that is intended for use and/or processing by a computer or a peripheral device connected to a computer e.g. an electronic game, an online system or service, software, etc. It includes primary research data for each of the other types of content e.g. cartographic data, laboratory notes, conceptual models, etc. Recommended file formats are Access, CSV, JSON, CSV. For items that do not fall into this content category, use one of the other categories that is most relevant e.g. a map is cartographic, an article is text, and so on.
Other learning points and advices from COLIBRI

- In the current setup the evaluation is done as pass/fail (i.e. without grading). We believe that grades could affect group dynamics and the teamwork – both virtually and during the seminars.
- Overall, the students rated the international and interdisciplinary experience very high, and we believe it was generally quite successful.
- One concept developed during the course is Just-in-time material for Problem Based Learning (PBL). The idea is to provide the students with relevant courses/materials just when they need it in their project work, since:
  - The students are aware they need the knowledge to solve a specific problem, leading to a very high motivation.
  - The students will apply the knowledge right after learning it, leading to a better learning process.
  - When providing the knowledge in courses, it is very hard to time it correctly, especially when different groups need different knowledge at different times. This model plays well together with the current modules, since an overview of the field is needed in order to know what knowledge to look for afterwards.
  - It should be noticed that most students are unfamiliar with this approach, and therefore might need extra guidance. The supervisor would play an important role with respect to this.

![Flowchart diagram for problem analysis and PBL approach](Image)