Interdisciplinary Presentations in Bachelor End Projects

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Dr.ir. Peter Ruijten – Dodoiu (IE&IS)

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1 Background of the project

With the reform of the Bachelor programs of TU/e, an important element that was introduced in the new Bachelor College were the Professional Skills. These skills are intended to enable students to develop professional competencies that will help them in their future career. Since this reform and the introduction of the Bachelor College, surveys consistently show that the Professional Skills are not sufficiently integrated in the discipline-specific part of the educational programs. Bachelor students consistently rate the Professional Skills as insufficient. Alumni indicate that Professional Skills are an important component of their jobs, but that they are insufficiently incorporated in the TU/e educational programs (van Dijk, 2018). Employees of our alumni indicate a lack of communication and other skills, which manifests itself by the notion that a programmer and a designer working on the same project have difficulties communicating about this project. The Dutch minister of education indicated in an interview in Trouw on October 25 2019 that students experience a high pressure to perform, while the job market asks for very different qualities such as the ability to work in groups and to connect to others.

At the same time, the TU/e Strategy 2030 document highlights that our university is an environment in which real life challenges are introduced in the educational programs (Eindhoven University of Technology, 2018). In this new way of designing education at TU/e, intensive, challenge-based and project-based education is provided. This way of learning will prepare students better for their life after University. This also requires that students learn to give constructive feedback, work together in (interdisciplinary) teams, learn to communicate on an academic level, and learn how to plan for longer projects at an early stage in their Bachelor Programs. Students should be able to communicate and work together in multidisciplinary teams in order to become the engineer of the future. Efforts that allow students to work together with peers from different programs are successful, indicated by the high amount of attention towards innovation Space. At innovation Space, students from different departments work together on projects with an applied focus. This approach allows students to learn how to communicate with those who have different backgrounds. The number of students who can participate in this program is however limited, as most students will continue doing their final Bachelor projects in their own departments. If TU/e wants to manifest itself as the university that enables interdisciplinary communication between students, other innovative solutions should be considered.

The notion that Professional Skills in general, and especially the ability to link different disciplines, should be a crucial element of higher education is also highlighted by Bert van der Zwaan (2017), who argues that soft skills applied to a multidisciplinary context will play a defining role in teaching in higher education in 2040. He also states that it becomes increasingly important that educational programs are tailored to rapidly changing demands from society. This prediction fits well with the so-called T-shaped skills, which refers to the notion that engineers need to have both in-depth knowledge and expertise in their own domain (i.e. the vertical bar of the T) and the ability to collaborate across disciplines (i.e. the horizontal bar of the T). When it comes to the learning of new skills, students are more likely to learn when new ideas are presented. This helps them to have a fresh look on their own work as well (Kezar, 2013), implying that that interdisciplinary presentations and discussions help students to expand their knowledge and perspectives on their own topic. As such, providing the option for students to present their work in interdisciplinary settings enables them to learn more, and simultaneously it better prepares them for our future society.

2 Objectives of the project

The main objective of the project is that students are able to communicate about their (research) findings to peers with different backgrounds, which will prepare them for their future jobs better. In order to achieve this, students need to be given the right tools and support that helps them developing this new skill. Students from various educational programs participated in the project, and the project was split into four phases.

1. The first phase (exploration) was designed to gather information on how the existing communication skill can be adjusted into an interdisciplinary approach that works for all stakeholders. The goals were to identify current testing practices, collect student evaluations of current methods of assessing presentations, gain insights on how to organize a training program for students that prepares them for interdisciplinary presentations, and gain insights on how to assess these interdisciplinary presentations.

2. The second phase (development) was designed to apply the knowledge gained in the first phase into a training program for students and teachers, and to develop a rubric for evaluating interdisciplinary presentations. The program would be applied in both practice presentation sessions and final presentations, such that its effectiveness for both types of presentations could be evaluated.

3. The third phase (intervention) was designed to gain experience with the training program and collect some feedback from students that would help the further development. Students who followed the program were questioned about its benefits and downsides, providing us tips on how to improve the program for further development.

4. The fourth and final phase (evaluation) was designed to disseminate the information gathered in the project and provide recommendations to other departments and/or universities. This report is the main outcome of this last phase.

Due to the COVID-19 pandemic, many of the original plans had to be adjusted. There were supposed to be several co-design sessions, organized in March 2020. Due to the working-from-home regime and work pressure that came along with it, several sessions had to be canceled.

Besides, against expectations, several departments did not support the work in this project to the level that was expected. Teachers were on board, but administrations were very reluctant to ask students to fill in evaluation forms or share information on their current and BEP students. As a consequence changes in the implementation of the project had to be made. Students from innovation Space Bachelor End Projects (ISBEP) were asked to participate in the project, such that there would still be participation from a variety of departments.

The two tables below show the original planning and the adjusted planning that was made based on these drawbacks. Even though the project runs until the end of 2021 in the adjusted planning, the current document should already show most of the project's outcomes.

Table 1: Original planning of the phases in the project

Phase	Planned activities	Timespan
exploration	• identify current testing practices • report on evaluations of current method • gain insights on how to organize a training program for students • gain insights on how to assess the interdisciplinary presentations	02-2019 / 08-2019
development	• develop training programs for students and teachers (tailored to departments) • develop a rubric for evaluating interdisciplinary presentation skill	09-2019 / 01-2020
intervention	• apply training program in the three participating departments	02-2020 / 08-2020
evaluation	• evaluate the program and formulate recommendations for further use • ask students to become a member of a network for long-term evaluation	09-2020 / 12-2020

Table 2: Adjusted planning of the phases in the project

Phase	Planned activities	Timespan
exploration	• identify current testing practices • collect student evaluations of current method • gain insights on how to organize a training program for students • gain insights on how to assess the interdisciplinary presentations	02-2019 / 07-2020
development	• develop training programs for students and teachers • develop a rubric for evaluating interdisciplinary presentation skill	07-2020 / 09-2020
intervention	• apply training program in relevant programs (PT & ISBEP)	09-2020 / 02-2021
evaluation	• evaluate the program and formulate recommendations for further use	02-2021 / 12-2021

3 Phase I: Exploration

The main goal of this phase was to gather information on how the existing communication skill can be adjusted into an interdisciplinary approach that works for all stakeholders. To achieve this, data has been gathered in two ways.

1. Students who recently finished their Bachelor End Projects were asked to complete a survey that tapped into their experiences with the final presentations, and how they could be altered to be given to an interdisciplinary audience.

2. A co-design session was organized in which teaching support staff, experts from Education and Student Affairs (ESA), and students worked towards a description of the training program that had to be developed.

3.1 Survey responses

A total of 32 students (20 males, 12 females, age ranging from 20 to 26) completed the survey, a majority of which (84%) followed the Psychology and Technology major. The first set of questions focused on students' experiences with the presentation they had given as part of their BEP project (all on scales ranging from 1-7). The results of this part of the survey are presented in the figure below, after which the most important findings are discussed in more detail.

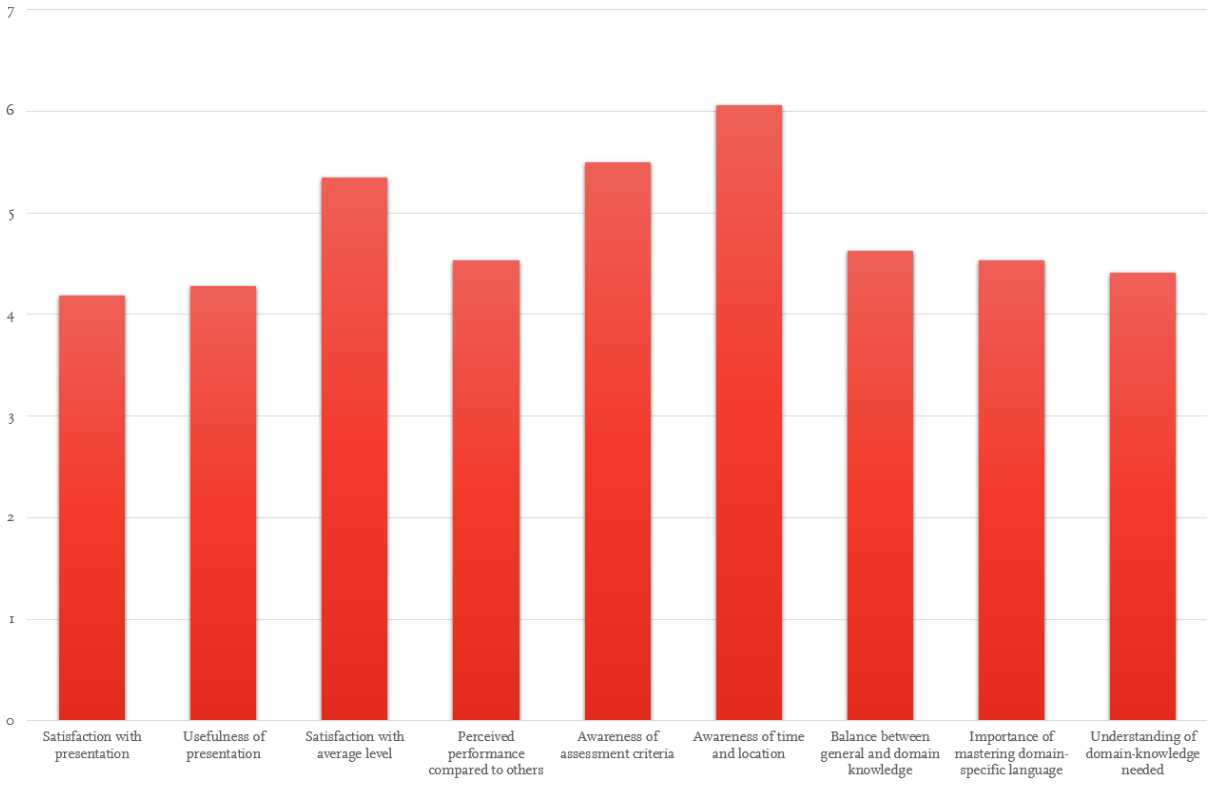

Figure 1: Overview of results from the first part of the survey on student experiences with BEP presentations

The first and most important finding is that students do not necessarily feel that understanding of their domain knowledge is crucial for their presentation, as shown by the relatively low averages on the questions that asked whether it was important to master the domain specific language required for their presentation (Mean = 4.53) and whether an understanding of domain specific language was needed for the BEP presentation in general (Mean = 4.41). This finding indicates that domain knowledge is not perceived as a very important criterion for giving a good presentation. Important to note is that these questions represent student perceptions of presentations that are given to an audience of peers who followed the same educational program.

The second finding that stands out is that students do not seem to be very satisfied with how the presentations are organized (Mean = 4.19), nor do they find it a very useful addition to their BEP (Mean = 4.28). This shows that there is room for improvement, which could potentially be created in the current project by organizing interdisciplinary presentations for which students develop skills that prepare them for similar presentations they will likely give in their professional career.

The third finding is that students seem to be satisfied with the information that was provided about the time and location (Mean = 6.06) and the assessment criteria (Mean = 5.5). Also, the average level of presenters in their group is perceived as good (Mean = 5.34). This shows that the organization of the presentations in general is appreciated by students.

The second part of the survey focused specifically on students' expectations of interdisciplinary presentations. They were given a short explanation on the goal of this project and what the intended outcomes are. They were then asked to which extent they would like to participate in an interdisciplinary presentation (Mean = 4.25) and whether they think an extra training session to prepare for such interdisciplinary presentations would be necessary (Mean = 3.56). These findings show rather low enthusiasm for interdisciplinary presentations, indicating that communicating about the value of such presentations is important for making them a success.

The final question was an open question on what students would need from us to help them prepare for an interdisciplinary presentation. Some students gave answers that are related to presentations in general (e.g., help with being less nervous, ordering of the slides and other visuals, timing, and general skills related to posture and gestures). Others did provide some useful insights that can be categorized in three topics; (1) knowledge on what information is domain-specific and what is general knowledge, (2) balancing general and in-depth information such that people can follow the talk, and (3) a basic level of understanding of other disciplines.

These three topics were included in the discussion in a co-design session in which teaching support staff, experts from ESA, and students worked towards a description of the training program that had to be developed.

3.2 Co-design session

On March 9 2020, stakeholders with different levels of expertise were invited to participate in a co-design session on interdisciplinary presentations. The session was attended by members of the teaching support staff, ESA experts, and students.

The session included the following discussion topics: (1) tips and tops of the current organization of the presentations, (2) the type of training that needs to be developed, and (3) the assessment of interdisciplinary presentations.

3.2.1 Tips and tops of the current organization of the presentations

Attendants of the session were asked to provide elements of the presentations that they thought should not change when developing a training program for interdisciplinary presentations.

- The current organization prepares students well for the basic presentation skills
- The attention that is given to the skill throughout the educational program helps students in reducing their stress levels and nervousness
- Most presentations require a specific structure that make preparations easier
- Organization and assessment is clear upfront

They were also asked to provide some points of improvement that could be taken into account when developing a training program for interdisciplinary presentations.

- There seems to be limited interaction with the audience in an average presentation
- Students would benefit from practicing with external stakeholders
- Students are not concerned with doing an audience analysis and the target group is often unclear
- Having presentations at the end of a project does not provide any content-related feedback

3.2.2 The type of training that needs to be developed

The second part of the co-creation session focused on the training for helping students develop their presentation skill, specifically for interdisciplinary presentations. The main conclusion of this part was that providing one type of training will likely not work for all students. Some students thrive when they can study for a topic themselves by following weblectures and other online modules, others benefit from having a live training with a small group of students that can give each other feedback on small practice elements, and a third would do better after doing a full practice run of their presentation.

From this it was decided that students will be given the standard Canvas page with weblectures on presentations, and that page will be extended with information specific for interdisciplinary presentations. Interim presentations can be used as practice sessions in which students receive (peer) feedback on their performance. For those who would want this, an extra training session can be organized with a small group of students to go over some general pitfalls.

A more theoretical question is which approach works best when students have to acquire new skills. If students are aware of the fact that they are likely to end up working in multidisciplinary teams and need to be able to communicate with people from different disciplines, the interdisciplinary presentations can be framed as a real-world task. Providing authentic, real-world tasks is known to increase the value that students place on this task and thereby create an environment that supports motivation (Ambrose et al., 2010).

The outcomes of this discussion align with the types of training that are offered for Professional Skills throughout the P&T and SI BSc programs: (i) plenary sessions in which an expert on the respective skill explains with examples what is expected from students and how they achieve the desired level, (ii) online materials and web-lectures that allow students to obtain detailed knowledge about the skills, (iii) practice sessions in which students receive immediate feedback on their performance on the skill, and (iv) individual contact with experts on the skills for discussing or analyzing students' performance on the skill.

(i) The **plenary sessions** are organized in the first year, since this is the first time students are exposed to the Professional Skills. If there are requests for more plenary sessions in the following years, we will consider organizing more of them.
(ii) The **online materials** are available on a designated Canvas page. Here, students can watch web-lectures, read informative documents, share ideas, and see their own evaluations on all Professional Skills throughout the BSc program.
(iii) The **practice sessions** are organized in the first and second year to enable students to practice with the Professional Skills. These practice sessions are always optional, so students who have doubts about their abilities as well as those who want to be challenged to get the best out of themselves can receive feedback on their performance on a skill before finishing the assignment in which the skill is embedded.
(iv) The **individual contact** allows students who do not feel comfortable going to a practice session to get in touch with an expert on the Professional Skill and receive feedback on practice materials. Experts can be contacted directly through the Canvas page.

An interactive discussion with the group on what makes an interdisciplinary presentation different from a 'normal' presentation led to the conclusion that doing an audience analysis is the crucial part. If a presenter understands what the background is of people attending their presentation, they can use this in their preparations. Therefore, specific attention will be given to this element in further development of training programs and assessment tools.

3.2.3 The assessment of interdisciplinary presentations

The third and final part of the session focused on the assessment. All participants agreed that presentations should be assessed on both content and form, and separate assessors should be present for those two elements. A key factor in this is the question who will assess the content. This usually is an expert of the domain in which the student has done their work, but for multidisciplinary presentations this may require a different type of expertise.

Both assessors will make use of their own rubric, where one focuses on the form of the presentation (e.g., language, posture, gestures, clarity, structure) and one on content (e.g., depth of the work, relation between the disciplines, original contribution). The element that considers an audience analysis should be part of one of those rubrics. The participants of the session did not agree which of the rubrics that should be. As the project focuses on the implementation of interdisciplinary presentations as a Professional Skill, it would make most sense to include the audience analysis as part of the rubric on presentation skills.

4 Phase II: Development

The main goal of this phase was to develop a workshop to be tested in ISBEP projects. To achieve this, the following steps have been taken.

1. A brief workshop was created in which the relevance of interdisciplinary presentations were discussed with the students
2. A description of audience analysis was created and students performed a small assignment on this topic
3. The audience analysis was incorporated in a presentation rubric that students used to give each other feedback.

4.1 Workshop creation

In order to help students prepare for their interdisciplinary presentations, a workshop was scheduled in which various topics related to giving a presentation in front of an audience with various backgrounds would be discussed. We decided to include three components in the workshop. The first was a short overview of the desired achievements in this project; giving students experience with interdisciplinary presentations, as this would prepare them better for the job market. The second was an overview of criteria that are included in all presentations at TU/e. Students should be familiar with these criteria, and giving them an overview would help refresh their memory. The third was the most important component; the additional audience analysis that would help students prepare for their interdisciplinary presentation.

4.2 Audience analysis

We wanted to make students prepare for the workshop well, and therefore we asked them to do a small audience analysis for their interim presentations. With audience analysis we refer to an a-priory inquiry of the kind of people who will be in the audience of a presentation, to help tailoring the presentation to those people. We decided to make students think about this topic by asking them to answer the following three questions:

(i) What are the backgrounds of people in the audience for the alignment presentations? You are unlikely to know all of them but making a list of the ones you do know can be helpful.
(ii) What are the roles of people in the audience? Try to connect this as much as possible to the backgrounds you know those people have, for example by putting it in a table.
(iii) Now pick the three or so people that are most important for you to either convince about the quality of your work or to receive some feedback/input from and write down how you will achieve this.

We noticed that students struggled a bit with the third question, especially the last part of it. As they had never really thought about their presentations like this, writing down *how* they would achieve their goals with the presentation turned out to be difficult for them. Based on this, we decided to put some extra emphasis on this element during the workshop itself.

4.3 *Presentation rubric*

We believe that students benefit more from receiving timely and constructive feedback on how to improve their skills rather than demanding them to perform well. An important element here is the combination between formative and summative assessments, and the role of both in our efforts to facilitate learning (Bennett, 2011). We want to create an environment in which development is central, allowing for multiple feedback moments, and making the student more responsible for their own skills. For this reason, we decided to have students evaluate each other's presentations and provide peer feedback.

Students were asked to complete a rubric for each other, see Table 3 below. The rubric contained both the six standard presentation elements and an extra criterion for the audience analysis. A box with open comments allowed students to give more detailed feedback and elaborate on their assessment, particularly for the audience analysis.

Table 3: Rubric for peer assessment of presentations

Criteria	Good	Sufficient	Insufficient
Quality of work delivered	The presenter knows the content by heart and can elaborate and explain in depth when necessary. The presenter gives a convincing motivation for the work. The presenter provides background about the problem. The presenter and supplies sufficient technical details and experimental results to substantiate his work.	The presenter has some difficulties remembering details, leading to superficial parts. Not all technical details are clear, and explanations could benefit from a more in-depth explanation.	The presenter seems very ill-prepared and makes up the story as they go. The content is largely unclear, showing little effort in setting up the storyline of the presentation. Technical details or experimental results are not provided.
Structure of the presentation	The presentation is well structured, with a clear organization (i.e. introduction, methods, results, conclusion and discussion). The presenter separates main issues from side issues. The goal of the presentation is clear. The main points are highlighted in relation to the goal and sub-goals.	There is a clear structure, but some parts are hard to follow. Some side issues get too much attention, making it a bit difficult to separate the main and sub parts.	There is no clear structure, it is unclear what the main and side issues are, and the goals of the presentation do not come across. There is no highlighting of points that are important.
Non-verbal behavior	The presenter appears confident when presenting (i.e. has a grounded upright posture, gestures support the presentation and make it lively). Frequent eye contact is made with the audience.	The presenter appears less confident (or over-confident). There is some use of gestures and eye contact, but rather limited, making some audience members feel uninvolved.	The presenter is not confident, has a bad posture, does not make use of gestures and does not seem to make eye contact with the audience.
Verbal behavior	The presenter's use of English is good and communicates with ease during the presentation. The presenter's speech is smooth and fluent, volume is constant, and all words are audible.	The use of the English language seems to be a barrier for the presenter, leading to a less smooth and fluent story in which not all words are easy to hear.	The presenter makes bad use of English and has difficulties communicating. The speech is rigid and quite some of the talk is inaudible.

Visual aids	The presentation is supported by visual aids that reinforce the presentation. The visual aids illustrate a perfect balance of text and images.	The visual aids are clear, but they do not add too much to the presentation. The balance between text and visuals is skewed.	The visual aids do not seem to add anything to the presentation and illustrate a bad balance (either no visuals or hardly any text with ill-chosen pictures).
Audience analysis	The message of the presentation fits the target audience perfectly. The presenter showed that they have carefully considered who would be in the audience.	There does not seem to be too much attention to who is in the audience; the presentation contains too much / too little technical details. The message does not fit the target audience well.	The presentation is not created to make a connection with the audience. The presentation does not fit the expectations of the audience.
Comments on audience analysis			

For the final Bachelor projects, the Professional Skill Presenting is evaluated based on the extent to which students achieve the intended learning outcomes of the skill. The TU/e assessment policy describes four principles for effective assessment:

(i) **Validity**; for valid assessment of the Professional Skills, the learning outcomes of the courses in which skills are embedded are aligned with the learning outcomes of the skills.
(ii) **Reliability**; rubrics will be used for an accurate and precise evaluation and assessment of Professional Skills.
(iii) **Transparency**; the rubrics will be available for students from the start of a course, such that they can see what the evaluation and assessment looks like, what they are expected to do for the skill, and what the expected level of their performance is.
(iv) **Efficiency**; the evaluation and assessment of the skills with rubrics can be done by any staff member at any time.

We hope that the addition of the extra criterion on the audience analysis allows for a smooth incorporation of the extra element in case students give an interdisciplinary presentation. As such, the Professional Skill itself is enriched with an extra element, rather than regarding the interdisciplinary presentation as a completely different skill.

5 Phase III: Intervention

This chapter describes our experiences with the workshop. It should be noted that the lockdown in the Netherlands had significant impact on the way the presentations of ISBEP were organized. We tried to implement the audience analysis in the process, but the new situation did not make things easier.

On 2 October 2020, a workshop was given to students in ISBEP. The workshop had three main components: (1) background information on giving interdisciplinary presentations, (2) a discussion on current criteria for presentations, and (3) a discussion on extra criteria that play a role when presenting for a multidisciplinary audience.

5.1 *Background information*

The background information included the general outline of this project. That is, we presented the notion that students tend to work in multidisciplinary teams after their graduation, they also often present their work to various stakeholders, and that these presentations call for a different skillset than the presentations they are used to giving. This part of the workshop is meant as an eye-opener and to attract the attention of students to the topic.

We expected that this eye-opener would make students understand that a presentation in front of an audience of people with various backgrounds is conceptually different from any presentation they had given so far in their career. At the same time, we did not expect that students would immediately be able to explain what makes a presentation for a multidisciplinary audience different from a presentation for an audience consisting of likeminded people.

Our experiences with this part of the workshop were that students did seem to understand what the main reason was for putting this focus on interdisciplinary presentations, but they did not yet fully grasp how they would go about preparing for this type of presentation. This is a good thing, as the remainder of the workshop was designed to do just that; provide the tools for students to prepare their presentation in a different way than any other presentation they had ever given.

5.2 *Discussion on current criteria*

The discussion on current criteria started with an open question; what criteria do you think are included in our assessment of your presentation skills? Students were able to mention most of them, although not in their official classification:

a. *Quality of work delivered*; focuses on content and explanations
b. *Structure*; focuses on primary versus secondary topics and goals
c. *Interaction with audience*; focuses on engagement of audience members
d. *Non-verbal behavior*; focuses on eye-contact, posture, and gesturing
e. *Verbal behavior*; focuses on fluency, language, volume, and pronunciation
f. *Visual aids*; focuses on balance between text and visuals

When asked to reflect on how well they scored on these criteria, students were mostly positive about their abilities, with an occasional exception. One observation was that students felt comfortable sharing their strong and weak points on these criteria. We believe this was enhanced

by creating an informal atmosphere in which these elements were discussed, and that the workshop had a small-scale character as only 12 students participated in ISBEP that semester.

We expected that the small group setting would allow students to open up about their capabilities in terms of presentation skills. We did not perform this workshop with a bigger group or on another (online) platform, so it is hard to predict what will happen with such a bigger group.

We also expected that students would have a good understanding of the criteria that are included in the assessment of presentation skills. Despite the notion that different wordings and categorizations were used by students, they did manage to list all the criteria.

We did not know what to expect in terms of students' perceived abilities in these criteria. The first answers were mostly positive; students had the idea that they would be well capable of delivering a presentation that addresses all criteria sufficiently. When asked in more detail (e.g., how do you use visual aids in your presentations?), students did admit that there is still room for improvements. There were no criteria on which all students felt they had to improve, nor were there any criteria on which no student felt that they had to improve. This was not a surprise, some students are more confident and tend to have strong verbal and non-verbal behavior and a well-designed presentation, while others are less confident and tend to focus more on the structure and quality of their presentation. Hence, there was room for improvement on different levels for different students.

This part of the workshop showed that all students have room to improve their presentation skills, and as such opened students' minds for learning these new skills. This was a good environment for the discussion that was coming next.

5.3 Discussion on extra criteria

The discussion on extra criteria focused on elements that make a presentation for a multidisciplinary audience more complex than a regular presentation. Two distinct elements were highlighted.

The first was that such a presentation requires the student to obtain knowledge that reaches further than that of their own discipline. It is important for students to understand the work their team members are doing if they want to present this to a multidisciplinary audience. This requirement of obtaining a conceptual grasp on the materials of others perfectly fits in the learning objectives of ISBEP, where a strong focus lies on creating a basic understanding of the concepts and theories that play a role in other disciplines.

This element was agreed upon easily by the students, mainly because they had been working with students from other disciplines for about 2 months, and had realized that such a collaboration needs an understanding of the basic concepts that other students are working with. They indicated that a group project could not be performed if members of the group are not informed about what the others are doing (even while final deliverables would be individual). As these others were students with different backgrounds, this basic understanding was perceived as more complicated compared to regular group projects with students from the same educational program.

The second element that was highlighted was the importance of doing an audience analysis. After doing an exercise on this, students indicated that they found it useful to think about who would

be at the presentations, as this would also help them seeing the presentations from a different perspective than they had before.

The exercise itself was not performed very well, as indicated earlier in this report. Students had difficulties putting themselves in the perspective of different audience members, or trying to understand what those audience members would like to hear from them. The discussion therefore went into the details of this part; how do you know what to do to make members in your audience satisfied with your presentation.

An important part of this discussion revolved around the question: if you would be [audience member, e.g., an academic coach], what would you expect to hear and see in this presentation? From this it easily became apparent that audience members could be categorized into clusters. People in the different clusters would expect different levels of complexity, detail, and background information from a presentation. Seeing this realization take place in the group of students was a good moment in the workshop, as this would help the students prepare for their presentation (a question that remained unanswered in the first part of the workshop).

We had expected that moderating the discussion between the students would be sufficient to help them reach this conclusion, but a bit of nudging was needed to step away from seeing the audience as separate people but more as clusters that could be addressed separately. From this we learned that the assignment connected to the workshop could maybe do this nudging next time, and change the description of it in such a way that the roles that are mentioned with the second question more explicitly steer towards a classification of roles, with specific criteria for the categories in which audience members are classified.

Our first overall experiences with this workshop are very positive. Students were engaged with the materials, were open to share their shortcomings to each other and discuss ways to improve them. They also seemed to understand the importance of doing an a-priori audience analysis when preparing a presentation for a multidisciplinary audience.

6 Phase IV: Evaluation

This chapter presents the main outcomes of the student evaluation related to the interdisciplinary presentations throughout the project, and lists a number of other dissemination platforms that will be used to reach out to other departments/faculties, universities, and education researchers.

6.1 Student evaluations

Student evaluations have been performed after the course. However, no specific questions were asked about the workshop on interdisciplinary presentations. Students indicate that they enjoy learning from other disciplines, thinking about how to make their disciplinary knowledge valuable for the interdisciplinary projects, and working on open ended challenges.

Even though these elements are positive, they do not necessarily provide clear data on how the specific activity in the course was experienced by the students. It is important to include questions that are connected to specific activities in future instances of the course.

Nevertheless, many discussions have taken place between the coaches and the students shortly after the activity. From the notes of those meetings, we noticed the following:

- Students asked many questions about levels of detail that should be included in their final presentations. This shows that they had internalized the notion of presenting for people with varying backgrounds, and wanted to verify whether the decisions they were making were the right ones.
- Students expressed concerns that the audience analysis made them drop too many details of the individual parts of the project, and that the academic coach would therefore not hear anything new in the presentations. This shows that they were trying to involve all members of the audience equally, and that they had difficulties doing so. This in turn is not unexpected, as it is the first time that students are involved in interdisciplinary presentations.
- Students indicated that they wanted to discuss details of their individual projects with their academic coaches before the final presentations. This would help them find out which elements were crucial to include in their presentations, and which details could be omitted. This shows that students understood that not all technical details should be included when presenting for a multidisciplinary audience, but a certain level of expertise was still expected to be shown.
- Students were more keen to perform stakeholder analyses prior to other presentations. This shows that they were working out what the goals and ambitions of different stakeholders in the projects were while they were preparing for further presentations. This in turn could be interpreted as a way for students to try to understand their audience and tailor their presentations to that audience.

6.2 Dissemination platforms

An important part of this project is getting the results out to other educators and education innovators. There are a number of ways in which we attempt to get the biggest possible outreach. The overview below shoes that various types of platforms that are intended to be used.

1. The 49th Annual Conference of the European Society for Engineering Education (SEFI)

A concept paper is being written for this conference, in which the main elements of this project are outlined. The paper presents the general background of the project, and shows an overview of the most important lessons learned in each of the four phases of the project. The abstract of the paper has been submitted and is accepted. This means that the paper will be part of the program of the conference. The (preliminary) abstract of the paper is pasted below.

The value of interdisciplinary presentations for engineering students

The engineer of the future can make significant contributions to global societal challenges. They are not only able to find innovative solutions to big problems, but also continue to learn about new topics that are relevant to these problems. They have a can-do mentality, are system thinkers, and are able to link their engineering background to relevant societal challenges. And most importantly, they work in multidisciplinary teams together with engineers with diverse backgrounds. One aspect crucial to the success of this scenario is the engineer's ability to communicate with those who have a different background. Time and time again, projects get delayed or even fail because, for example, the software engineer did not fully understand the architect. In order to prevent such scenarios, students should be able to discuss and present their work in interdisciplinary settings. The main objective of this project is to create an environment in which students can communicate about their (research) findings to peers with different backgrounds. The project was split into four phases: an exploration phase to gather information on how communication between students can be deployed in an interdisciplinary approach; a development phase in which a training for students and teachers was created; an intervention phase in which experience with the training was gained and feedback from students was collected; and an evaluation phase designed to disseminate the information gathered in the project and provide recommendations to other departments and/or universities. This concept paper presents the main outcomes of these four phases.

2. 4TU Center for Education Innovation Map

A page has been created on which the outcomes of the project are presented. A short description will be written, and will be posted together with this report. The link to the page (https://www.4tu.nl/cee/innovation/project/13174/interdisciplinary-presentations-in-bachelor-end-projects) will be shared with education innovators at the TU/e and beyond.

3. 4TU Center for Education Newsletter

As soon as the innovation map page is finalized, a message will be included in the newsletter that is sent to the mailing list of 4TU

4. Applying for grants to bring the project to a next level

Attempts will be done to apply for grants (Comenius, CBL funding) that bring the project to a next level. No concrete steps have been taken in this direction yet.

7 References

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