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Tackling Resource Motivated Cross-Listing of Courses: Maximizing Learning Opportunities

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ABSTRACT

There is a potential conflict between making courses available for many different student groups (by cross-listing), while at the same time maintaining satisfactory course outcomes. A first common step to address the full range of challenges is transparency, which includes both sufficient teacher knowledge about cross-listing and open communication with the students about the issue. We propose a framework to classify different formats for cross-listing across educational program boundaries and describe some key challenges related to these different formats. The framework development has been informed by outcome guided interaction with over thirty selected members of the faculty, staff and students at Chalmers University of Technology with experience and interest in cross-listed courses. For cross-listing motivated predominantly by resource efficiency, there are challenges for the delivery of maintained quality related to: an increased diversity of the students, increased number of students, increased scheduling constraints, access to facilities, and increased organizational interdependence. In order to achieve resource efficiency, all these challenges should be addressed when considering cross-listing, including the consequences for the responsible teachers, both in the short and long term.

KEYWORDS

Cross-listing, homogeneous, heterogeneous, asynchronous, hidden

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Introduction

Cross-listing is when a course is given for two or more groups of students who belong to clearly distinguishable and different groups, e.g. being enrolled in different educational programs aiming at different degrees in the end. Cross-listing of courses can be done for various reasons as illustrated in Figure 1. Some are to improve the learning for the student, considered as intrinsically motivated, while others are motivated by external factors, like resource management, here considered as extrinsic. The

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third option is to have an opportunistic reason, where the cross-listing creates extra opportunities for a subset of students.

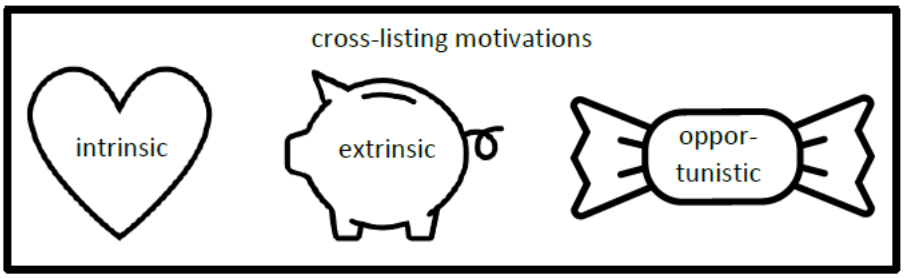

Figure 1. Illustrating three different reasons for cross-listing.

Cross-listing is versatile in what it can achieve, such as enabling interaction between students with different competences/educational backgrounds and experiences or making content accessible for more students. It can free up time for the development of courses and course material, and it can lead to more efficient use of classrooms and other facilities. There are also potential benefits when it comes to summative assessments; a cross-listing in the form of conformity between course instances provides more opportunities for students to be examined, and the conformity could help in increasing the coherence and consistency of examinations over time.

At the same time, there are serious challenges with cross-listing, resulting in bigger classes, fewer options to adapt the content, scheduling, program awareness, highlighting different viewpoints, disputes over academic territory etc. (Lucas, 2024; G. Strimel et al., 2022; G. J. Strimel et al., 2023). Most of these aspects can be seen as hygiene factors according to Hertzberg's two-factor theory (Herzberg et al., 2011) which has a great impact on the studies and the students' willingness to continue their studies (Pedraza & Chen, 2022; Sabrowsky, 2023). Despite these challenges, there is a lack of the research on the topic of the impact of cross-listing of courses (Gubala, 2021).

Many of these challenges are particularly important for students who aim for specific degrees and especially for professional degrees. In different branches of engineering for example, the relevance and importance of specific course content can differ significantly, such as computer programming needs for a software engineer compared to a civil engineer, or knowledge of fluid mechanics between an aerospace- and an electrical engineer.

In this paper we define *resource motivated cross-listing* as a case where there are sufficient intrinsic motivations and conditions for *not* cross-listing a particular set of courses, but this is done anyway, with the main extrinsic purpose of achieving improved resource efficiency.

In view of this definition, the following types of courses are not in focus in this paper:

- A program-specific course that inherently has a large and heterogeneous student group (as there is no actual cross-listing)
- A course with a clear dominant majority student group that has the course adapted to their conditions and circumstances, but different minorities are allowed to participate (a case of opportunistic cross-listing)
- Courses designed with the intrinsic purpose of mixing students across program boundaries (as this is intrinsic cross-listing), e.g. to practice collaborating with people with different backgrounds.

It is nevertheless likely that courses of the types above have many relevant aspects in common with resource motivated cross-listing, such as challenging student diversity in a big group even if they are

from the same program or logistic limitations in scheduling also for intrinsically motivated student mixing, and in our gathering of information we have not explicitly excluded experience from courses that would typically fall outside of our definition. And even when extrinsic reasons dominate the agenda, intrinsic benefits might be found, and in this sense the distinction of whether a course is cross-listed due to intrinsic or extrinsic purposes is not razor sharp.

Extrinsic reasons, like demands for increased resource efficiency, increase the incentives for cross-listing, which in itself is not necessarily bad. It is not trivial to predict if a particular cross-listing will create more benefits or challenges. When cross-listing is driven by the need for, or desire for, resource efficiency, there is a risk of a compromise of optimal conditions for quality driven work. Sometimes cross-listing seems to work well and sometimes not, but this is difficult to predict, probably because there are so many different conditions and perspectives involved. Methods that enable evaluation and management of challenges before the extrinsically motivated cross-listing is carried through are needed. Therefore, there is value in an adapted framework describing how cross-listing can take place in different formats, which can help to explain the differences in outcomes and also to support the selection of a cross-listing format with good potential to yield better results. Such a framework will also give a language to use to discuss the matter mainly between teachers but also within the program management and among administrative personnel.

The format for conducting engineering education in Sweden has a strong tradition of being highly programmatic. As a student you are enrolled to a subject specific engineering program when entering the university, and the courses that you take are then controlled by the program design, which e.g. restricts elective options. You furthermore receive a direct affiliation with the student organization (a part of the student union, called "*section"*) linked to the program, and much of the social introduction and identification is defined by these sections. It is common that introductory courses strongly reflect the particular branch of engineering that the program is designed for, and for all courses in the program there is an advisory board consisting of both faculty, industry- and student representatives and an educational program management deciding on the group's agenda. In this tradition, a course in Linear Algebra delivered to first year engineering students on both the Mechanical- and Technical Design programs would be considered cross-listed.

The definition of cross-listing of the Swedish Council for Higher Education (Universitets- och högskolerådet, 2023) is not entirely equivalent to ours, as, for example, courses designed with the purpose of integrating heterogeneous student groups are included in the Swedish Council for Higher Education's generic definition, but in our terminology, this would be the special case of cross-listing with intrinsic motivation. In the literature, courses for mixed student groups are often used to incorporate other perspectives for/by the students (Gubala, 2021; Lotfi et al., 2019; Roughani, 2020) or to practice communication (Gubala, 2021) or other collaborative skills (Shamir et al., 2023). The contributing authors have only found isolated examples in the literature discussing cross-listing explicitly driven by resource constraints, primarily concerning what occurred during the pandemic from 2020 to 2022 (Khan et al., 2023).

One aspect that has been extensively studied is how to teach in student groups of heterogeneous students (Briggs, 2020; Ghanbari & Abdolrezapour, 2020; Pozas et al., 2020; Scherer et al., 2021; Wyman & Watson, 2020). Just because a course is cross-listed for two different programs does not mean that it is automatically heterogeneous, although the likelihood for this to be the case increases. The connection in research to different program affiliations is rare as most work focuses on smaller groups, but parallels can be drawn, such as how instructions should be communicated. The importance of the teacher's attitude and knowledge in the topic for successful course implementation with heterogeneous student groups has been emphasized (Pozas et al., 2020; Scherer et al., 2021).

In contrast to previous engineering education research which discusses intentional interdisciplinary practices, opportunities and challenges (Van den Beemt et al., 2020), we focus on capturing features of cross-listing that appear when the motivation or positive vision for its intrinsic benefits are lacking. The framework suggested by Van den Beemt list the categories of vision, teaching, and support as key themes for promoting intentional interdisciplinarity. In our description, we give the four categories of homo- and heterogeneous, hidden and asynchronous cross-listing rather as structural classification factors that can be used to describe any juxtaposition of different students without multidisciplinary goals or intentions (Borrego & Newswander, 2010).

In this paper we present a framework to describe resource motivated cross-listing. The framework includes diverse types of cross-listing but at the same time, it delimits itself from certain situations with mixed student groups. The purpose is not to try to define the optimal way to conduct cross-listing, as it is assumed that the outcome depends heavily on many disparate factors; nor do we attempt to rank diverse types of cross-listing or argue that one format is better than another. The aim of this work is rather to highlight characteristic challenges that may exist for diverse types of cross-listing and to suggest tailored support and tips to course organizers regarding the design of such courses. The benefits of the framework are to identify challenges before the course starts and to give the teachers a possibility to tackle them already the first time the course is given. This is especially valuable for new teachers.

The key questions addressed in the paper are the following:

- How can different resource motivated types of cross-listing be classified to ensure clarity and usefulness?
- What are the various challenges associated with the identified types?
- How could these challenges be tackled?

Methodology

This study was conducted completely within the organizational framework of Chalmers University of Technology (Chalmers) so all conclusions are informed by the practices and conditions of this particular institution. Chalmers produces some two thousand engineering graduates annually and collaborates with many international universities of similar size and general educational operation (such as participation in CDIO) (Crawley et al., 2007; ENHANCE., 2024; IDEA League, 2024; Nordic Five Tech., 2024). By selection of the managements of the respective educational programs in the subject areas of electrical, computer-, software-, and medical engineering and industrial economics, individual teachers were approached for dialogues on their experience of conducting cross-listed courses. The selection was requested to include examples of both problematic instances and of successful outcomes. At the university's annual internal conference on teaching and learning a one-hour workshop which attracted some twenty participants was arranged, including both faculty, staff and students. The topic of the workshop was "our different ways of cross-listing courses". In addition to these two structured formats for gathering information and input for our development, an informal collegial discussion has been cultivated where our thoughts and ideas have received further nurturing. In the following, four different modes of working with our material will be described: 1) development dialogue between the authors of the paper, 2) dialogues with selected teachers and students, 3) curated input from conference workshop and 4) informal collegial discourse. All these four modes taken together we frame as an outcome-guided interaction approach in line with the concept of guided interactions as described by Knowles (Knowles, 1950). The outcome in this case is learning about cross-listing within the organization, and the writing of this paper constitutes yet another step in this collective learning process.

The main purpose of our inquiry is to provide a useful structure for describing the existing variations in resource motivated cross-listing, in a way that is useful for both teachers and educational managers when considering or implementing cross-listing. In the early phase we wanted to collect input from those with current experience using only the necessary prompting to obtain relevant information, with a minimum of suggestions of structure or categories. This we could accomplish in the dialogues with selected teachers and students, where the focus was on their particular experiences as prioritized by them with regards to cross-listing. In its essence, this was a data collecting phase. In the structured workshop, the complementary approach was adopted, where we proposed and argued for the active use of the set of categories presented in this paper. In this phase we could both evaluate the way colleagues could relate to these categories as well as gather further examples of characteristic features that the participants could identify in the different categories. In all instances there is learning occurring regarding cross-listing, and your reading of this paper is a further step in this shared learning. In this context we follow the suggestions by Knowles as described by (Harper & Ross, 2011) with regards to us teacher colleagues learning about cross-listing: we need to know the reasons for learning, we use experience as a base, we take responsibility for our own learning, we prioritize the content of highest relevance, and our learning is centered on problems rather than content.

Framework development dialogue

The authors of this paper have engaged in a creative dialogue where we both contributed with suggestions and ideas, which we subsequently elaborated on interactively together. The focus of this framework development dialogue was to come up with a way to categorize different forms of cross-listing, which would be simple enough to be communicated directly to colleagues, and which would still be sufficiently elaborate to capture important nuances and variations in how cross-listing is conducted at Chalmers. As a preparation for this dialogue, we looked for relevant literature on the subject of cross-listing and concluded that the prevalent focus in existing literature on the topic was on what we call intrinsically motivated cross-listing (Van den Beemt et al., 2020). We initially identified courses that fit well within the scope we wanted to address regarding challenges and possible ways of tackling them. This identification helped to define typical examples of courses that we exclude from our scope of resource motivated cross-listing (see the delimitation provided in the Introduction).

In the dialogue we used a common whiteboard as a tool for sharing, elaborating and commenting on our ideas and suggested concepts. We were both active in proposing concepts, which had already been partially preconceived by us individually. An important background for the conceptualization was our own experience of managing cross-listing both from a teacher's perspective and as program management. Although the base format of four types of cross-listing as described in this paper materialized already in our very first dialogue session, the labelling and description of these types have been worked out continuously and reached their present format in the process of writing this paper.

Dialogues with selected teachers and students

Dialogues were conducted with all but one of the twelve teachers selected by program managements. The conversations typically lasted for 20-40 minutes and were conducted in the offices of the teachers. A group of three selected student representatives from student union chapters were met in a dedicated session. At the beginning of the meeting, the participants were prompted to define cross-listing according to their understanding and were then asked to discuss the main rationale for cross-listing and the consequences cross-listing had on their teaching or learning. If not addressed automatically, the issues of course development and resource management were brought up in questions.

In view of the fact that some new aspect or alternative perspective of cross-listing was addressed in nearly every dialogue, it could be relevant to continue to collect and document teacher experience to properly cover existing concerns regarding cross-listing. We cannot claim that we have an exhaustive

inventory of all relevant perspectives, concerns and issues at this point, even pertaining to only our own university.

Notes taken during the dialogues were shared between co-authors. These notes constitute the basis for our description of course sensitivity to heterogeneous cross-listing, for our collection of challenges, and for our understanding of short-term and long-term consequences for faculty as addressed in the discussion.

Curated input from conference workshop

The conference workshop was presented as having the purpose of giving the participants a chance to become familiar with our cross-listing categories, but also as an opportunity for us to get feedback on how our categories work for Chalmers courses. Four questions were addressed during the workshop:

1. What is the appropriate definition for the cross-listing that takes place at Chalmers?
2. How can different types of cross-listing be classified so that the classification becomes clear and useful?
3. What different challenges are there with the different types identified?
4. How could these challenges be met?

After a brief introduction, where we described our delimitation of cross-listing and the four proposed categories, the participants were divided into discussion groups where they could choose to focus on one particular category or to discuss alternative types of classification. The distribution of participants was according to Table 1, and notes from the group discussions were collected. A conclusion from the workshop was that our framework served as a useful tool for generating a collegial discussion that could generate part of the content that we present in this paper concerning both challenges and possible remedies.

Table 1. Distribution of workshop participants on subjects

Topic	#
Suggestions for alternative cross-listing category	2
Homogeneous cross-listing	2
Heterogeneous cross-listing	4
Hidden cross-listing	9
Asynchronous cross-listing	3

Informal collegial discourse

During the spring semester of 2024, the topic of cross-listing was a natural priority for the authors of this paper, which implied that it was addressed in informal collegial dialogues continuously during this time. Although there is no direct documentation of this activity, it has been instrumental in shaping the understanding of the topic for the authors, and it has had an influence on the outcome of this paper, so we want to acknowledge this; the random and unplanned meeting with a colleague added a spontaneous reflection on the topic, which would otherwise not have been collected.

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Categorization of cross-listing of courses

We have identified four different categories. The categories are based on how courses are set up and hence they are not by definition associated with particular challenges. A given course could fit in up to three categories according to Figure 2. The two categories of *heterogeneous* and *homogeneous* cross-listing are mutually exclusive, but neither of the categories *asynchronous* and *hidden* are disjoint with the others.

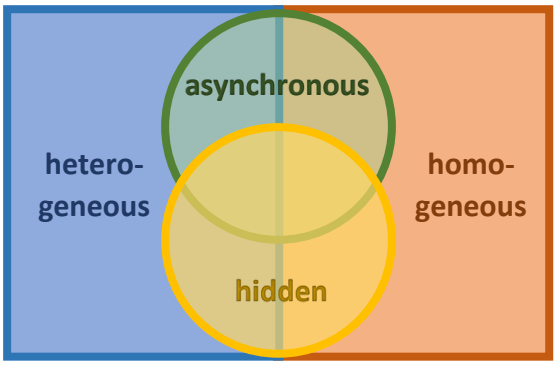

Figure 2. Describing different possible combinations of categories.

Homogeneous cross-listing

Homogeneous cross-listing is when two or more clearly distinguishable groups of students take the same course, but in terms of course delivery with regards to pedagogy, subject content, or assessment format, the groups are essentially equivalent. All groups fulfill the minimum requirements to follow the course. Even in this case, when the student groups are equivalent in terms of prerequisites, study techniques, and motivation (program-related factors), there may be differences in the concurrent curriculum (net requirements) and in the scheduling of important extra-curricular activities. Also, the differences in expectations, interests and potential control exerted by different educational program managements, who have their students collected in the same course, might give rise to conflicts and friction.

Heterogeneous cross-listing

Heterogeneous cross-listing is a situation where two or more clearly distinguishable and significantly diverse groups of students take the same course, and their differences change the overall character of the heterogeneity of the student population with regards to the consequences of teaching and assessment formats or any other part of course design and delivery. There may be several different factors that differentiate the student groups – group affiliation/identity, level of preparation, inherent motivation for the subject, or adopted study techniques, but the technical minimum prerequisites for participation in the course are met by all groups.

Asynchronous cross-listing

Asynchronous cross-listing describes a course that is offered at several separate times (different instances) for different student groups completely without, or with very limited, target group adaptation. The groups could either be homogeneous or heterogeneous. This category enables us to include compromises that course design can be subjected to in order to optimize e.g. for interchangeability or redundancy in teacher resources or in examination preparation and delivery. In this case, a student belonging to a certain population would see little or no difference in the content or

structure of the course if they shifted from one course instance to another – even if the course would have a different name and a different teacher. What could change between instances is teacher-specific aspects that would change also when one and the same course would change teacher.

Hidden cross-listing

Hidden cross-listing pertains to a situation when two or more separate courses, with different course identification codes, share several and/or extensive course components based on the provider's preferences. The groups could either be homogeneous or heterogeneous. Entire or part of the course can be asynchronous, but a hidden cross-listing could also be conducted in a synchronized manner. A "light" form of hidden cross-listing could be said to occur whenever a teacher is reusing material between courses in an undiscriminating fashion, without adaptation to the specific circumstances of a specific course.

Challenges and how to tackle them

Resource motivated cross-listing has several general challenges that are relevant independently of our categorization. The suggestions on how to address or tackle the challenges are typically directed at a level in the organization where responsibility for program management and development resides, i.e. the suggestions are typically aimed at program managements or equivalent. Some aspects are more basic than others, which should be considered first and are marked in bold.

General cross-listing

Challenge	**Suggestion on how to tackle**
The number of students increases, which will increase the workload for the teachers, when wanting to provide timely feedback.	*Allocate more teacher resources to the cross-listed course. Be sure to scale resources with the number of students in the course.*
Fairness and consistency in assessment are challenged when volumes increase.	*Allocate more time to assessment, and more systematic work with rubrics and collective efforts in assessing. Consider alternative assessment methods, such as digital auto-correction.*
From a program perspective it will be hard to adjust the course if needed, to follow trends or to change if something happens that requires changes to the program, since the course is more interdependent by being part of several curricula.	*This could be tackled by having open discussions between managements of the different programs. If the programs are within the same subject area or discipline, there is a chance that they can agree on adjustments and modifications in the course.*
External factors might also have an impact, such as concurrent courses, which might restrict when the students have time for group assignments or create a temporary	*Conduct course scheduling in collaboration with all courses involved. If it is hard to find a suitable schedule for the combination of courses, try to create more flexibility in*

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high workload that influences the cross-listed course.	*timing for e.g. hand-in deadlines and lab exercises.*
Too many cross-listed courses in the beginning of the program might make it harder for the students to find their program identity and also to find long lasting friends to study with.	*Divide the students into separate groups based on their program affiliations. This could be done by creating variations in assignments e.g. related to application scenarios for a certain theory, where the students from different programs have different preferences.*

Homogeneous cross-listing

Challenge	**Suggestion on how to tackle**
There might be hidden prerequisites that are not officially required, but which are presumed when delivering the course. Different student groups fulfill such hidden prerequisites to a varying degree.	*Making an inventory of all presumptions regarding students' previous skills and knowledge while also referring to material accessible for students who need to boost their background knowledge can help to homogenize the group.*
Despite having equivalent nominal backgrounds, the students might be different when it comes to e.g. language proficiency, studying preferences or a range of other skills that are not transparently represented in the available documentation.	*This could be tackled by investigating how the separate groups have acquired the prerequisites. If differences are found, the teacher could try to initially address and accommodate these; central concepts can be introduced in accordance with suitable previous terminology and/or in different languages using glossaries. The teachers could also provide more detailed study instructions and perhaps allow a wider variation of possible forms of study.*
Even if the student groups are considered homogeneous at one point, that might change over time.	*This could be tackled by questioning when the assessment in homogeneous was made and if needed, reconsider.*

Heterogeneous cross-listing

Challenge	**Suggestion on how to tackle**
Students have different attitudes towards the course which impacts learning, e.g. relating to their view of its relevance for their future careers.	*By trying to put the course in contexts that are relevant for all, this impact can be reduced. This might require some investigation and effort from the teacher.*

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If the programs result in different degrees (Bachelor of Science vs Bachelor of Engineering) there might be an added distance between students. One group could be considered superior to the other, and there might be issues when the students are to interact with each other.	*This could be tackled in different ways. One could mix the groups to let them know each other across the "barrier" or have assignments that are contextualized for each group; the students could still be allowed to choose topic freely, but the differentiation could help highlight the role and the importance of each group.*
Students from an allegedly inferior group do not dare to ask questions in case the question can be perceived as stupid and to confirm inferiority.	*Encourage questions during classes. Give positive feedback when questions are asked and add possibilities to ask questions anonymously, e.g. in an online forum.*
The connection to earlier courses and the degree of perceived continuity differs, and there are variations in labeling and nomenclature.	*Show awareness of the challenge. Enable interaction between teachers in courses in different programs.*
Augmented negative impact on heterogeneity earlier in the studies before a certain maturity and confidence has been established for the student.	*Specifically addressing the challenges for courses given in the early part of the program; reallocating resources to early courses.*

Asynchronous cross-listing

Challenge	**Suggestion on how to tackle**
High degree of variability between different teachers in different course instances.	*Organize regular meetings among the teachers to enable calibration and checking of progress and challenges.*
Course development and updates become more challenging. There is also an issue about *when* updates should be made.	*Work with the teachers' team to address the question in a timely manner in advance.*
Varying time delay to relevant previous courses.	*Include enough margin for repetition/overlap early in the course, since the need can vary.*
Synchronization between examination events being offered as valid for all course instances. This increases the complexity in exam administration.	*Pay extra attention to the scheduling of these exams to include students from other course instances.*

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Hidden cross-listing

Challenge	**Suggestion on how to tackle**
This type of cross-listing might be hard to spot as it might not be that obvious, perhaps even from a teacher's perspective.	*This could be tackled by having open discussions on what courses other teachers are giving and their content. It is also important to communicate this to the program management and administration to facilitate proper accreditation and also to guide students.*
If only part of the course is cross-listed, there might be issues with how many credits a certain part corresponds to. There might be valid reasons for discrepancies between cross-listed parts.	*Provide good motivations for the differences for all students and also make sure that the examination reflects the differences.*
If two courses are too similar, it might be hard for the lecturer to remember to which students he/she has said something.	*Have separate teacher notes for each instance of the course.*
Individual teachers might be suspected of undue acknowledgment of effort if several very similar courses are given by the same teacher under the pretense of being different by official labeling. Such acknowledgment could correspond to reallocation of resources.	*Ensure transparency and a fair way of distributing resources for teaching.*

Discussion

The framework we describe in this paper is derived strictly within the boundaries of Chalmers University of Technology, and we furthermore delimit our scope to a particular subset of courses that generally could be described as cross-listed, so it is not obvious how well our framework works in other settings. Our intention is to describe categories that are applicable to any higher education context, and that the identification of a particular type of cross-listing, albeit under different circumstances, still makes our suggestions for how to tackle related challenges valid. We do not claim that our framework captures all aspects of cross-listing, but it serves the purpose of classifying typical challenges in a way that helps identify which issues you should consider when planning for or implementing cross-listing.

The items discussed in the following serve as examples of what can emerge when cross-listing becomes the subject of collegial discussion in a guided interaction setting. We believe the dialogues conducted in the manner described in this paper match the hypothesized (Harper & Ross, 2011) key motivators for faculty to learn about cross-listing: resource motivated cross-listing is already an identified challenge, we use the existing collective experience of this as a base for our framework, and participants are invited to use the framework based on their interest.

Although our focus is on challenges, the possible benefits from cross-listing beyond the (main) purpose of increased resource efficiency should be sought. Different formats of cross-listing allow for different potential advantages. One example is the following: an asynchronous and hidden cross-listing of two courses is modified so that the courses are openly cross-listed and given simultaneously instead. Assume that we have student groups that are quite homogeneous with regards to each other, but where both groups consist of a mix of more and less ambitious students. By organizing the course for both groups at the same time, resources could be allocated to specifically address students with different levels of ambition, rather than providing the same course twice, in the same way, on different occasions.

The format of the course and its scope makes it more or less sensitive to the consequences of cross-listing. A basic, well established, and fundamental course in a general topic, is easier to accept having in one and the same shape for many different student groups, whereas a novel, applied or advanced course is more sensitive to prerequisites and its tailored usefulness for different student groups.

In our dialogues it became clear that it makes a significant difference to what degree the course is interactive for its sensitivity to heterogeneous cross-listing. A course that is dominated by delivering instructions (traditional lectures) might benefit from recalibrating if the student distribution changes with cross-listing, but otherwise the teaching is not significantly affected. A course relying heavily on individualized feedback will see an upscaling in the workload for cross-listing that increases the number of students, but the format of the teaching and the experience for the students is not strongly impacted. In courses designed for a large degree of group interaction, however, whether mediated by the teacher or not, the impact of cross-listing can be defining for the course, for better or worse; there are examples where the mixed student groups lead to an improved interactive outcome and examples of the opposite. Since group interaction, for example with a high degree of interaction during class sessions, is a practice that requires some experience and confidence to carry out as a teacher, these sensitive courses are in many cases delivered by experienced and highly qualified teachers. We recommend that such courses should only be cross-listed in a process where the course responsible teachers are strongly involved.

When there are intrinsic reasons to have students in one and the same course, but the course is split anyway, it could be considered as “split-listing”. One special example would be to divide a course to keep the number of students in each course section low for increased teacher accessibility. Split-listing could also occur for extrinsic reasons – organizational conditions might induce unnecessary division of students into different classes and courses.

One effect of resource motivated cross-listing is that there is a shift in workload, so that some teachers will see a higher teaching load by having to handle larger and/or more diverse classes, and/or having to teach the same course multiple times. It can be argued that this would make the most out of the best suited teachers. However, at least two long-term consequences must be considered: the continuous cultivation of less experienced teachers and the synergies between teaching and research. If the teaching overall becomes concentrated on a smaller fraction of the faculty, those teachers will have less room for pursuing research. At the same time, those members of faculty who have a large investment in research will be less exposed to teaching. In view of providing students with close contact to research, it would make sense to “split-list” courses, so that more teachers could partake in teaching smaller classes while maintaining rich research agendas.

There are several challenges with cross-listing, especially when it is extrinsically motivated. By implementing our proposed framework, the basic hygiene factors for functional cross-listing can be addressed (Herzberg et al., 2011). The main implication of the proposed framework is that it provides a terminology that can be used by any stakeholder. The common terminology will make it easier to

identify and act on potential challenges with cross-listed courses, such as: limited options to adapt course content, complex scheduling, maintaining program integrity and accommodating different attitudes towards the subject of study, before they really become issues for the students (Gubala, 2021). The implications for teachers are multifaceted, as the framework can help them to both identify and communicate challenges, preferably even before challenges have become a problem in the classroom. The list of challenges and suggestions on how to tackle them can support prevention or reducing the most common issues with extrinsic cross-listing. The framework terminology can also be valuable for program managements and administrators during syllabus development, especially when during interaction between program managements and administrators for different educational programs.

Conclusions

Four different categories of cross-listed courses have been identified, and a course can be classified as belonging to up to three of the categories. Some challenges are common for all kinds of cross-listing, but each category that we have identified comes with a number of particular challenges. The challenges we list are complemented with suggestions on how to tackle them. Common keys to addressing many of the challenges of extrinsically motivated cross-listing in all its forms are transparency, communication with students, teacher knowledge about cross-listing, and the sharing of that knowledge.

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