

# Systematic course analysis – how infrastructure and research findings collaborate to support course development

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**Abstract**—This work-in-progress research-to-practice paper describes how a technical university has worked to build a research-based course evaluation and analysis framework into its IT-infrastructure and how it is used for course development.

We report an initial analysis made to see how spread the use of the framework is over the university. We investigate the usage and the ownership of course evaluations and discuss different approaches of how the system has been utilized. By analysing the use of the framework at the university we gain a first insight how the framework has been received among faculty and how they make use of the framework for course evaluation, analysis, and development in a systematic way.

**Keywords**—Course evaluation, development, communities of practice,

## I. INTRODUCTION

Course evaluation and development is a common task for academics. However, from a teacher's perspective, course evaluations are often regarded as a mandatory necessity, and the way they are constructed often give little useful information for a teacher interested in course development [1], [2]. Furthermore, the use of student course evaluations has been discussed and criticized for not measuring what they aim for [3].

In this paper we present the development of a new approach to course evaluation and analysis with the idea of shifting focus from measurement of student appraisal of teachers' performance in courses to acquiring useful information for course development. A framework for a quality assurance process at the course level has been introduced and a pilot tested at a technical university. We will firstly focus on the main building blocks of the framework and show how we bring research into faculty and course development. Later, usage data for the system's first three years of operation is presented and discussed, and future development plans are highlighted.

### A. Course development - a shared concern between teachers

Course evaluation and course analysis can be used with several outcomes in mind. Primarily it is used for quality assurance, but it can also be used for course development as well as identifying needs for faculty development. The

approach to include support in the entire part of the evaluation and development process reinforces the ability to enhance a development of teaching and learning grounded in results from pedagogical research.

The framework for cyclic quality development for courses combines several desired items such as collegial discussion, student involvement, as well as a questionnaire designed to investigate the students' learning environment. Wenger's [4] ideas of communities of practice was central in the development of the framework. The overall aim was to emphasize collaboration between teachers in order to enhance quality in teaching and learning based on the assumption that quality increases if teaching is a shared concern between teachers.

To make the framework easily available, and to reduce the resistance for teachers to adopt it, the essential parts were integrated in the university's IT infrastructure. The aim is to save time for the teachers by automating the process of gathering students' opinions, as well as automatically compiling course statistics. In addition to the evaluation and data gathering solution, a template for course analysis has also been developed. Through this automation, the teachers are able to focus on the analysis and development of the course and minimize administrative burdens. The development was made in collaboration between educational developers and teachers and in accordance with modern agile working methods. Using the framework in a repeated, cyclic, manner, it can be used to systematically improve courses based on findings from educational research and knowledge about factors we know support students' learning.

### B. Description of the framework

The framework, termed Systematic Course Analysis, is consisting of a continuous process depicted in Figure 1. A cycle starts with a completed course offering being evaluated. The evaluation data gathering process is followed by a course analysis meeting at which teachers meet and jointly analyse the outcomes of the course evaluation and thereby have the opportunity to share experience and pedagogical ideas. Preferably, the analysis meetings are led by a pedagogical developer or an experienced teacher and arranged with 3-5 teachers participating.

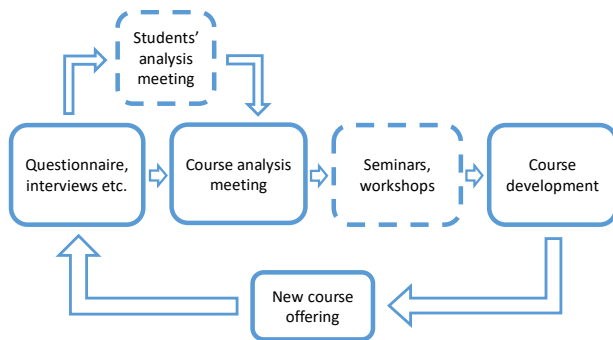


Figure 1: The elements of the course evaluation and analysis process.

The course analysis meetings both serve as a way to help individual faculty members to identify areas for course development by systematically analysing results from the course evaluations, and to identify areas of competence development for the individual teacher or teacher team. Once a development need in a course is identified, the teacher(s) can choose to attend workshops offered by the educational development unit at the university. If a new strategy for teaching and learning is introduced, it is also likely that the teacher(s) needs to develop his or her own competence. The workshops provides opportunities for easily accessible professional development for teachers, and the content of the workshops is of a practical nature in connection to presentation of research into learning in higher education. At the end of the cycle, the teacher will implement improvements in the course before the course is offered and evaluated again in a continuous improvement loop.

Another dimension of the framework is that it allows the possibility to involve students to participate in the analysis and development process. Two different ways for students' participation is suggested within the framework. Either the students arrange a separate analysis meeting where they are given the evaluation data to analyse and report back to the responsible teacher, or the students can be invited to participate in the course analysis meetings together with faculty. At this point, one can ask why students should take part in the process of identifying areas for improvement at all? Our early experience shows that the students often have different views of the need for development of courses and thereby bring in new perspectives and ideas.

In 2017, the president of the university decided on new regulations on course evaluation and analysis highlighting collegial experience exchange as an important required part. It was suggested that the SCA framework should be used due to the natural way students could be included in the process.

### C. Theoretical background to the questionnaire

#### 1) Research-based learning factors

To be able to facilitate fruitful discussions between teachers, a common ground to evaluate a course offering was identified as a concrete and delimited area, relevant for most of the university's teaching staff. By evaluating course offerings with a newly developed questionnaire, a new approach to evaluation was introduced at the university. This approach gives both experienced as well as inexperienced teachers a

chance to contribute to the collegial conversations on equal terms and puts the focus on course development aiming to improve students' conditions for learning. The evaluation is done through a questionnaire and constitutes one way for the students to voice their opinions of a course they just attended. The questionnaire used within the framework has been developed by teachers, pedagogical experts, and pedagogical developers at the university and is inspired by course questionnaires at other universities, e.g. the Course Experience Questionnaire [5]. The aim and purpose is not (only) to rate the course from a range of parameters but is primarily a base for discussion about course development in the specific context, and about teaching and learning in general.

The questionnaire investigates the students' perception of their learning environment in a course. It is based on probing factors that according to evidence-based research show that we learn more efficiently if these learning factors are in place [6-10]. The statements the students need to consider in the questionnaire is based on 14 learning factors. The questionnaire in its full version consists of 22 statements designed to probe whether the students agree or disagree to these statements on a 7-grade Likert scale. The 22 statements can be divided into 3 general areas describing the learning environment; meaningfulness, comprehensibility, and manageability. The background and the development of the questionnaire have been reported earlier [11].

As an example, one learning factor is phrased "A natural learning environment is characterized by the students working with problems that they think are important or exciting, and worth investing time and interest in." The corresponding statement in the questionnaire investigating is formulated "I worked with interesting issues". Beside the statements investigating the learning environment, the questionnaire also includes 4 open questions allowing the students to elaborate on the best aspects of the course, possible aspects that could be improved, advice to future students, as well as other comments. The students are also asked to estimate their weekly workload spent on the course.

#### 2) How the questionnaire is used within the framework

As stated before, one main aim with the framework was to reduce teachers' administrative burdens and having them focus on quality enhancement. Therefore, much effort was spent on simplifying and streamlining the framework. A teacher can initiate and distribute the questionnaire to the entire student population from the university's internal homepage in less than 5 minutes. The students get easy access to the questionnaire by a link sent to them through e-mail. While the questionnaire is open, the students that have not yet answered it are automatically sent regular reminders to do so. Once the questionnaire is closed, the students' responses to the statements are averaged and put in a report containing diagrams displaying the different aspects of the learning environment. The distribution of responses for each of the statements is also shown.

The report per se will not state what needs to be improved in the course, but forms a basis for areas or aspects that needs to be considered in future course development.

By using the evaluation report to focus a collegial discussion around, faculty members can discuss and problematize the learning environment rather than evaluating the performance of the teacher(s). We have found that probing the learning environment yields more useful insights and gives rise to more ideas for course development as compared to previously used evaluation questionnaires. Earlier, students were inclined to leave comments regarding the teacher(s), rather than suggesting ways to improve learning in the course. With the new questionnaire, we see a clear shift in students' comments as they focus less on the teacher and more on the learning environment and their learning in the course.

#### D. Institutional culture and pedagogical development

The institutional climate will affect to what extent development can and will be made and to what extent it will happen individually or in a common and shared community. According to Biggs and Tang [7], organizational units can be divided into four levels. The most sophisticated and highest level is described as an organisation where quality enhancement is established as a part of the culture, and where an approach of scholarship and the willingness for collaboration is strong. Roxå and Mårtensson [12] uses a socio-cultural starting point when describing different microculture environments at higher education institutions. In order to create a supportive environment with a high level of togetherness, both a high level of trust, and an expression of shared responsibility needs to be present [12].

In this part, we will focus on units defined as the organization level formed by clusters of departments at the university. The ten units described in this paper were defined by the formal organization of the university, all of them in different areas of engineering.

## II. THE USE AND APPLICATION

The framework was officially launched as an integral part of the university's IT infrastructure (i.e. accessible for everyone through a web solution) during the spring semester of 2015. For this work-in-progress paper an initial analysis of the adoption of the framework has been done by tracking the use of the system.

#### 1) Use of the evaluation part of the framework

Data from the first three years (2015-2017) has been analysed. In total, 473 individuals have used the evaluation part of the framework (the questionnaire) for 1323 course offerings of 773 unique courses. The analysis show that several teachers had been using the questionnaire on more than one course offering as well as for several different courses.

An increase in usage of the questionnaire could also be identified; 9.7 % (2015), 14.7 % (2016), and 17.6 % (2017) respectively of all courses at the university used the evaluation part in the framework.

It is recognized from the data that the system is used by all types of faculty categories (e.g. by assistant, associate, and full professors) including faculty serving in the top management of the university, by teachers in a training or learning position, as well as by educational administrators.

In figure 2, the number of course offerings using the framework are shown for the 10 units, for the first three years of operation. It is notable that the framework is not spread equally over the entire university. In this context, a unit is defined as an organizational level formed by clusters of departments. Some units does nearly not use the system at all (J), while other units use the system to a large extent, see figure 2. As the statistical data for unit J is so small, we henceforth omit it in the analysis and discussion.

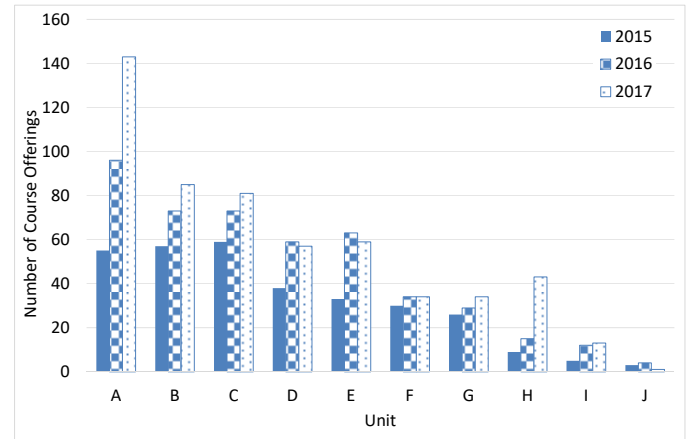


Figure 2: Number of course offerings using the questionnaire per unit and year.

From figure 2 it can be seen that all units have increased their use of the evaluation part of the framework since it was introduced in 2015, even though some units (D and E) experienced a small decrease between 2016 and 2017.

It should however be noted that the units are not equally sized. Normalizing the usage by dividing the number of course offerings using the questionnaire with the total number of course offerings for each unit, a more general picture of the usage is found, figure 3.

The number of course offerings varies between the years, most often as a result of minor reorganisations within educational programs, or that some courses are only offered biannually. The difference in number of course offerings can be as large as  $\pm 10\%$  between years.

The units with the largest number of course offerings, units A, B, and C (see figure 2), are not the units having the largest penetration in terms of usage. Figure 3, show that units D and E have the largest penetration. In these units, there is a deep-rooted engagement in educational development and quality issues that has been present for a long time, and this may explain this finding. If figures 2 and 3 are compared, the total number of course offerings at the respective units does not seem to play an important role on penetration.

Unit I, which by far is the smallest unit at the university, evaluate the same or larger percentage of their courses as compared to the largest units (A, B and C).

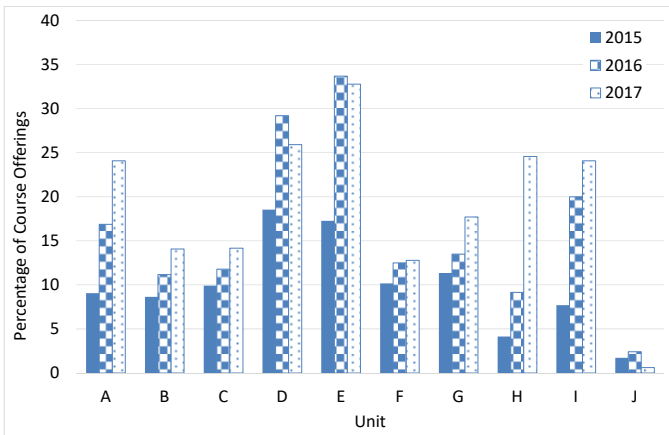


Figure 3: Percentage of course offerings using the questionnaire per unit and year.

The data show that the questionnaire part of the framework is utilized differently depending on unit. In some units, it was found that one individual could be responsible for initiating a large number of questionnaires while for other units, individual teachers are responsible for initiating their own questionnaires. For units A, and B, many questionnaires are started by very few persons that are assigned administrative roles at the respective unit. For units C through I, the questionnaires are initiated by course-responsible teachers.

## 2) Discussion on the analysis of use

The overall penetration of usage seems limited. However, before the system was officially launched at the university (i.e. during 2014), the questionnaire had been extensively tested in parallel systems by a number of teachers. It is therefore likely that some of these teachers, instead of migrating to the integrated course analysis framework instead continued using the questionnaire in the test environment to evaluate their courses. The number of teachers that did so is not available to the authors at this point in time, but it will be investigated in future.

At this stage of the evaluation of usage of the framework, we can only speculate on the reasons why the usage differ between different units. A combination of educational leadership, as well as devoted teachers interested in course development can be possible explanations. Another reason may be that it is easier to convince a smaller number of teachers to use a newly developed evaluation system than a large number of teachers.

The unit that has had a large increase in both number and percentage of course offerings analysed with the system is unit H, see figure 3. One major reason for this is that a large portion of the courses at the unit had undergone a major revision when it comes to both learning activities, as well as assessment during 2015. It was therefore important to evaluate these changes, which in turn has led to this increase in usage.

## III. FUTURE STEPS

This work-in-progress report of the on-going development and system integration project is at an early stage regarding the analysis of how it is used. The intentions with the introduction

of the framework is to facilitate opportunities for well-functioning microcultures [7], [12] and the initial analysis shows an increasing use. Therefore we can identify a possibility for collegial discussions aiming to focus on enhancement of students learning. With a common and well-grounded approach to course development one can assume the university has a capability to construct microcultures and environments for informal learning with focus on the common task; to deliver, design and develop courses based in deep content knowledge and on factors we know increase students' deep learning. The outcome of the usage, and the result of the integration of it, in terms of increased collegiality and actual course development need to be examined more deeply.

The data presented in this paper enable us to identify clusters of teachers using (and not using) the system in different ways. A qualitative approach in the investigation of the use should give us more insight about difficulties and opportunities in adopting the framework in the local context. A deeper understanding to the teachers' approaches to each different part of the system makes it possible to identify areas of improvement. Furthermore, we also need to, with a qualitative approach, investigate how the framework is used and what kind of approaches the teachers take for course development.

From present data one can ask why the system is used in some units but not in others and what approaches to research-based development can be identified in the different contexts. We also need to look deeper into how the teachers make use of all the steps supported by the framework. For example, are teachers sharing their course development work with others, as is suggested, or is it still done as an isolated development? And do the teachers also make use of the support given to analyse the collected data and what kind of knowledge-enhancing activities are being conducted to enable a change in teaching practice? Another important aspect to investigate is if the course development actually is based on knowledge on factors promoting learning and how other teachers and students perceive these changes. Of interest is also to look deeper into the student perspective. Does the student role in course development change and what approaches to learning and development does the student bring into the discussion? The work reported in this paper gives a possibility to identify different categories of environments in which teachers has adopted different approaches of using the system. The next step in the work is a more detailed analysis of the user data and to add user data from the part regarding the analysis of questionnaire data. A more qualitative approach needs to be used to investigate the results of the integrated framework.

It has been observed that the introduction of this system indeed has increased the frequency of spontaneous pedagogical discussions among faculty.

The possibility of involving students in the process was implemented in 2016, and how students influence course development has not been investigated yet.

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