Enabling and supporting quality assurance in a major engineering faculty

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INTRODUCTION

The Faculty of Engineering Science at the KU Leuven faces many challenges considering quality assurance, not only because of its numerous departments and programs, but also because of varying student characteristics and numbers per programme. The imbedding of the faculty in a major university that houses about 60 000 students across 16 faculties provides some extra conditions that have to be taken into account as well. The engineering faculty consists of 22 programs that need to receive customized support in providing quality assurance. In this paper, we will focus on one important aspect, that of learning outcomes and the ensuing curriculum mappings, which form a vital aspect of the quality assurance process. Through them, each programme can be sharply profiled and form a clear identity. It allows us to spot overlap, both in form and in content. Moreover, a systematical defining of learning outcomes enables the entire faculty to discuss and exchange experiences at the same level. This causes quality assurance to be more accessible to professors and teaching assistants, and encourages them to participate in ongoing didactical debates. A third advantage of a systematical approach to learning outcomes and curriculum mappings entails the involvement of as many professors as possible, thus creating a common agreement on the programme profile and programme learning outcomes.

Because of the sheer size of the engineering faculty, but also because of the significant differences in characteristics between the engineering programs, a thoroughly systematic approach was necessary to ensure the faculty's quality

assurance standards can be upheld. That is why the staff members education designed a three step approach for the harmonizing and fine-tuning of learning outcomes and the execution of a faculty wide curriculum mapping.

1 THREE-STEP APPROACH

1.1 Translating the learning outcomes

The first step of our approach consists of reformulating the faculty's programs already existing learning outcomes. Each programme already possessed a set of learning outcomes that had been evolving independently from each other. Creating a certain level of uniformity without losing each programs unique character was the greatest challenge.

The faculty's education staff members looked for an approach that would provide a flexible framework to enable the programs to formulate their learning outcomes. The general guidelines that were issued university-wide proved to be too general, it was felt that a more engineering specific approach was necessary. Moreover, the framework needed to be competence based, in line with the university's vision. A competence is defined as 'a realistic and individual capacity to use both theoretical and applied knowledge, skills and attitude in practice'.[1]

The ACQA-framework, developed in collaboration between the TU Delft, Eindhoven University of Technology and the University of Twente, was chosen as a model. ACQA distinguishes seven areas of competence that characterize a university graduate. It was inspired by a competence-based approach and was developed specifically for technological programmes.[2] The Dublin descriptors formed the basis for the framework.[3]

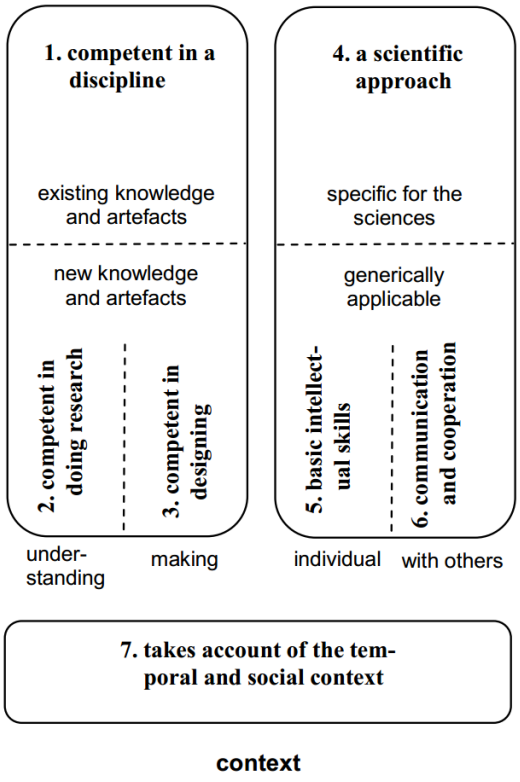

Figure 1: ACQA areas of competence schematically

[1] Hermans, I. (2007), Competentiegericht onderwijs als strategische doelstelling, *Ethische perspectieven*, vol. 17, 373.
[2] Meijers, A.W.M., Van Overveld, C.W.A.M., Perrenet, J.C. (2002), *Criteria for academic Bachelor's and Master's curricula*, Eindhoven.
[3] See http://www.jointquality.nl/ for the Dublin descriptors.

The seven areas of competence of ACQA, as schematically represented in figure 1, can be grouped into three elements. The first element is **domain**, which entails domain specific knowledge and skills. Secondly we have **method**, meaning general scientific competences that are less domain specific, and finally **context**, which comprises all competences that encourage students to take into account the temporal and societal context. The two first elements were subdivided into three areas each. This makes a total of seven areas, that were each elaborated further into about ten sub competences each.

Adopting ACQA had practical consequences for the KU Leuven engineering faculty. A number of programs had already formulated their learning outcomes in the ACQA-framework, others had to start from material that was up to seven years old and had no affiliation with ACQA whatsoever. The education staff members divided the 22 programs into two equally sized 'waves'. Both waves were a mix of programs that already had ACQA-learning outcomes and others that did not. Each programme was asked to form a focus group of about three to five professors and teaching assistants. The focus groups were invited to attend one or two sessions where the learning outcomes would be discussed and revised. There was no possibility to deviate from the ACQA-framework, all learning outcomes had to be placed in one of seven areas. We found it useful to schedule a comeback session after the first one, since new ideas would always sprout in the two week interval between two sessions. Programs that had already formulated their learning outcomes into ACQA in the past merely needed to perform an update. A first advantage of the approach became clear while supporting the latter group: both education staff members and professors/TA's immediately used the same terminology and were able to proceed much quicker with the update.

When a programme completed reformulating their learning outcomes, the result had to be presented to and validated by the program's steering committee. The committee gave the final feedback that was taken into account when finalizing the definitive learning outcomes for the programme. The aim for each programme was to end up with a set of ten to fifteen learning outcomes.

We should note that drafting formal learning outcomes is a difficult process and does not have a decisive, definitive result. Programme curricula are ever changing. However, this does not mean that formulating learning outcomes is not useful. The continuous involvement of stakeholders in the programme curriculum and the constant reflection is a goal in itself and is part of the quality assurance process.[4]

1.2 Performing a curriculum mapping

When the learning outcomes were all in place, a faculty wide curriculum mapping ensued. This entailed that each professor or TA that was responsible for a course, was provided with the learning outcomes that were discussed and reformulated in the first phase. They had to indicate through a custom made online tool whether the outlined competences were practiced in their course and whether they were assessed as well. It was also possible that an outcome was neither practiced nor assessed during a course. We chose not to include all offered courses of the programme in the mapping. This would make no sense, because no student takes up every course. Instead, we chose to select all (compulsory) core courses of each programme, and include a number of optional courses that together constituted a 'model pathway'. We also decided not to include a dimension of progress (i.e. indicating a level of mastery of the competence) because of efficiency concerns. Not only did the education staff members need time to process all 22 programs, but the professor's/TA's workload needed to be taken into consideration. Many course titular's had to fill out several mappings for the same course, since a lot of courses were offered in different programs, and each programme has its own set of learning outcomes. Our choice for a more 'simplistic' mapping enabled us to create a user-friendly tick-box format that was easy to fill out and provided us immediately with a visual profile of each course within a programme. When combined, these mappings produced an easily accessible overview of the programme concerned, as shown in figure 2.

This is a tool that can have multiple purposes and advantages. When a programme is up for accreditation, the mapping can provide the assessing team with a visual insight of the key competences for each course. The mapping can demonstrate consistency and quality across a number of modules and degree pathways. Outside of accreditation, the mapping is an excellent start for a curriculum review. This way, the education staff members can map whether the competence based learning outcomes that were formulated during the first phase were sufficiently represented

[4] Hermans, I. (2007), 377.

within the programs curricula, and which learning outcomes were (nearly) absent in a model pathway.[5] The mappings also proved to be a starting point for professors to share good practices. Ervin et al. (2013) also pointed out that in the competitive institutional climate, a higher education institute (HEI) needs to be able to prove that graduating students will possess competencies that meet the requirements of the professional world.[6]

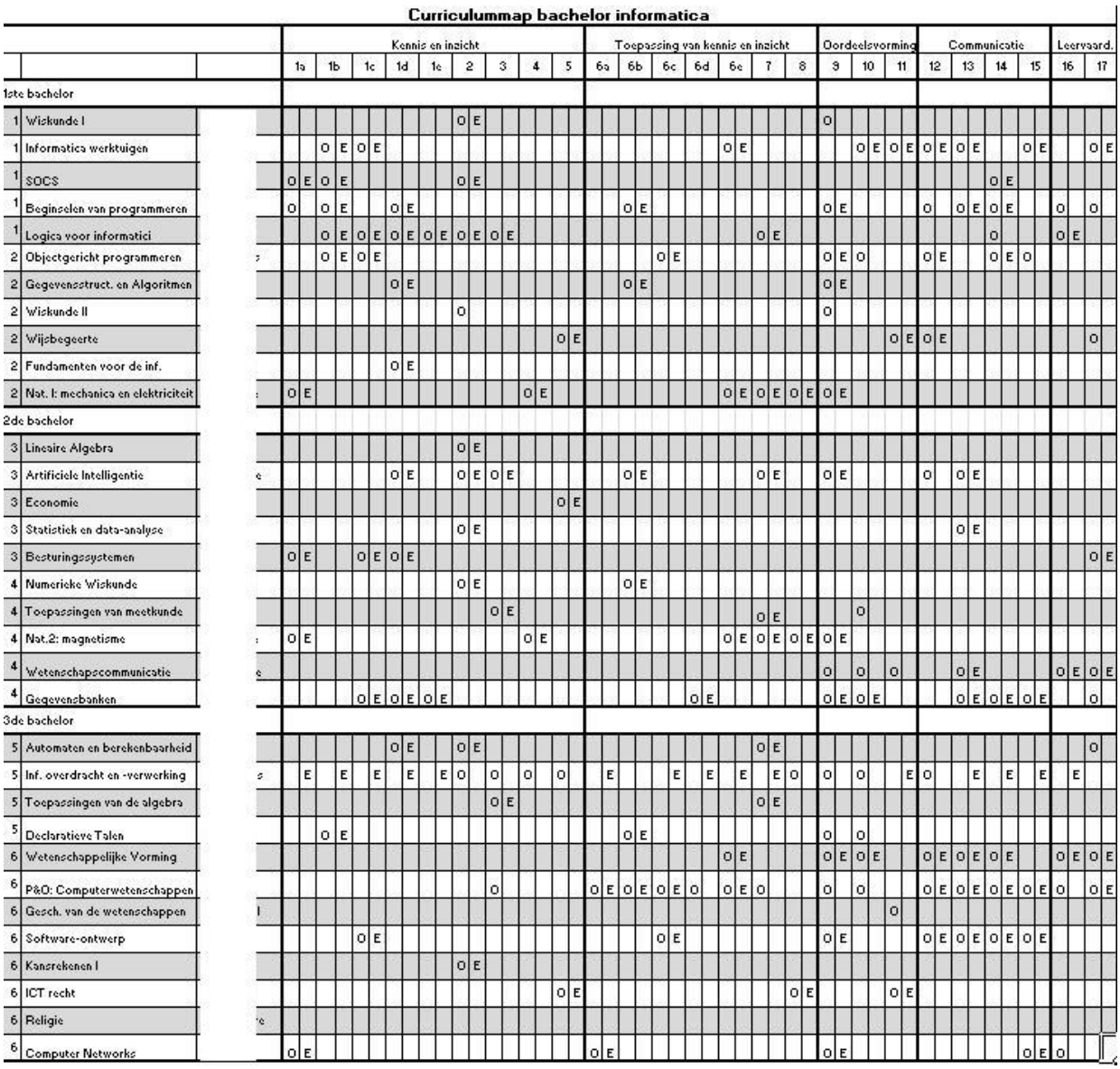

Figure 2: A completed programme curriculum mapping7

1.3 Updating the ECTS-files

Step three of this quality assurance process consists of a manual check of all the faculty's ECTS-files[8]. The number of these files ran over a 1000, so this was a lengthy and intensive step. The check-up has been running for a year now and still continues. However, since the files are of grave importance to

[5] Tariq, V.N., Scott, E.M., et al (2004), Auditing and mapping key skills within university curricula, *Quality assurance in education*, vol. 12, 71.
[6] Ervin, L., Carter, B., Robinson, P. (2013), Curriculum mapping: not as straightforward as it sounds, *Journal of vocational education and training*, vol. 65, 315.
[7] We would like to thank Bavo Meuwis for providing us with this example of a completed mapping.
[8] For more information on ECTS-files, see http://ec.europa.eu/education/tools/ects_en.htm.

the participation of the KU Leuven in international networks, and form a binding legal contract between the university and its students, it was and is of great significance that they contain correct and complete information about courses offered in each of the faculty's programs. Through the ECTS-files, the university can also communicate course content and form to (prospective) students.

The education staff members set about checking the files, starting by dividing the programs into waves. A total of three waves was set, each containing about seven programs. We continued in logical order, starting with the bachelors, continuing with the masters and ending with the 'Manama's' (Master-after-masters).

To facilitate and streamline the process of checking and commenting the ECTS-files, a pilot check was run on the general bachelor programme. A small focus group, consisting of the faculty's vice-dean for education and the education staff members compiled a list with requirements for the files that had to be met. This list formed the first draft of an ECTS-checklist. Some examples included 'Does the English ECTS-file match the Dutch file?' and 'Is there a clear link between the course's goals and their evaluation?'. After the first check of the bachelor's files, the list was adjusted and completed with a number of extra requirements. The checklist was then sent to the directors of every programme within the faculty. They were offered the chance to provide feedback, which was taken into account during the compilation of the finalized checklist.

The start of the checking process was announced to the involved programme directors, so they could alert their professors and TA's that recommendations for the update of their ECTS-files were forthcoming. An education staff member started going through the files, beginning with a second check of the bachelor's files with the new and improved checklist. The staff member proceeded with the architect's bachelor and five master programs. For each course, the checklist was filled out, and some additional comments could be added so we didn't need to go back to the files themselves every time a question arose. When all the files of the first wave had been manually checked, a number of standard recommendations for the course titulars were formulated. For instance, we noticed that a lot of course goals were only summarily written down, so one of the standard recommendations was that these goals needed to be elaborated further. In this case, we also included a link to a manual that was drawn up by the Department of Teaching and Learning.

With the checklist on the one hand, and the standard recommendations on the other, we started to contact all the individual professors and TA's that were responsible for a course by e-mail. They received custom advice, so general comments that did not apply to them were not included. A deadline of one month for the correction of the files was imposed. It was important that we discussed this with the programme directors beforehand, because their support meant a higher success rate of our action. We also included the contact information of the education staff members in every e-mail, as to ensure titulars knew who to contact when they came across problems or had questions. The staff members assisted professors and TA's when asked to. A week before the deadline, a reminder was sent out, as well as on the day the deadline expired. The responsibility for the further correction and follow-up of those files that had not been corrected yet was transferred to the programme directors. This way, the staff members education were free to maintain a rather tight schedule and advance to the next wave of files.

2 A TOOL FOR COMMUNICATION AND UPDATES

Reformulating 22 learning outcomes and performing as many curriculum mappings is an intensive and complex process. Since a total of six staff members and dozens of professors and TA's were involved, it was necessary to keep each other posted of the progress that was made during each session. Not all the staff members had their offices in the same building, so the need was felt for an online communication tool that allowed the participating members to exchange ideas. This tool would also prove to be a back-up when one of the members was unexpectedly indisposed and someone had to fill in. It was necessary that they were able to look up information at a moment's notice so they could prepare for a session in a relatively short time span.

We created an extra bullet in the faculty's SharePoint-website, that was only accessible to the six staff members that were involved in the mapping process. Every programme got assigned a folder, and an Excel-sheet, among other documents, was added to each of them. The Excel-sheet was modified so they contained some basic information about the progress of each programme in the mapping

process. This allowed staff members that were not involved in some programs to keep updated on the progress and fill in if necessary.

3 IN CONCLUSION

The three-step approach as described above had many advantages, as we concluded in our introduction. It also serves several purposes. By checking a course's ECTS-file and course-specific learning outcomes against the learning outcomes as described for the entire curriculum of a programme (a fourth and optional step with many benefits), we can check whether the intended curriculum matches the actual curriculum. Potential overlaps can be spotted and possibly superfluous courses can be eliminated from the curriculum. These actions should take place in the larger framework of a programme's broader reflection on its curriculum. This reflection will be facilitated greatly by our adoption of the ACQA-protocol, which allows all parties involved to discuss educational matters at the same level and using the same terminology. Lastly, we would like to point out the advantages of the process as a means to deliver input for a policy of evaluation methods which is a hot topic in today's educational scene. Expanding quality assurance to the field of evaluation is enabled by the thorough examination of the programme's curriculum. Evaluation, learning method and learning outcomes can be matched a lot more accurately when working with completed curriculum mappings and streamlined learning outcomes. In conclusion, we believe that through our three-step approach we have reached higher levels of transparency, uniformity and efficiency in our quality assurance process.

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