# A PROPOSAL FOR AN ASSESSMENT FORM FOR ENGINEERING DESIGN THESES

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## ABSTRACT
To evaluate a student's work best possible, the assessment of theses written as part of the curriculum has to meet certain standards from both an academic and an industrial perspective to fully embrace the goals of engineering education.
Most universities usually use standard forms for the evaluation of theses. For the purpose of this research, available assessment forms within the Berliner Kreis, the German-speaking network of university institutions active in design education and research, were collected, compared and interpreted in order to find common evaluation criteria and to judge the current state of how theses in design education are evaluated.
This paper shortly describes the theoretical background to evaluation of engineering theses, it presents the results of a comprehensive study about current German and international evaluation procedures and criteria, and it concludes on future directions for the evaluation of theses in universities.
The result of the observation is a proposal of a comprehensive evaluation form for theses that could be adapted to special needs of evaluating institutions.

*Keywords: Design Education, Assessment, Thesis, Evaluation Criteria*

## 1. INTRODUCTION
The main goals of engineering education in universities are to provide technical knowledge and to enable students to apply it successfully to concrete design problems in the "real world". Thus both requirements of industry as customer and upcoming demands of accreditors for study courses in the Bologna process challenge the education of design engineers at university to "prepare graduates for the practice of engineering at a professional level" [1] [2].
The necessarily required skills can be acquired by solving realistic design problems in order to cope with for example holistic technical tasks as well as work organisation or conflicts in design teams. Project-based learning is a fundamental model to implement practice-oriented education in undergraduate courses. Within common curricula in engineering sciences, such projects usually take shape as written term papers and master or diploma theses.
They are mostly implemented in the advanced phase or at the end of study courses and therefore demonstrate academic skills and recheck the employability of students. The main objective of this paper is to compare and discuss actual approaches to the evaluation of such theses in German universities and to provide subsumed criteria as a result of this survey. The paper is part of a series of papers on this topic [3] [4].

## 2. OCCUPATIONAL PROFILE OF ENGINEERS

### 2.1 Industrial requirements
More than 50% of all positions in management in german industry are nowadays occupied by engineers [5]. Therefore the industrial demand for engineers includes technical experts or engineers with a broad technical knowledge as well as diverse soft skills, personal attributes, intercultural competence and interdisciplinary knowledge, figure 1 [6].

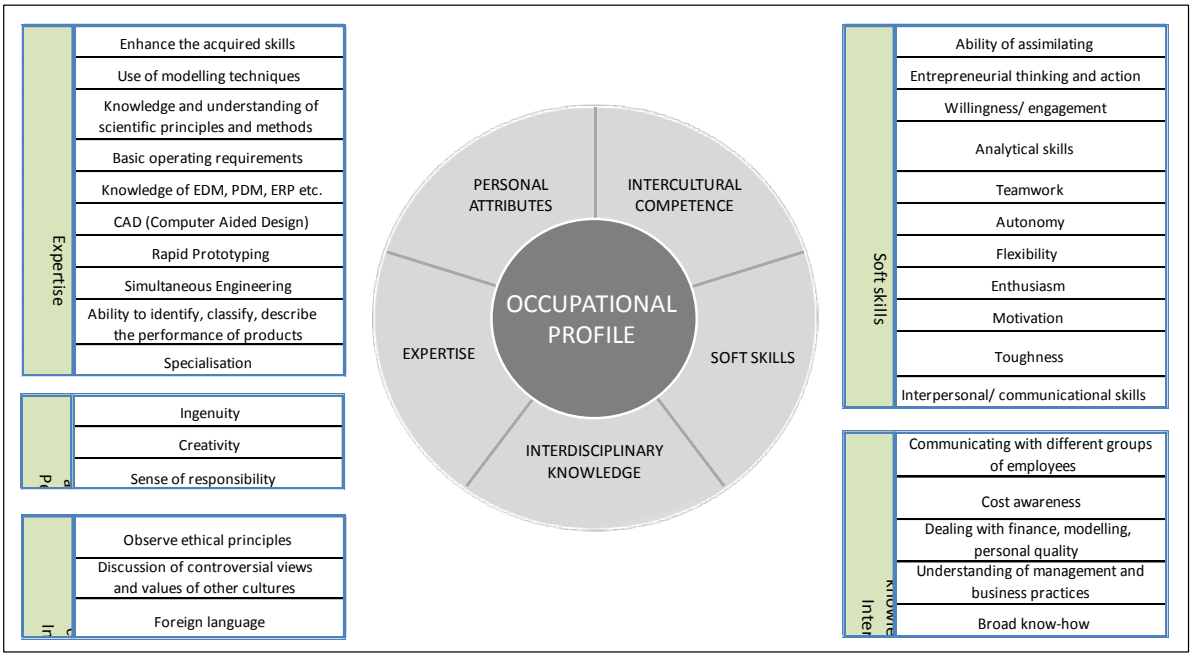


Figure 1: Occupational profile of engineers

## 2.2 Goals of education and accreditation criteria

It is the goal of design education to provide students with the core competencies for their future careers. [7] distinguishes six kinds of competencies to this end: heuristic/practice-related (i.e. learning by doing), branch/subject-related (i.e. expertise), methods-related, systems-related, personal/social and socio-economic. [8] equally structures competencies into six categories that are necessary for today's working environment: professional competency, social competency, teamwork, methodical competency, creativity and elaboration potential. Overall, it is most important to not simply provide basic technical skills to future engineers and designers, but to endow them with a large variety of competencies [9]. The corresponding methods applied to teach these competencies are various. Lectures and tutorials mostly serve for communicating a solid theoretical foundation.

The accreditation of engineering programs is, among other criteria, increasingly based upon learning outcomes as described above. Learning outcomes describe the knowledge, understanding and skills that graduates are expected to have demonstrated after finishing a study course. The formulation of learning outcomes supports e. g.

- comparability, mutual acceptance and accountability of study programs
- formulation of curricula and quality of teaching processes
- better orientation of students

Criteria for these learning outcomes of engineering bachelor and master programs can be found in diverse publications, e. g. by the European EUR-ACE [10], the Dutch Joint Quality Initiative [11], the British UKSPEC [12], or the international Washington accord [13]. Students should demonstrate the desired abilities in their final theses.

Theoretically seen, these criteria should be included in the evaluation of theses. Table 1 regroups all criteria into a common overview:

| | Engineering practice | Engineering task | Engineering approach | Interaction with collaborators | Written/oral presentation | Awareness of context |
|---|---|---|---|---|---|---|
| [7] | heuristic / practice-related | branch / subject-related | methods-related; systems-related | personal/social | | socio-economic |
| [8] | creativity | professional methodical | | social; teamwork | elaboration | |
| [9-13] | doing research; designing | scientific discipline | scientific approach; intellectual skills | managing, coorperating, communicating: awareness of social context | | |

*Table 1: Categories of goals and focus of engineering design education*

### 2.3 Design projects in German universities

To gain practical experience and to mediate professional competency, student design projects are commonly employed in many universities [14]. Figure 2 shows the actual characteristics of theses Most universities differ between Term Paper (SA), Diploma- (DA), Bachelor- (BSc), and Master-Thesis (MSc) in their descriptions of writing projects. In German universities, the Bologna system necessitates three larger projects for the MSc level: the BSc thesis, a graduate term project of 350 to 500 hours, and a MSc thesis of six months. Typically, students receive a task description and some initial material when starting their projects, and they are closely supervised throughout their work; in many cases, the thesis is part of a larger project in research or in cooperation with industry and/or other disciplines. For each project, students have to hand in a written report. Varying among the universities as well as within the universities, projects take different forms but are always of scientific character. They can range from classic design tasks, e.g. the development of a certain device ("constructive"), to e.g. researching the means of managing communication in the design process ("theoretical"), to e.g. running a series of tests or trials ("experimental"), although often this differentiation is not further regarded.

Duration (in months)

| | min. | max. | Ø |
|---|---|---|---|
| SA | 3 | 6 | 5 |
| DA | 3 | 6 | 5 |
| BSc | 2 | 6 | 4 |
| MSc | 4 | 6 | 5 |

Effort (in hours)

| | min. | max. | Ø |
|---|---|---|---|
| SA | 200 | 600 | 360 |
| DA | 800 | 900 | 850 |
| BSc | 250 | 500 | 350 |
| MSc | 600 | 900 | 830 |

ECTS-Credits

| | min. | max. | Ø |
|---|---|---|---|
| SA | 10 | 14 | 15 |
| DA | 30 | 30 | 30 |
| BSc | 6 | 15 | 13 |
| MSc | 15 | 30 | 30 |

Figure 2: Characteristics of projects in German universities

### 2.3. General aspects of assessment in engineering education

Commonly, there are two ways of assessing a student's work: summative, i.e. at the end or after an assignment, and formative, i.e. throughout the course of the project. Summative assessment contributes to the marks for a module, level or degree and licenses to proceed to the next stage of a study course or certifies the successful completion of a study program and the readiness for the professional world. Formative assessments also fulfill pedagogical intentions. Based on feedback during courses students can compare their performance to the standards at the end of the course and develop and improve themselves. [15] points out the importance of such assessments: "Assessment of students is a fundamental and pervasive element of teaching and learning, and a potentially powerful means of driving their continuous improvement". Assessment provides, in fact, for a number of effects.

Grading is the primary form of assessment, and evaluates the performance of a student. The grades provide a means of orientation towards the own expectations and effort by indicating whether and how well a student has attained the formulated requirements of the project task. Since student design projects usually incorporate a high degree of teamwork and project results are developed together, the individual performance has to be distinguished from the overall team performance.

An assessment has to motivate the student for learning, both by providing a goal worth obtaining and by positioning the learning effort to motivate future learning. The positive aspects need to be stressed in order to recognize the student's work. In addition, the negative aspects also have to be clarified in order to show potential for optimization in further projects.

The assessment has to be fair with respect to the overall student body and the general level of quality that is to be expected. This is a big challenge, as different students are assessed by different supervisors on different projects, and it is hard to reach an objective frame of reference for grading. Therefore, the assessment has to assure as much objectivity and transparency as possible.

## 3. ACTUAL ASSESSMENT PROCEDURES

### 3.1 Setup of the study

Most universities use standard forms for the assessment of theses. This study was based on the evaluation forms from institutes that are part of the Berliner Kreis network, a German speaking society regrouping 24 institutions that focus their educational and research work on engineering design; the quota of using a methodical means of evaluation is therefore at least 50%, as possibly all partners in the Berliner Kreis supplied their evaluation forms for the purpose of this study in case they were available. To achieve comparability, only evaluation forms of study courses in mechanical engineering were included. All focus on the assessment of design projects similar to the description in section 2.2.

### 3.2 Academic regulations

Examination regulations in technical universities in Germany specify the elements of study programs and their sequence. From the perspective of these academic regulations projects in higher education primarily aim at the students ability to use scientific methods and to demonstrate that they are able to solve engineering problems autonomously, accurately and timely. Results of a survey among German universities teaching engineering design about formal criteria in examination regulations concerning the purpose of projects are shown in figure 3.

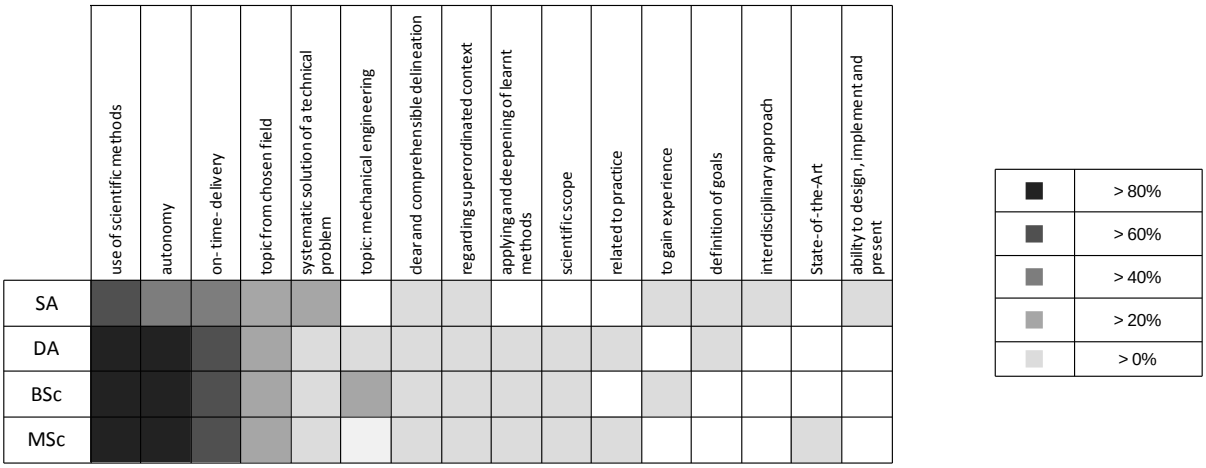


Figure 3: Academic regulations

### 3.2 Procedures and criteria

Table 2 lists all criteria groups all criteria according to their use in institutions 1 though 24. Overall, there are six categories of evaluation criteria used to generally assess theses, table 2. On the one hand, there are those criteria that relate to the different aspects of applying engineering expertise to a project (i.e. practice, task, and approach in table 1); on the other hand, there are those that relate to the softer skills of a professional engineering career (i.e. interaction, presentation, context in table 1).

In short, there are a few common denominators to the various forms of assessment: The scientific approach, the results and the written elaboration are always part of the evaluation. The evaluation of a scientific approach mainly incorporates methodical, organizational and personal competence of the student. Results must meet professional standards and require competence in reasoning, reflecting and forming of a judgment about the findings. The written elaboration must fulfill formal standards concerning layout, the quality of the illustrations or linguistic correctness, but also enable the reader to follow the thread and understand the subject matter; in this way, the ability to present a complex matter in a simple way is evaluated. Ultimately, the oral presentation, if required by the type of thesis and the respective study guidelines, is taken into account on an optional basis in many forms.

The criteria use different kinds of scores, mostly school grades, and pre-defined weighting factors to rate the importance of each criterion towards the overall grade; however, many forms also allow for an adjustment where necessary, e.g. when normally the use and application of design methodology would be evaluated but are not applicable to a specific task that is being assessed. To this end, some of the evaluation forms distinguish between different kinds of theses, e. g. design or programming tasks to

better account for the varying degree of complexity. In other cases, the overall degree of complexity is estimated as an additional criterion.

| | Evaluation criteria | Used in evaluation forms ("x"= yes) | | | | | | | | | | | | | | | | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | criteria | category |
| Task | Effort of familiarisation | x | | | | | | | | | | | | | x | | | x | | | | | | | | 3 | 14 |
| | Content | | | | | | | | | | | | | | | x | | | | | | | | | | 1 | |
| | Complexity | x | | | | | | | | | | | | | | x | | | | | | | x | x | x | 5 | |
| | Basic conditions | | | | | | | | | | x | | | | | | | x | | | | | | | | 2 | |
| | Organisation | | | | | | | | | | | | | | | | | | | | | | | x | | 1 | |
| | Realisation | | | | | | | | | | x | | | x | | | | | | | | | | | | 2 | |
| Approach | Autonomy | x | | | x | x | | | x | x | x | | | x | x | | x | x | x | x | | x | x | x | x | 16 | 61 |
| | Recognition of task | x | | | | | | | | x | | | | | | | | | | | | | | | | 2 | |
| | Creativity | x | | | x | x | | | x | x | | | | | | | x | x | | | | | x | | | 8 | |
| | Motivation | | | | | x | | | x | x | | | | x | x | | x | x | x | | | x | x | x | | 11 | |
| | Working style | x | | | x | x | | | x | x | | | | | x | | x | x | | x | x | x | x | | x | 13 | |
| | Timing | x | | | x | x | | | | | x | | | x | x | | x | | | x | | x | | x | x | 11 | |
| Results | Literature | x | | | | x | | | x | x | x | | | | | | x | | | | x | | | | | 7 | 40 |
| | State-of-the-art/ Theory | | | | | | | | x | | | | | | | x | x | x | | | x | | | | | 5 | |
| | Discussion/ conclusions from findings | | | | | | | | | | | | | | | x | x | | | | | | x | | | 3 | |
| | Quality | x | | | x | x | | | x | x | x | | | x | | | x | | x | | x | | x | | | 11 | |
| | Solution | | | | | | | | | | x | | | | x | x | | | x | x | x | x | | x | x | 9 | |
| | Amount and completeness | | | | | x | | | | | | | | x | x | | | | | | | x | x | | | 5 | |
| Written elaboration | Content | x | | | x | x | | | x | x | | | | | x | | x | x | x | | x | | | | | 10 | 68 |
| | Layout | x | | | | x | | | x | x | x | | | x | x | x | x | x | x | | x | x | x | x | x | 16 | |
| | Stylistic design | x | | | x | x | | | | x | x | | | x | | | x | x | x | | x | x | x | | x | 13 | |
| | Argumentation | x | | | x | x | | | | x | x | | | x | | x | x | | x | | x | | | | | 10 | |
| | Clarity | x | | | x | | | | x | x | x | | | | | | | x | x | | | | | | x | 8 | |
| | Accuracy | | | | x | | | | x | x | | | | | | | | | | x | | | | | | 4 | |
| | Visualisation of charts and graphs | | | | | x | | | | x | | | | x | | x | x | | | | x | x | | | | 7 | |
| Oral presentation | Task | | | | x | x | | | x | | | | | | | | | x | | | | | x | | | 5 | 17 |
| | Verbal skills | | | | x | x | | | x | | x | | | | x | | | x | | | | | x | | | 7 | |
| | Use of media | | | | x | | | | x | | | | | | | | | | | | | | x | | | 3 | |
| | Timing | | | | | | | | | | | | | | | | | x | | | | | x | | | 2 | |
| Interdisciplinary competences | Interdisciplinary share | | | | | | | | | x | | | | | | x | | | | | | | | | | 2 | 14 |
| | Regarding superordinated context | | | | | | | | | | | | | | | | x | | | | | | | | | 1 | |
| | Interpersonal skills (social competence) | x | | | | x | | | | | | | | x | | | x | x | | | | | x | | | 6 | |
| | Basic skills | | | | x | x | | | | x | x | | | | | | | | | | | | | | x | 5 | |

*Table 2: Overview of the evaluation criteria used in the received forms*

The final result is always a grade assessing the thesis. About half of the assessment forms are automated, e. g. by use of spreadsheets, few of them require an additional text to be formulated. The evaluation is usually conducted by the responsible professor and the staff supervising the student.
Many forms make use of a few written statements to complete the numerical assessment; this is done for three purposes: To better document the decision for an individual grading in case of later concerns of the student, to comprehensively document the assessment of the thesis in the form of an expert report as suggested by the Bologna process and to communicate the result to the student in a complete manner. The latter is only done “here and there”, even within individual institutions. While most institutions allow for the students to see the criteria set out to their theses, few only communicate the results in a comprehensive way including constructive feedback on possible improvements (for e.g. the next thesis) to the students.

### 3.3 Commonalities and differences

Figure 4 regroups the criteria shown in table 2 by their occurrence. As can be seen, there is no single criterion that all institutions deem universal to engineering design education. Autonomy and the amount and quality of the results rank among the most important criteria, followed by a systematic progress to obtain the results. Overall, the task is not considered much, and possibly there is little

systematic integration of the overall complexity of the task design into the assessment as tasks are supposed to be equal, which, in practice, is not always the case to the best of the authors' experience. As the project is part of the curriculum, a lot of focus is put onto the quality of the documentation and, if applicable, presentation. As teaching and learning a scientific and methodical way of problem solving is an important part of engineering education. The systematic approach of the student to reach his results is therefore approximately as important as the actual amount and quality of the results that were obtained.

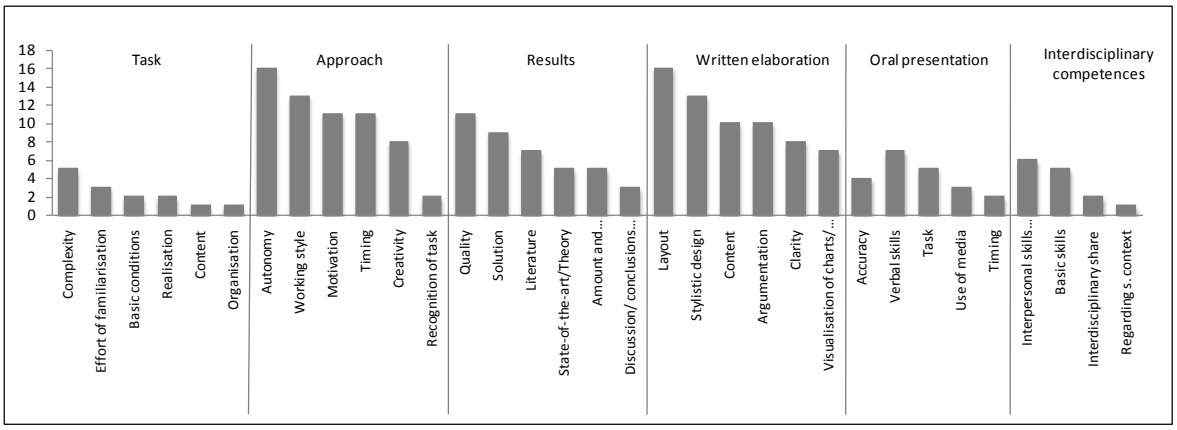


Figure 4: Occurrence of evaluation criteria per category

### 3.4 Reflection and Directions

A comparison of the criteria in table 1 to those in table 2 (only those that appear reasonably often, i.e. more than 5 times) is shown in table 3. A direct relationship of goals and criteria cannot be determined, mostly because study guidelines, legal reasons (documentation of academic records) and the other aspects from section 2.2 need to be taken into account.

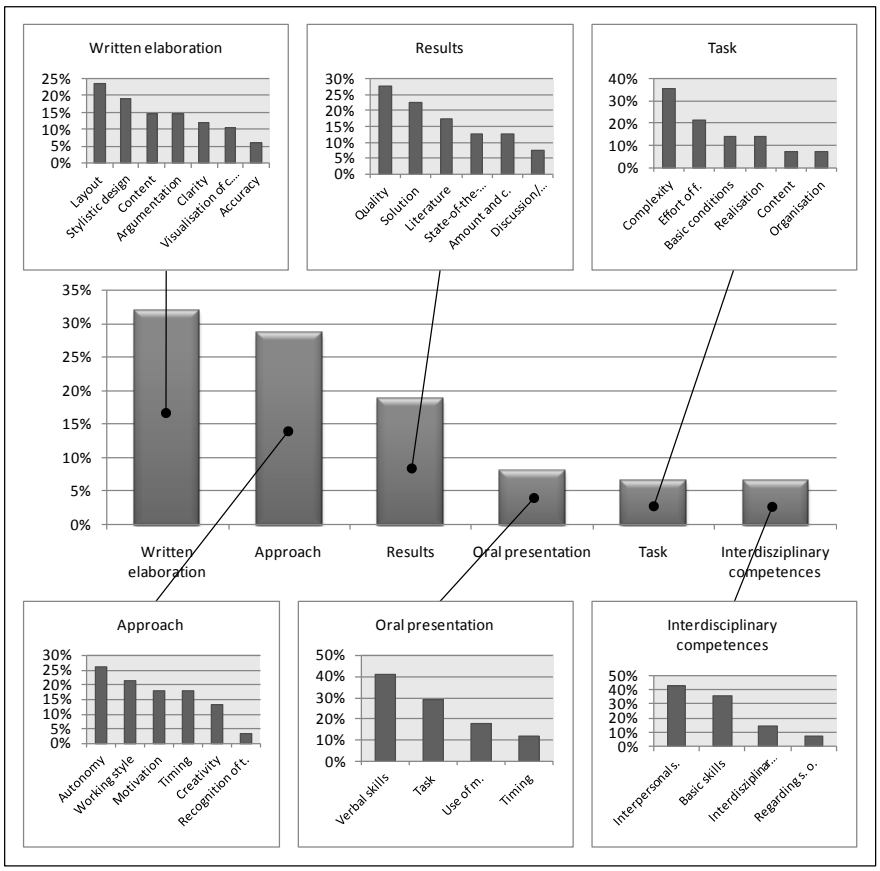


*Table 3: Use of assessment criteria (only most important ones) and goals of education*

Although no direct mapping between goals and criteria is possible, it can be seen that some aspects are more stressed than others, above all the written elaboration and the oral presentation. A strong focus is furthermore put onto the approach, which is of course what engineering design education is most about. There, the stress is mostly put on the effort taken, the active project management, the extent of dedication to and familiarization with the task, and the level of innovation achieved, which is among the hardest to judge. The section "results" focuses mostly on the scientific aspects of a thesis, i.e. what skills and effort a student has shown in his work. The task design is actually quite under-represented. Both the interaction in a team (if teamwork is applicable, which is not the case in all student theses) and the context of the work, e.g. the relation of a solution to neighboring disciplines or the use of similar concepts in other disciplines, draw no attention at all, although they are stressed to be just as important.

## 4 FINDINGS AND SUGGESTED EVALUATION CRITERIA

An improved assessment process for theses has to meet several requirements: On the one hand it has to fulfill the current practice, which implies that all already commonly considered assessment criteria should be enclosed. On the other hand the goals of education as well as the demand of industry on graduates have to be considered in an extensive way. Moreover the learning outcomes, outlined in the context of Bologna have to be involved and evaluated.

### 4.1 General Requirements to an evaluation form

In general, grading is the primary and probably the most important outcome of an assessment by indicating whether and to what extent a particular student has attained requirements of the project task [16]. Therefore, fair and equal evaluation and grading has to meet several requirements, as it has to be towards the students, recognize their work, evaluate success, or has to motivate for future learning. In the context of PBL this implies that projects have to be judged in comparison to the overall students' body and the general level of quality that is to be expected. Moreover, good assessment has to ensure overall fairness with respect to the overall student body and general level of quality, as well as being as simple as possible, which is actually a matter of the right workflow and template. In using a standardized template and communicating the important assessment criteria to the students before they start their projects, in order to provide transparency of the expectations set on the work, this fact is taken into account. In addition to that, a specific and timely feedback and a systematic analysis of students' performance on assessed task, which can help to find areas need improvement, can be named as further fundamentals of effective assessment.

Criteria included in the assessment forms have to meet several requirements. They have to enable the consistency of marking as well as to provide a basis for useful feedback to the students, but also have to match the assessment task and help students in achieving the determined learning outcomes [17].

All points mentioned above concern to assessment in general. Furthermore the requirements outlined by the several mappings, figure 5, have now to be considered in creating a new evaluation form. In summary evaluation has to emphasize the high order cognitive skills, like ability to think and apply, ability to analyze and synthesize, and solving problems. In addition to that, other personality trials as the ability to work in groups, ability to work independently, and the ability communicate to other people in a comprehensible manner have to be part of students' evaluation, as these competences gain more and more attention today. "Soft skills" is the key word in this connection. Furthermore, those assessment criteria that arer less considered in the current practice according to the mappings with academic regulations, goals of education, occupational profile and Bologna have to be embedded in a new evaluation form.

| | |
|---|---|
| Academic regulations | •Interdisciplinary approach<br>•Relation to practice<br>•Scientific Scope<br>•Regarding superordinated context<br>•State-of-the-art<br>•Gaining experience |
| Goals of education | •Problem sensitivity<br>•Creative techniques, practice<br>•Development methods<br>•Courage for new solution<br>•Branch or subject-related knowledge |
| Occupational profile | •Sense of responsibility<br>•Creativity, ingenuity<br>•Observe ethical principles<br>•Communication in interdisciplinary/intercultural context<br>•Understanding of management and business practices |
| Learning outcomes | •Ability to fulfil engineering practices<br>•Interdisciplinary knowledge<br>•Ability to use a variety of methods<br>•Ability to use adequate tools |

*Figure 5: Criteria to be considered*

### 4.2 A proposal for a coherent set of assessment criteria

As suggested before, there are different groups of assessment criteria, which have to appear in the evaluation form. Primarily these groups of criteria are written elaboration, approach, results, task, interdisciplinary competences, and oral presentation, figure 6. All types of criteria have in common that they either are a statement of what the learner will do, or a reference to the quality of the work. Therefore, the criterion has to refer to something that must be present or absent (e.g. presence of stylistic design or absence of grammatical mistakes), or some requirement that must be fulfilled, for example verbal skills [18].

The proposed form has three main categories: *project management, documentation, and presentation. Project management* implies the accomplishment of project, as well as the working style of student in general, and is divided into four groups (scope and challenge, approach taken, results during project, and cooperation and communication). While scope and challenge covers the complexity of task (e.g. different types of theses), the approach taken requires deep understanding of the task. The results during project and the quality of solution have to incorporate a certain volume regarding content and must be based on the actual State-of-the-art. Within *project management* it is primarily verified how the project is carried out, if the student has recognized the task, delivered in the provided time, worked independently, and achieved planned results (discussion and conclusions from findings). Cooperation and communication assesses interpersonal competences, as the ability for teamwork and leadership, and considers the interdisciplinary share of project as it is required. These criteria attach great importance in the proposed form as they are required of industry and academia.

The resulting evaluation form is exemplarily shown in figure 6.

| **Written elaboration** | 35% | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Content | *** | The coverage of the project is appropriate, the content is made clear | | | | | | | 0,00 |
| Layout and graphics | ** | Layout is attractive and clear, content is presented in a useful way, praphics are useful and comprehensible | | | | | | | 0,00 |
| Structure and rationale | *** | The chapters are designed in a consistent way, articulacy of project is apprpriate, typographical and | | | | | | | 0,00 |
| Literature | ** | Literature research, citation, bibliography | | | | | | | 0,00 |
| Written comment | | | | | | | | Grade: | 0,00 |

*Figure 6: Exemplary evaluation form (Documentation)*

*Documentation* rather deals with the content and layout of thesis, the stylistic design, the logical understandability of the written elaboration, clarity, accuracy, and the visualization of charts and graphs. The documentation of project implies the demand made on students to structure the thesis in a comprehensive way and to use a well understandable verbalization.
If applicable in the type of thesis, *final presentation* implies the oral presentation at the end of project time and assesses criteria as the content, verbal skills, the use of media and the timing of the student.
For every particular assessment criterion the evaluation scheme provides a little description of how the formal criterion has to be met in the project. Additionally these descriptions oblige the supervisor to reflect upon every criterion and to consider to what extent the student has achieved the requirements. Moreover, the evaluation scheme implies a grading system, which specifies whether the criterion is met in an “inadequate”, “sufficient”, “satisfactory”, “good” or “excellent” way. Moreover the form provides space for an additional text or a few written statements of the supervisor to complete the numerical assessment and to communicate he results to students in a complete manner. Besides that, the written comments aim at documenting assessment in a comprehensive way in the form of an expert report as suggested by the Bologna process [19].
Another important aspect with regards to evaluation forms is the weighting of every particular criterion. A system of weighting may be superimposed in many assessment forms. On the one hand this is important and necessary to stress criteria, which are more significant than others in later career. An independent working style, for example, may play a more important role from the employer’s view than the visualization of charts and graphs or the use of media. On the other hand weighting of criteria can be used to adjust the assessment to the different forms of theses. A thesis with a constructive or experimental character, for example, therefore has to emphasize the results of elaboration, whereas in a theoretical thesis the written elaboration plays a more significant role. In general there are some aspects of the work, which can be identified as contributing to a greater extent to the achievement than other (e.g. scientific approach by contrast to literature research).
The approximate weighing of project management and documentation of project, which combines the documentation itself and the final presentation, is based on current practice. Primarily this aims at ensuring that e.g. bad projects that are well written up, well presented are graded accordingly. However, this proposal emphasize the project management (55%) in comparison to the documentation of project (45%) in order to meet the requirements of industry and academia and to provide students with the necessary skills.

## 5 CONCLUSION AND OUTLOOK

The analysis of the approaches of engineering design institutes used to assess theses in engineering design shows clear similarities and few variances in the criteria that are used. The suggested set of evaluation criteria is therefore based upon the intersection of the criteria used in the actual evaluation forms in German universities and completed by requirements of the Bologna process. The Bologna process suggests the idea of using similar criteria for the evaluation of engineering courses and their outcome and the evaluation forms clearly show a common perspective.
There is a broad consensus about core competencies that must be demonstrated especially in projects at the end of engineering courses, which, however, is slightly different from the goals that engineering design education is supposed to comply with. Commonly, an autonomous and systematic approach is an obvious goal of engineering education that requires deep understanding of the task and a creative and efficient solution process. Results must be based on the actual state of the art and incorporate a certain volume regarding content. The written elaboration and the oral presentation, if required, demand a comprehensive structured and an understandable verbalisation. Reasonable additional criteria used by some universities cover the complexity of the task to distinguish between different types of projects, the treatment of the results and the accuracy of the student. Teamwork and interdisciplinary play an increasingly important role in engineering sciences, but they are not yet sufficiently regarded in projects and their evaluation. They require a continuing revolution of tasks and evaluation.

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