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Evaluation of the effectiveness of teaching in the module Measurement and Automation Technology

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Abstract

Ausgelöst durch die Corona-Bedingungen wurde in den letzten Jahren viel in der Lehre verändert. Dabei stellt sich die Frage, welche Elemente der Lehre – digitale wie nicht digitale – für den Lernprozess der Studierenden tatsächlich förderlich sind. Um sich dieser Fragestellung anzunähern, wurde für das Modul Mess- und Automatisierungstechnik ein Evaluationskonzept entwickelt und im Sommersemester 2022 erstmals umgesetzt, mit dem Ziel, die studentische Perspektive auf diese Frage zu erfassen. Im folgenden Artikel werden das Konzept und Ergebnisse vorgestellt und kritisch diskutiert. Außerdem wird der Nutzen einer Evaluation konkreter Lehr-Lernelemente für die Weiterentwicklung der Lehre hervorgehoben. Dieser wird gesteigert, je häufiger eine Evaluation durchgeführt wird – in nachfolgenden Semestern, in anderen Modulen oder auch an anderen Universitäten. Ein klares Ergebnis dieser Evaluation ist die Bevorzugung von Präsenzveranstaltungen (auch in Ergänzung der Möglichkeit, online teilzunehmen) gegenüber reinen Online-Angeboten.

Triggered by the Corona conditions, much has changed in teaching in recent years. This raises the question of which elements of teaching - digital and non-digital - are actually conducive to the learning process of students. To approach this question, an evaluation concept was developed for the Measurement and Automation Technology module and implemented for the first time in the summer semester of 2022, with the aim of capturing the student perspective on this question. In the following article, the concept and results are presented and critically discussed. Furthermore, the benefit of an evaluation of concrete teaching-learning elements for the further development of teaching is emphasized. This is increased the more often an evaluation is carried out - in subsequent semesters, in other modules or even at other universities. A clear result of this evaluation is the preference for face-to-face courses (also in addition to the possibility to participate online) over purely online courses.

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1. Introduction

In the summer semester of 2022, the second part of the Measurement and Automation Technology module was evaluated with the aim of recording in detail the students' perspective on the effectiveness of teaching in the module. From this, relevant indications for the further development of teaching are to be gained. At this point it should be noted that the evaluation is not a substitute for the TU-wide course evaluation for the purpose of quality control, which is carried out at the TU Dresden by the Center for Quality Analysis. The objective of the evaluation presented here is different. It is described in more detail in the section 2 in more detail. In the section 3 the evaluation concept and the research design are described and critically discussed. An excerpt of the evaluation results is the subject of section 4. In the section 5 these are summarized and the gained knowledge is described, in the section 6 a conclusion for the teaching is drawn as well as an outlook on further surveys is given.

This article is primarily intended to address lecturers and persons involved in teaching in the field of engineering sciences who are also interested in obtaining impulses and indications for the further development of their own teaching concepts through evaluation. If similar evaluations are carried out in different modules, comparisons can be made or questions can be evaluated together. This would lead to a higher significance and to more far-reaching indications for the further development of teaching.

2. Motivation and objective

After several Corona semesters and repeated upheavals in teaching concepts triggered by the pandemic conditions, there has not been - as perhaps suspected - a weariness and reluctance to change teaching concepts. Instead, there are efforts to put further changes on a solid footing, to incorporate the findings from the Corona semesters into teaching, and to figure out the best possible variant that combines classroom formats with online or digital elements. In addition to the expertise of the teaching staff and their ongoing discourse on teaching, the focus here is on the students' perspective.

The question is how effective the individual elements from the teaching offering - digital and non-digital - actually are from the students' perspective. Are there elements that seem particularly useful to students? Further questions to be answered with the help of the evaluation are: Are there different assessments between German and non-German students? How often are teaching offers (lectures, exercises, laboratory practicals, lecture videos) used? Which format (in presence, hybrid, digital) is preferred by the students?

How these questions can be answered with the help of the evaluation carried out is shown and discussed in section 4 and discussed in the following section. The evaluation concept, which is presented in the following section, is fundamental for a targeted interpretation of the results.

3. Evaluation concept and study design

What is evaluated?

The subject of the evaluation is the module Measurement and Automation Technology, which includes a two-semester lecture, lab practicals and computational exercises (hereafter referred to as teaching-learning offerings). The individual elements (see study design), which are intended to support the learning process of the students in the teaching-learning offers, are examined with regard to their effectiveness. It is not possible to measure the effectiveness directly. It is ascertained via the assessment of the students. Although it is possible to derive statements about the achievement of learning objectives from the results of self-tests offered in the course of the semester and the exam results at the end of the module, these cannot be related to individual elements.

The aim of the teaching-learning offers is an increase in competence, i.e. knowledge, skills and abilities in the field of measurement and automation technology. **Learning processes** are understood according to the description in the study regulations [1]: They aim at an increase in competence in a specific technical area and include various processes that can be

supported by different teaching-learning offers. Relevant are cognitive processes for the development of an understanding of the subject, application processes in which skills are developed and knowledge is deepened, and practice or training phases in which skills develop into abilities that are more automated. Of secondary importance when considering the effectiveness of teaching-learning opportunities, but nevertheless significant, is motivation, without which no learning process can be started and maintained.

What is the purpose of evaluation?

The aim of the evaluation is to find out which teaching-learning offers and elements are assessed by the students as helpful for their learning process in order to obtain indications for the further development of teaching concepts (insight interest). The aim is not so much to omit elements from teaching that were assessed as less helpful on the basis of evaluation results, but rather to determine the need for optimization in their implementation or to use more frequently those elements that were assessed as particularly helpful (development interest). In addition, it should be found out whether different groups of students (non-German, German, male, female) evaluate teaching-learning offers differently.

How is evaluation done?

The evaluation was carried out ex-post, i.e. at the end of the offer period, and consequently has a summative character. The evaluation is based on the following assumptions:

A learning process in the sense of gaining knowledge with subsequent consolidation through application and practice, which leads to an increase in competence, is optimally supported by motivating, knowledge-supporting elements as well as elements of application, consolidation and practice. Students can assess which elements motivate them to deal with content and which elements contribute how strongly to understanding, comprehending and consolidating contexts (it is neither a matter of ranking, nor of either/or). In doing so, an ex-post facto design allows for comparison between student groups.

In addition to the teaching-learning offers, whose effectiveness is to be recorded with the evaluation (intervention effects), other factors can significantly influence the learning process. These external confounding effects are included in the survey at the end of the teaching-learning offer period. Examples include: Learning with friends, talking with family, watching YouTube videos, etc. The effects that these factors produce are not part of the subject of the survey. This needs to be thought about in the survey.

In addition to the summative character, the survey has a formative character, since the results are to be used for the continuous further development of teaching. Further surveys allow a comparison across semesters and enable statements about the long-term development of teaching.

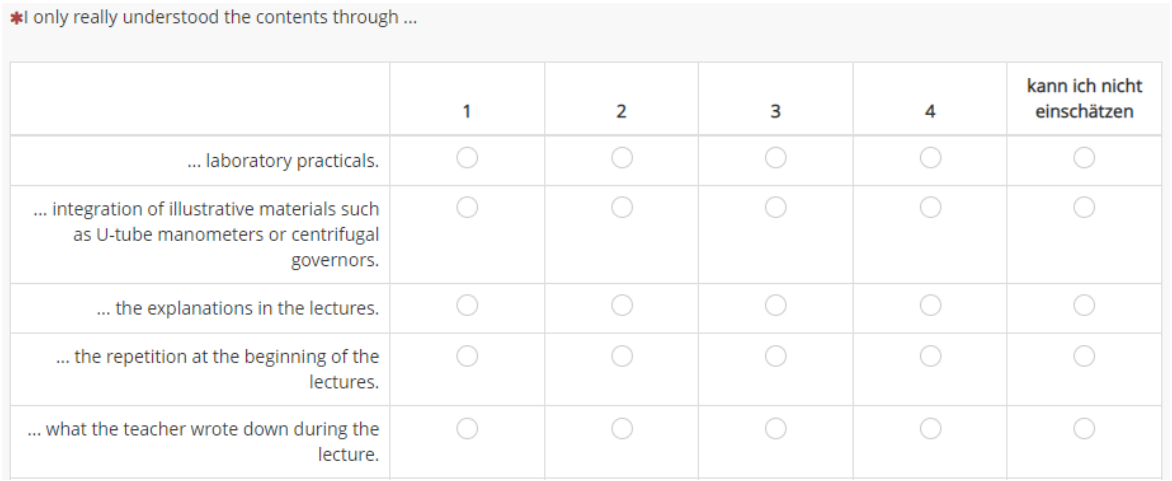
Study Design

The evaluation took place in a final survey in the last lecture of the summer semester 2022. All students present were asked to complete the online questionnaire in a time slot within the lecture. For this purpose, a QR code was generated that led directly to the survey. This approach made it possible to survey almost everyone in attendance. In addition, the link to the survey was sent to all students, so that people who did not attend the last lecture could also participate in the survey. The standardized questionnaire was created using the online survey application LimeSurvey, which is provided to the TU Dresden via the Saxony Education Portal [2]. The survey was anonymous, with recording of the date and timings to the individual question blocks.

The questionnaire contains primarily closed questions with a 4-point unipolar Likert scale ("1," "2," "3," "4," "I can't estimate"), whose lowest expression ("1") is specified as "disagree" and whose highest ("4") is specified as "agree completely." For the first question of the questionnaire, examples are given on the answer options. The questions are bundled into the following blocks:

- Block 1: The course offering on measurement and automation technology in the summer semester 2022: What helped you?
- Block 2: What did you use?
- Block 3: What do you prefer?
- Block 4: General information (socio-demographic data)

In **block 1,** the participants were asked about their assessment of the following elements: explanations in the lecture, interim queries using the learning platform Kahoot! [3], repetitions at the beginning of the lecture, integration of illustrative materials, what was written down by the teacher during the lecture, practical applications, own transcripts, X-chapter[1] , historical narratives, lecture videos, solving exercises, attending exercises, sample solutions to the exercises and the lectures and exercises as a whole, as well as lab practicals. No further differentiation of lab practicals into individual items was made, as there were separate surveys [4] for this purpose. An example of the items can be found in Figure 1.



*I only really understood the contents through ...

	1	2	3	4	kann ich nicht einschätzen
... laboratory practicals.	○	○	○	○	○
... integration of illustrative materials such as U-tube manometers or centrifugal governors.	○	○	○	○	○
... the explanations in the lectures.	○	○	○	○	○
... the repetition at the beginning of the lectures.	○	○	○	○	○
... what the teacher wrote down during the lecture.	○	○	○	○	○

Figure 1: Sample items from the survey in the summer semester 2022 on teaching effectiveness.

Other item beginnings are:

- "I was able to understand the connections through...",
- "I was able to consolidate my acquired knowledge by...",
- "I was motivated to engage with the content by...",
- "In my learning process, it has moved me forward...".

In **block 2,** students were asked how many lectures, exercises, and meetings on the lab practicals they attended. The answers were given via numerical entries. Likewise, the self-study time per week was queried numerically in minutes, as well as used possibilities besides the teaching-learning offer, such as textbooks, Youtube videos, conversations with friends etc.

Which variants were preferred in the area of digital teaching was the subject of **block 3**: lecture in presence, screen recording, live transmission, hybrid implementation as well as the temporal integration of Kahoot! - at the beginning, in the middle or at the end of the lecture.

The following data were requested in **block 4**: degree sought, field of study, semester, gender and nationality (German, EU countries, non-EU countries). At the end of the questionnaire, comments, wishes and criticisms could be expressed in a free text field.

Critical discussion

No pre-post design

If the effectiveness of teaching-learning offers is to be recorded, it is advisable to measure the level of competence at the beginning and end of the offer period. A pre-test is not possible in the measurement and automation technology module. In addition, the comparison between the competence levels does not provide a differentiated view of individual elements. For these reasons, an ex-post survey was chosen to assess the effectiveness of individual elements as well as the teaching-learning offerings as a whole.

Distortions

Due to the amount of items in block 1 (26), there may be some fatigue in the assessment.

[1] Here students are asked to photograph measurement technology in everyday life, to question it and to send it to the teacher. In the so-called X-chapter in the lecture, the underlying measurement principle is explained.

However, since this was the first time the survey had been conducted, it was important to have as many items as possible assessed. In addition, isolated items were asked twice with different wording to check for random ticking.

Further biases are possible due to the measurement time in the last lecture. The assessment of the effectiveness of individual elements of an entire semester may well be difficult. It should also be considered that elements of the teaching-learning offer do not contribute directly and noticeably to understanding or consolidation, but possibly with a delay or unconsciously. These effects are not recorded in the survey, but are just as desirable as those that are directly and consciously perceptible.

External Confounding Effects

These effects have already been addressed. The survey was used to ascertain whether students used textbooks, YouTube videos, conversations with friends, fellow students and family to make better progress in the learning process. However, since all individuals use such resources to a greater or lesser extent, data sets cannot be excluded to rule out corresponding effects.

Also mentioned here are students' performance and willingness to perform, which can strongly influence the assessment of elements of teaching.

No representative sample

All students present at the last lecture were surveyed. It is possible that these students are more motivated to complete the module than the students who did not come to the last lecture. Other reasons for non-attendance could be illness or family commitments, or a preference for using the lecture videos. Thus, the group of respondents is not representative of the entirety of students in the Measurement and Automation Technology module.

4. Evaluation results

In the following, selected results from the survey are presented and critically discussed.

The participants

A total of 160 complete data sets were available for inclusion in the evaluation. Of these, 26 were female, one was diverse and 120 were male. 13 persons made no statement. The proportion of women is 16% and thus corresponds approximately to the proportion of women in the entire student group in the module in the summer semester 2022 (17%). The proportion of students from EU and non-EU countries is 17.5%. A total of 356 students participated in the written exam for the module Measurement and Automation Technology in the summer semester 2022.

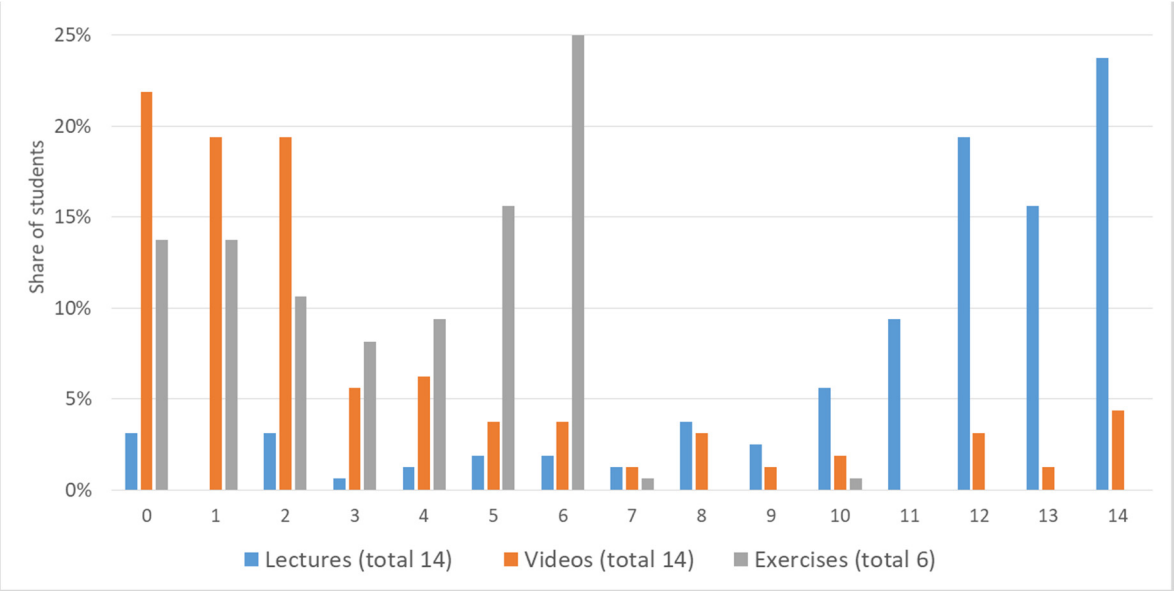


Figure 2: Number of offers used.

Thus, 45 % of the students could be surveyed. 85 % of the respondents are aiming for the diploma degree, the rest for the bachelor's degree, master's degree or the diploma postgraduate degree. Over 90 % of the respondents are studying mechanical engineering, with just under seven percent studying process and natural materials engineering. 76 % of the respondents are in their 6th semester at the time of the survey, the others in their 2nd (Diplom-Aufbau), 4th, 8th or 10th semester.

Use of offers

Students were asked how much of the 14 lectures, 14 lecture videos, and six exercises offered they used. The following graph (Figure 2) shows the results.

Nearly 90% of respondents used at least half of the lectures and about half used four or more exercises. Seven or more videos were used by just under 20% of respondents. The percentage of people who did not attend lectures was 3%. One fifth of the respondents did not attend any exercises.

Although only six exercises were offered, two individuals reported a number above six. It is possible that these individuals went to parallel exercises that were offered at staggered times. In future surveys, an upper limit should be set here, since the issue is whether all exercises were attended or fewer.

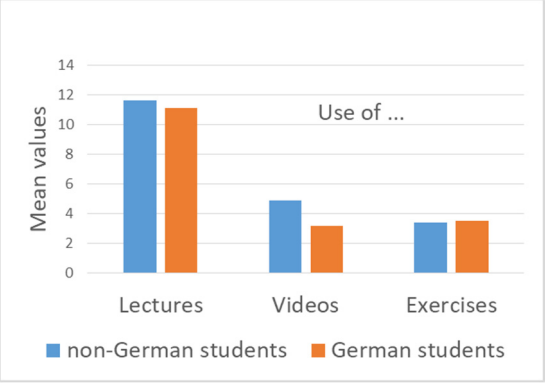


Figure 3: Comparison of usage means between non-German and German students.

A comparison between German and non-German students is interesting with regard to the use of teaching-learning offers. However, due to the small group size of the non-German students (28), the results are only of limited significance. For the comparison, the mean values of the usage frequencies of both groups were compared for lectures, videos and exercises (Figure 3). Lectures and exercises are used with similar frequency by both groups, but videos are used somewhat more frequently by non-German students. The reason for this could be the language barrier, which can be compensated for by the possibility of interrupting the videos or playing them more slowly.

The comparison of mean values of usage frequencieswas also drawn between women and men (Figure 4). Here, too, the group size of women (26 respondents) is too small to make any generally valid statements.

A significant difference in the usage behavior of the two groups is not evident for lectures, lecture videos, or exercises.

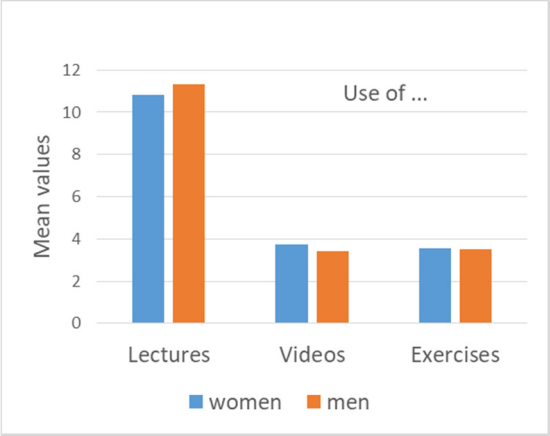


Figure 4: Comparison of mean usage values between women and men.

Assessment lectures, exercises, lab practicals

The students were asked how much they were advanced in their learning process by the lectures as a whole, the exercises as a whole and the lab practicals as a whole. This evaluation was asked chronologically after the evaluation of individual elements, so that it can be assumed that "exercises as a whole" was understood to mean not only the Exercise event, but also the exercise tasks and sample solutions.

Only the results of respondents who had attended at least half of the lectures and the exercises were used (Figure 5).

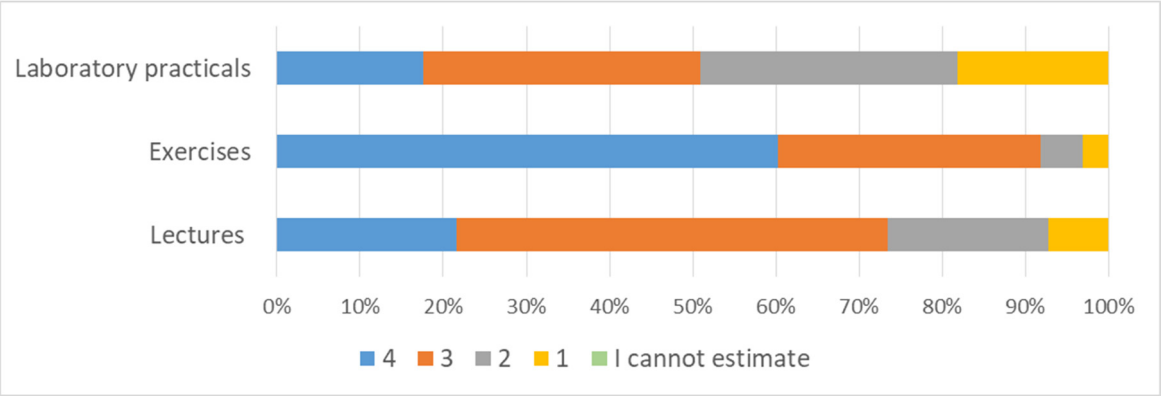


Figure 5: Overall assessment of teaching-learning opportunities.

More than 90% of the respondents rated the exercises positively (response categories "3" and "4"), just under three-quarters rated the lectures positively, and half of the respondents rated the lab practicals positively. The reason for the different evaluation between exercises and lectures can be found in the didactic function of both teaching-learning offers. While the lectures primarily present the content and the students largely acquire it by taking notes, exercises promote a more active engagement with the content by solving the exercises independently. It is quite understandable that the exercises are thus rated as more effective for one's own learning process than the lectures, even though the lectures provide the basis. The added value of doing things independently as opposed to just listening is likely to be even more apparent in the lab practicals, as these are even more action-oriented. Here, not only calculations have to be performed, but data has to be determined by experiments. However, the results show that the lab practicals were rated significantly lower. A very likely reason for this is the stage of development of the lab practicals. They were redesigned during the Corona pandemic and have yet to be optimized accordingly, while exercises and lectures have been adapted but are still based on concepts that have been tried and tested for years. For example, the coordination between lectures and lab practicals still needs to be improved. This explanatory approach is supported by comments in the free text field at the end of the questionnaire.

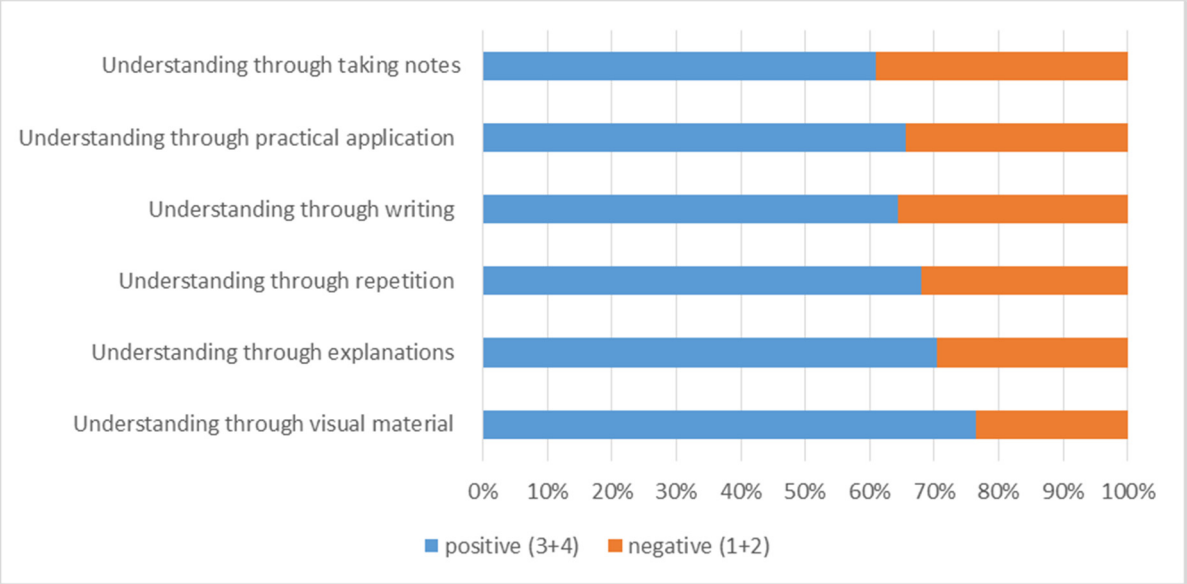


Figure 6: Evaluation of lecture elements.

Evaluation of the lecture elements

In question block 1, students were asked how effective the various elements, such as note-taking or writing to them by the teacher, were for their learning process. The following graph (Figure 6) shows results from students who attended at least half of the lectures. For the evaluation, the response categories "1" and "2" were combined under "negative" and "3" and "4" under "positive".

The elements were predominantly evaluated positively. Three quarters of the respondents rated visual aids as helpful for their own understanding (highest effectiveness). 60% of the respondents rated understanding through their own note-taking positively (lowest effectiveness). All other elements were in between.

When evaluating these results, it should be noted that these elements are only effective in combination and basically cannot be considered on their own. It is possible that the respondents found it difficult to differentiate between the effectiveness of individual elements. If we look at the correlations (calculation of the coefficients with the Excel function KORREL) between similar items, we get values between 0.3 and 0.5.

The correlation, for example, between "I only really understood the contents by including visual materials" and "I only really understood the contents through practical applications" is 0.33. The correlation between the teacher's note and the students' notes is 0.48. Consequently, there are correlations.

Furthermore, the participants were asked which elements of the lecture helped them to consolidate the material. In the Figure 7 shows the results for the elements repetition at the beginning of the lesson and intermediate questioning.

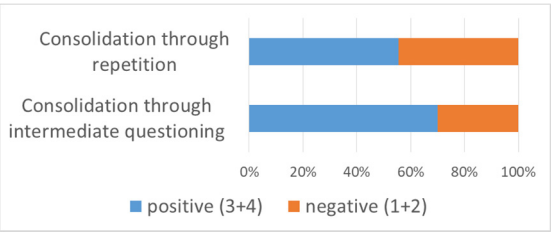


Figure 7: Evaluation of the elements repetition and intermediate query.

Both were predominantly evaluated positively, whereby the intermediate question scored better. This is possibly due to the fact that the intermediate question refers to the material that was discussed directly before. The review was done at the beginning of the lesson, the material was then a week ago. Thus, the repetition at the beginning of the lesson serves more for reactivation than for consolidation. This should be made more explicit in a subsequent survey.

An interesting aspect of the assessment of the lecture elements is a comparison between the groups of non-German and German students. For this purpose, the mean values of the groups for the individual elements were compared (Figure 8).

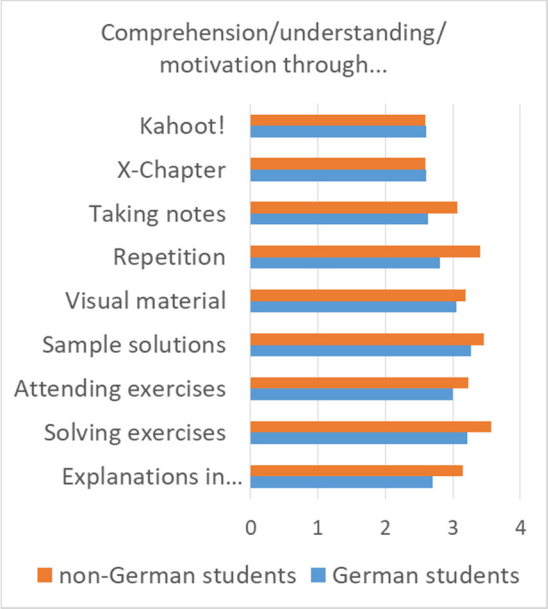


Figure 8: Comparison of lecture element ratings.

Except for the elements Kahoot! and X-chapter, the non-German students rated the elements 0.1 to 0.6 points better than the German students. This can be interpreted as a tendency to rate individual elements better. The small group size of the non-German students should be pointed out again as a limitation.

Exercise evaluation

Students were asked about the exercises and how helpful the elements were in helping them to understand the subject-specific connections. From Figure 9 it can be seen that solving

exercises and the sample solutions to the exercises were positively evaluated by over 80% of the respondents, and attending the exercises by just under three quarters of the respondents. Possibly the reason for the different evaluation is the fluctuating quality of the exercises, depending on the person leading the exercises. This hypothesis is supported by the somewhat larger spread of answers than for the other elements.

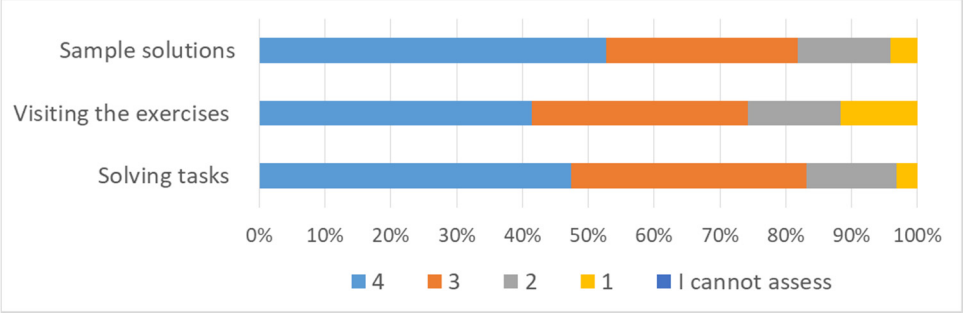


Figure 9: Comparison of exercise element ratings.

Preferred variants

The students were asked which variant of the implementation of the lecture they personally preferred. For each variant, they had the opportunity to select one of the following response categories: "yes," "no," and "I cannot assess." The results are shown in Figure 10.

Over 80% of respondents voted for a face-to-face lecture and likewise over 80% voted for the hybrid option, i.e. a face-to-face lecture with the option to participate online.

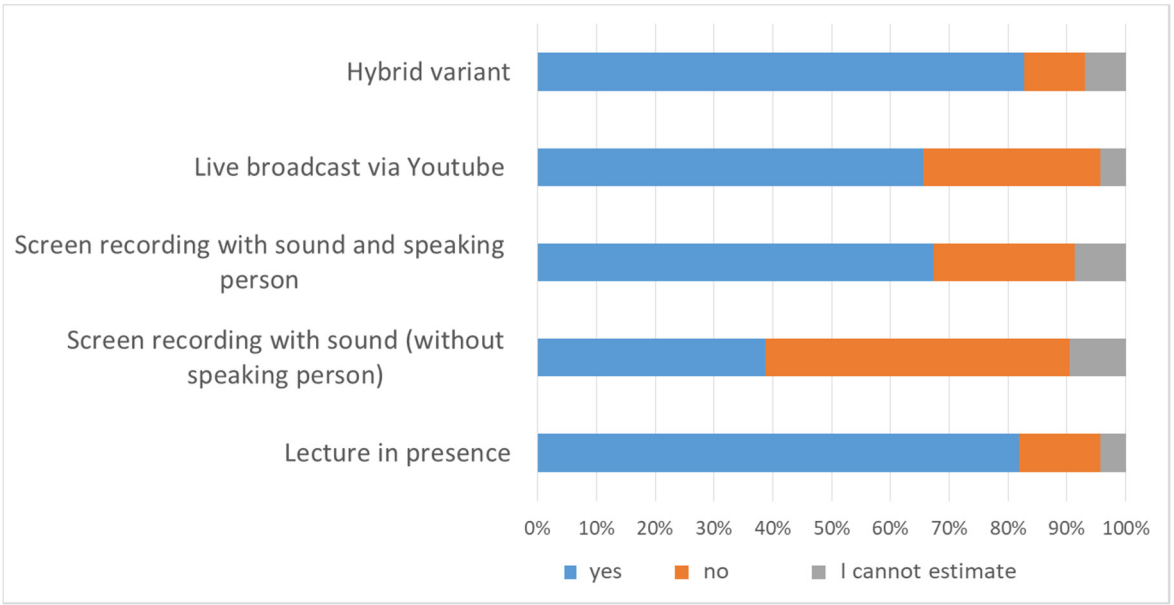


Figure 10: Preferred variant of the lecture.

The correlation of these two variants is less than 0.1, so there is no significant relationship between them. 65% of the respondents were in favor of live broadcasting via YouTube, screen recording with sound and speaking person by 67% of the respondents. The majority of respondents (61%) rejected screen recording with sound but without a person speaking. Consequently, there is a clear preference for face-to-face lectures.

Furthermore, students were asked which variant of the query with Kahoot! was preferred.

Students had the option to answer "yes", "no", "not at all", or "other" to each variant. The results in Figure 11 show that respondents clearly favor the mid-lecture query. The results "not at all" and "other" have been omitted from the figure (total of three people).

In question block 2, the students were asked about what other options they use to progress in the learning process in addition to the teaching-learning offer for the Measurement and Automation Technology module. The following graph (Figure 12) shows that conversations with fellow students as well as conversations among friends were used far more frequently than documents from other students, tutorials or textbooks. However, a comparison of the effectiveness of these elements compared to the teaching-learning offer for the module cannot be drawn with these results.

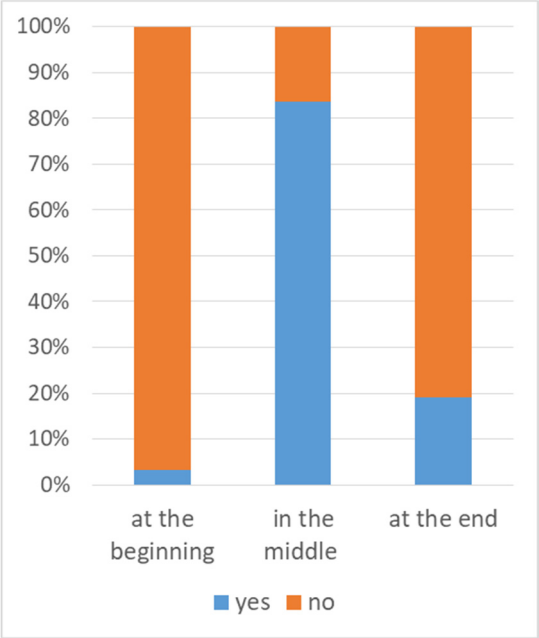


Figure 11: Preferred variant for intermediate query with Kahoot!

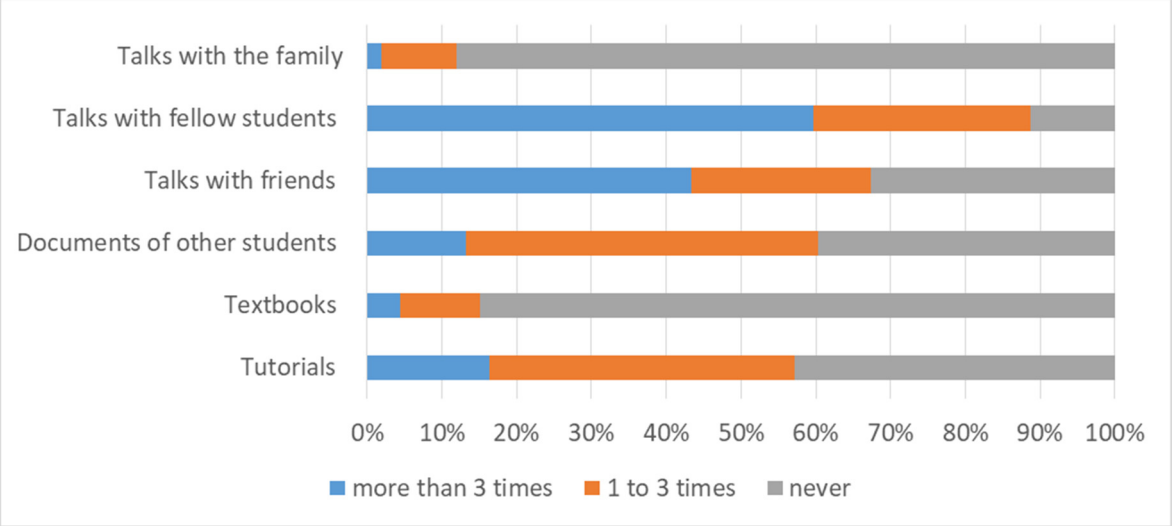


Figure 12: Use of other learning opportunities.

5. Summary and interpretation of results

Almost 90% of the respondents use at least half of the **lectures** and about half of the respondents use four or more exercises. 20% of the respondents did not attend any exercises. It can be concluded from this that the students consider attending the lectures to be useful, while attending the exercises seems to be less useful or helpful for some. However, in the overall assessment of the teaching-learning opportunities, the exercises score best. If one looks at the evaluation of individual elements in the exercises, it becomes clear that the exercise tasks and sample solutions are assessed as very effective, the attendance of the exercises as less effective. It can be concluded from this that the quality of the exercises can be improved in terms of their effectiveness on the learning process.

Even if the lectures perform less well than the exercises, this may not mean that they should be improved. The reason may also lie in their

didactic function. The practical courses, on the other hand, should be adapted, which was already named by the lecturers before the survey and which is evidenced by the comments in the free text field.

The **videos** on the lectures were not considered effective and used by all. However, it was shown that they were used more frequently by the group of non-German students.

The solving of **exercises** and the sample solutions to the exercises were rated positively by over 80% of respondents. They thus achieved the highest result in the evaluation of teaching-learning offerings and elements. Solving tasks independently is consequently perceived as very effective by the students. The positive effect of exercises on the learning process could have been further supported by the sample solutions, in that they provided helpful hints when students were unable to progress in exercise tasks and thus prevented frustration. This could be explicated in a later study.

More than 80% of respondents voted for a **classroom lecture** and another 80% for the hybrid variant, i.e., a classroom lecture with the option to participate online. Accordingly, students clearly favor face-to-face lectures. Equally clear is the favorite of the intermediate survey in the middle of the lecture.

Review of the questionnaire

For this purpose, the following points were examined:

If it was stated that no lecture was attended and no video was watched (applies to one respondent), the answer category "I cannot assess" should have been selected for the assessments of the elements of the lecture. The verification showed that all answer categories were ticked. In order to avoid incorrect ticking, it would make sense to ask about the use of teaching-learning offers before assessing the individual elements and to skip the assessment of the lecture elements if lectures and videos are not used.

When indicating that lecture videos were not used, the following items were checked:

"I didn't really understand the content until I watched the lecture videos."

"I was able to understand the connections through the lecture videos."

For the first item, the answer categories "1" to "4" were used by 60% of respondents, and for the second item by 51%. This indicates that the answers were randomly selected. This problem can possibly be reduced by reducing the number of items and by clearer formulations that are immediately understood by the students.

Furthermore, the correlation between two items targeting the same content was investigated.

"I was able to understand the connections through the explanations in the lectures."

"I only really understood the content through the explanations in the lectures."

The comparison was made for the whole group, for the group of German students, and for the non-German students, with the following result:

Group:	**total**	**Non-German**	**german**
Correlation coefficient	0,65	0,78	0,59

The total value of 0.65 certainly indicates a correlation, but not to the extent that would be expected if the content were the same. This suggests that the items do not clearly reference content, at least for the group of German students. Thus, they seem to differentiate the two items more strongly in terms of content than the non-German students. Another explanation would be that they ticked a value rather randomly and thus would be less conscientious than the non-German students. In order to obtain clearer results here, the items would have to be formulated in such a way that they actually do not permit different interpretations.

6. Conclusion and outlook

An evaluation of teaching in the direction of the effectiveness of individual teaching-learning offers and elements is a good basis for the concrete further development of teaching. The evaluation presented here was conducted for the first time in the summer semester of 2022.

Initial findings could be drawn from it. However, reliable statements in the breadth of the survey can only be derived once it has been conducted several times and, if necessary, applied in other modules. In the following, a conclusion is drawn from the findings for the teaching concepts and subsequently an outlook on further evaluations is given.

Conclusion for the teaching concept of the module Measurement and Automation Technology

In order to increase the number of students attending **exercises**, it can be helpful to train the exercise instructors and thus improve and ensure the quality. The instructors should learn how to work in a more student-oriented manner, so that the exercises do not involve pure recitation and are more advisory in nature.

Furthermore, **lecture videos** should be provided to give the possibility to repeat lecture contents or to use them as a substitute for the lecture if attendance in presence is not possible.

In order to use the positive effect of exercises also in the **lecture**, smaller exercises could be integrated already there, which would have to be solved independently by the students. This would increase the activity of the students and interrupt the process of pure listening and taking notes - similar to the intermediate questioning. This would be a better way to maintain student attention. It can also make it easier to link lectures and exercises.

Events should be offered **in presence** if possible. Additional online participation can be very useful for persons with disabilities, but will not completely replace attendance in presence.

During the **evaluation** it became clear that the questionnaire for the next evaluation round should be adapted according to the following points:

- Clearly worded and easily distinguishable items,
- Fewer items,
- No assessment of teaching-learning opportunities that were not used,
- Clarification on individual elements, for example: How were sample solutions used?
- Possibly multiple interviews throughout the semester,
- Inclusion of results from self-tests offered during the semester.

Despite adjustments, items that have provided clear results should be retained. Even when further developing items, it is useful for comparability to use scales that can be transferred to each other. Thus, developmental trends in teaching can become visible by comparison with the evaluation already available. In addition, as already mentioned in the introduction, long-term efforts are being made to ensure that other modules in the Faculty of Mechanical Engineering at the TU Dresden and beyond (subject and university) are conducted in a similar form and that joint evaluations are carried out. On this basis, it will be possible to discuss the effectiveness of teaching in an interdisciplinary and well-founded manner - especially with regard to the digitization or partial digitization of courses.

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