



# Digital, collaborative small group work in Active Plenary - a contradiction?

M. Kuhtz, N. Modler, M. Gude

*Institute for Lightweight Construction and Plastics Technology (ILK), Faculty of Mechanical Engineering, TU Dresden*

## Abstract

Der eingereichte Beitrag beschreibt eine neuartige Variante der Methode "Aktives Plenum" im Hinblick auf ihren Einsatz in digitalen Lern-Lehr-Aktivitäten im Rahmen eines computergestützten Praktikums, wobei dieser Ansatz mit einer Kleingruppenarbeit kombiniert wird. Neben der Beschreibung des inhaltlichen Ansatzes und des organisatorischen Ablaufs werden die Chancen und Grenzen des Unterrichtsformats aus der Perspektive von Lehrenden und Lernenden beschrieben.

The submitted paper describes a novel variant of the "active plenary" method with regard to its use in digital learning-teaching activities in the context of a computer-based internship, combining this approach with small group work. In addition to the description of the content-related approach and the organizational process, the opportunities and limitations of the teaching format are described from the perspective of teachers and learners.

\*Corresponding author: [moritz.kuhtz@tu-dresden.de](mailto:moritz.kuhtz@tu-dresden.de)

This article was originally submitted in German.

### 1. Didactic challenge

The practical course considered here is part of the course "**Simulationstechnik**" is set within the module "Berechnung von Leichtbaustrukturen" (MW-MB-LB-04) and is offered by the Institute of Lightweight Structures and Polymer Technology (ILK) in the summer semester. It is a compulsory module for students of lightweight structures in the diploma program and in the postgraduate program in mechanical engineering of the Technische Universität Dresden (TUD), whereby the postgraduate program in particular is mainly used by international students. In addition, students of industrial engineering can take simulation technology as a compulsory elective subject in their studies. This results in a very heterogeneous composition of the student group in terms of previous knowledge, semester and language competence. More detailed information about the general conditions of the course are described in [1].

While the teaching-learning activities were abruptly converted from analog to digital formats at the beginning of the corona pandemic, the gradual return to more face-to-face teaching offers the opportunity to use and further develop established concepts from both worlds and to link them with each other. For the practical course under consideration here, which can be carried out exclusively with the help of a computer, it is therefore appropriate to largely retain the digital formats, so that the practical course is embedded in the integrated teaching-learning concept [2] established at the ILK with the method of **flipped classroom**. The evaluation of the teaching evaluation of the previous semesters shows that in particular the active learning phase and the associated exchange between the students but also between the teacher and the students is conducive to learning success. In particular, the work in a further developed form of the **Active Plenum** [3] is positively emphasized, so that this format is increasingly used in the planning of the course.

### 2. Further development of the Active Plenum

The Active Plenary method is characterized by collaborative work on a task, with this format featuring a high degree of interaction between learners while simultaneously consolidating, deepening and applying familiar learning content. It is therefore extremely suitable for activating students within synchronous courses. This concept was originally developed for use in larger seminar or lecture rooms, with students forming *a group* to solve the task.

In the context of a digital synchronous course as a video conference, communication between students is inhibited. On the one hand, this is due to the fact that almost all students are not willing or able to activate their cameras despite corresponding instructions from the teacher, so that non-verbal communication is hardly possible. On the other hand, short and silent agreements between a few students are not possible because there is only one sound channel and the exchange via chat function is too slow. Therefore, in the context of digital teaching, the students are divided into several small groups, which results in a change in the flow of the method (see Fig. 1)

### 3. Procedure of the small group work

Even before the first learning unit, the mostly unknown teaching-learning situation is introduced to the students by means of a short video [4]. In **the first learning unit, in** which the active plenum is used, **this format is rehearsed with all students** as a real active plenum. The teacher first introduces the task and answers questions about it. Subsequently, one person from the plenum assumes the role of the moderator and the teacher assumes the role of the executor in the creation of the computer model. All other students contribute to the solution by giving instructions to the executor. The moderator coordinates the incoming instructions, the can be received both as word

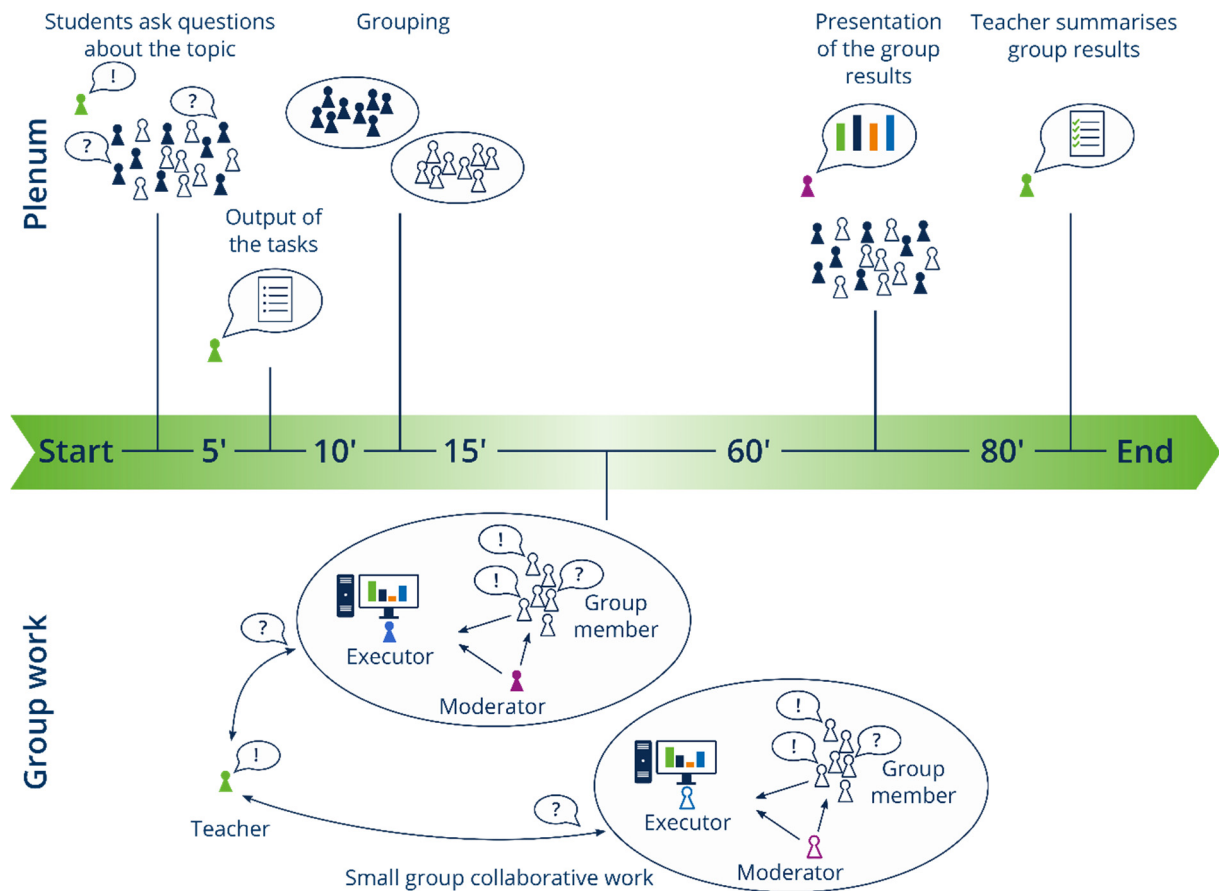


Fig. 1: Alternation between plenary and small group work within a

messages and as chat messages. The teacher strictly adheres to the instructions and also carries out non-target or incorrect solution steps, whereby queries are possible in case of ambiguities. Typically, wrong instructions are corrected directly by other students or revised by the group afterwards. The teacher should only intervene if the group work as a whole is in danger of failing. After the task has been successfully completed, the moderator or another person, possibly determined in advance, summarizes the most important steps in the solution and presents the overall solution.

In the further course of the learning unit, the teacher introduces a new but similar task and answers corresponding feedback or comprehension questions. Subsequently, the students are asked a question to divide them into groups, such as their favorite color, the answer to which is distributed as randomly as possible among the student body. The questions are given out using a survey tool integrated into the Zoom video conferencing system and the answers are collected. The instructor then summarizes the responses to create groups of

approximately equal size with about four to eight members. This procedure is intended to ensure that the **groups are as well mixed as possible**.

Before the group work starts, the teacher makes sure that the work instruction is clearly formulated and understood by the students. In addition to the actual problem, the **work assignment** also includes a time limit and the indication to secure the results in the form of a downstream presentation in the plenary. The students then enter sub-rooms of the video conference, which are referred to as breakout sessions in Zoom.

During the group work, the teacher enters the respective sub-rooms from time to time and observes the group work. Although the teacher is available to answer questions, he or she should be very cautious in giving advice. Counter-questions that facilitate a change of perspective on the problem as well as hints on time management are more suitable. The distribution of roles within the group as well as the **organization of work is left to the group itself**. Typically, the role of the moderator is

omitted in small group work, although the roles of executor and presenter are not always performed by the same person.

At the end of the allotted time, all students come together again in the plenary session. Selected representatives of the groups present the results of their work in a concise form and at the same time go into detail about the development of the solution steps. Following the short presentation or live demonstration of the model, the entire group is available for questions from the teacher or the other groups. It is up to the teacher to compare, summarize and classify the work results and the presentations of the groups. Furthermore, it is possible to collect the models of the groups and make them available to all students, for example by uploading them to the learning platform used.

#### 4. Positive aspects of the teaching format

The fixed external structure of the active plenum on the one hand and the freedom of content on the other encourages the students to actively participate in the course. The partial "absence" of the teacher in the group work reduces inhibitions among the students. The small group size makes it difficult for individuals to "dive in" and the pressure to actively participate increases as the group size decreases. At the same time, any gaps in knowledge are communicated more openly than in the plenum or to the teacher, which leads to a faster filling of these gaps (**learning through teaching**).

In contrast to many other exercise and internship formats, this learning format not only allows students to evaluate their own learning progress by completing set tasks. Rather, the **comparison with the learning status of the group contributes to** an improved visibility of their own learning status.

The fact that the Active Plenum is gladly accepted by the students can be seen, among other things, in the number of participants. Similar to analog teaching formats, the attendance rate for this course is also decreasing. Of 90 students enrolled in the OPAL course, about 40 were present in the video conference at the

introductory session for the internship. In the further course of the semester, the rate of participants in the consultations, which are also offered, drops to about ten students, whereas up to 20 people regularly participate in the active plenum format. The reasons for the rather low participation rate appear to be the unattractive timing of the course on Friday mornings, the parallel availability of online learning materials, and the increased stress level among students due to the activation.

Since the response of teaching evaluations in previous semesters was low, this course is evaluated in close cooperation with the Center for Interdisciplinary Learning and Teaching of the TUD (ZiLL) as part of the "Action Weeks Teaching Analysis Polls (TAP): Qualitative Teaching Evaluation for TUD Teachers". This evaluation is conducted by a ZiLL staff member without the presence of the instructor and takes place in the middle of the semester, so that students have a direct influence on the course going forward. Furthermore, the format of group discussion and evaluation seems far more appealing than filling out a questionnaire. Nevertheless, only nine students participated in the group discussion and only seven in the final evaluation of the most important points, so that the low response rate limits the significance of the evaluation results on the one hand. On the other hand, the possibilities of getting the majority of students to give constructive feedback appear to be exhausted, and further work can only be done with the statements made.

From the students' point of view, the most important points for the learning success were the joint elaboration in the Active Plenum (6 out of 7), the engaged teacher (6 out of 7) and the practical application tasks (4 out of 7). Thus, this teaching-learning activity appears to be **highly suitable for** the transfer of knowledge and skills in the field of simulation technology

#### 5. Limits of the teaching format

As with many digital teaching-learning formats, there is a risk that participants will use the learning unit to record the content. On the one hand, the mere **recording of the content** in

no way corresponds to the concern for increased activation of the learners, and on the other hand, this disturbs the protected space as well as the relationship of trust between students and teacher. This could also be a reason why almost no students, even in the small groups, activate their camera.

Although this format of working in small groups minimizes the risk of **individuals not participating in the group at all**, but assuming a supposed learning success due to the positive group outcome, this fact cannot be completely dismissed.

Another disadvantage of this format lies in the **technical equipment of** the students. Thus, for active participation, especially in the role of performer, moderator and presenter, it can be advantageous to operate two screens in parallel. From experience, most students use one screen and thus the readability is reduced during the screen transmission.

The proportion of international students in this subject is around one third, although the proportion in synchronous courses is significantly below average. On the one hand, **language barriers and the interactive learning culture** could be a deterrent; on the other hand, these students could also feel adequately provided with teaching material due to the online materials that are also provided.

As a key point of the TAP, it was noted that a lack of rounding or sample solution in the active plenaries inhibits learning success (5 out of 7), so in the future sample solutions will also be provided for the group work.

## 6. Conclusion

As part of the practical course on simulation technology, the active plenary method, which has been further developed for use in digital teaching, is examined as an interactive form of learning. After a short introduction by the teacher, the students work digitally and collaboratively in small groups and then present their work results to each other.

On the basis of an evaluation of ZiLL, an overall positive conclusion can be drawn regarding the use of this teaching format. In particular, the high level of activity during the work in small groups leads to a high level of motivation

among the participants and to considerable work results. At the same time, the participants seem to have a strong desire to receive a sample solution authorized by the teacher.

## Acknowledgement

The authors would like to thank the Center for Interdisciplinary Learning and Teaching at the TU Dresden for supporting the course as part of the "Action Weeks TAP: Qualitative Teaching Evaluation for TUD Teachers".

## Literature

- [1] M. Kuhtz, B. Grüber, C. Kirvel, N. Modler, M. Gude: Virtuell<sup>2</sup> - Simulationspraktikum im digitalen Raum. In: S. Odenbach (Ed.): Lessons Learned 2022, 3. <https://doi.org/10.25369/ll.v2i1.40>
- [2] M. Kuhtz, R. Kupfer, C. Kirvel, A. Hornig, N. Modler, M. Gude: The Practical in the Virtual - Digital Teaching at the ILK. In: S. Odenbach (Ed.): Lessons Learned 2021, 1. <https://doi.org/10.25369/ll.v1i1/2.28>
- [3] J. Gurr: Method profile: Active plenary. Lüneburg 2018, [www.leuphana.de/fileadmin/user\\_upload/portale/lehre/09\\_Support\\_und\\_Tools/01\\_Aktivierung\\_in\\_Grossveranstaltungen/Methodensteckbrief\\_Aktives\\_Plenum.pdf](http://www.leuphana.de/fileadmin/user_upload/portale/lehre/09_Support_und_Tools/01_Aktivierung_in_Grossveranstaltungen/Methodensteckbrief_Aktives_Plenum.pdf) (last access: 16.06.2022).
- [4] M von Amsberg. Active Plenum. YouTube video 2017, <https://youtu.be/79czW4YS0ww> (last accessed 16.06.2022).