

Collaborative Activities for University Physics during COVID and for post-COVID Times

Abstract. An active-learning workshop is offered to provide examples of a collaborative group-learning pedagogical environment for introductory physics at the university level. Participants will engage in various hands-on and minds-on activities that will illustrate how such a dynamic classroom can transform the strategy for teaching physics in university classes. A discussion about the benefits and challenges will help guide the participants in adopting this teaching method in their own physics classes, either in online mode or for in-person instruction.

1 Background and Motivation

As an immediate result of the pandemic that appeared in early 2020, universities had to shift all their courses to online mode. The effects of this still ongoing worldwide disruptive incident continue to be under investigation. Whereas studies focusing on the near-term results of emergency online teaching are now widely available [1], studies are sparse regarding the long-term effects and how the “new normal” of university teaching should be realized. Initial results, however, indicate that students were primarily lacking the elements of active learning [2]. These findings completely align with prior research on the positive effects of active learning [3]. In teaching physics, especially in undergraduate courses, there is a long tradition of implementing a wide range of learning activities such as peer instruction [4] or SCALE-UP [5]. Because all these activities rely on in-person interactions, it turned out to be extremely challenging to adapt them to a completely online setting.

2 Workshop Details

In this workshop, we will present a range of collaborative activities that have been developed prior to the pandemic and that now have been successfully transferred to online teaching. These examples cover SCALE-UP pedagogy for studio-style introductory physics courses [6], activities for recitation (exercise) classes [7] and for lab courses.

A further objective of this workshop is to provide a clear and impactful example of the dynamic atmosphere that can prevail in a physics classroom that is conducted using a collaborative group-learning approach. Having the workshop participants play the role of “students” in this environment will help to convey the real sense of teamwork and group dynamics that is brought to bear in such a classroom. With this background, participants will be well prepared to identify the benefits of the method and to deal with the potential challenges linked to this adaptation at their own institutions. The materials that will be used in the workshop can also be shared with the participants if they would wish to use some of these resources in their own classrooms.

The workshop will start with a short introduction to student-centered learning environments. Participants will then actively work on a selection of activities covering topics ranging from mechanics to electromagnetism, all suitable for calculus-based introductory courses. During the workshop, there will be time for questions and discussions, which are highly encouraged in an active-learning environment. We will also discuss problems related to the online realization of

these activities, including students' engagement, motivation and fatigue. The final part of the workshop will consist of an exchange and sharing of experiences from all participants, and we will conclude with a discussion about possible schemes for further networking.

Apart from these main lines, the workshop will be completely flexible, and the emphasis can vary depending upon the preferences of the participants.

3 Conclusion

The objective of this workshop is to provide a clear and impactful example of the dynamic atmosphere that can prevail in a physics classroom that is conducted using such a collaborative group-learning approach. Our plan is to allow the workshop to be completely flexible, and the emphasis (out of the topics mentioned above) can vary depending upon the preferences of the participants. We hope to establish ongoing connections with workshop participants that can be leveraged even after the time of the conference.

References

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