

## Pedagogical Setting

The Department of Physics annually offers 10 undergraduate introductory lectures for 2'500 students. Each of these lectures is supplemented with a set of small group exercise classes (24 students/class).

In a traditional setting all of those tutorials have an identical instructional structure. Their major aim is to support students in developing problem-solving skills by discussing weekly supplied problem sets. According to ETH policy the attendance of both, the lectures and the tutorials, is not compulsory and the assessment is performed by a final test.

Students and teaching assistants, however, expressed diverse needs regarding the content and the activities of the exercise classes. Some students need more specific support when working on the exercises; some students need further explanations regarding the lecture content, etc.

Responding to those requests, we decided to diversify the tutorials by applying the framework of differentiated instruction. According to a market model, based on offer and demand, tutorials with four different flavors are now being supplied.

## Differentiated Instruction

Differentiation is attending to the learning needs of a particular student or small group of students rather than the more typical pattern of teaching the class as though all individuals in it were basically alike. The goal of a differentiated classroom is maximum growth and individual success (Tomlinson&Allan, 2000).



## CLASS MARKET

### (A) Product Diversity (flavors)

Revision of specific topics presented during the lecture (Micro Teaching)	Solution hints working out the exercises at home (Scaffolding)
Challenging topics not discussed in detail during the lecture (Master Class)	Working out the exercises in-class with direct support (Coaching)
Based on lecture content	Based on problem solving

### (B) Market Regulation

- Students can change classes during the first 4 weeks
- Classes with less than 5 participants are discontinued and the TAs concerned are assisting those TAs with max. participants

### (C) Market Introduction

Half-day introductory workshop for each teaching team (lecturer & assistants)



## DIFFERENTIATED INSTRUCTION

Is a teacher's respond to learner's need

Teachers can differentiate:

Content

Activities

Material

Principles of Differentiated Instruction:

- Flexibility (grouping, organization)
- Ongoing assessment of learner needs
- Challenging tasks

(Lightweis, 2013)

## Acceptance study

In autumn 2013 we introduced the exercise class market in three physics lectures addressing a total of more than 1'200 students.

At the end of the term we carried out an acceptance study based on an online survey and on interviews. The results from the study revealed that the market is highly appreciated by students (fig. 1) and by teaching assistants.

Figure 1: The Exercise Market should be transferred to other lectures (results from 3 lectures)

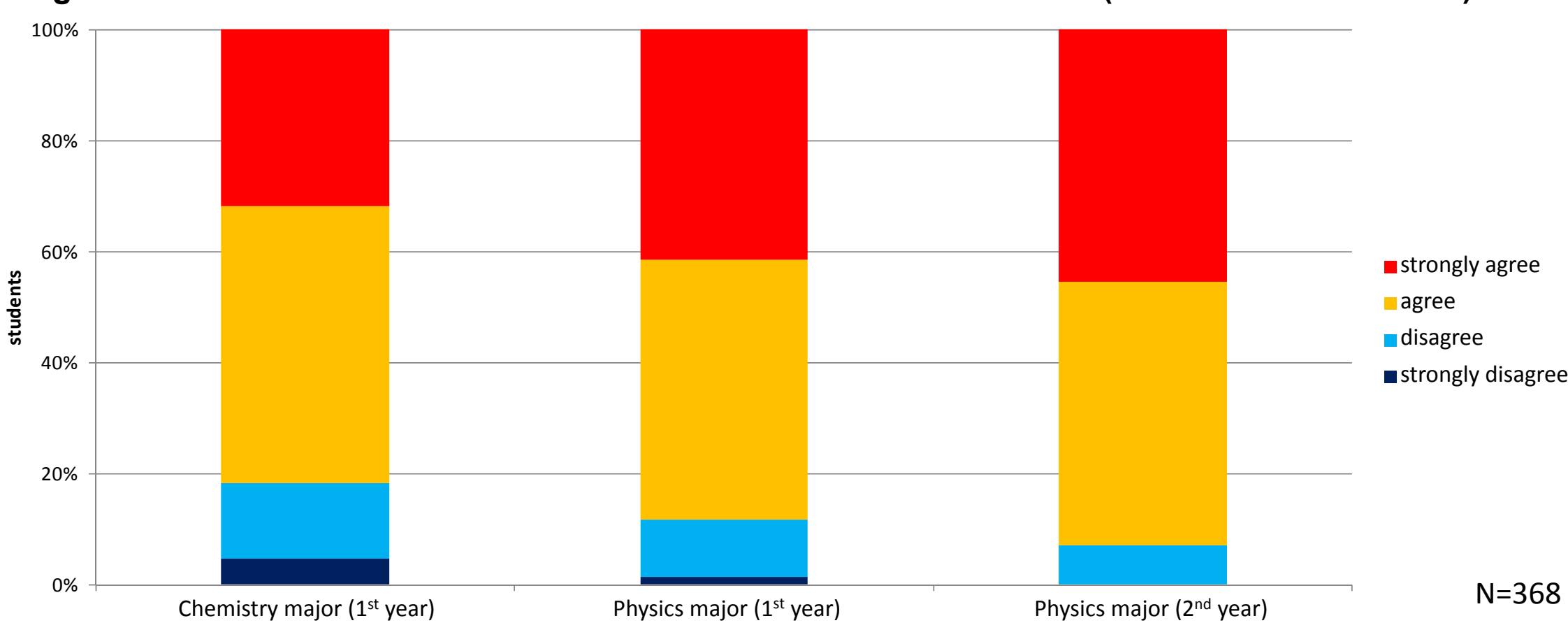
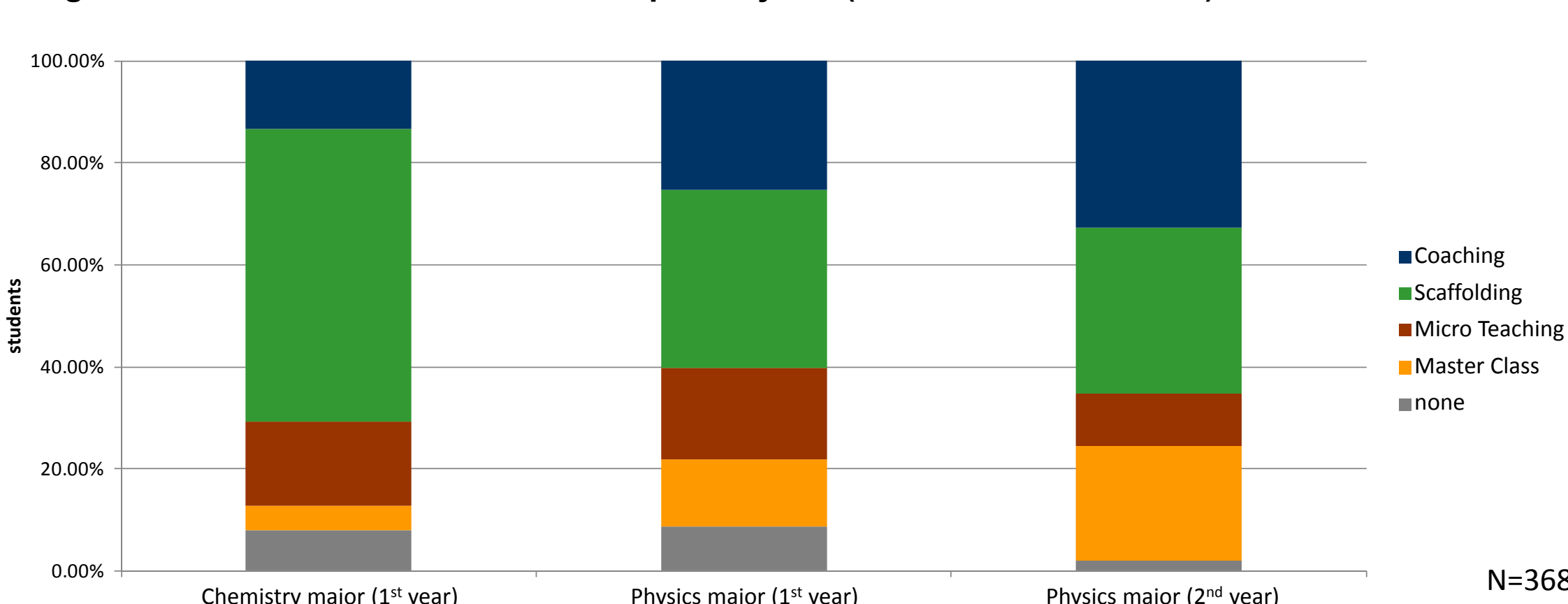


Figure 2: Which flavor was the most helpful to you? (results from 3 lectures)



## Conclusion & Outlook

The (not compulsory) attendance of the tutorials is much higher than expected and the distribution of the different flavors is not uniform (fig. 2).

Offering students the possibility to choose among different flavors turned out to be a major asset of the setting. Furthermore personal choice can positively affect a learner's motivation (Katz/Assor, 2006).

On the other hand, organizational flexibility and continuous adaptation are the major challenges for both, students and TAs.

### Positive feedback:

I like the concept. Having different options offers much more individual benefit.

In my opinion this is a really good idea. It is a given that the expectations to an exercise lesson differ from student to student. This gives the possibility to choose according to preferences.

### Critical feedback:

I think that the groups are too big (max 20 students would be better).

The teaching assistant did not implement the announced flavor, it was a mixture of everything.

My favorite flavor was always booked out.

Up to now, differentiated instruction has only been sparsely used in higher education settings (Lightweis, 2013). We present an example of how differentiated instruction can easily be implemented in undergraduate tutorials.

Based on the success of the pilot phase, more of our physics courses now have adopted the exercise class market that we are continuously refining. We are also planning to extend the framework to other subjects as well.

## References

- Katz, I., & Assor, A. (2007). When choice motivates and when it does not. *Educational Psychology Review*, 19, 429-442.
- Lightweis, S.K. (2013). College Success: A Fresh Look at Differentiated Instruction and Other Student-Centered Strategies. *College Quarterly*, 15/3.
- Tomlinson, C., & Allan, S. (2000). *Leadership for differentiating schools and classrooms*. Alexandria, VA: Association for Supervision and Curriculum Development.

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