When we study we usually have a choice of which learning strategy to use. We may read over our notes multiple times, and we may ask another person to question us of the content of these notes. We may also cram an hour before an exam, or study regularly throughout the semester. We can also focus solely on one aspect of a given subject or try and learn more broadly, gaining knowledge of additional facts and theories. Quite intuitively, the first alternatives presented here seem easier to apply – after all, most of us have the experience of repeatedly reading through the notes minutes before being let into the classroom to take a test. However, more often than not, the latter alternatives presented here – such as spacing our learning across the whole semester instead of studying for several hours at once or testing oneself rather than reading our notes – afford better accuracy at memory test. This is why they are called 'desirable difficulties', which means that when we make learning more challenging, we may actually benefit from that.

Another, more recently described learning strategy is learning by guessing. It is similar to learning by testing oneself, but with one important difference – when testing, we assume that the correct information was learnt at some point in the past; here we assume that we actually do not know what the answer may be and venture our best guess anyway. Interestingly, this guessing process, termed 'elaborative retrieval' turns out to be beneficial for final test performance. This means that even when we make a mistake – as is usually the case when we provide our best guess – our memory may still benefit from this compared to a scenario when we are simply presented with the correct answer outright.

The aim of the current project is to combine the traditional 'desirable difficulties' – learning strategies which have already been well researched – with the more recent learning-by-guessing strategy and investigate whether – when combined – they will result in a memory boost or drop compared to when people simply read the full information presented outright. We can imagine that strategies such as guessing or spacing can be introduced by both teachers and students without much financial or operational costs. However, in order to do that we need to investigate the boundary condition of their effectiveness, as well as theoretical mechanisms which underlie their benefits.

In the present project we thus plan to conduct four experiments which will systemically manipulate learning factors such as learning by guessing, spacing and introducing additional aspects of a given topic. These more demanding, however potentially desirable manipulations will be contrasted with 'easier' strategy choices such as learning by reading, learning in a massed fashion, without introducing intervals, and also learning only a single aspect of a given piece of information. Theory-based predictions concerning effectiveness of these combined manipulation are often bidirectional or unclear – which is precisely why we aim to study them in such systematic, careful fashion. As a result, we hope to provide a novel set of learning guidelines for students and for teachers to make the learning process maybe not intuitively most appealing, but definitely more effective.