Application for the

Icelandic Teaching Academy – Kennsluakademían

Teaching portfolio

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Acronyms in alphabetical order

CTL Center for Teaching and Learning

HE Higher Education

SENSE School of Science and Engineering

SoTL Scholarship of Teaching and Learning

UoI University of Iceland

In this document I describe my previous teaching and core teaching principles. I thoroughly describe three cases in my own teaching where I have emphasized my teaching principles and reflect on what worked and what did not. I conclude this document with how I see my future teaching development.

My teaching biography

I started my academic position at the University of Iceland (UoI) in August 2014 but prior I had been the only teacher in two graduate level courses at Reykjavik University and been a Teaching Assistant in nine undergraduate courses at the University of California Santa Barbara. At UoI, I have taught in 6 distinct undergraduate courses and one graduate course in Mechanical Engineering. I am the supervising teacher in three of those courses: Fluid Mechanics (undergraduate), Heat Transfer (undergraduate) and Computational Fluid Dynamics (graduate). Most of those courses I have taught multiple times, many entirely by myself but others jointly with other faculty members. I, therefore, have some experience in teaching in various subjects at a university level in Mechanical Engineering. I have also supervised six master students.

The courses I have taught have as many Engineering courses consisted of lectures, discussion sessions, weekly homework, some have had industry related expeditions and one has laboratory work. I regularly have students work in class independently on problems once the material has been covered, to let them become more active, because then the material is fresh in their memory and to help them realize if they have acquired the material to sufficient standards. Many courses I have taught have had group or individual projects with reports, often with peer review, and some courses have had in class presentations, all courses have had speedy feedback with detailed comments. The courses I am supervising teacher of were existing courses with prior learning outcomes and I initially just adopted those as they came but I have since adjusted the learning outcomes and revised as regularly as I felt necessary.

When I started teaching, I had no pedagogical training, but I always enjoyed teaching and had great ambition to teach superbly. After starting at UoI I was introduced to the Center for Teaching and Learning (CTL) and started in 2015 my study towards my Postgraduate Diploma in Teaching in Higher Education (HE). My interest in the field of HE research had sparked! I realized there was great room for improvement in my teaching, and I could base my improvements on more than just the ideas that my colleagues and I came up with, as I had previously exclusively done. As common with first time teachers, I was focused on getting through the material, that my transfer of information was flawless and not really paying attention to how students learned (Kugel, 1993). After learning more about Scholarship of Teaching and Learning (SoTL) I became more aware of my own teaching perspectives, how students learn and started to try to make iterative improvements based on the SoTL literature, measure the effects of the changes and even contributing to the teaching literature myself (Gurung & Schwartz, 2008). I particularly enjoy talking about teaching with colleagues in the academic staff coffee room. It often amazes me how casual talk in relaxed setting can spark gradual changes later leading to significant improvements in teaching methods. Initially I was mostly on the receiving end but now armed with knowledge on the teaching literature and some teaching successes I have taken more of a leader role in those conversations. In the recent School of Engineering and Science (SENS) Teaching Congress I was chosen to lead one of the smaller groups as secretary.

My core teaching principles

I value **listening to students' concerns** and **student-teacher dialog** and believe it is essential in helping students realize my main goal is to assist their learning (Race & Pickford, 2007a). Since teaching my first course, I have always gone through the midterm teaching evaluation survey in class once the results are available, making sure to cover all comments even those that are hard for me to swallow. When I have gotten a complaint from a student, I have always listened, but prior to getting pedagogical training I did not always know how to react. Was the complaint valid and how could I fix it? I wanted to please or do better but often did not know how. After getting some pedagogical training I have continued to respond to students' complaints but if I disagree with their suggested resolution, I aim to find a more constructive solution often in cooperation with students. Usually, multiple iterations are needed to find a fitting solution but almost without exception this has led to students realizing we are all in the same team with the common goal of maximizing their learning on the subject.

Students learn most if they get **formative feedback while the material is fresh** in their memory. It helps them to realize themselves at what level their learning currently is, and that ability is of utmost importance for future learning development (D. J. Nicol & Macfarlane-Dick, 2006). I, therefore, always post solutions to homework just as the deadline passes and, if possible, also book then time in my schedule for grading. After being a Teaching Assistant for 9 quarters I have trained up a to a good grading speed on problems meaning it usually only takes me 30 – 120 minutes to grade homework of 20-60 students. So, I usually return graded homework within a day of the deadline, the latest.

Structure and repetition are one of my core teaching technique. Clear and good structure is what students comment most on liking in my teaching in the teaching evaluation surveys (see Appendices 2.a, 2.b, 2.c, 2.d, 2.e, 2.f, 2.r and 2.u) and I believe it is an essential aid to help students know what is expected of them and in organizing themselves. All disciplines have threshold concepts that are difficult to grasp but need to be understood to dig deeper into the subject, and once they have been understood that understanding is not taken away (Mayer & Land, 2003). To help students with those concepts and other concepts that I have figured out they tend to have a hard time comprehending, I repeat those over and over in short mantra like manner, while working on problems: "pressure increases with depth", "always check if your calculations make physical sense", "heat can only go from hot to cold" etc., in the hope they play in students' mind when thinking about Fluid Mechanics and Heat Transfer leading to "memorization with understanding" (Case & Marshall, 2009). I have got a comment in a teaching evaluation survey that students have noticed this and that they believe it helps them learn (see Appendix 2.b) but I have not yet systematically tested its validity.

In addition, I believe for students learning to be effective students need to get **clear instructions on what is expected** of them, there needs to be an **alignment in coverage of material and the assignments** that are meant to support it and **manageable workload** for students to be able to have time to dig into the material.

Case 1: Complete revision of laboratory component of a Fluid Mechanics course

When I started my academic position at UoI the laboratory component in Fluid Mechanics had been the same for decades. Students performed five experiments, each lasting three hours, one a week, five weeks in a row starting in week 6 of a 14-week semester. Only one equipment is for each experimental setup so five groups worked concurrently on different experiments, meaning the order of experiments varied between groups. All groups returned a full report on each experiment. In conversations with students, in the open-ended replies of the midterm and end of term teaching evaluation surveys students complained that the laboratory work made the workload in the course immense, that they learned little from it and some mentioned not seeing its purpose and wanted to do something else (see e.g. Appendix 2.w). The purpose of the laboratory component of the course is to give hands-on experience on various aspects of Fluid Mechanics and thus provide students with a deeper understanding of the subject. This was what the teachers thought students got out of it but was clearly not how many students experienced it. Spring 2016, when taking my second course in the Postgraduate Diploma in Teaching in HE at UoI, I decided to analyze the Fluid Mechanics course especially with the newly acquired tools SoTL gave me. I realized the workload was indeed on the upper side for a 6 ECTS course (Sigurdsson, 2011) and the lack of learning might stem from that students often performed an experiment before learning about the material. The intended learning outcomes of the course were fitting, fitted well with the curriculum, and assessment supported learning (although too time consuming), but the learning activities meant to support learning did not, meaning constructive alignment was not met (Biggs, 1996). Because of lack of preparedness students just followed the procedure given for each experiment without reflecting, leading to surface approach learning and higher workload perception (Entwistle, 2009). I believe, the lack of valuing the purpose of the laboratory work was because their learning was sparse.

Fall 2016, I decided to make changes to the schedule and assignment format for each experiment both leading to a reduction in workload. The effects of the changes were monitored by thoroughly analyzing the midterm and end of term teaching evaluation surveys 2014-2019 (in 2020 the laboratory work needed to be adjusted due to Covid19 restrictions so those are not comparable. I was also on maternity leave). Since those teaching evaluation surveys are for the entire course and the laboratory work is just a small component of the course, the general Likert scale questions were not able to give answers on how the changes in laboratory affected students. Open-ended replies were useful but only up to a point since not all students give open-ended replies. Therefore, to get answers, I made a special online laboratory component focused survey in 2015-2019 (as examples see Appendices 2.g and 2.h). This survey had the same core questions every year but needed to be adjusted as adjustments were done to the laboratory component. The adjustments were an iterative process (as I will explain below) spanning five years in total. First changes were made according to the HE literature but then adjusted based on students' response and the literature. To deepen the understanding of some of the results a focus group interview was held in 2018 and analyzed with a thematic approach.

In the new schedule the material was covered in lecture 1-2 weeks before the experiment connected to it was performed. I believe this is the key component in increasing learning and interest in the laboratory work. All students performed the same experiment in the same week meaning it had to be shortened from 3 hours to 1 to fit all groups within that timeframe (remember only one experimental setup for each experiment). Students still did essentially the same experiments with reputations at most halved. This was possible because now only one group worked at a time with an instructor and a lab technician, who previously helped five groups at once. Students could therefore be more active and productive in the time allotted. Reducing the time students needed to be present obviously reduced their workload. In 2017, a postlab discussion in the lecture following each experiment was added where the results of all groups were compared and discussed. I could see how this further deepened students' reflection on the laboratory work leading to increased learning and interest. This would not have been possible in the old schedule because then groups did not perform the same experiment in the same week. The new schedule meant there was an alignment between lectures and experiments and the postlab discussion added student reflection on the material (Dallimore, Hertenstein, & Platt, 2017). In addition, the postlab comparison led to a detection of systematic errors in most of the newly renovated experimental equipment, that could then be fixed before next year. No wonder students had troubles seeing the purpose in the laboratory if it was not confirming but rather contradicting theory.

Before the changes in the laboratory component about 28% of students liked the schedule, about 41% wanted to even the workload and 16% wanted to skip laboratory work altogether. The workload was perceived high (44%) or too high (28%) by majority of students (see Appendix 2.g). After the changes students perceived that they learned more, their enjoyment of the laboratory work increased and in open-ended replies students mentioned that they saw the purpose of it. First year after the change, half the students liked the new schedule and additionally a quarter saw the merit in aligning lectures and laboratory work. Majority of students still perceived the workload as high (67%) or too high (17%, I will explain below). In the years following, majority of students perceived the workload as fitting (74-82%) and all or all but one student thought the alignment of lectures and experiments was the best schedule (see Appendix 2.h). I saw an obvious shift in my students' attitude towards the laboratory work: previously many despised it and were drained from the workload but now they enjoyed it and had time and interest to dig deeper into the material.

In 2016, armed with ideas of successful assignments and assessments in the pedagogical literature, I substituted full reports for each experiment with filling out worksheets with emphasis on analysis (see Appendix 2.i). Aimed to emphasize that feedback on one experiment's worksheet, should be formative assessment helping students improve on next experiment's worksheet, students did not receive a grade for their worksheet but rather I gave a written feedback on strengths, what needed to be improved and how students could improve (Sadler, 1989). Furthermore, students returned one full report, after receiving feedback on the worksheet belonging to that experiment. Each group gave and received formative peer review on the report and had time to make changes before turning in the final version. I made a detailed rubric (see Appendix 2.j) to help students, realize what was expected of them in the full report and to help them in giving their peer review. Students claimed they learned from the worksheets, and by returning the one full report, but they neither felt they learned from giving nor receiving the formative peer review. I clearly saw in students' reports that they barely exploited the peer review. Furthermore, they apparently felt it was additional useless workload. I believe the peer review might have failed mainly because the peer review itself did not count towards students' final grades, the significance of the peer review was not explicitly explained, and students were only given short descriptions and not explicitly shown how to do a peer review (Andersson & Weurlander, 2019). I have had success with peer review in other courses where those factors are met (see Case 2). To my surprise students felt the worksheets were too time consuming leading to excessive workload. I went on maternity leave in 2017 and that year's teacher decided to keep the new schedule but lessened the workload with a short report for each experiment. Students felt the workload did decrease and they learned from the short reports. In 2018, determined to find a better solution for an assignment format for each experiment we decided to try Excel-sheets (see Appendix 2.k) tailored for each experiment, where students filled in and gave a detailed analysis in a large, merged cell. The analysis is essential to push students to a higher level of thinking according to Bloom's taxonomy (Bloom, 1989). Students claimed they learned from this and even agreed learning more from this than writing a report. This also made it easy for the instructors to write a Python script to make the comparison of all groups used in the postlab discussion, almost automatic. I believe this comparison in the postlab discussion puts students learning into new context and has been essential in deepening their learning of the material. Because of all those factors, the Excel-sheets have been the assignment format used for each experiment since.

The focus group in 2018 did confirm most of the findings of the surveys and that the learning outcomes of the laboratory component were met. One major change it led to, was that students asked for more thought-provoking reflective questions on each experiment. The teachers thought this was an excellent way to get students reflect and become more active in their learning, i.e. leading to more inquiry based instruction in the laboratory work which has been linked to higher order learning (Domin, 1999). This was added in 2019 and in the laboratory work focused survey that year, students claimed that they both learned from them and enjoyed tackling them. I could see how the groups were enthusiastically discussing and debating the reflective questions leading to deeper learning and interest in the subject.

Analyzing the effects of the changes in the laboratory component of the Fluid Mechanics course was my research project in the final course in my Postgraduate diploma in Teaching in HE at UoI, which I completed in 2019 (see Appendix 2.l). I initiated and led the changes in the laboratory component and did all the analysis of the results, but my co-teacher, Professor Halldór Pálsson, came up with the ideas for the Excel sheets, short reports, postlab discussion and wrote the Python code to make the comparison of all groups effortless. Associate Professor Guðrún Geirsdóttir and the Head of CTL at UoI has given me plentiful direction and inspiration in the HE literature on this issue. I have presented my results on the laboratory improvements in an open lecture in SENSE at UoI (Helgadottir, 2019a), in the conference Menntakvika (Helgadottir, 2019b), in a short article in the yearly report published by CTL (Helgadottir, 2020), in a published paper in a peer reviewed journal on research in HE in Engineering (Helgadottir, Palsson, & Geirsdottir, 2020) (see Appendix 2.m) and in another paper in preparation for the same journal (Helgadottir, Palsson, & Geirsdottir, In preparation) (see Appendix 2.n). I have personally experienced this project as a very exciting and effective roller-coaster-ride in digging deeper into SoTL while also making lasting improvements to the laboratory component of Fluid Mechanics.

Case 2: Even out workload – chop large projects into smaller tasks each with a deadline and formative assessment

In the Heat Transfer course there is a large group project in computational simulation. Students need to formulate numerical equations for conduction of heat in two dimensional objects, with correct boundary conditions and return a report on the subject (see Appendix 2.o). Spring 2015, when I taught the course first time around students were struggling with the project and complained about the workload. Three days before the due date of the project I had a long line outside my office, spanning those entire days. Students seemed to be starting the project at the wrong end and running into major problems. They were looking for bugs in the code when the formulation of their numerical equations was incorrect i.e., they were looking for a cause to their errors multiple steps later in the chain of action than where they originated. They did not realize that first the formulation of the equations needed to be verified before coding and that writing the report was the final step. They also seemed to completely underestimate the time it took to complete the project, causing them to start too late and being completely overwhelmed with the project. This most likely resulted in surface approach learning (Kember, 2004) contrary to the main purpose of the project, i.e. to dig deeper into one section of the course. Between teaching Heat Transfer at UoI the first and second time around, I took my first course in the Postgraduate Diploma in Teaching in HE at UoI. There I became certain that I could find a solution that helped students better realize the tasks that needed to be taken, helping them getting a deeper learning on the subject, help them start in a timely manner and minimize times when a student came to me completely clueless on where they were struggling in their project.

Spring 2016, I spread the workload of the project more evenly over the semester by breaking the large project into a few tasks each having a separate due date, instead of one due date for the entire project (see Appendix 2.p). This was meant to help students to work more evenly over the semester on the project and thereby evening out the workload and hopefully reducing surface approach learning. To help students, deepen their learning on the subject each of the intermediate tasks was given formative assessment. The first task was formulating the numerical equations and I gave feedback on what were the strengths, what could be improved and how. The next task was to program the equations, do numerical simulations and write a report. The report was sent to another group for peer assessment. I decided to add peer assessment because the Heat Transfer course is in their final semester and by that stage in their studies, I believe they should be able to judge what is good work and what is not both in their own work and in the work of others. Peer review has also been shown to be effective in assisting students in their learning (D. Nicol, Thomson, & Breslin, 2014). To help students, realize what was expected of them and help them with the peer review I made a detailed rubric for the report (see Appendix 2.q) available once the project description was presented (Stevens & Levi, 2005). In the peer review, students were instructed to point out the strength of the report they got, how it needed to be improved to fulfill the criteria of the rubric and how the other group could achieve that. It was emphasized that students were not supposed to give their peers a grade and thereby stressed that the purpose of the feedback was to be constructive. The quality of the peer review and how the group responded to the peer review counted to their final grade which I am certain was important in making it effective. They saw merit in spending enough time on it to get to a point where it became an effective learning experience (contrary to Case 1).

After making this change, students did come and ask me questions but more evenly distributed during the semester and they seemed to be taking the correct procedure and not skipping vital steps as previously. So, students seemed to be learning more from it and my workload was more even, so I could better assist those that did have questions. There were minimal complaints on workload after the change even though the extent of the project was the same but now with additional workload of giving a peer review. There was also a significant improvement in the final reports after the changes, much more than what can be explained by differences in cohorts. Many students mentioned in the end of term teaching evaluation survey (see Appendix 2.r) that they liked the peer review, and I could see that they were reflecting on the subject. It was also evident that they learned from reviewing each other's reports, often improving their own reports with ideas from other groups. Some students did, however, also report finding it uncomfortable to do and mostly receive a peer review and I believe that is because they were not used to using peer review and felt judged by their peers. I think this is partly because still some students believe their academic strength is based on their intelligence rather than on their effort (Ashwin et al., 2015), which is a misconception that I would like to change. I have used this format in the group project in Heat Transfer since, tweaking it slightly, mostly how much time is given for each portion of the project, clarifying the rubric where I find students have troubles understanding my directions and emphasizing that the peer review is not meant to judge other students but rather help everyone to improve. I have, almost without exception, got positive feedback from students on the group project since the changes.

Some may argue that I am spoon feeding the project to students that are getting close to graduating and should be capable of splitting it up themselves. This might be true, but my observation was that they were struggling with that and as a result their learning on Heat Transfer suffered. I also did not water down the scope of the project by splitting it into multiple tasks. This general inability, to organize oneself independently and effectively in large projects, in students about to graduate is, however, something the study line needs to address and tackle, since it is an essential skill required in most Engineering workforce.

Case 3: Timely formative feedback

When I started teaching, I thought it was important to give detailed and fast feedback to all assignments. Afterall, in the UoI Social Science Student Survey consistently less than 40% of students in my department claim that they have got a thorough feedback on their assignments in their studies, and I was determined to do my best to change this. Despite my extensive efforts with detailed feedback, I kept seeing students repeatedly doing the same basic mistakes I was pointing out to them in my feedback. This made me really perplexed but when I started my Postgraduate diploma studies in Teaching in HE at UoI I learned why. I was giving detailed feedback to assignments that often were summative assessment, so students rightfully only looked at the grade. They could not improve their grade on this assignment, and therefore possibly did not read the feedback or at least did not take much from it and missed an opportunity to learn and improve themselves. They did not view the feedback I gave on those assignments as a formative assessment for the next assignment that was similar or for the final exam in the course. So, I could have saved me a lot of effort and frustration by emphasizing the difference between formative and summative assessment both in my actions and actively talking to students about it (D. J. Nicol & Macfarlane-Dick, 2006).

As common in undergraduate Engineering courses, in the Heat Transfer and Fluid Mechanics courses there are weekly homework assignments throughout the semester. The purpose of homework is to train students in solving problems based on the course material and it is, therefore, important that they learn from their mistakes in order for them not to repeat their mistakes. To acknowledge that students put a lot of effort into those, they count 10% towards the final grade of the course. I always gave a generous score for homework even though there were some errors or misconceptions because I believe it is important to encourage students to try even though they might not have mastered the material yet. I view the homework as formative assessment, and the grade as just compliments for their effort. But it was evident that students did not experience it in that way, and what worried me was how many students seemed to be copying each other’s solution or even some solution manual.

Spring 2016 and since I, therefore, decided to stop giving a grade for weekly homework and only give a written feedback. As previously they get a full score for an honest attempt, but this score is not written on their homework. The reason I chose this is because often students do not fully understand what their grade is based on (Black & William, 2001) and if a grade and remarks are given they often only focus on the grade and not the written feedback (Race & Pickford, 2007b), despite learning most from that. I do not want students to be too fixated on the score itself and I do not want them to be shy to try to work on the problems even though they might not have fully mastered the material. In the first lecture of those courses, also written in the syllabus (see for example Appendix 2.s), I explain this process and emphasize that this is a formative assessment meant for them to deepen their learning. I tell them it is by no means mandatory to turn in homework but generally students that do so do better in the course. I, also, emphasize that they gain nothing from copying a solution: their grade will be the same no matter if their results are correct or not and they miss an opportunity to learn by trying to figure out the solution themselves. In the first two homework assignments I tried this, students were a bit uneasy with this, constantly asking me what their grade for the homework was. When I repeated that everyone with an honest attempt got a full score and learning from the feedback was most important, I could see this settled with them and they started to see the benefits. They were just not used to this and initially did not completely trust me. Once the simplicity of this settled with students, getting a written feedback on homework instead of a grade has been well perceived by students. I have gotten multiple comments in the teaching surveys that students stated that they liked this a lot (see Appendices 2.b and 2.r), and this fact was often a breaking point in them deciding to work on the homework in my course instead of another course where the homework was harshly graded (see Appendix 2.r).

Some may argue that with my arrangement students get too much credit for poorly done homework but the total score for returning all homework (13-14 in total) in the courses is only 10% of the final grade, most students are not trying to game the system and I believe what is gained for them trying to solve all homework is much more valuable than the inflation that comes from those 10% in their final grade.

I have observed that copying has reduced since the change, but I still see solutions that are suspicious of copying or that students are at least working together on homework. Often it is hard to tell the difference between the two. I obviously do not want them to copy since they learn nothing from that, but I do consider it good that they build learning communities (Lenning & Ebbers, 1999) and work together in the initial stages but would prefer them to finish their solution separately. How to encourage that is still a work in process. Some may argue that students that copy other student's solutions or the solution manual should not get any points for completing the homework and that is probably true. But the burden that puts on me to proof that a homework solution is copied (and who is copying who) is in my mind too high with such low stakes in their final grade. I believe students' major loss in copying is by far the lack of an opportunity to learn from trying to solve the homework themselves and that will be very evident in the final itself. Those students rarely pass a course and at least never with a good grade, so I believe those worries are not necessary and the benefits of full credit only formative feedback for homework in my courses by far outweigh the drawbacks. I have been able to convince my main co-teacher to give only remarks on homework in courses we teach together and aim towards convincing more of my colleagues of the benefits, making it eventually the norm in my study line.

The way forward

Maintaining the quality of teaching while being suddenly forced to practice emergency distance-teaching with minimal preparation became the main challenge of academic staff in 2020. Most of 2020 I was on maternity leave, so I did not have to tackle those challenges until Spring 2021. That meant I could benefit from the experience of my colleagues, multiple recorded instructions, and discussions from SENS and UoI CTL. However, I faced two challenges: technical and mental. My lecturing style before Covid19 included massive writing on the whiteboard which students generally liked (see e.g. Appendices 2.a, 2.b, 2.d and 2.e). Despite it being obvious that computer-screen and sound-recording of face-to-face lectures would not capture whiteboard writing, I did get repeated requests to videotape those lectures (see e.g. Appendix 2.a). This was because students felt that if they did not show up for lectures, they had only the textbook to learn from and that it was insufficient. Collectively we agreed to a compromise: following each lecture I gave a review in Ugla of what material was covered in that lecture. Once it became clear that students felt this review was helpful but insufficient (see Appendix 2.c), I also made short glossaries on each section of the material with examples. Both actions were additional workload for me, but the review turned out to be helpful next year when planning the course, since I knew better what was realistic to cover in each lecture. The glossaries also benefitted students in all following years, making the additional work worthwhile. After this I did not get requests to record lectures and students seemed pleased with the solution, despite it not being what they previously requested (see e.g. Appendix 2.d, 2.e and 2.f). Now, however, all material had to be digital. I feared my knowledge on video recordings and the poor quality of writing on screen by hand was an obstacle I was not capable of overcoming. Conveniently, UoI just started using Canvas, therefore, Canvas Studio is available. In addition, my department head offered to rent a computer with a good touch-pen for handwriting onto the screen. The tables were turned! Technical difficulties were not an obstacle anymore but I was also reluctant because some research has shown that students having available recorded lectures online may lead to procrastination and doing worse in the course (Geri, Gafni, & Winer, 2014; Jensen, 2011). The board of SENSE put emphasis on keeping scheduled lecture hours to keep students active and aid them in organizing their learning tasks. I am skeptical that recording 80 to 120 minute-long lectures is effective for learning but I am aware that short videos have proofed to be effective, e.g. in flipped teaching (Foertsch, Moses, Strikwerda, & Litzkow, 2002). I decided to go into that direction. I recorded 28 short videos making the material attractive in a concise way. Students could make comments to all videos, marked at what second they were made, to make things clearer and easier to respond to. To further assist students, I added interactive quizzes to some of the videos (Geri et al., 2014). To fulfill the criteria of SENSE to keep lecturing hours, I used the task manager in Canvas to arrange the videos to the allotted lecture schedule, in a logical way (see Appendix 2.t), but students could view them at any time they preferred. In addition, I had informal, office-hour-like, unrecorded, Zoom-sessions that started once the schedule of the short Canvas studio videos were over. In general, students took a liking to the short videos and mentioned in the midterm teaching evaluation survey that they liked the flexibility in those (see Appendix 2.u). I hope I do not need to do distance teaching again, but now that I have tried this video format, I would like to make such short videos as supplementary aid in my other courses, either as a substitute or as a compliment to my written glossary mentioned earlier. I believe those can be particularly important when dealing with threshold concepts and may also be an effective way to present the material with a different angle, particularly important for students that might not benefit enough from my repetitive mantras mentioned earlier as one of my teaching techniques.

Engineers do need to be proficient in calculating all kinds of scenarios and, therefore, calculations make up for majority of homework assignments and final exams. But it is equally important to know if the calculated results make physical sense. This is where students often lack experience and especially where they often underestimate its importance. When I do an example or ask students to work on problems in lecture, I always ask students if the results make sense. To test if students have this deep understanding on those concepts, not just able to calculate, I have put questions on the final in Fluid Mechanics and Heat Transfer asking them to tell what would happen in certain scenarios and explain with words why. I am trying to push them to analyze and evaluate, and not just apply, as considered higher levels of learning in Bloom's taxonomy (Bloom, 1989). Sadly, first time I tried this half the students did not answer those questions sufficiently, many skipped them and those that did reply often just replied with a yes or a no and no explanation, meaning I had no way to judge if they fully understood or where just simply guessing. I thought this might be because they were used to only do calculations so the following year, I also systematically added questions to homework where I asked students to justify if calculated results made sense, to explain in their own words what to expect instead of doing calculations or explain the reason why some factors may be neglected (see Appendix 2.v). Students often found those questions most challenging and thought provoking. To see if my efforts had a positive effect, I repeated questions like that on the final. Sadly, a large percentage of students were still not able to answer them effectively but still less than previously. So, I felt there were some improvements but much more work ahead. I, therefore, think finding ways to help students grasp the material more deeply and not just mindlessly calculate is the largest teaching challenge I face. I believe that challenge will be an ever-ongoing project that I will have to focus on my entire academic carrier.

Another teaching challenge I would like to be able to tackle better is supervision of masters and later PhD students. When advising a graduate student, the teacher and student get to know one another better than in traditional courses and it requires better communication and human relation skills. I have taken a few courses on how to advise graduate students given by the Graduate School and found those to be helpful but learning by doing is as true in advising as in other form of learning. My advising perspective is a mixture of nurturing and apprenticeship teaching perspective (Pratt, 2002) and has resulted in all my students graduating, eventually. Motivating students that are clearly struggling but are not willing, despite being asked repeatedly, to explain why, is something I find really challenging. Finding a good balance of academic and mental support without being too overwhelming, has also proven to be challenging for me. However, seeing students, especially those that have had to overcome some setback, thrive when finding their calling is rewarding.

As the only academic staff member in my study line that has completed the Postgraduated diploma in Teaching Studies in HE, I was asked to standardize and make a short summary guide for other academic staff in Mechanical and Chemical Engineering on how to write effective learning outcomes. The curriculum for the bachelor's degree in Mechanical Engineering has been completely reshaped recently and learning outcomes of the new courses needed to be added as well as the learning outcomes of previous courses needed to be updated. I was an active member of my study line in making those adjustments. In July I will become the Study Program Chairman for the Mechanical Engineering study line which also includes the Chemical Engineering study line. I am looking forward to this challenge, tackling teaching challenges from more administrative perspective and not just from the floor. I plan to emphasize close monitoring of the quality of the new curriculum changes in the bachelor's degree program. Next on the agenda in my study line is a complete revision of the master level program as few students and budget cuts have called for a vicious cycle of dropping courses making the program less attractive, meaning ever fewer students. This is something I am eager to reverse, building up a strong master level program in Mechanical Engineering.

Concluding remarks

As demonstrated above, I have systematically tried to improve my teaching based on clever solutions from the HE literature. By doing so I have been able to tackle problems in teaching with efficient solutions with the same scientific approaches as my other research instead of just basing my reaction on my own experience, experience of others and my intuition. In my teaching I have put emphasis on listening to students and make adjustment based on their feedback. In my adjustments I have also looked for solutions based on how the literature claims students learn. I emphasize clear structure, presenting material clearly, incremental steps towards increasing difficulty, speedy formative feedback, and ways to keep students learning active. I have always considered improvements in teaching as an ever-ongoing project with ever increasing possibility for improvements. I have also put great emphasis on sharing my experiences in conversations with colleagues and research publications.

It would be great honor for me to be accepted as a part of the Icelandic Teaching Academy. I believe that my experience and dedication to teaching would be a valuable contribution to the Teaching Academy. My vision demonstrated best with my actions, and can be confirmed by the multiple people listed as references in my CV, is to make it desirable and achievable to maintain high quality teaching practices in

HE in universities in Iceland and to make research on those as scholarly as other research within the universities.

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