Peer Teaching Review for Aleksa Vujicic (Fall 2023)

Overview: This review is based on several components:

1) An approximately one hour interview via Zoom on Monday, October 2nd.
2) A visit to Aleksa's MATH 237 class (Monday, November 13th 2:30-3:20)
3) A roughly 30 minute follow-up meeting on Wednesday, November 15th.

The courses being reviewed: This semester Aleksa is teaching MATH 237. MATH 237 is the third course in the Faculty of Mathematics core Calculus sequence. The focus of the course is to provide students with an introduction to the core ideas of Multi-variable Calculus. It covers both the differential and integral aspects of the topic.

Aleksa is teaching one of four sections of MATH 237 this term. The other three are being taught by the course coordinator, a very popular senior lecturer, who is also one of the co-authors of the course notes.

The pre-lecture meeting: The course is very tightly coordinated, with all assessments and all key policy decisions being made exclusively by the course coordinator. On one hand this means less work for Aleksa in delivering the course, but it also means considerably less freedom in terms of how the content is presented and what is to be emphasized. It also means that Aleksa had to do background work to prepare for how the coordinator wanted things done. Based on the interview it seems that he took this quite seriously and before the course began, in fact in July, he went over the course notes to get a feel for what he saw in his own words to be "the big picture" items. The intent was to familiarize himself with key aspects of the course to make links to future lectures when presenting the content. When I asked him what he felt he could add in such a tightly coordinated course, his first reaction was "additional motivation".

Aleksa did mention that the course uses Piazza as a tool for student questions and that while he was not primarily responsible for monitoring the platform he did so occasionally. Instead he stated that he had regular direct communication with his students through email and via his office hours. Aleksa noted that during his office hours his students would often ask him about things external to the course including more advanced mathematical topics. In particular, he spoke of one student who asked questions about topology. I came away with the impression that Aleksa very much enjoyed these exchanges and encouraged his students to come and see him if they needed help.

Overall, I was quite impressed by what I heard from Aleksa during our meeting. He clearly sees teaching as an important part of his graduate training and possibly his future work after graduation. Aleksa has taken significant steps to prepare himself to teach for for the Faculty. In particular, he completed the 1/4-credit graduate teaching training course MATH 900 as well as the Centre for Teaching Excellence's New Instructor Foundations Program in August. In addition to these activities prior to the beginning of the course Aleksa has a also taken the time to participate in the Faculty's Teaching Circles Program which sees instructors of various levels of experience visit one another's classes to provide constructive feedback. Moreover, I found him quite animated in speaking about his class. I had a strong sense that he had invested a lot of effort in helping to foster their success.

The lecture: The class started right on time at 2:30 with 19 students out of the 37 registered in attendance. Before commenting further on the lecture it is important to note that this was a terrible room to be assigned to teach this course in particular. It is a large and very badly designed lecture theatre that has the feel of a bomb shelter. There is an upward sliding blackboard that is one modest sized panel

in length. This makes it very difficult to keep reference material in the students sight including the many important diagrams that are such a key part of this course. In front of this very narrow blackboard is a large fixed desk that severely restricts the lecturer's ability to move freely. The acoustics in the room and the lighting are both very bad compared with more modern class rooms. It also did not seem to be set up so that an instructor could use any audio-visual aids in addition to the blackboard. The room was also too large for the enrolment making it challenging to achieve to the type of student engagement that I think Aleksa is capable of.

The topic for the lecture was an introduction to the Change of Variables Theorem for multiple integrals. This is perhaps one of the more difficult aspects of this course and can be quite challenging to teach. This lecture was intended to set up the main theorem which would be presented in a future class. To motivate the topic Aleksa began by reminding the class of an example of a double integral they had seen previously that had been a challenge to evaluate by the basic techniques that they had see so far. Specifically, they were to evaluate

$$\iint_D x^2 + y^2 dA$$

where D is the annulus $\{(x, y) \mid 1 \leq x^2 + y^2 \leq 2\}$. Aleksa reminded the class that this calculation was long and somewhat challenging and that after much effort they saw that this double integral had value $\frac{15\pi}{2}$. From here he indicated that a strategy to evaluate this integral would be to re-imagine D as all points with polar coordinates (r, θ) where $1 \leq r \leq 2$ and that the general process they want to use is to use "Change of Variables" to transform the integral into one taking advantage of the much simpler description of D using polar coordinates. At this point one of the students asked the question: " Does this have anything to do with substitution?". Aleksa enthusiastically acknowledged this key question with an emphatic YES, and indicated that this was where they would be going in a few minutes. This was one of several instances in the lecture where students provided important contributions. The next example occurred soon after when Aleksa asked his class to supply the resulting integral on the right from the single variable Change of Variables Theorem after the transformation $x = g(u)$

$$\int_a^b f(x)dx \overset{x=g(u)}{\longrightarrow} \int_{g(a)}^{g(b)} f(g(u))g'(u)du.$$

The next ten minutes of the lecture was a discussion on how to interpret the components of this formula in the setting of double integrals eventually leading the class to the need for a detour to talk about mappings from $\mathbb{R}^n$ to $\mathbb{R}^n$. Throughout the rest of the lecture Aleksa frequently reminded the class of core ideas from earlier in the course concerning differentiability of such functions. He stopped at regular intervals to ask if there were questions and comfortably handled those he received. As was the case earlier in the lecture the students themselves supplied some of the insight Aleksa was trying to highlight including an observation concerning the role to be played by linear approximation and the fact that "if you zoom in enough all nice mappings look linear" as well as confirming a students feeling that a change of basis matrix can be viewed as an important type of mapping.

Throughout the lecture, Aleksa succeeded in keeping the group engaged and actively participating. I did not notice anyone who was not paying attention and there was no noticeable background chatter to distract students in the class. Aleksa's pace was seem relaxed but was very appropriate for the topic. Looking back on my notes, he did cover a lot of material in the lecture. Despite the very poor class room set-up Aleksa's board work was very good. He provided a number of nice illustrative diagrams that would be helpful in understanding the content. His voice was clear and loud enough to be easily heard in the last row of this rather large lecture theatre. Aleksa also made a point of facing the whole class whenever possible while he was speaking or asking for questions.

Post-lecture and the follow-up meeting: The lectured ended on time and immediately several

students approached Aleksa with questions from the lecture. Aleksa spent several minutes answering questions before moving outside the classroom where I had intended to speak to him about the lecture. At that point he indicated that he could not meet me immediately because two students wanted to speak to him about some deeper questions concerning the lecture. I later found out at our follow-up meeting that this was a regular occurrence and that these post-lecture sections could go on for quite sometime. It seems clear that Aleksa is willing to be quite generous with his time.

At the follow-up, Aleksa and I discussed how the lecture went. I mentioned that I had no concerns, but did suggest that when students asked questions or provided answers to his questions it would be a good idea to repeat them to the whole class so that others could hear, and that it would also serve to focus the class' attention on the response. This was particularly relevant in this lecture since the student involvement was on of the strong points. Aleksa was very receptive to this comment and acknowledged that it is something he should concentrate on.

One observation I made was that Aleksa seemed more reserved in the lecture than I had expected, given how enthusiastic he was in our meetings and how engaged he was in answering student questions. I pointed out that I thought that the room might play a role in this. Coincidentally, the day before our follow-up Aleksa substituted for the course coordinator, lecturing in a room with an expansive blackboard and a much better overall environment for this course. He described the experience as "freeing", a word that had come to my mind as well. He felt that being able to simply move around the room made a world of difference.

Summary: Aleksa seems genuinely interested in teaching and obviously put in significant effort to make his students experience a positive one. His technical skills in the classroom are very good and his delivery of the content was clear, easy to follow and appropriate for the course he was teaching. My sense is that Aleksa is very open to constructive comments about his teaching. His participation in Teaching Circles is further evidence of this. For a graduate student teaching a challenging course in an even more challenging environment, Aleksa handled himself very well. I see him as having a strong aptitude for teaching and would be very comfortable recommending that he be given the opportunity to teach additional classes in the future.

Summary: Brian Forrest

December 4, 2023