To the Electrical and Computer Engineering Planning Committee:

In my final year of high school I had an opportunity to attend one semester of school at the Ontario Science Centre Science School (OSCSS). To this day, I consider it to be the best education I have ever received. This is not to say that everything was idyllic, however, I came away from it a better person and a proud graduate. In comparison, I would not rank my time in Computer Engineering at the University of Waterloo anywhere nearly as favourable. The simple question is: what makes the experiences at each of these institutions so different? There are many factors, both academic and social, and I feel that in all the ways that matter, OSCSS is considerably better than E&CE, yet most of the details of the two institutions are reasonably comparable. I will endeavour to explain the differences in the hopes that this can be used by the Planning Committee to improve the E&CE programmes.

The first logical place to begin is the location. At first glance, the OSC has a higher ‘‘wow’’ factor when compared to the UW campus. However, the UW campus is not really lacking in any way. Both places share a maze-like construction and the non-academic facilities are adequate for most activities. Both are in relatively isolated areas and are not able to borrow favour from their surroundings. Overall, I would rate the physical environments comparable, even though I do miss pushing random buttons on my way to class. Still in the realm of the location, one must consider the learning environment. This includes classrooms, lecture halls and labs. The facilities at the OSC were adequate, at best. In fact, our classrooms, where we also conducted labs, were considerably more run-down than any lab facility used by visitors. If anything, UW provides better academic facilities.

I think the next logical area to consider is work. The work provided at OSCSS was meant to be considerably more challenging and stimulating that the work of a regular high school. I do not think that it is acceptable to compare them directly, but it is fair to compare the intent of the work. Assigned work was rarely check at OSCSS; like a university, students were left to be independent. Since the instructors at OSCSS knew we were all bright, they would assign a small set of meaningful problems. The idea being that if the set was small enough, students would actually be inclined to do it. By providing a limited set of meaningful questions, students required deep thought into the subject material and gained an intuitive understanding of the material. This is not so in E&CE. Most of the assigned work is working on a sort of osmotic technique that if the ideas are presented enough times, the students might remember. This, generally, causes students not to bother doing the work.

The second academic area of importance would be the labs. Similarly to the problems, OSCSS labs were short and meaningful. The labs were presented to either directly reinforce the taught material or as a discovery of the material about to be taught so students would have an intuitive understanding of the subject material as the ‘‘heavy math’’ was brought out. Occasionally, we had ‘‘reward’’ labs. An example would be the chemistry lab where we built organic molecules out of candies and had to determine the names of our classmates’ molecules...then ate them. E&CE’s labs are considerably less meaningful. I have reasonable praise for the E&CE 223, 222 and 324 labs. I have found, of all the courses, these labs to be challenging without hours of pointless work unrelated to the concepts being taught. I also found the ‘‘ping-pong’’ lab in E&CE 223 to be just-plain fun. The polar opposite would be the E&CE 231 and 241 labs. The E&CE 241 labs were presented before the material, incredibly difficult to complete and did not promote a sense of discovery. Sure, I built the circuit and produced the plots, but doing so filled all of my lab time and I gained no intuitive sense about how the circuit worked. A simpler, meaningful lab could have been ‘‘built a circuit to filter out frequencies less than 10MHz’’. Based on the course concepts, I would have had to think about what that meant and actually experimented in the lab to create a working circuit. Many people praised the E&CE 231 labs, because, compared with the E&CE 241 labs, they could be completed in the time alloted. However, I cannot say I really learnt anything. Most of the lab was pushing the *Print* button on a pre-configured device. I hope this effectively communicates the problems with the labs. Students will always complain about labs being either too easy or too hard; both of these irrelevant. The only real concern is whether the labs are meaningful and instructive in a way a lecture hall cannot be.

The final component of our work is, of course, the exam. Again, students will complain about too long, too short, too hard, too easy, questions are too dependent on previous answers and on and on. The only question for an exam is whether it tests the understanding of the student writing it. If I can get a random person with some math background from a different faculty to pass an E&CE exam by reviewing

old finals, then the exam is a failure in and of itself. OSCSS exams were similar to the assigned work, not necessarily in content, but, in the idea that an intuitive understanding of the core concepts in the curriculum results directly in being able to answer the question. Everyone here who does well on exams that I know does not study from notes or labs; they study by committing old finals to memory.

Of course, one of the areas that is difficult to compare is the instructors. OSCSS had four instructors for a mere twenty-eight students while the E&CE Department has some sixty instructors for hundreds of students. I would like to say that all of the instructors at OSCSS were excellent, but they were not. I had a particular problem with the teaching and marking style of one particular teacher. It is impossible to ever have a group of perfect teachers, especially as the requirements of 'perfect' vary with every student. The real issue is the personal relationship with the professor. At OSCSS each teacher made themselves so accessible, not merely as instructors, but as people, that our relationship made it possible to solve problems directly in a comfortable social setting rather than an adversarial one. Even when I was angry with teachers, I never lost respect for them as people or felt uneasy dealing with them. I had an unfortunate experience with a mis-delivered exam and I have so little faith in the personality of this professor that I did not want to approach him directly to resolve it because I feared his anger and retribution. Such a situation should never be allowed to develop. It requires flexibility on both sides and the Department, despite its position, must allay my fears that it will side with a professor merely to protect its own interests or save face. In my mind, I would prefer a professor with lower instructional competence who cares about the students than one who can lecture will with complete disregard for us. The best two examples of this would be Troy Gonsalves and Andrei Sazonov. Troy Gonsalves, although only a masters student, attempted to provide as much support and assistance as possible. Andrei Sazonov was constantly improving based on our suggestions and his exams were fair and appropriate representations of what was taught.

The final and most important factor is the students themselves. Applying to OSCSS is, in many ways, similar to applying to university. Students who wish to apply must fill out a questionnaire and send it, two teacher recommendations and a transcript to the OSC. The selection of a candidate is based on more than marks. Part of our time at the OSC was spent running demonstrations for visitors. The OSC needed each and every one of us to be acceptable, professional representations of themselves to the public. This is why an interview was performed to test our communication skills and creativity. For the purposes of university enrolment, interviewing candidates is highly impractical. However, I am willing to bet that the University does not really attempt to asses the creativity and drive of incoming students. I suppose that this depends on what the University is attempting to produce as graduates. One professor described this place as an ''engineer factory''. If that is the case, what is the desired product? Each of us is now a representation and reflection of the University and the E&CE Department. What does industry want us to be? The answer to that question must be present in your final product, your graduates. To produce those graduates, what must be present and what must not be present in the raw material, high school students? How can you assay for these qualities? I admit it is not an easy task and that no test is perfect. This is also instrumental in determining the social interaction with the class. I admit that OSCSS involved a mere twenty-eight people where as my class as about one hundred students. However, if you think of it as a rate at which I meet new people, then, for the time spent here at the OSCSS rate, I should be able to bond with 180 people. At the end of my time at OSCSS I had bonded very closely with 28 strangers. My sister also attended OSCSS and she has bonded as closely with her class. In OSCSS, there was no person I couldn't just sit down with and start talking about anything. I don't feel that way here. I find it difficult to talk with most of my class about topics that should be of mutual interest. This is not attributable to fluke or chance; we were selected to be compatible at OSCSS. In a place like this a common interest in computer technology should bind us together. Another factor that greatly reduces our social interaction is the state of tutorials. In first year, we had, comparatively, excellent T.A.s. Because the tutorials were mandatory and useful, all the students attended and the tutorial sections were small enough to interact with other people. By second year, tutorials became useless and attendance plummeted. The material in the tutorials is sometimes completely unrelated to the courses, many of the T.A.s do not have an acceptable command of the English language and many simply do not care. This was especially infuriating in E&CE 250 where the class complained about an inept and lazy assistant which the professor defended as a ''good researcher''. Tutorials would have helped us to interact as a group, but the painful mismanagement of them makes them an unwelcome forum for interaction. There is a direct benefit for the professors out of such a cohesive group: we will solve problems

on our own. A functional social group improves our ability to work as a class and reduces the outside (i.e., professor and T.A.) assistance we need. In industry, a strong social web benefits us to be able to recommend our classmates as candidates for jobs and improves the reputation of the Programme. What frightens me is that some graduates of this programme become the professors of the future. If the Department is a reflection of us, then I feel very badly for the social situation that must exist.

I hope I have displayed the differences between the best education of my life, the Ontario Science Centre Science School, and Computer Engineering at Waterloo. I don't believe that any changes made by the Planning Committee will directly impact me, so I write this for future students. I wish I could write a laundry list of items to fix that will make everything better, but I believe there are fundamental beliefs that need to be re-evaluated. I believe the Department must ask itself what it wants for itself in terms of graduates for the industry and graduates for the next generation of academia and then work backward to determine what kind of environment is needed for those students to thrive. I think many of the concerns raised by students will each be based on our individual views of what we wanted to become through this programme. The path laid out here is so far from what I wanted to become in terms of being challenged to think, design and create that I feel no pride in this institution. This is why I have an OSC patch on my knapsack and not a UW-branded item.

Sincerely,

Andre Masella