TEACHING DOSSIER
DR. RAMON LAWRENCE, COMPUTER SCIENCE, UBC

EXECUTIVE SUMMARY

My teaching career includes three institutions (University of British Columbia Okanagan, University of Iowa, and University of Manitoba), 19 distinct courses with 65 separate offerings, and 2438 undergraduate and 185 graduate students taught. I have graduated 2 Ph.D., 13 Master's, and 32 undergraduate honours students and supervised many more on research projects. Under my supervision were 3 NSERC CGS, 9 NSERC USRA, and 3 IKBSAS URA winners. My core belief is that quality teaching and mentoring requires passion for education and personalized motivation for students. I build relationships with my students that exist beyond individual courses. I am very proud of my supervised students and their accomplishments. All three Ph.D. students (Dr. Scott Fazackerley, Dr. Terry Mason, and Dr. Edward Dragut) hold academic positions and have a passion for teaching. Undergraduate students went on to work at Microsoft, create their own companies, and win awards for their research and presentations.

Teaching is my passion, and I invest my energy in making each course better using an iterative process of experimentation, data collection, and content and pedagogical refinement. I approach teaching like a science. Results should be measurable. Techniques should be verifiable, repeatable, and improvable. Technology is extensively used in the classroom for engagement and efficiency, including my own technologies to encourage learning such as the competitive game system (published in IEEE Transactions on Education) and the automated testing and learning system. Teaching requires more than good content and effective technology. Teaching requires a passion for learning, an enthusiasm to motivate and encourage, and strength to persevere when things are hard.

At UBC, I have developed numerous courses and programs to encourage more students to learn computer skills. In response to growing industry demand for data analysis skills, I developed DATA 301 Introduction to Data Analytics, which is one of the most popular courses in Computer Science and is growing to be one of the largest. I also developed a two course introduction to computer science (COSC 122/123) designed to attract arts students, women, and underrepresented groups to computer science by emphasizing creativity and using innovative teaching. These courses were introduced as part of a new B.A. in Computer Science. I was a member of the Irving K. Barber School of Arts and Science Curriculum committee from 2006 to 2013. I have also served as the undergraduate advisor (2010-2013) and IGS graduate advisor (2010-2012) for CS. As the Director of the Master of Data Science at UBC Okanagan, I developed the MDS to be the premier professional program at UBCO and exemplar for other programs envisioned in Outlook 2040.

My course evaluations and student comments are very positive and motivate me tremendously. In 2017, I was the recipient of the Provost Award for Teaching Excellence and Innovation, which is the highest teaching award at UBC Okanagan and recognizes exemplary role models who have and will continue to have significant impact on the culture of teaching and learning on the Okanagan campus and beyond. I am a 9-time member of the UBC Okanagan Teaching Honour Roll recognizing the top 10% of faculty in student evaluations. These recognitions reflect my emphasis on placing student learning first including being accessible and developing courses that require minimum expenses (e.g. textbooks) while maximizing student learning opportunities. There is nothing quite like being in front of a classroom. It is an opportunity I truly cherish.

KEY FACTS AND ACCOMPLISHMENTS

Employment

2019 -	UBC Okanagan	Professor (Computer Science)
2010 – 2019	UBC Okanagan	Associate Professor (Computer Science)
2006 – 2010	UBC Okanagan	Assistant Professor (Computer Science)
2001 – 2006	University of Iowa	Assistant Professor (Computer Science)
Summer 2001	University of Manitoba	Summer Instructor

Education

2001	University of Manitoba	Ph.D. (Computer Science)
1996	University of Manitoba	B.C.Sc. (Honours) (Completed in three years)

Awards

- In 2017, recipient of the Provost Award for Teaching Excellence and Innovation – highest teaching award at UBC Okanagan.
- 9-time member of the UBC Okanagan Teaching Honour Roll (2007, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016).
  - Recognizing professors in the top 10% in student evaluations of teaching effectiveness.
- Nominated for President's Instructional Technology Innovation Award at the University of Iowa in 2005 and 2006.
- Best paper award at ACM Symposium on Applied Computing for paper written with undergraduate student Graeme Douglas in 2016.
- Supervisor for undergraduate student Ryan Trenholm who won Top Oral Presenter award at the Universitas 21 (U21) International Undergraduate Research Conference in 2011.
- Best student paper award at IEEE Sensors Applications Symposium for paper written with graduate student Scott Fazackerley in 2010.

Pedagogical Publications

- Alyosha Pushak, Deb Carter, Teresa Wrzesniewski, and Ramon Lawrence. "Experiences using an Automated Testing and Learning System", *Computers and Advanced Technology in Education (CATE 2011)*.
- Ramon Lawrence. "Motivating Students Using Competitive Programming". *Guide to Competitive Learning*, Springer. 157 – 172. ISBN 978-84-937580-3-5. April 2010.
- Ramon Lawrence. "Teaching Data Structures using Competitive Games". *IEEE Transactions on Education.* 47.4 (November 2004): 459 – 466. Citations: 185 (Google), 59 (IEEE)

Teaching Grants

- "On Demand Student Support with Virtual Labs and Help Desk", ALT-2040 funding ($25,000) and IKBSAS Curricular Innovation Award ($15,000). Grant period: May 2020 – May 2023
- "Improving Pedagogical Efficiency and Effectiveness using an Automated Testing System", UBCO AVP Learning Services – Grant for Integration of Teaching and Research in Undergraduate Education, Awarded May 2010 for $10,000. Grant period: Apr. 2010-Apr. 2012.
- "Teaching Competitive Games", Innovations in Instructional Computing Awards, University of Iowa, 2004, $5,100 US dollars.

TEACHING PHILOSOPHY AND GOALS

The most direct impact that a university faculty member can have is through inspirational teaching of students. Although research achievements and breakthroughs are critical to the health and reputation of the institution, the very core of a university is its students and their learning. I strongly believe in the importance of excellent teaching and greatly enjoy my time in the classroom.

The most important factor in being a successful educator is truly caring about the students and their success. It takes more than mastery of the material, as you must also strive to connect with students and present the material in ways that it can be easily understood. During class time, student interactivity, involvement, and participation in the learning process are essential. Course material becomes more interesting when you realize the motivations for learning it. I want students to realize value from attending class that they cannot get by simply reading the content. My goal is for every student to learn the material, pass the course, and improve their skills. Although not all succeed, every student knows that I will work with them if they put in the effort. Due to this commitment, my student reviews are consistently excellent, and I frequently receive reviews indicating that my teaching or my classes are the "*best that they have ever had*."

Overall, I am deeply committed to teaching and believe strongly in the value of quality education. Teaching provides the opportunity to have an immediate impact on students' lives. I take this opportunity very seriously, and tirelessly strive to improve my teaching style and courses.

Teaching Goals and Strategies

Effective teaching has two fundamental features: preparation and presentation. Preparation is the act of planning the course including material covered, timelines, areas of emphasis, and evaluation methods. The first time teaching a course always involves significantly more preparation. In my first course preparation, I typically read two to four textbooks in the area and attempt to summarize the material into a set of electronic course notes. I avoid using standard materials and try to produce unique examples and notes. These notes are designed as the student's primary reference and as my instructional material for every class. Notes are available in printed and electronic formats before the course begins. The notes also contain written and clicker questions that are used during class. I have received many comments from former students (especially of the database course) how my notes are still the reference they use for questions. Students rarely use a textbook in my classes. The notes are iteratively improved after every course offering to resolve issues in presentation or student misunderstandings.

Another important issue in preparation is planning timelines including exam and assignment due dates. Poor planning causes considerable issues, and it is not always easy to synchronize lecture and lab schedules. I measure my preparation effectiveness by the amount of time it takes to prepare each successive offering. The goal is to reduce this time by streamlining the process. Students get most upset when preparation is not evident. Amazing presentation cannot overcome poor organization.

The second aspect of effective teaching is quality presentation. My primary presentation method is an interactive lecture style based around PowerPoint slides. I have settled on this style for a variety of reasons. First, the pre-packaging of notes is convenient for the students and the instructor. I do not have to worry about writing on the board, and the students do not waste valuable time copying

notes down. Although I believe that there is value in having students write down material, I do not believe it is valuable enough to justify a slower pace of delivery. Second, my communication style is not conducive to "improvised lectures". I like to know exactly what I am teaching thoroughly before speaking, and present well-prepared, specific material every class.

My goal is to present the material in the most efficient amount of time to ensure broad student understanding such that they have the ability to answer written and electronic questions. Even though all materials are available before class to allow for a completely "flipped classroom" with no instructor led content, I have found that having time to present and motivate the material during class increases student interest and engagement and reinforces reading done before class. This allows all students the opportunity to do the numerous questions in class. After presenting the core ideas, students do practice questions on the just covered material. This tests to see if they really understand the material, gives them practice for future evaluations (labs/tests), and allows me to get feedback to see what they understand. These questions also make the lecture more interactive. I move around the classroom (regardless of lecture size) and take student questions. I believe it is these points where the first initial stage of learning begins. I use clickers to allow for rapid feedback of answers for simple multiple choice questions. Clickers have been very well received by students. They attend class more frequently and understand more material than before clicker introduction.

Deep learning of concepts occurs during labs and assignments. The labs are designed to be primarily free-form instruction. After I produce the lab, the TA may cover some background and examples in the first 30 minutes. The TA then answers questions and helps direct students as they work through the lab. Some labs allow students to work through them on their own time, although most students realize the value of being in the lab working with other students. Depending on the course, labs may involve independent or group work. The labs are the time where students get to apply the theory into practice on the computer. Consequently, this is where the true insights happen and most of the work and excitement occurs. I often drop in on TA-directed labs to answer questions and participate in discussions.

After some introductory examples, the rest of the lab time is used for assignment questions, which are typically due at the start of the following week's lab. My assignments are designed to test the most important concepts, most of which will appear on exams. Students completing the assignments generally will have a fair grasp of the material and have done similar questions already in class and the labs. This helps them make the jump from assisted learning (in the lecture or lab) to personalized learning of the material when completing the assignment. Supporting their learning is an open-door policy. I help students at any time I am available.

Although the grades in my courses are above average, the difficulty level is always challenging. My exams are comprehensive, and the assignments require significant work. I have a list of abilities I want students to master when they leave the course, and I test them all. Students should always complete a course feeling it was valuable and useful.

I encourage the use of technology and innovative techniques for education and adopt them in classes when they have demonstrated benefits to student learning. All my course materials are available electronically, and I have been very active in adopting and developing technologies to improve education.

Teaching Reflections

Simply, I love teaching. I have taught courses that I enjoy (database systems, data analytics, programming, data structures), courses that are outside my area (networks, software engineering), and courses that I grew to love (software engineering). Regardless of the content, after some initial "first offering challenges", teaching boils down to engaging, motivating, and supporting students.

My favourite courses to teach are the introductory courses where students are learning programming for the first time. These courses are often challenging, but they are also the most rewarding as new students appreciate quality teaching. My first teaching experience was with two introductory courses at the University of Manitoba. Interacting with students who are starting to see the wonders of programming made that time very memorable.

One of the strategic goals of UBC Okanagan is student engagement, and the creation of a world-class environment for undergraduate instruction. My focus on student interaction and engagement directly contributes to this vision. Students feel connected to the professor in my courses, and relationships are built that transcend course offerings. My passion for teaching and teaching innovation helps to distinguish our Computer Science program from programs at other schools that have more course offerings and resources. I have offered courses above and beyond my regular teaching load to support UBC students. In the summer of 2016, I taught our COSC 499 Capstone project course as many students needed it to graduate and would otherwise need to take another full year. I have also taught numerous directed study courses at the undergraduate and graduate level in order for our students to experience training in areas where we do not have courses at UBC.

My success in teaching can be summarized by:
- Be *prepared* with well-planned material that is valuable with specific learning outcomes.
- Be *clear* and direct on why material is important, what is being covered, and how learning will be evaluated.
- Be *caring* about student success and their individual learning goals.
- Be *passionate* to motivate and engage students and inspire them to learn.

My passion for teaching extends outside the classroom. I was a volunteer coach and executive member for Kelowna Minor Fastball from 2014 to 2018. I encouraged young girls of all ages to be active and enjoy the sport of fastball including helping with offseason training. As head coach of my daughter's team in 2016, her U14 team finished 2nd in Provincials. I was also District 9 coordinator for fastball from 2016 to 2018 responsible for direction and administration for all teams in the south Okanagan from Sicamous to Penticton, and won Softball BC Minor Coordinator of the year in 2017. In 2019, the City of Kelowna recognized my service with a Volunteer Sport Hero award, and I was one of three finalists for a City of Kelowna Civic Award for Coach/Sport Administrator of the Year.

TEACHING ACTIVITIES

A detailed list of teaching activities is available in my CV. The following is summary information and comparisons to discipline and university norms. My standard teaching load from 2006 to 2013 was 4 courses per year, and after 2013 is 3 courses per year. More details on courses and reviews are available at: https://people.ok.ubc.ca/rlawrenc/teaching/.

STUDENT SUPERVISION

At UBC, I have supervised 32 undergraduate projects, 32 undergraduate theses, and graduated 6 Master's and 1 Ph.D. student. At the University of Iowa, I graduated 3 undergraduate honours theses, 7 Master's students, and 1 Ph.D. student. In Figures 1 and 2 are charts showing the number of students graduated and supervised during each calendar year at UBC. Students are considered actively supervised if they were under *supervision* for at least one semester (4 months) of that year.
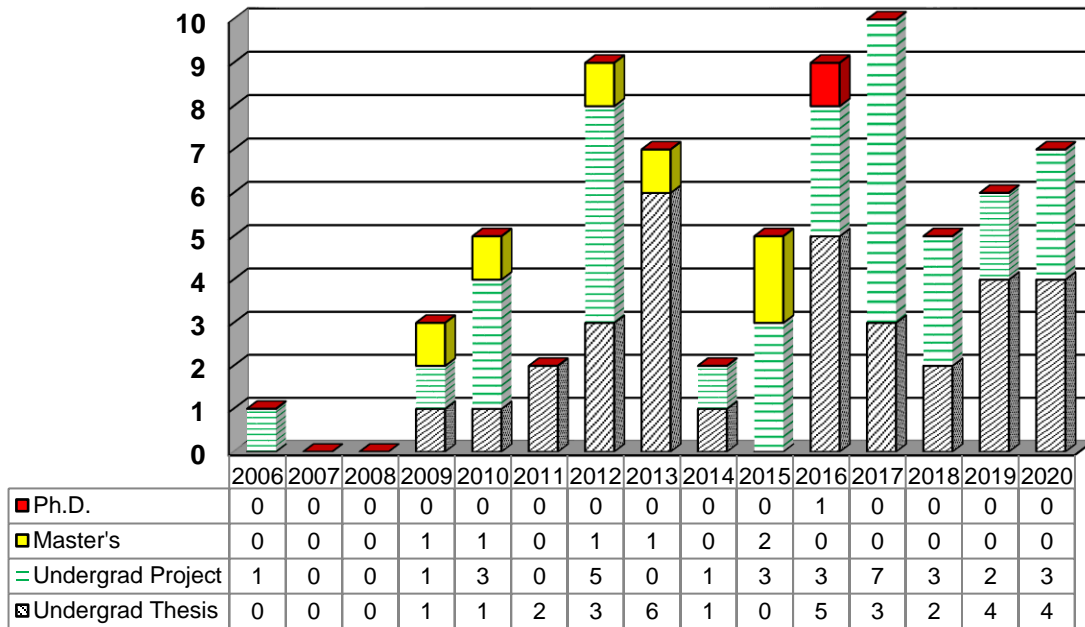
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
■Ph.D.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
□Master's	0	0	0	1	1	0	1	1	0	2	0	0	0	0	0
▤Undergrad Project	1	0	0	1	3	0	5	0	1	3	3	7	3	2	3
▨Undergrad Thesis	0	0	0	1	1	2	3	6	1	0	5	3	2	4	4

Figure 1 – Students Graduated per Year (UBC)

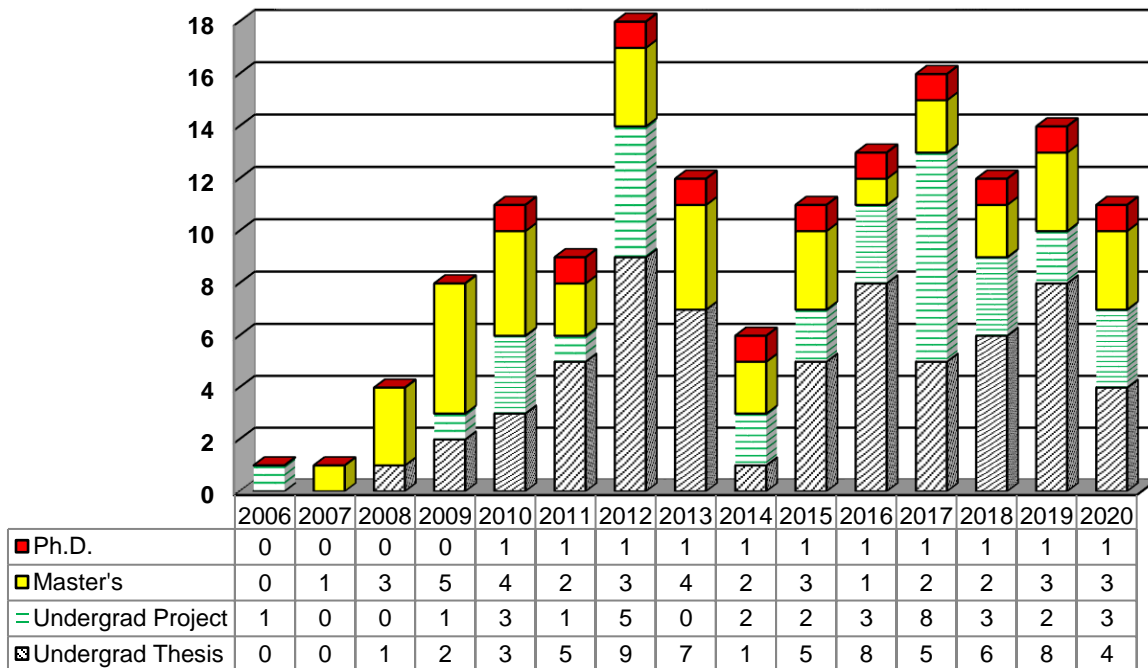|	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
■Ph.D.	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
□Master's	0	1	3	5	4	2	3	4	2	3	1	2	2	3	3
▤Undergrad Project	1	0	0	1	3	1	5	0	2	2	3	8	3	2	3
▨Undergrad Thesis	0	0	1	2	3	5	9	7	1	5	8	5	6	8	4

Figure 2 - Students Supervised per Year (UBC)

STUDENT SUPERVISION HIGHLIGHTS

Ph.D.
- All three Ph.D. students (two at Iowa, one at UBC) hold academic positions at a college or university.
- One NSERC CGS award winner (Scott Fazackerley).

Master's
- Every student published at least one, peer-reviewed paper.

- Giuseppe Burtini had three publications and started his own technology business.

- Ryan Trenholm (NSERC PGS) working with the City of Kelowna produced a mobile system that is in production use to improve sustainability and efficiency of park management and water usage.

- Scott Fazackerley's (NSERC CGS) research project that used sensor networks to control irrigation systems was published in the IEEE Sensors Applications Symposium 2010 and won **best student paper**.

- Michael Henderson (NSERC CGS) studied multi-way join algorithms and helped with the modifications to the PostgreSQL join algorithm.

- Bryce Cutt developed a join algorithm called Histojoin that was published at the IEEE Canadian Conference 2008 and the journal Information Systems. The algorithm was implemented in PostgreSQL.

Undergraduate
- Dana Klamut (NSERC USRA, Honours) won the Unit 5 Graduating Student of the Year award in 2018 and the Pushor Mitchel Gold Medal Leadership Prize for UBC Okanagan.

- Eric Huang (Honours) was top computer science graduating student in 2017 and founded blockchain company, BlockCat that raised over $9 million in ICO.

- Graeme Douglas (NSERC USRA, IKBSAS URA) built the smallest relational database that supports SQL for use on Arduino systems. He has four publications including the **Best Paper Award** at the ACM Symposium on Applied Computing in 2016. He received a graduate scholarship offer from UC Berkeley.

- Wade Penson (NSERC USRA) built the IonDB system and has two peer-reviewed publications. He was co-founder of BlockCat.

- Andrew Moldovan developed an analytics system for the Physics AutoEdu system that supports automatically marked student labs. His first position was a software developer at Microsoft.

- Ryan Trenholm (IKBSAS URA) worked with the City of Kelowna to install and test the effectiveness of a wireless sensor network to reduce water usage by 50%. Ryan was a Top 3 presenter at the UBC Multi-disciplinary Undergraduate Research Conference, and won a Top Oral Presenter award at Universitas 21 (U21) International Undergraduate Research Conference.

- Alyosha Pushak (NSERC USRA) developed the first version of the AutoEdu system that was used by over 1000 Physics students for lab and tutorial marking.

- Geoffrey Appleby won Best Computer Science Thesis for 2010.

- Stephen Smithbower's research on graphics systems won first place presentation at the UBCO Undergraduate Research Conference in 2010.

- Jacob Orr built a schedule viewer application for course planning for his undergraduate honours thesis. His presentation received 3rd place at the UBCO Undergrad Research Conference in 2009.

- Elizabeth Heithoff help construct the competitive programming system that was nominated in two successive years for the President's Instructional Technology Innovation Award which is the highest innovation in teaching award at the University of Iowa.

TEACHING SUMMARY

This section contains information on quantitative and qualitative teaching evaluations. The goal is to display trends over time and compare with discipline and university norms.

During the twelve years at UBC Okanagan, I have taught 45 undergraduate course sections with a total enrolment of 2167. I have taught 36 graduate course sections for a total enrolment of 103. Figure 3 shows the number of students taught per academic year. Note that I was on sabbatical leave from January to December 2014.

Courses taught have grown considerably in student numbers while maintaining very high student ratings. For example, COSC 304 has grown from an individual learning environment of around 10 students to over 8 times larger (197 students in 2019). The three 1-credit MDS courses (DATA 530/531/540) have been counted as a single three credit course.
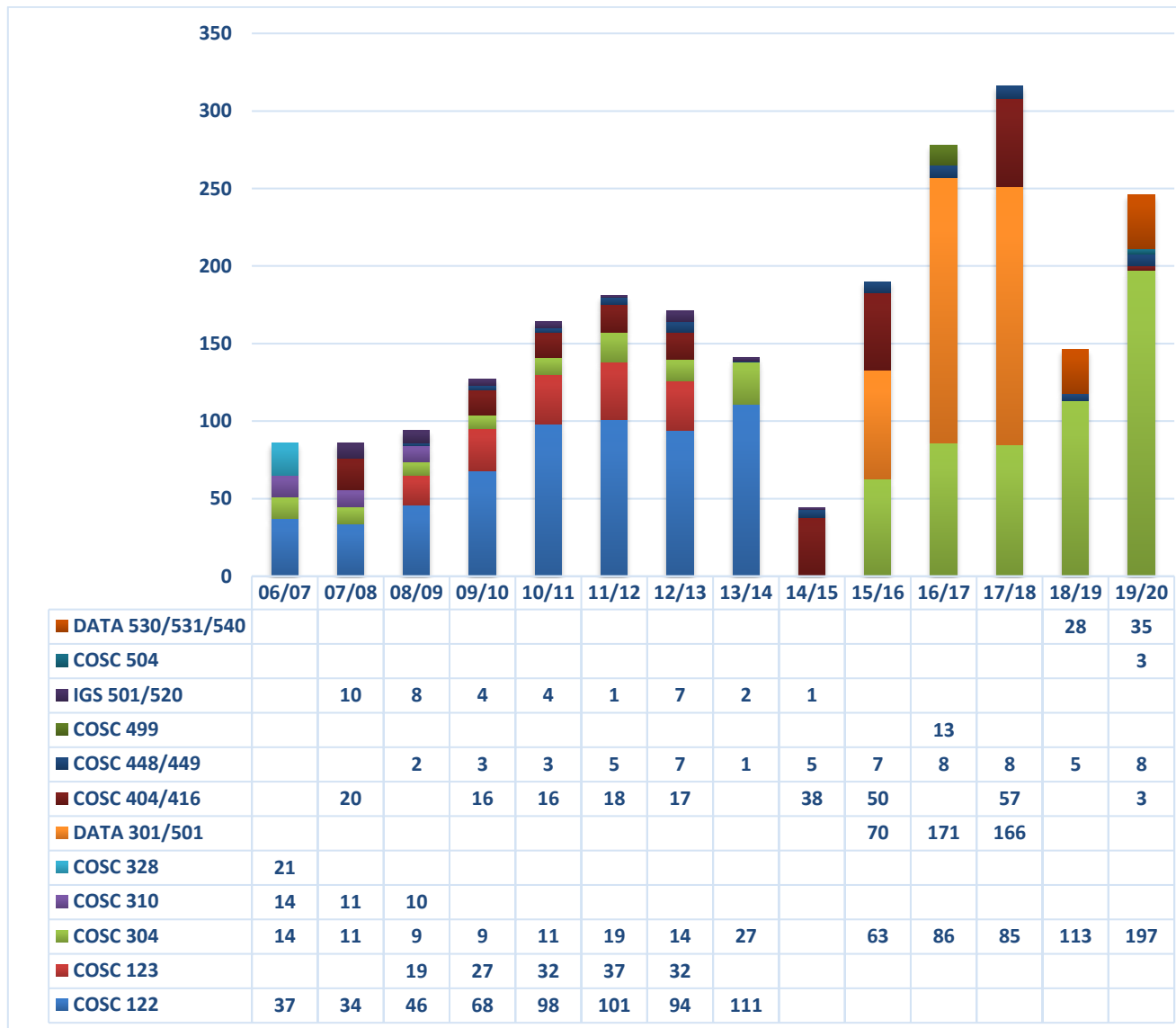

	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
■ DATA 530/531/540													28	35
■ COSC 504														3
■ IGS 501/520		10	8	4	4	1	7	2	1					
■ COSC 499											13			
■ COSC 448/449			2	3	3	5	7	1	5	7	8	8	5	8
■ COSC 404/416		20		16	16	18	17		38	50		57		3
■ DATA 301/501										70	171	166		
■ COSC 328	21													
■ COSC 310	14	11	10											
■ COSC 304	14	11	9	9	11	19	14	27		63	86	85	113	197
■ COSC 123			19	27	32	37	32							
■ COSC 122	37	34	46	68	98	101	94	111						

Figure 3 - Students Taught Per Academic Year

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Career Progression Summary

My overall teaching effectiveness has improved rapidly from the beginning years and is maintained at an extremely high level. I have taught large and small classes in a variety of areas. At UBC, I taught courses that are outside my research area (networks, software engineering) as well as introductory and service courses. My teaching process is efficient, measurable, and repeatable. This is partially demonstrated by the continued excellent evaluations, but also by the incremental improvement as I offer courses several times. My teaching evaluations are considerably above the discipline and science norms at UBC Okanagan. Figure 4 is a chart showing my overall performance for all courses in a semester against the discipline norms over the years as measured by the question "overall instructor rating (2006/2007)" or "very good instructor (2007-ongoing)". Figure 5 is a similar chart showing my overall performance as measured by the question "overall course rating (2006/2007)" or "very good course (2007-ongoing)". The maximum rating is 5.
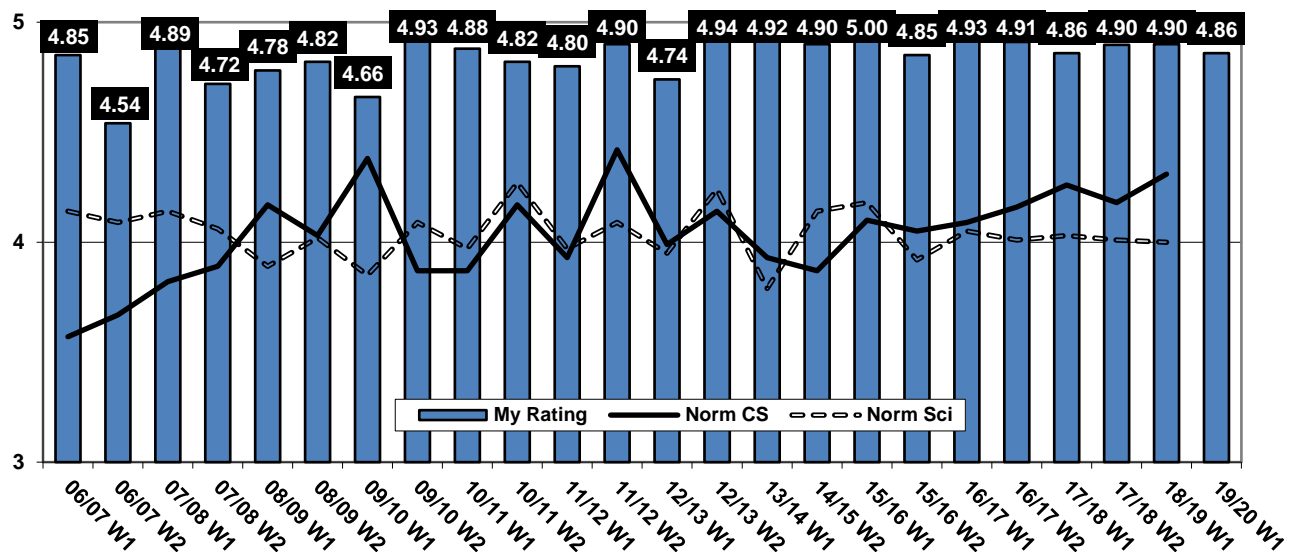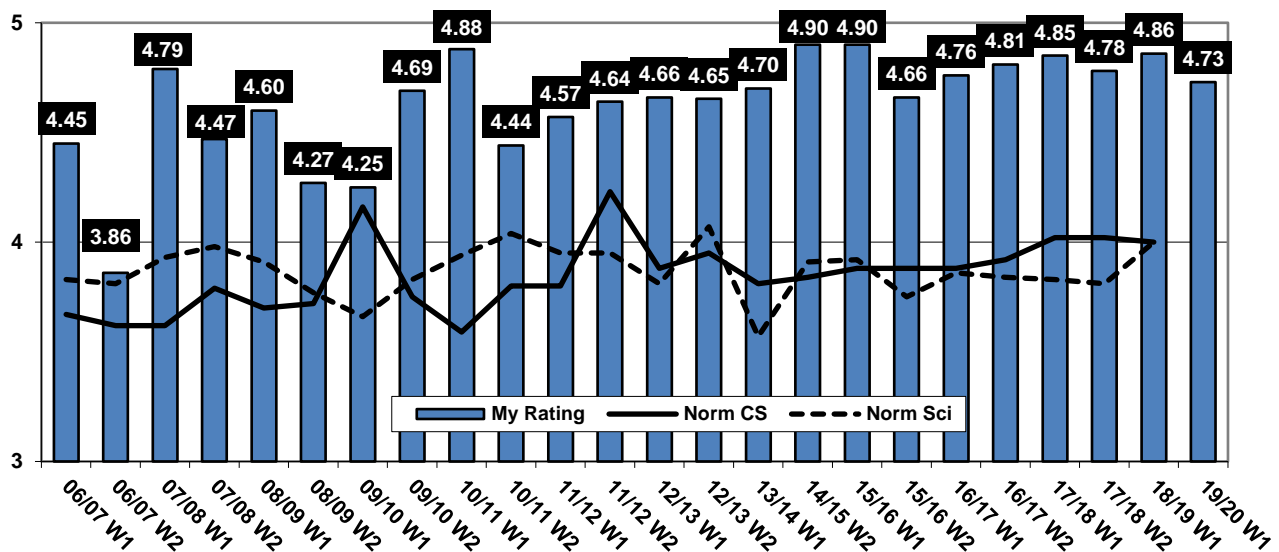

Figure 4 – Overall Instructor Rating

Figure 5 – Overall Course Rating

Student Reviews

The following is a selection of ***positive*** comments. A more balanced set of comments is available at http://people.ok.ubc.ca/rlawrenc/teaching/ where the goal is to present at least one representative positive and at least one representative negative comment for each course.

➢ "This course was amazing. It was so interesting and well taught. The labs were very useful and realistic of typical data analysis work. Dr. Lawrence was an awesome instructor. He had well laid out notes; his instructions were clear. He also gave you time in class to practice questions and helped guide you through the problems. He did an amazing job. This class was so well designed that it is very hard to believe it was the first time it was ever run. The material was so broadly applicable that I think this may be one of the most important classes of my degree. It gave me good skills and I have a great base level of knowledge to grow from." *(DATA 301 – **first offering** – 2015-2016)*

➢ "This was the single greatest course I have ever taken in my entire life. I can't think of a better course. I literally love this course. The professor made everything seem so fun! He developed my interest a lot, and made me feel and believe in myself! I wish I could have taken more courses with this professor. The labs were so well designed, and they were challenging enough to get me thinking, but they did not go to the level of becoming frustrating. If I was ever stuck, there was always someone there to help me. I learnt so much from this course that I actually want to write the professor a thank you letter. For some classes, it becomes a challenge to get through the 80 minutes of lecture time, but I honestly can say that I wish the lecture was longer. I would attend Dr. Ramon's classes if they were 3 hours a day, 5 days a week." *(DATA 301 – 2016-2017)*

➢ "Dr. Lawrence is as good at teaching, as Lionel Messi is good at soccer. That is the largest compliment that I could give him. He is a Database Master-mind. I heard other professors talking about how good Dr. Lawrence is teaching and how some professors look up to him." *(COSC 304 – 2016/2017)*

➢ "This course was excellent. Probably one of the greatest courses I will ever take. The content was extremely well organised and the lab exercises were completely relevant to the material. I think I learned more practical knowledge in this class than all my other classes combined." *(COSC 304 – 2016/2017)*

➢ "Amazing, clear professor who clearly understands his field of research and readily demonstrates his knowledge of the computer science industry. Even given his expertise, he still has the impressive talent to break things down and explain complicated concepts in a way entry level students will be able to grasp and understand. Professor Lawrence flexibly adapts his course material to his audience, and focuses class resources on the topics he knows the class is having trouble with. This is reflected in the excellent class average of this semester. As a result, this course feels alive, engaging, and excellently structured. Additionally, Professor Lawrence uses technology in a seamless manner, utilizing the iClicker better than any other course I have seen. The results of the iClicker directly feed back into the course itself, providing instant feedback and results. Bravo." *(COSC 122 –2013/2014)*

➢ "I enrolled in this class originally as just a required credit for my degree and ended up completely loving it. I even signed up for his class next semester! He really engages the students and puts in a lot of effort to make sure they do well. There are not enough words to describe how amazing this professor is. He really deserves to be recognized for all that he does. He is incredible, and it is so nice to finally see someone who cares so much about what they do. I have never had a professor that has cared so much. He makes the course fun, but also ensures all the students understand the material. I would recommend this class to any students that are aspiring to become teachers because this is how it should be done." *(COSC 122 – Computer Fluency 2012/2013)*

TEACHING EXCELLENCE CRITERIA
Developing Innovations in Teaching

A key challenge for an instructor is integrating technology appropriately in the classroom to maximize student learning and engagement. I have developed and published two pedagogical technological solutions. I use technology extensively in the classroom including integrating clickers in every class and developing assignments that use automated marking techniques. Disseminating techniques that work is important to allow for an impact beyond an individual instructor's classroom. All my materials are freely available on the Internet for both students and other instructors.

At the University Iowa, I was funded for innovative methods for teaching programming and developed a learning method called "competitive programming" that encouraged students to spend more time programming to develop better solutions for artificial intelligence for games. The unique

feature was that during the assignment time students could challenge other students and the instructor code solutions. The ability to compare with others (especially to beat the instructor!) motivated many students to spend considerably more time programming. The system was released to the world-wide community and used by other instructors. The study results were published in IEEE Transactions on Education, and the system received nominations in two successive years for the President's Instructional Technology Innovation Award, which is the highest innovation in teaching award at the University of Iowa. The research was published in extended form as a book chapter on Competitive Learning Technologies. The IEEE paper has over 185 citations.

In 2010, in collaboration with Dr. Teresa Wrzesniewski, I received an UBCO AVP Learning Services Grant for Integration of Teaching and Research in Undergraduate Education award for $10,000. This award funded the creation of a system designed to automatically mark and tutor science students. The system was first deployed in PHYS 112 and surveys indicated 90% of students preferred the system to paper assignments. The research was published in 2011. The system was used in Physics for several years and supported over a thousand students at no cost, unlike systems offered by companies. The savings for students was tens of thousands of dollars.

My goal is to build courses and programs that attract students and train them with skills of interest to employers. At the University of Iowa, I was the Undergraduate Curriculum Committee Chair from 2003 to 2004 and implemented a major update of the curriculum. At UBC, I helped lead the construction of the B.A. in Computer Science and the new Data Science minor and major, and developed and grew some of the most popular courses in Computer Science. COSC 122 Computer Fluency was totally redesigned and tripled in size (now consistently over 100 students and the 4th largest course in the department). COSC 123 Computer Creativity was a completely new course to encourage arts students, women, and underrepresented groups to try computer science by emphasizing creativity. In 2016 to meet growing industry demand for data analysis skills, I designed and delivered DATA 301 Introduction to Data Analytics that has become a very popular course for both Computer Science majors and students across the university. DATA 301 teaches data analysis skills to a diverse, interdisciplinary audience and enrols hundreds of students. Since January 2018, I am the Director of the Master of Data Science at UBCO responsible for curriculum, program delivery, and student recruitment and retention.

Demonstrating Excellence in Teaching Practice

Everything in my teaching puts student success as the number one priority. This is partially shown in the instructor reviews, but it is more than that. Every course I teach does not require a textbook to save students money. Instead I prepare a custom notes package that is freely available. I am accessible to students who contact me in and out of office hours. I am accessible to students who use the Disability Resource Centre, and was awarded an accessibility award in 2016 and three Golden Apple awards in 2018, 2019, and 2020. I also was involved in the Steps Forward program that provides educational opportunities to disabled students. One student, Jamie Schofield, was in my classes, and I was very dedicated to his learning success.

My courses have scaled from 10 to 20 students to 100 to 200 while maintaining very high student satisfaction in evaluations. I am a 9-time member of UBC Okanagan Teaching Honour Roll, and continually strive to provide the best quality educational product possible. Details on my approach and my ratings were discussed previously. My teaching diversity is a major strength. I can teach first year and upper-year service courses (COSC 122/123, DATA 301), courses in the CS major

(COSC 304), to graduate level courses in the MDS with class sizes from 10 to 200 while delivering student experiences that are engaging, motivating, and personal.

I am very proud of all the students supervised for research and directed studies. The three Ph.D. students are all in academia, and more importantly, are passionate educators. The 6 graduated Master's students, including 3 NSERC PGS award winners, all went on to high-level positions in industry or academia. Every graduate student published at least one paper, and many undergraduates published research as well. At UBC, I supervised 32 undergraduate honours students, 32 undergraduates for directed studies, 9 NSERC USRA, and 3 IKBSAS URA award winners. I have two students hired by Microsoft and one offered a graduate scholarship at UC Berkeley. All students went on to great careers based on the research and educational training.

Course Development and Design

I have developed numerous courses and programs to encourage more students to learn computer skills. In response to growing industry demand for data analysis skills, I developed DATA 301 Introduction to Data Analytics. This course has become a key course taken by students from across the university with enrolments of several hundred students a year. I also developed a two course introduction to computer science (COSC 122/123) designed to attract arts students, women, and underrepresented groups to computer science by emphasizing creativity and using innovative teaching.

My latest challenge was leading the development and deployment of the Master of Data Science (MDS) as Director of the MDS. The MDS is a cross-campus, professional program in partnership with UBCV. The role involves everything from scheduling, course content and objectives, marketing, admissions, and program management. Although it has been a huge investment in time, the MDS is amazingly successful and is an exemplar program for future programs as envisioned in Outlook 2040.

My current goal is to redesign computer labs for today's reality with the goal of making them virtual and on-demand, which will be more suitable for students and help with resource utilization on campus. My main course, COSC 304, has grown from 10 students to almost 200 with eight lab sections. Lab sections consume significant space and TA resources and are not always well attended by students. Funding has been received from an IKBSAS Curricular Innovation Award and ALT-2040 to use COSC 304 as an example course to see how we can redevelop labs for all CS courses.

Building a Learning Community

Mentorship is as valuable for instructors as students. I actively assist other professors by performing peer teaching evaluations, consultations on course content and planning, and share teaching material. For example, all content for COSC 122, 123, 304, and DATA 301 was shared with and used by other instructors teaching the courses. As part of the MDS, our department hired three new CS faculty members who are instructors in the program. In 2018 for the first year of the MDS, I made it a priority to help these new instructors. I attended the majority of their classes in the MDS program and provided regular feedback and critique. The instructors' technique and the MDS program were better for that time investment. I have also done over 20 peer-teaching reviews, including nine in 2019 as we have many new instructors in the department.

At the University of Iowa, I participated in circles of teaching meetings where teachers shared their ideas and techniques for teaching. To make learning opportunities more accessible for students, I frequently teach directed studies courses beyond my standard teaching load. I have taught directed studies courses for students when UBC does not have courses students are interested in. Examples include teaching COSC 499 in the Summer of 2016 and teaching over 25 directed study courses. In the last 3 years I completed with distinction 10 online (Coursera/EdX MOOCs) including Data Science, University Teaching 101, Data Analysis, and several courses on Android Mobile programming. This knowledge significantly updated my skillset and prepared me for teaching Data Science courses. Invited educational presentations to the San Francisco Java Users Group and Silicon Valley Java Users Group were done in 2016. Other learning community service include being a member of three instructor search committees (2014, 2015, 2016) and the curricular innovation award committee (2016).

I am passionate about increasing accessibility and diversity in Computer Science. I am the faculty sponsor for the ACM Women in Computing chapter and Girls in Tech, and active promoter of women in science and computing.

Service commitments to the community include being the CS Undergrad Advisor (2010-2013) and DS Undergrad Advisor (2017-). I have influenced curriculum, including the recent update to the B.Sc., as a member of the IKBSAS Curriculum Committee (2006-2013) and B.Sc. Review committee. As a member of UBCO Senate (2014-), I have examined the financial and space impacts of curriculum and programs, and been involved in UBC-wide decision making including the UBC Exceptional Learning Working Group (2017-2018) and President's Strategic Plan Implementation Advisory Committee and Board of Governors Academic Renewal Working Group.

SUMMARY AND FUTURE GOALS

At this point in my teaching career, I am excited to continue to improve existing courses, develop new courses for evolving skill requirements, and expand the delivery and effectiveness of teaching using new technologies. I have taught for many years, and many of my core courses are in "optimizing mode". These courses consistently get outstanding student reviews and the only challenge is to continue to innovate and update with new content. I have embarked on teaching new courses in data analytics to an interdisciplinary audience. The goal is to innovate at the introductory level to attract more students to computer science and more students overall having fundamental computational skills. To be competitive in today's job market, everyone needs computer literacy and the ability to systematically solve problems and efficiently communicate solutions. However, most students do not take a computer course at UBC. My goal is to develop and promote courses and programs for all university students to learn these skills. COSC 122, COSC 123, and DATA 301 are three examples of previously developed courses. Such broad audience courses are extremely challenging and interesting to teach due to their diverse student body and motivations for taking the course. These courses have grown significantly from their inception, and the goal is to continue to grow these courses with innovative teaching, and to significantly increase the visibility and number of students taking at least one computer science course. My other main goal is to continue to develop and integrate technology in teaching. My past research has shown some individual approaches and systems, but there are continual improvements in process and technology to reduce the teaching preparation time while maximizing student learning and engagement.

Finally, my ongoing goal is to enjoy every moment in the classroom. Once you lose the passion for teaching, your effectiveness decreases as well. I always want to *love* teaching!