MINUTES OF THE STATISTICS SUBCOMMITTEE
95th BCCUPMS MEETING, MAY 16 – 17, 2017
University of Calgary

Wednesday, May 17TH, 2017

Present: Mahshid Atapour (Capilano U), Jeannie Cameron (North Island College), Susan Chen (Camosun College), Kevin Craib (Langara C), Bruce Dunham (UBC-V), Simin Jolfaee (BCIT), Gabriela Kakushkin (VCC), Joyce Kwan (Ascenda School of Management), Jason Loeppky (UBC –O), Julie Peschke (Athabasca), Shane Rollans (TRU)

Apologies for absence received from Jinko Graham (SFU)

Chair: Bruce Dunham

Acting Secretary: Susan Chen

1. Approval of Agenda

Motion to approve agenda: Kevin Craib; seconded: Jason Loeppky. **Carried unanimously.**

2. Approval of minutes of the Statistics Subcommittee Session of the 94th meeting.

A number of minor errors were noticed in the minutes circulated. In particular, under item 4: the subheading "Acsenda" should be changed to "Acsenda School of Management", the last line of the institutional report of Langara College contains two commas that should be removed, and the subheading "Victoria Island University" should read "Vancouver Island University". Under item 8 (Proposed new grade 12 course) the statement "and will be available to any student with Foundations and Principles of Math 10" should be removed because STAT 12 will not have any formal prerequisite. The chair proposed to correct these errors and moved the motion to approve the modified minutes.

Motion to approve minutes: Kevin Craib; seconded: Gabriela Kakushkin. **Carried unanimously.**

3. Matters arising from minutes

In following up on the brief discussions on the proposed new STAT 12 course, the Chair commented that the proposed STAT 12 curriculum looks more like an undergraduate intro statistics course instead of a high school statistics course, and it appears to be too mathematical. He invited everyone to review the proposed curriculum and send him any comments. The Chair hopes to be invited to attend the BCAMT professional development

meeting in the fall to offer our willingness to assist teachers who will be teaching statistics at high school.
The Chair described the possibility of developing a set of resources for training high school teachers to teach STAT 12, so that instructors will be able to draw from the resources to conduct training sessions without having to develop their own workshop materials.
Further discussion of this topic was deferred to agenda item 6.

4. Institutional Reports

The issue of course articulation was discussed when institutional reports were shared, in part prompted by an issue of unqualified instructors raised at the main meeting. There was a general agreement that courses that are not labelled as MATH or STAT should normally be directed to another appropriate department or subject area for credit transfer evaluation. For example, a PSYC xxx course should usually be directed to a psychology department for credit transfer when applicable. Qualifications of instructors should also be considered when assessing course credit transfer.

Acsenda School of Management

There has been a major change in the grade allocations in the introductory Statistics course, Fundamentals of Economic and Business Statistics (BADM 221), starting in January 2017. The midterm and final exams together now weigh 70% of the total grade, which is matching the requirement for the Quantitative Methods in the articulation with the Chartered Professional Accountants (CPA).

The school has also implemented the course contents in BADM 221. This course includes the elementary and intermediate levels of Statistics, and now also includes the hypothesis testing about the population proportion for one- and two-samples and introduces goodness-of-fit tests, whereas only the hypothesis testing about the population mean was discussed in the past. The introduction of ANOVA may also be included when time is permits. The follow-up courses, Management Science (BADM 222) and Operations Management (BADM 202) include topics such as linear and multiple regression, time series and forecasting, quality control, and decision analysis. Excel and a calculator are used in BADM 221, and Excel only in BADM 202 and BADM 222.

The enrollments in BADM 221 are steady, keeping the class size between 15 to 20 per term. The class size of BADM 202 is about 20-27 per term. Both courses are offered four terms in a year. In BADM 222 it is about 11 students per class. This course is offered one or two terms in a year.

British Columbia Institute of Technology

The Mathematics department at BCIT teaches about 20 statistics courses but some programs run

their own statistics courses. A new upper level statistics course is developed for the new Applied Data Science part time certificate. There are a couple of intermediate-level statistics courses, but most of BCIT statistics courses are introductory statistics.
R, Excel, and Minitab are all used on courses although over the last two years there have been moves toward using R in the classroom.

Camosun College

There were no curriculum changes in university transferable statistics courses this year. For the first time in a long time, a section of Stat 216 (Applied Statistics) was offered in the summer of 2016 and the section was filled; another section of Stat 216 is to be offered this summer and it is waitlisted. Due to high demand, a section of Stat 116 (Elementary Statistics) is offered this summer for the first time and the class is waitlisted. From September 2016 to April 2017, the enrolments in Stat 116 and Stat 216 were slightly up but remained at the same number of sections as the previous year. The enrolment in Stat 218 (Introduction to Probability and Statistics 1) stayed at the same level as the year before, but the enrolment in Stat 219 (Introduction to Probability and Statistics 2) was doubled.

WeBWorK is used in some sections of Stat 116 and Stat 216 while ConnectMath (from McGraw Hill) is used in other sections. Some students who look for extra materials to study and practice really like the SmartBook (adaptive learning) feature in ConnectMath. There has been continued use of R for the bi-weekly computer labs of Stat 216, 218 and 219, and MegaStat add-ins for Excel for Stat 116 computer labs.

Stat 254, part of the Engineering Bridge programs to UVic and UBC, has just received individual transfer credit to UBC-V STAT 241/251 and UBC-O STAT 230.

Susan Chen and Susan Kinniburgh conducted a controlled crossover experiment on two-stage exams in Stat 116 last fall. It came as some surprise to find two-stage exams not only turned exams into positive collaborative learning experiences, but also made students happier to write exams (on late Friday afternoons!) in a course that many preferred not have to take. There are plans to run two-stage midterms in future classes of Stat 116.

Capilano University

The two statistics courses MATH 101 and MATH 205 have been relabeled as STAT 101 and STAT 205 respectively. A new third year Statistics course STAT 301 has been developed. This course will be offered for the first time in fall 2017 and in particular expects enrollment from the Liberal Studies Bachelor of Arts students. The course will have a weekly computer lab component where Excel and R will be used for analysis. Lessons learned from delivering this course will be

used (in the future years) to add computer lab sessions and replace the use of calculators with Excel and/or R for the first and second year statistics courses.

A group project component was added to both first year and second year statistics courses in fall 2016 and spring 2017. The students had to choose a topic, collect data, use a list of statistical methodologies, prepare a final presentation file (based on the results), and give a five minute oral presentation. It was accounted as 5% of their final grade. The project seemed to trigger the students' curiosity and facilitate their overall learning of statistics.

Langara College

In 2017, Langara's enrolment in statistics courses was 2,329 students (1,532 domestic = 66%, 797 international = 34%). Introductory courses STAT 1123 (Basic Probability and Statistics for Business), STAT 1124 (Statistical Methods I), STAT 1181 (Descriptive and Elementary Inferential Statistics), and STAT 4800 (Business Statistics) continue to exhibit the largest enrolments. The statistics area is currently developing a post degree diploma program in data analytics and a third-year course for an undergraduate degree in bioinformatics at Langara. Alternative statistical software packages for use in introductory and intermediate level courses are being considered, including SAS, SPSS, MINITAB, and R. Statgraphics (version 16) and Excel are currently used. There will likely be hires of one or two part-time statistics instructors during the next six months.

North Island College

North Island College has one statistics course: MAT 115 (Introduction to Statistics). MAT 115 is an algebra-based course which serves life science, business, and criminology students with a minimum Foundations of Math 11 prerequisite. There are approximately four sections per year of Math 115 with three at the Courtenay campus and one at the Campbell River campus as well as a distance option offered in the Fall and Winter terms. There is no lab attached to the course. Students use technology via online applets. The textbook changed this year to Deveaux *et al*. Stats: Data and Models, Second Canadian Edition (2nd Edition). In the future, the course will be reviewed and rearticulated if needed based on the introductory statistics transfer credit proposal.

Simon Fraser University

Undergraduate enrollments: SFU Statistics and Actuarial Science experienced about a 5% decline in undergraduate enrollment in academic year 2015-16. Part of this decline is due to a 20% drop in enrollment in our STAT270 as a result of Engineering Science (ENSC) and Mechatronics Systems Engineering (MSE) replacing STAT 270 with their own lower-division Statistics courses, ENSC 280 and MSE 210. Sociology and Anthropology moved to drop the service course STAT 203, but

enrollments in the course are down only slightly. By contrast, enrollments in service course STAT 201 are down by about a third. Health Sciences students seem to prefer STAT 203 over 201 because of a lower content in mathematics. Despite a small enrollment decline last year, this spring 2017, undergraduate enrollment reached a high of 2211 students. Increased enrollments in spring semester 2017 are expected to offset lower summer enrollments in STAT 270 and 201. We started introducing new courses for our minor program in in 2012; however, our new minor came into effect in the Spring of 2013. After an initial increase from 2013-2015, enrollments in our minors courses have levelled out.

Undergraduate program changes: Moves are continuing to eliminate restrictions that prevented students who had taken statistics in other departments from taking courses from the department. For example, it is now allowed for STAT 100 to be taken after other STAT courses. There is now a route to the minor program with weaker mathematics requirements. At the same time, there has been an increase in the minimum statistics requirement of the minor program from 7 to 11 units of upper-division credit. Both major and honours programs have, until now, required a minor in another discipline but this has been weakened to allow either a minor or any 12 upper-division units completed using courses outside of MATH, ACMA, and MACM.

Two new lower-division courses were launched, STAT 180 and 240. STAT 180 is a one-credit, seminar course on career development that brings in speakers from industry. STAT 240 is Introduction to Data Science and is designed to get lower-division, statistics honours, major, and minor students to see real data earlier. Also launched is an upper-division, capstone course in big data for major and honours students, STAT 440. This hands-on course will be taught again in 2017-18 and both STAT 240 and 440 will be offered annually. New courses will continue to be refined. A new upper-division course for honours, major, and minor students on statistical learning, STAT 452, will be offered annually starting in Fall, 2017.

Faculty news: In September 2017, Luke Bornn will be away on a three-year leave of absence to take up an opportunity in the sports industry. The department is pleased to welcome Dr. Harsha Perera as a new lecturer in the fall.

Thompson Rivers University

Last summer the School of Tourism changed their program to require the statistics course taught by the Geography Department rather than the course offered by the Department of Mathematics and Statistics. The department fought the decision but lost other than ensuring that the original course will still be acceptable as a substitute. So far there has been little effect as the section of the STAT course that was dedicated to Tourism students was still full of Tourism students.

The proposed Masters of Science in Data Science is progressing and the department are currently advertising for a tenure track position to help support this degree.

Peter Moyls, a faculty member who was half time in the department and who taught introductory statistics retired at Christmas. The tenure track position is also to help replace him.

Bruce Crofoot is the new chair of the Department of Mathematics and Statistics. Richard Taylor will continue as program coordinator. Suzanne Feldberg will be the acting program coordinator while he is on sabbatical.

The numbers in all statistics courses remain stable.

University of British Columbia, Okanagan

Statistics at UBC Okanagan Campus has undergone significant changes to the entire curriculum at the 3rd and 4th year level. In addition, several STAT courses have been renamed as DATA courses. The UBC Okanagan website gives detailed information on the changes. A new minor in Data Science and a B.Sc. Major in Data Science have been successfully launched and a Data Science stream has been added to an M.Sc. in Computer Science. The first year and second year courses have all remained the same. R (RStudio) is used exclusively in all STAT and DATA (taught by a statistician) courses. The OpenIntro text has been used for STAT 121 and STAT 124.

University of British Columbia, Vancouver

Numbers on the Statistics program continued to rise over the past year with a total of 54 students graduating since May 2016, this being a record high. Demand for STAT courses also exceeded previous years. For the first time the department has been obliged to cap the number of students entering our specialisations, the limit to entry being about ninety per year. Some students appear to be looking to enter Statistics and Computer Science programs via the Mathematical Sciences specialisation, which will be incorporated into the capping in future years.

Proposed changes to credit exclusions for STAT 200/241/251/302 described in last year's report did not move forward this year. The intention is to initiate these changes next year. The department is exploring creating a new data science course, probably in a joint venture with Computer Science. It is possible the new course will be at first-year level with little or no pre-requisites.

The new Master of Data Science (MDS) program runs out its first cohort this summer. There is high demand for the second run, which is expected to recruit around fifty students to commence in the fall.

The Flexible Learning project, funded by UBC's Teaching and Learning Enhancement fund, has continued developing and testing applets, videos, in-class activities, and WeBWorK questions for introductory courses. All resources created will be open-source and made freely available via a new website, StatSpace.

In faculty news, Marie Auger-Méthé joins the department from Dalhousie in September, a joint appointment with The Institute for the Oceans and Fisheries. Hiring is on-going for an new in-

structor position linked to the MDS program, and at least one sessional lecturer post. It is expected that further new faculty positions will open in the coming academic year. Harry Joe has been awarded the Statistical Society of Canada's Gold Medal, the highest research honour the society bestows.

Further details on any of the above can be obtained by either visiting www.stat.ubc.ca or contacting Dr. Bruce Dunham at b.dunham@stat.ubc.ca.

Vancouver Community College

Statistics courses: The Mathematics Department in the School of Arts and Sciences offers multiple sections of Introduction to Statistics (MATH 1111) within the academic year.
A new Statistics-calculus based course, MATH 2700 - Probability and Statistics for Science and Engineering, has been introduced which will complement the Associate of Science degree (in progress). This course will also be open for transfer credit to UT students. The new course has been developed and currently been revised to include Calculus II as a prerequisite rather than a core-requisite. Articulation transfer requests have been initiated through BCCAT with BC institutions.

Enrolment: The Statistics course MATH 1111 experiences high enrolment as it serves as a core course for many Health Science programs and especially for the BSN (Bachelor of Nursing). The newly developed Environmental Studies (three concentrations) first-year transfer certificate includes the Introduction to Statistics course (MATH 1111). It is anticipated that enrolments will slightly increase. The new certificate program is projected to start in September 2017.

Software: MS Excel is the software that is currently used in MATH 1111.

Vancouver Island University (in absentia)

Statistics offerings at the university have remained the same. Offerings comprise four sections of MATH 161 (Introduction to Statistics for Social Sciences), two sections in each of the Fall and Spring terms (using The Basic Practice of Statistics by Moore for MATH 161 as of last year) and Math 181 (Introduction to Statistics), for the technology programs (Fisheries, Forestry and RMOT). Excel is used in MATH 181. MATH 254 (calculus-based) was offered again last year, and Probability & Statistics for Engineering and the Sciences by Devore adopted as the text. R is used for MATH 254. Both MATH 203 (Biometrics) and MATH 211 (non-calculus based) for science students have remained the same. Four upper level courses have been proposed for the upcoming Math Major. It is planned to use R (and or Excel) for these courses.

If the proposed Health Sciences program takes off, the department will be offering MATH 155 (Introductory Statistics for Health Sciences). The software SPSS will be used for this course.

5. Articulation agreements between Alberta and BC: Introductory Statistics transfer credit proposal

Prior to the meeting the chair circulated a revised version of the proposal for the content of a generic introductory course put forward by Julie Peschke. The document indicated proposed core and elective topics, with suggestions from several members of the committee incorporated.

The chair clarified what he perceived to be the goals for the discussion and resulting document. It was not the aim to revise or prompt revisits to existing articulation agreements, though any proposal that resulted from the discussion could be used to guide articulation decisions. It was thought useful for the committee to discuss in some depth what is being taught in our introductory classes and why. The proposal prompted such reflections.

The committee discussed the second draft of the Introductory Transfer Credit Proposal item by item. There was a general agreement in the proposed core and elective topics for Intro Stats. Julie will post the third draft, which will probably be the final draft, on the Stats listserv. Future Intro Stats credit transfer evaluations may be informed by this document. The committee thanked Julie for her efforts on this initiative.

Due to time constrain, the committee only very briefly discussed about the expectations of the depth of coverage of each of the core topics, as proposed by Julie Peschke in the Stats Listserv just prior the meetings using Bloom's taxonomy of critical thinking.

6. Proposed new grade 12 course

A new Statistics course at grade 12 has been proposed by the Ministry of Education, STAT 12. The course will be an elective, and will have no formal prerequisites. The course may be offered starting in the 2018/19 academic year.

The Chair suggested that STAT 12 is probably more important than some MATH 11/12 courses for many students, especially if they either will not be going to university or will not further study a STEM discipline, but this message may not be well channeled to the students. Further, some teachers may not be prepared to teach the course.

The view was expressed that the proposed STAT 12 appears too focused on mathematical thinking, and looks much like an intro stats course at undergraduate level. When teaching a high school level stats course, the students could, for example, be asked to do both an observational study and an experiment in their classes to understand the sources of data and concepts of variation, and to get some idea of where statistics can be applied. STAT 12 should prepare students to come into an intro stats course in higher education, but not a replicate such a course that research and experience informs is difficult for most students even at university level.

The Chair called on statistics instructors to go to schools to do training sessions for teachers on ProD days; to give half-day training sessions, and to discuss the differences between statistical thinking and mathematical thinking.

A question about availability of teaching training materials and resources was raised at

the meeting, and the Chair stated that there will be a set of resources for instructors to use, so that instructors do not have to prepare the teaching materials, but only need to be prepared to go out to teach the teachers.

The Chair informed the committee that he and the heads of SFU, UBC and BCIT co-authored a letter to the Ministry of Education with suggestions of changes to STAT 12, and had yet to hear any response from the Ministry other than a formal acknowledgment of receipt.

A member pointed out that we should also promote statistics in elementary teachers who will be the first to introduce some simple statistical concepts to the children.

7. Provincial Minitab license (Bruce Dunham, UBC)

Following up from the item on the previous year's agenda, the Chair informed the committee that the procurement officer for BCNet (who coordinated the provincial Maple license) is now in negotiations for a Minitab provincial license and will meet with representatives on May 18. The Chair will circulate further details when they appear.

8. Open source textbooks (Claude Laflamme, Calgary).

At a previous BCCUPMS meeting Claude Laflamme had presented on his Lyryx project on open source textbooks. Claude was unable to attend this meeting, so there was a short discussion about open source texts in Statistics. Jason Loeppky informed that UBC-O use OpenIntro Statistics 3rd Edition. The chair mentioned a text he was aware of from the SOCR project (http://wiki.stat.ucla.edu/socr/index.php/Probability_and_statistics_EBook), commenting that it is not great, but free. It was noted that University of Toronto has a stats course online with videos, which is open access.

Julie Peschke informed that for her distance learning students she put together relevant YouTube links in a PDF document.

Members recalled the "Against All Odds" videos (David Moore *et al.)* are also online for free, but the materials are rather old.

9. Any other business

There was no further business.

10. Motion to adjourn

Moved: Jason Loeppky, seconded: Susan Chen. **Carried unanimously.**