Response of the Statistics Department to the Academic Program Review Exit Report

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March 18, 2014

We begin by thanking the Academic Program Review Team (hereafter, the 'Team') for their time, effort, insight and most specifically for their suggestions for how we can improve. We also thank the members of the admistration of UNL for organizing this review. The whole procedure was handled with a professionalism that sets an example for others to follow. Of course, this has meant a lot of work for many people – work that is nowhere near over. On the other hand, the Department of Statistics looks forward to doing it.

This report was written by the Chair of the Department of Statistics in close consultation with all members of the Department. In particular, all members of the Department of Statistics (hereafter, the 'Department') have read and approved this document. The structure of this response is as follows. The first part is a summary of our response to the Team's Exit Report (hereafter, the 'Report'). The second part gives a more detailed response to the major points in the Report. The third part is our vision for the future. An Appendix lists the attributes of a 'complete statistics department'.

As a generality, the Department is in agreement with the Team on the big picture. There are differences of opinion between the Team and the Department on some priorities, some particulars of strategies to achieve certain goals, and in the assessment of the nature of some problems and their severity. This is the usual spread of opinion one expects amongst academics committed to their profession.

1 Summary

The team commented extensively on four main areas.

1. Graduate programs:

   - The Report recommended a smaller number of graduate students with stepped up recruiting.

     Plans to do this were implemented before the Team arrived.
   - The Report recommended teaching fewer courses per semester.

     This is already planned for next academic year; a Course Consolidation Committee (3C) has been set up to look into ways to rationalize our course offerings over the longer run.
   - The Report recommended overhauling graduate curricula.

     3C will also be examining the content of courses so as to recommend improvements.
   - Add a statistical computing course and more consulting experience at the MS level.

     This is something we plan to formulate and implement at an approriate stage in the overall revamping of graduate programs.

2. Undergraduate offerings:

   - Statistics Major: The big item here is the recommendation that the Department form an undergraduate (UG) program in Statistics. The Team recommends hiring a Professor of Practice (PoP) to start the program and work with faculty on the design of courses for the major. The Team also recommends hiring a second PoP as the undergraduate program develops.

     There is a strong desire to start an UG program in Statistics. However, the strongly held consensus within the Department is that at least one of the two PoP's should be a regular tenure track or tenured faculty member.
   - The secondary item here is that Statistics service courses be redesigned to make more use of technology.

     To an extent this is underway. For instance, the computing equipment has been brought up to speed and other teaching technology has been replaced. However, there is much more to be done both technologically and in terms of course redsign to make use of new technology. Several people in the department are working on this individually; a more organized effort would be worthwhile.

3. Research:

   - Computational Biology should grow as a discipline and as a service.

     It turned out that one of the hires in the new chair's package is required to be in Computational Biology. This hire should occur next academic year. In terms of 'providing support and standard statistical analyses for collaborators', it is unclear how much more can be done without more resources or finding huge efficiency gains from some other quarter that can be put into consulting without harming other aspects of Deaprtment function.

- Education Analytics should build on existing strengths – in particular, a Discipline Based Educational Researcher (DBER) should be hired to help with UG course redesign and pre-university statistics teaching. (This is separate from the discussion of personnel – two PoP's or otherwise – for starting an UG program in statistics.) The idea is that the DBER and the PoP's (or, better one PoP and one TT faculty member) would combine their efforts. The DBER's career would be education analytics centered; one PoP would be primarily teaching, and the third position would ideally be a TT faculty member to help make sure curriculum was up to date.

  As it stands, we currently have a few faculty members and PhD students working in the general area of Education Analytics. Moreover, there is general agreement among the faculty that given all the teaching oriented directions in which the Department must advance hiring a DBER will be essential. Once the main course/program redesign is largely done, a DBER would be necessary to help manage it and keep it up to date.

- Foundations: The Report said little about this except that 'Foundations of Statistics are included in every dimension of the departmental teaching and research mission'.

  In fact, this is not a true statement since 'providing support and standard statistical analyses for collaborators' can be the mainstay of highly successful careers in Statistics. Moreover, Foundations have to be balanced against the two research foci advocated in the Report which, being application and technology driven, do not focus as much on foundational issues in statistics as methodological work usually does.

  The Departmental consensus is that neglecting Foundations, and specifically failing to hire in that area, would be undermine the Department's visibility, graduate programs, and ability to lend cutting edge support to other fields.

4. Department Climate:

   - Staff, faculty, and students suffer low morale, exhaustion from workload, confusion about the path forward/vision, lack of communication, and disregard for people's time.

     This somewhat overstates the severity of the discontent. Moreover, mostly this is a reaction to constrained resources.

   - The Chair should formulate a five year plan.

     A plan for the next two academic years is outlined in Sec. 3. Events and constraints change too quickly for longer term planning to be useful.

   - Staff and faculty should not involve students in Department/University politics.

     A thorough investigation did not turn up any instances of this. We remain puzzled about the origin of this comment.

   - Conduct a climate survey to find any underlying issues that are preventing a healthy and productive work environment.

     This is premature. There are several items that we know we should fix e.g., better advising for students entering the grad program with an MS, pieces of furniture in grad student areas that are eyesores, re-arrangement of space so that private discussions among faculty cannot be heard by grad students, etc. It seems prudent to do these things and re-assess before looking for more problems.

2 Detailed responses to the major points from the report

The Report had many recommendations. Here we focus on the major ones.

2.1 Graduate programs

1. Reduce size of graduate programs.

   Currently, there are approximately 67 graduate students (MS and PhD combined). There used to be more than 70. Only one student was admitted for 1 January 2014 and the goal is to reduce admissions to only high quality applicants who have demonstrated a commitment to the field. Indeed, this reduction has been going on since 2012. In terms of progress, some 14 (MS and PhD) students are expected to graduate in 2013. We expect this will lead to a net reduction of seven students.

   We agree that, in practice, given the faculty FTE's and the other work they do (consulting, research, service, administrative, etc.) the operational number of students should be no more than 50. This will increase the resources (advising capacity and money) per student from what it is now. The report recommends a student:FTE ratio of no more than 5:1. In fact, this depends on the relative proportions of MS and PhD students: The more students pursue a PhD, the fewer students a department can produce. Current thinking is a mix of 2/3 MS and 1/3 PhD students.

2. Increase recruiting efforts for graduate students.

   In December, Prof. Zhang was funded by the Department to visit several universities in China in a recruitment drive. He is on sabbatical in China this semester and has continued his recuitment efforts. The Graduate Committee has authorized him to make verbal admission offers (one at a time) to students who seem promising. This summer, Prof. Eskridge has been invited to give a talk in Croatia and he will attempt to do additional recruiting in Eastern Europe. We are still looking for someone to visit institutions in India and Latin America. Note that graduate student recruitment should be more effective once the graduate curricula has been re-organzied (see the following point). The hope is that by the time these students arrive, 3C will be far enough along that these students will be well served.

3. Revamp graduate curricula.

   The Department's graduate course offerings were more collected than built. Thus, the remit of the Course Consolidation Committee (3C) is to examine our graduate course offerings and make suggestions for how to streamline them and make them flow logically from one topic to another. 3C will address questions like: Are the three pairs of theory courses (UG, MS, and PhD) necessary and appropriate? Do we need all the courses we have? Is the collection of regression courses sufficiently non-overlapping and achieiving what they should? Should we permit graduate level service courses be part of the MS or PhD program requirements? Indeed, the goal is to rationalize the MS and PhD program courses and requirements in the sense of understanding what purpose each of the courses serves in our programs and ensure the curriculum is appropriate. Another benefit of this will be understanding the roles of our graduate level service courses.

4. Reduce the number of courses taught per semester; offer elective courses less often.

A way to do this sensibly should be one of the outcomes of 3C. This will permit teaching release for heavy administrative burdens and sabbaticals. (This should contribute to improvements in the Department climate, see Sec. 2.4.)

5. Add a computing course and increase graduate students consulting experience.

   This is within the remit of 3C. It should be noted that a course on statistical computing has occasionally been offered and there is a Consulting Practicum that is regularly offered for graduate students. This indicates that the Department as a whole is generally supportive of this recommendation from the Team. 3C will have to propose how we should proceed.

6. Cross-list or otherwise take advantage of courses offered by other departments:

   This is a good idea, but only makes sense after 3C has completed a substantial portion of its work. At this time it is unclear where the gaps in our programs are and it is unclear whether courses on topics such as optimization, computing etc. exist at UNL in a appropriate form Statistics students.

7. The Report also suggests that the joint PhD programs we have be advertised to undergraduates in affiliated departments.

   This is not a bad idea, but there are two caveats: 1) Until 3C has made substantial progress it may be premature since UG's at UNL may take some courses that are cross-listed Grad/UG or cross-listed with another department. 2) It is inadvisable for a student to get all his/her degrees at the same intitution.

2.2 Undergraduate program

Two central points that need to be borne in mind are 1) the huge discrepancy between between the demand for graduates with strong quantitative skills such as statistical literacy and facility and 2) the complementary nature of UG and PhD programs in Statistics in the current environment.

1. Redesign Statistics service courses using technology to improve learning and reduce costs.

   To the extent that our service courses are at the graduate level, comments have been provided in Sec. 2.1. In this section, comments are only provided on current undergraduate offerings.

   The main undergraduate service courses are 218, 380, and 462-463. However, to the extent that these are required for the existing Statistics Minor they are not service courses in the usual sense.

   To begin, it should be noted that it is not at all clear that increasing the use of technology will lower costs overall.

   As of August 2013, we started pooling sections of 218 and 380 into larger sections for lecture purposes. This went into effect 1 January 2014. The large lecture sections of 218 then are separated into recitation/lab sessions of about 30; there is no lab associated with 380. This brings our program into conformity with other introductory statistics courses at other universities and will continue next academic year. There are three benefits to this: One is that it permits more efficient use of computing labs that had hitherto been used as classrooms as well thereby permitting growth. The second is that it will increase faculty contact at the undergraduate level. The third is that it will reduce English requirements on non-native

speakers of English who get admitted to our graduate programs since they will mostly be TA's not teachers.

Despite this move to larger sections, several small sections for these courses will be retained for graduate students in the teaching track of our graduate programs, see Sec. 2.3, and possibly for experimentation with new teaching methods and/or curricula.

Specifically, on the technology front, computing facilities began to be upgraded in December 2013 and efforts are ongoing via the Technology Committee. The exploration of novel teaching methods has been done individually – flipped classrooms, distance education, etc. – and it may be a good idea to coordinate this more. This will be one of the issues that the Department as a whole will have to discuss.

There are two related items that must be mentioned. First, the use of new teaching technology will in part be coordinated by the Technology Committee that already makes recommendations to the Chair regarding the purchase of hardware and software. Second, over the past five or so years, Stat 218 was turned from a course many students found distasteful into a course that students find much more congenial. Indeed, we regard the current reception of Stat 218 as one of our UG successes from the last five years. Given that many regard both 218 and 380 as successful courses, it is imprudent to change too much too fast.

2. Create a unique Statistics, or Data Science (or, Data Analytics) undergraduate major with an integrated curriculum that offers a variety of attractive end points for students; specifically, terminal degree (i.e., students entering the workforce), graduate school (students continuing their education), and/or 2+3 Masters (5 year BS/BA and Masters for students in the Undergraduate Statistics Program).

   Starting a unique UG major in Statistics is a strongly supported goal for the Department. There is a wide range of ways to achieve this goal and exactly how to proceed is a topic of many ongoing disucssions within the Department. As much as we would wish to, it is unclear that we could create a terminal degree in Statistics that would enable students to enter the workfoce directly; most jobs in statistics require an MS.

   There are three related issues. First, a Minor in Informatics has been proposed and may be germane to the formation of our Major. Second, there are discussions to the effect that a School of Information Sciences should be formed and that this would have a major. There is a School of Information Sciences at Arizona that has been discussed as a possible model for UNL. While this model does not overlap substantially with Statistics, a School of Information Sciences major at UNL might. We will have to coordinate with any such a proposal as we develop our own. Third, we already have a Statistics Minor and any Statistics Major would have to be logically connected to it.

3. The report goes on to state: 'Two pieces are needed for a successful UG major in Statistics: First, an integrative theme that gives the major a unique character....Second a co-op... or research experience for UG's...'

   The Team discusses two options for the philosophy behind the formation of an undergraduate program. They call these 'experiential' and 'grad school oriented'; loosley these correspond to commercial vs. academic. Obviously, there are many other options with different goals, orientations, benefits, and costs. The Team may take the view that the two options they

discussed are the most appropriate for us. However, it would be premature to commit to any particular approach to organizing an undergraduate major in Statistics until the Department as a whole has discussed the issue internally, reached a consensus and consulted adequately with groups outside the Department. As to the character of an UG program, the Department consensus is that (i) there is little benefit to creating an UG major like so many others that already exist and (ii) there are many ways to develop a unique character for an UG major that would be prized by many. We just have to find one that fits the particularities of our situation. This is desirable and possible since UG the field of Statistics as a whole has evolved much more rapidly than education in Statistics has.

4. The Report suggests that a PoP be hired to begin the process of starting an UG program and that a second PoP be hired not too long after as the program begins growing.

   This is a point on which we disagree with the Team. The unfortunate truth is that even though PoP's make contributions that are frequently equal to those of regular faculty members, having an UG program run primarily by PoP's is inadvisable. We do not want to reinforce the idea that an UG major is beneath tenured and tenure-track faculty and they need not participate. Although PoP's are less expensive than regular faculty members, they are also rarer (at least in Statistics) – and harder to hold onto if you can find them.

5. The Report suggests making it possible for students to do a double major with Math, CSE, and other quantitative programs.

   This is a good idea provided it doesn't dilute the statistical content. In fact, the credit hour requirements for majors at UNL are generally low enough that double majoring is relatively easy, at least in related fields.

2.3 Research orientation

The Report highlights two fields explicitly: Computational biology and education analytics. It also suggests a relationship between consulting and methodological research. The general subject of 'foundations' is only mentioned to the extent that it is implicit 'in every dimension of the Departmental teaching and research mission'.

1. The Report suggests building on collaborations and needs of other univeristy units, especially in 'Computational Biology, Big Data, Genetics, Genomics, Epigenomics, and the like'.

   Within our resources constraints, we're doing this. Several faculty members are already involved in interdisciplinary work of this nature. Moreover, the hire we plan to make in early 2015 will be funded from a POE whose scope is limited to these areas.

2. The Report encourages more consulting type work.

   In addition to the Consulting Practicum, many faculty members already do a lot of this sort of work – up to the limit of resource constraints.

3. The Report encourages doing novel statistics research as a follow-up to a standard statistical analysis for collaborators.

   This is a tall order: While there are cases where a consulting project leads a faculty member to a new methodological approach often a faculty member does not have the time to follow

up on these ideas because s/he is already busy with other work. Accordingly, it is important to optimize faculty time so they have a chance to do this kind of methodological work. The report notes that some fields move too fast to permit methodological developments as part of a subject-matter specific consulting project – a point on which we agree.

Also, it is relatively rare for methodology to arise from a single application. More typical is that a class of problems is recognized over some years, an abstracted form is found, and then methodologists of all sorts work on it. As a separate point, statisticians who are methodologically oriented and those who are application oriented often have different skills. So, while it is not unheard of, it is not typical for one person to do both applications and methodology without a collaborator on each side.

4. The Report suggests joint faculty appointments with new and existing faculty across the univeristy.

   At this time, the Department cannot afford a net loss of positions without substantial loss to its teaching and research programs. Moreover, a swap of faculty members e.g., we give .5 FTE to another department in return for .5 FTE from them, would only be feasible is we received some one who could teach statistics. In terms of new FTE's joint with other departments, we've already requested joint positions (one with Geography and one with Math/Biol/CSE). We have not yet heard whether either request will be met. There has also been discussion of tailoring statistics courses to the preferences of other units on campus and arguing for a PoP (for instance) to teach them. So far, however, nothing formal has emerged and earlier efforts at joint hires were unsuccessful.

5. The Report lists a number of efforts the Department could make to publicize its direction within UNL.

   This is a nice idea. Many faculty are already in contact and in collaborations with faculty in other Departments; formalizing this might be useful. At this point, however, it is unclear how much can be gained since faculty time is such a scarce resource. The various CSI hires to date have not included statisticians; nevertheless, it is argued that the hires are quantitative enough to reduce the backlog of analyses in the departments that hired them.

6. The Report recommends building on Departmental strengths in Statistics Education and Analytics.

   Currently the Department has several faculty involved in this area of research and hence there are several PhD students who are writing theses in this general area. Building on this strength in the view of the Team includes hiring a DBER to help with curricular reforms, teaching methodology, K-12 teacher training efforts, and course redesign. A DBER would also maintain contacts with DBERs in other fields and access UNL resources for educational development. A DBER would help keep our delivery of curriculum up to date; a tenure track hire in place of a PoP would help keep the curriculum up to date.

7. Use the recommended course and curriculum redesign to enhance the Department's research program in Statistics education.

   This issue will be one of the items that 3C will consider. As has already been mentioned, UG service course class sizes have increased. Nevertheless, some small classes will remain to

permit students in the teaching stream of our programs to get 'on the ground' experience and possibly to experiment with new techniques.

8. The Report also suggests continuing with value-added modeling using stochastic networks since it will help build reputation.

   This work is being done by several faculty members; the Team is encouraging them to disseminate their work more widely in UNL outreach and development. This is a good idea, but must be left to the faculty members themselves since few others would be qualified.

9. Foundations:

   The Report said almost nothing about this. However, none of the members of the Team were in Foundations so perhaps this is not surprising. They did agree on the importance of statistical Foundations and the Departmental consensus is that neglecting Foundations would make for a very weak department. For instance, most of the top journals in Statistics rarely publish a paper that does not have some foundational contribution.

It is important to note that there are multiple opinions on research foci. One is that departments should seek faculty in specific areas so as to build strength in those areas leading to recognition and/or maximizing the chance to get grant money. Another opinion is that departments should just hire the best candidate according to the accepted standards of excellence of the field. The Department must have a debate within itself, seek the views of subject matter experts outside the Department, and consult with administration to assess how strongly the Department should emphasize any particular subfield of statistics. It is important to note that as grant money gets tighter, it will play a smaller role in the identification of research direction. On the other hand, as evidenced by the Innovation Campus for instance, alternative funding sources may end up influencing research direction.

A further point not addressed in the research section of the Report is that this Department is dual IANR and CAS. Both sides want more-or-less the same things from the Statistics Department but they prioritize them differently. For instance both IANR and CAS want us to support their other departments and develop an UG major. However, CAS seems more keen on an UG program than IANR and IANR seems more keen on our support to other departments than CAS.

2.4 Department environment

The Report states that 'staff, faculty, and students still revealed low morale, exhaustion from workload, confusion about the path forward/vision, lack of communication, and disregard for people's [sic] time. ... there is a distrust of upper administration due to promised faculty positions and resources from both colleges not being delivered...students seem oddly well-informed about the inner workings of the Department, and they too are suffering low morale and a general feeling of instability and no support.'

This is one area where the Department as a whole thinks the Team has over-reacted. Everything the Report says is true but the apocalytic tone seems excessive; moreover, in our deliberations and investigations we find meaningfully different shadings on the concerns of the Team.

1. The report states that hiring a chair 'has already brought some level of stability and resolve for moving forward in a unified manner' and advocates mentoring for the Chair.

The Chair is already meeting regularly with Ron Yoder for guidance and has frequent discussions with other chairs/heads. With all due respect to the Team, the on-the-ground fact is that the Department has readily identifiable problems of an objective nature e.g., too large a graduate student complement, graduate programs in need of major reforms, introductory class sizes that are too small, lack of explicitly and accessibly recorded policies, etc. that need to be solved before morale and stability can improve. That is, to a substantial extent, the morale problems are reactive and will not be alleviated until their cause is eliminated. That being said, one can argue that Department morale is beginning to show some signs of improvement because solutions for some of these problems are beginning to emerge.

2. The Report recommends the Chair define, communicate, and delegate feasible initiatives and form a 5-year plan. It is recommended that the Chair provide faculty and upper administration objectives, strategies, deliverables, and metrics for assessment.

   The Chair has been defining and communicating feasible initiatives. Here is an incomplete list: Reduced number of graduate students, improved teaching assignments, policy on promotion of PoPs, updating of technology, improving graduate student quarters, identifying the steps required for forming an UG program, hiring of new faculty, and, of course, the 3C committee. This is separate from the efforts of the chair to support individual faculty members in their various pursuits.

   The notion of formulating a five year plan is not one that seems helpful at this time. It would take effort that would be better devoted to solving the Department's currently identified problems. After all, real problems are solved bit by bit over a period of some years. This is done as circumstances permit since both circumstances and constraints evolve in ways that are hard to predict. In two or three years, a five year plan might be more useful.

3. There are a number of recommendations in the Report about how the chair conduct himself. These include social functions, being more obviously 'present' for staff and graduate students, holding extra meetings, how he does his research, etc.

   All of these fall into one of three categories: 1) they are being done, 2) they are inappropriate, or, 3) they are infeasible at this time.

4. The report states that 'staff and faculty should refrain from involving students in Departmental/University politics ... Students need a clear path forward without the distractions of being invovled in negativity.'

   This is very puzzling. There are several theories for why the Team might come up with this. Thin office walls, a specific malcontented student (who apparently called in from Hawaii), the fact that the Department is much smaller and probably more egalitarian than those where the Team members are based, etc.

   An interesting item that turned up as a result of investigating the allegations of student dis-satisfaction was that students who enter the program with an MS already do not think they have been satisfactorily advised academically. The Graduate Student Representative estimates about 10% of graduate students fall into this category.

5. Regular faculty/staff meetings should be established once a month with agenda circulated 24 hours in advance with defined start and stop times and minutes taken and posted.

Since September, meetings have been more typically every two weeks owing to the volume of work that had to be done. Many items on the agenda are regular so even in the cases where an agenda was not 24 hours in advance most of the topics would be clear. From the beginning minutes have been taken and made available. The only item here that bears comment is the length of meetings. Some have run a too long – but the volume of policy that had to be hammered out quickly and the informational aspects of many of the items should not be downplayed. The Department meeting is the main forum where policy is debated and information is shared.

Monthly staff meetings are possible – but there are only 2 administrative people and one technical support person. It seems a bit much not to run things informally.

6. Conduct a department climate survey (WISELI) to uncover 'issues that may be preventing a healthy and productive work environment.'

   This is a good idea but premature. It would only make sense if morale problems remain after we've done all the things we know to do to improve the circumstances of graduate students, faculty, and staff. It's important to fix what we know is wrong before we go off in search of more subtle problems.

A point not raised in the report that may bear on morale is space and furniture. A cursory glance shows a lot of the pieces of furniture are eyesores and space is not being used well. Plans have started for some re-allocation of office space (as the number of graduate students drops) and for replacing some of the furniture while making more use of the decent looking furniture.

While it must be acknowledged that the Departmental environment is not as good as we would like it, the picture painted by the report seems to miss the point. First, two units were merged from two distinct intellectual cultures, more or less successfully. Aside from being a noteworthy accomplishment, this means the Department has a very broad mandate compared to other statistics departments. Indeed, it is hard to think of another statistics department that has a larger range or per-FTE volume of obligations. Moreover, there has been a severe resource squeeze on the Department, particularly from CAS. In its initial plan – which is remembered by many people in the Department – support to the Department was meant to be 1:1 CAS and IANR. However, the ratio is more like 1:2 as faculty with CAS as lead college left the Department but were not replaced. Note that it is not just the numbers but also the fact that the people who were not replaced were in statistical foundations necessary for Department progress as noted earlier. It is unclear how much this will be remedied but, until it is, or the people who remember the initial plan leave, there will be hesitancy amongst some in the Department when it comes to dealing with CAS.

3 Overall plans for the future of the Department

The three big goals the Department has are 1) Revamping its existing graduate programs, 2) Starting an UG major, and 3) Increasing its recognition for intellectual contributions. These over-arching goals have numerous subsidiary goals (e.g., hiring fresh PhD's who seem like high-achievers, increasing statistical computation, etc.) and the Department has many smaller goals that are important but not so foundational (e.g., bringing in more outside speakers for our seminar series, increasing donations to the Department foundation funds, etc.).

In terms of what to do next, the obvious first major step is 1). The reason is that this can be done internally without requiring more resources and can be done on a shorter timeline than the other two major goals. It makes sense to improve something that already exists before starting something new and a revamped graduate program will contribute to the other two big goals because a revamped graduate program will help the Department to gain recognition as well as setting it up better for an UG major since more MS courses may end up being cross-listed as 4XX courses.

The second major step is 2) because it is on a longer timeline as more extensive plans must be formulated and resources found to enable the formation of an UG major. Indeed, there is a wide range of opinions on what sort of UG program might be developed and this debate must be started within the Department, and resolved, before it makes sense to formalize our collective thinking in a program. Improving the UG minor we currently offer might be a good place to start thinking about an UG major. Another good starting point might be the recently created Bachelor of Integrated Science: This would enable us to develop the components of a Statistics major over a longer period of time thus enabling as to match the demands of a major with our ability to provide them.

The Team does not appear to agree with this prioritization. They write: '...the strongest graduate programs in Statistics exist because of large service teaching commitments to the University, successful undergraduate programs, and statistical consulting services.' However, the Department has substantial service teaching commitments and extensive consulting activities (likely with more to come). Since improving the graduate programs will not take resources away from our ability to form an UG program, and the duration and complexity of forming an UG program is so high, there is no point in waiting for an UG major before improving our graduate programs. Indeed, the internal discussions about what sort of UG program we'd want to form can be done at the same time as improving the grad program. The challenges involved in developing a unique and successful UG program for UNL are big enough that proceeding cautiously is advisable.

For the balance of this academic year and the next two, it is relatively clear how the Department should proceed to solve its problems. During this period, plans for the longer term that must be formulated. Clearly one of these is an UG program, but the setting becomes murkier as one looks 3 or more academic years into the future.

A key strategic question that neither the Report nor this document can address directly is what upper administration wants from this Department. Within the Department we can certainly chart our own way, but it is prudent to hear how upper adminstration would like us to allocate our resources. To help with this, the Appendix lists the features of a 'complete statistics department'. A perusal of this list in the context of Sec. 2 leads to a variety of questions that will be answered one way or another. Here are a few: Will CAS and IANR be comfortable if education analytics growth takes away from supporting subject matter researchers? Will CAS and IANR be happy with computational biology if federal funding for it continues to decrease forcing researchers to turn to industry for support? In answering these questions one must bear in mind that over-focusing on external funding tends to reduce academic stature in Statistics over time. The bottom line is to answer the question: Given the list of features of a complete statistics department and the resources available, which major functions of a complete department should be sacrificed? This does not have to be answered in the next few years because we have so much to do as it is. Although, it would help morale, stability, and recruiting if they were answered sooner rather than later. Since we are moving toward substantial changes in program and faculty complement, we have to find answers that will be acceptable and feasible for the Department, our colleagues in other departments, and upper administration.

Appendix: A complete statistics department

As a field Statistics has research waves that have major impacts on the field as a whole more than it has 'hot' areas. One can argue about the details, but three relatively recent waves are high-speed computing and hierarchical Bayes (the 90's), high dimensional and complex data (the 00's), and so-called Big Data currently. Each of these has spawned new subfields of statistics even if the center of gravity of some of these fields is not in statistics departments. Another important aspect of Statistics is that it is no longer mostly an English-speaking world subject.

With these rapid developments in mind, it is worth listing the functions of a statistics department that have remained relatively constant over many decades. Not every statistics department has all of them but all of these functions are desirable. The better departments omit only one or two, usually the co-op programs because the job market is so strong, but sometimes comparative advantage when there is little departmental vision. A complete statistics department – such as would suit UNL in our Departmental opinion – would have all of them.

- Undergraduate programs (major, minor, combined majors).
- Graduate programs (MS, PhD, joint PhD).
- Co-op programs (with companies, government agencies, etc.).
- Service teaching (grad and UG levels).
- Consulting programs (for students and subject matter researchers).
- Research level interactions with subject matter researchers.
- Research that would be primarily of interest to other statisticians.
- Staying current with technology (data generating, teaching, and analytic).
- Outreach (beyond the university and immediate employers).
- Bringing in money (federal, state, corporate, philanthropy).
- Administration, especially climate, hiring and annual evaluations.
- A comparative advantage that makes a Department recognized.