Bioinformatics Baccalaureate Executive Summary

**Strategic Alignment.** This degree seems to align well with the Strategic Plan; it is an innovative program using existing resources, building community and business partnerships, and establishes a unique program that doesn't exist elsewhere in the state or region. Currently, there are no baccalaureate offerings in the field in the state of Utah; the University of Utah does offer a Master’s and PhD program in Bioinformatics.

**External Demand.** Because this occupation is relatively new, job trends stem from several areas including statistics, computer programming and development, and health care in addition to the biological sciences. Overall, computer programming and developing positions have average growth rates between 25% and 30% over the next decade along with most healthcare positions and statistics. Biological sciences have average growth rates; however, when one considers the application to healthcare and computer programming/development, it appears that the Bureau of Labor Statistics has not developed a category yet for this profession. A number of outside professional, academic and industry sources suggest that this is a burgeoning field with high potential and high future demand. Equally, potential salaries are also above average.

**Internal Demand.** 2.83% of 212 students (6 students) polled said they would switch their major to Bioinformatics. Out of the eight bachelor’s degrees on the survey, this was tied for fifth. If 2.83% were representative of the full Fall 2015 student body estimate, it would equate to 258 students.

**Costs.** A DSU Bioinformatics program could offer a degree with an additional faculty members and two additional adjuncts with professional experience in the field. Because of the advanced education and training it would be expected that the salary schedule for faculty would exceed what is currently offered by the institution. One faculty at 10% premium = 75K * 10% = 82.5K. Two adjuncts = 50K. Total = ~132.5K annually. One major advantage to offering a Bioinformatics curriculum is that the overhead costs are relatively low when compared to traditional laboratory-based sciences. Ave. cost of a FTE student in the related field of Biology is $2,947 = Low. Comparably an Ave. FTE student at DSU is $3,484 = Low - Mid (DSU FY14 Costs). Ave. cost of a FTE student in the School of Science & Technology (SST) is $2904 = Low (DSU FY14 Costs).

**Revenues.** DSU Bioinformatics faculty suggests that 10 students would be interested in entering this program in the first year = $156,320 tuition. Y2 = 20 students = $312,640 tuition. Y3 = 30 students = $468,960 tuition. Y4 = 40 students = $652,280 tuition. Y5 = 50 students = $781,600 tuition. Total ~ five-year revenue = $2,371,800. Total ~ five-year costs = $662,500. Simple ROI = 3.58.

**Other.** A partnership with IHC has already been explored. This could be a traditional, online or hybrid degree. A capstone project would be built into the curriculum, and research would be available to faculty and students.
### Category

1. **Strategic alignment.** Cite specific examples of how the program aligns to the DSU strategic plan, mission, and goals. Are there aspects that make the proposed program unique or enable it to stand out from similar programs? How?

### Data

- This degree aligns well with the Strategic Plan, specifically feedback we’ve received to look for innovative programs using existing resources, building community and business partnerships, as well as establishing unique programs that don’t exist elsewhere in the state or region. Hybrid programs that draw on existing faculty and existing courses, many of which are not currently filled to capacity, may provide the opportunity to expand program offerings without straining resources. This degree has the potential to be such a program.

- Currently, there appear to be no baccalaureate offerings in the USHE system, but BYU does offer the only baccalaureate in the Intermountain area; the University of Utah does offer a Master’s and PhD program in Bioinformatics and is currently celebrating their 50th year.

- Currently Dixie State does not have any emphases in the area of Bioinformatics, however, there are a number of degrees and emphases that intersect and/or run parallel to this area, including degrees in Biology, Computer Information Technology (CIT), and Computer Science. In addition, there are emphases within Integrated Studies in Biology, Computer Science, CIT (and sub-emphases).

- In terms of fulfilling the breadth of a comprehensive university, Dixie State is already doing well in terms of offering degrees within the CIP code 11 “Computer and Information Science and Support Services” (average is 1.84, we currently have 2). However, given existing resources as well as strategic goals related to identity, community and economic development, etc., this is a potential area where DSU may want to build out an identity and niche. For example, discussions between DSU and IHC are
ongoing, including bringing experts in to teach adjunct, etc.

| 2) **External demand.** What need(s) will this program help fulfill for our DSU footprint and stakeholders in Washington County? What impact would the program have on existing programs in the state? Bordering states? Are projected employment opportunities reasonable? Does the proposal contain both local and national statistics on potential employment of graduates? Will the program meet projected future demand, growth, and economic trends? How? | ● A Baccalaureate of Science (BS) of Bioinformatics will meet the demands of the local, regional and national job market. Specifically, Bioinformatics is the use of computers and statistics to make sense out of the huge mounds of data that are accumulating from high-throughput biological and chemical experiments, such as sequencing of whole genomes, DNA microarray chips, two-hybrid experiments, and tandem mass spectrometry. Because bioinformatics uses technology to provide solutions, customers and utilizers of the technologies can come from areas worldwide even though they may be located in one geographic location. Thus, as southern Utah continues to grow in a workforce with these types of skills, more businesses and resources will likely locate to the area in order to meet global demands. Equally, graduates of this degree will be very employable as the demand for workers with computational and biological skills are high.

● Because this occupation is relatively new, job trends stem from several areas including statistics, computer programming and development and health care in addition to the biological sciences. Overall, computer programming and developing positions have average growth rates between 25% and 30% over the next decade along with most healthcare positions and statistics (Bureau of Labor Statistics, 2014). Biological sciences have average growth rates; however, when one considers the application to healthcare and computer programming/development, it appears that the Bureau of Labor Statistics has not developed a category yet for this profession.

● A number of outside professional, academic and industry sources suggest that this is a
burgeoning field with high potential and high future demand (e.g., Science Magazine, 2014). Equally, potential salaries are also above average (Biostatistics Blog Article, 2014).

- Overall, it appears that current demand is high with future demand only increasing.
- From (Bioinformatics summary) Bioinformatics is the theory, application and development of computing tools to solve problems and create hypotheses in all areas of biological sciences. Biology in the post-genome world has been and continues to be transformed from a largely laboratory and field-based science to one that integrates experimental and information science. Bioinformatics provides tools that handle datasets too large and/or complex for manual analysis. Computational tools are central to the organization, analysis and harvesting of biological data at the level of macromolecules, cells, and systems. Consequently, there is a growing need for trained professionals who understand the languages of biology and computer science. Biologists trained in more traditional programs may not have a working knowledge of statistics and algorithms, whereas computer scientists trained in more traditional programs may not have a working knowledge of the chemistry and biology required in the field.

- The Bioinformatics Degree at Dixie State University, which could be operated jointly by the Departments of Biology and Computer and Information Technology, would offer training that builds a solid foundation in chemistry, biology, computer science, mathematics and statistics. This training will enable students to communicate fluently with experts across these disciplines, and to have the skills necessary to apply computing tools to address contemporary problems in biology and medicine. The training will enhance the professional opportunities for undergraduates to pursue careers in pure or applied research in academia, government, pharmaceutical, medical, or biotechnology sectors.
3) Internal demand. What is the enrollment and graduation outlook over the next two, five and ten years? Is there compelling evidence of student demand at the county level? State? National? International? Are there other DSU programs (including GE) that will rely on this program for instruction and support? Are there other internal demand factors this program will help meet?

- 2.83% of 212 students (6 students) polled said they would switch their majors to Bioinformatics. Out of the eight bachelor’s degrees on the survey, this was tied for fifth. If 2.83% were representative of the full Fall 2015 student body estimate, it would equate to 258 students (survey results).
- Overall, a steady 3-5% enrollment increase is projected over the next 10 years. WashCo student growth is projected at about the same 5%.
- Though unknown by most students, Bioinformatics may be an appealing major. At DSU, STEM majors continue to be of the most popular. Nationally, Statistics’ majors continue to be in demand. A combination of the two degrees would appeal to a wide range of students.

4) Quality/Costs of the program. Future costs. What costs will be incurred over the next two, five, and ten years? What will be the cost per student credit hour? Are the costs and budgets sustainable for potential future program growth and expansion? Are there adequate plans for student support/assistantships? Will the current and future faculty be able to deliver a quality program? To support and appropriately instruct the projected student enrollment? Why? What are the credentials and reputation of the faculty? Are there adequate equipment, facilities (research space), & library resources? Is the proposed administration for the program appropriate and adequate? What other factors will influence quality?

- From (Bioinformatics summary). If modeled after other successful Bioinformatics programs, a DSU program could manage to offer a degree with an additional faculty member and two additional adjuncts with professional experience in the field. The faculty members could be shared between the Departments or exclusively within Biology. Because of the advanced education and training it would be expected that the salary schedule for faculty would exceed what is currently offered by the institution. However, recent efforts to achieve equitable pay may effectively alleviate this and allow the university to attract qualified candidates.
  - One faculty at 10% premium = 75K * 10% = $82.5K
  - Two adjuncts = 50K
  - Total = ~$132.5K annually
- From (Bioinformatics summary). One major advantage to offering a Bioinformatics curriculum is that the overhead costs are relatively low when compared to traditional laboratory-based sciences. It is possible that DSU currently has the IT infrastructure to facilitate the operation of a bioinformatics program. Conceivably, some additional hardware and software packages would
require purchasing, as needed.
- Ave. cost of a FTE student in the related field of Biology is \$2,947 = Low. Comparably an Ave. FTE student at DSU is \$3,484 = Low-Mid (DSU FY14 Costs)
- Ave. cost of a FTE student in the School of Science & Technology (SST) is \$2,904 = Low (DSU FY14 Costs)

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<th>Program</th>
<th>Cost</th>
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<tr>
<td>SST</td>
<td>$2,904</td>
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<td>HUM</td>
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<td>HSC</td>
<td>$6,574</td>
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5) Revenue and other resources generated by the program. What revenues (tuition, grants, other) will this program generate in two, five, and ten years. What kind of grants are anticipated? Is there adequate support for research grants? Other sources of revenue?

- From (Bioinformatics summary). It’s anticipated that a Bioinformatics degree would begin modestly with likely less than 10 students in the initial cohort. However, the integration of Bioinformatics coursework into the existing Biology and/or CIT catalog would promote the program and by year five. Judging by the popularity of the Biology and CIT programs, graduating classes of 50 or more could be expected by year 5.
- DSU Bioinformatics faculty suggests that 10 students would be interested in entering this program in the first year = \$156,320 tuition.
  - Y2 = 20 students = \$312,640 tuition
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  - Y5 = 50 students = \$781,600 tuition
  - = \$2,371,800 total (Bioinformatics summary)
- Again, the value of offering a Bioinformatics program becomes evident from this angle. Whereas the technological capacity of DSU Biology and its relative isolation from a significant biotech industry limit its ability to receive large grants and form revenue-generating partnerships, a bioinformatics
program is, by definition, *in silico*, and therefore is not constrained by space or material resources. Coupled with the increasing demand for the services of a university and its graduates, it is easy to imagine revenue-generating partnerships with the private sector; both local (e.g. Intermountain Healthcare, etc.) and beyond. Moreover, the field is so “in-demand” that grant funding is annually increasing even as other sources for research in the biological sciences is diminishing or becoming concentrated within select large research institutions. Applying the success of DSU’s CIT program, a bioinformatics program could easily prove to be a model for entrepreneurial pipelining in Biology *(Bioinformatics summary)*.

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<th>6) <strong>Research/ program design/ other.</strong> Will this program create research and creative opportunities for our faculty and students? How will these research opportunities help our faculty? Students? Is the program a partnership or collaboration with a private organization, USHE or other institution, or standalone? What are the merits of it being a partnership or standalone? What is the percentage of face-to-face, online, hybrid, evening, or weekend time spent in this program? What other instructional innovations/delivery methods are being proposed for this program? Are there other opportunities that this program will create? Develop new markets? How will the program adapt to changes in technology, trends, student populations, and/or employer needs?</th>
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| ● This would be a standalone degree, but a partnership with IHC has already been explored.  
 ● The department should explore the possibility of online and/or hybrid courses. Especially where this is a degree that specializes in technology, technology should be employed in its delivery.  
 ● Research would be available to faculty and students. A capstone project should be encouraged. |