**OHSU – Biomedical Informatics Graduate Program - Core Competencies for PhD in Bioinformatics and Computational Biomedicine**

**Rubric**

**Intended Use:** This rubric is meant to be a guide for students and their advisors and mentors to help track their progress through the BCB PhD degree program. Measurements are a suggestion – feel free to add as you see fit!

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| **Professional Knowledge and Skills** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| SLO:   * Apply a broad knowledge of bioinformatics and computational biomedicine, and related disciplines, to solve problems in research, clinical and educational settings. | | | |
|  | Advanced understanding of the knowledge base related to bioinformatics and computational biomedicine | Basic knowledge base related to bioinformatics and computational biomedicine | * Present a symposium on their research topic * Student initial presentation of dissertation proposal * DAC (Dissertation Advisory Committee) meetings – reports * Research rotations * Course Midterms * Course Finals * Passing other larger course projects * Successful defense of dissertation * Submission of dissertation * Possible course alignment: BMI 650, BMI 651, BMI 652A/B, BMI 653 |
| Knowledge base |
| Advancements | An in depth understanding of the advancements in bioinformatics and computational biomedicine | Basic or lack of understanding of the advancements in bioinformatics and computational biomedicine |
| Specialization | Advanced knowledge of one specialization in bioinformatics and computational biomedicine | Poor or basic knowledge of one specialization in bioinformatics and computational biomedicine |
| Development of new knowledge | Develops new knowledge in their specialized field | Incomplete or lack of development of new knowledge in their specialized field |
| **Reasoning and Judgement** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| SLO:   * Identify gaps in scientific knowledge; formulate a research question; design a research study; employ and apply appropriate methods or develop new methods as necessary; analyze, contextualize, and interpret results; and evaluate the internal and external validity of the research findings. | | | |
| Critical thinking | Viewpoints presented in the scientific literature are critically analyzed to identify gaps in the research | Viewpoints presented in the scientific literature are not critically analyzed to identify gaps in the research | * Present a symposium on their research topic * Student initial presentation of dissertation proposal * DAC (Dissertation Advisory Committee) meetings – reports * Research rotations * Course Midterms * Course Finals * Passing other larger course projects * Successful defense of dissertation * Submission of dissertation * Possible course alignment: BMI 660, BMI 661 * Course: Quantitative Research Methods |
|  | Research question is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding | Research question is stated without clarification or description, or is otherwise unclear. |
| Research methods | Applies appropriate methods or develops new methods as necessary | Does not apply appropriate methods or does not develop new methods when necessary |
| Critical analysis | Research results are evaluated, including whether results were internally and externally validated. | Research results are not evaluated. Validity of results is not mentioned or is unclear. |
|  | Conclusion is based on an in-depth synthesis and analysis of the data, even if hypothesis is disproven. | Conclusion is based on an incomplete synthesis and analysis of the data. |
| **Evidence-based Practice and Research** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| SLO:   * Identify and define problems, critically compare options, make timely decisions or recommendations, identify uncertainties, and use findings to improve outcomes in light of evolving evidence. | | | |
| Literature review | Critical review of the relevant scientific literature | Basic or missing review of the relevant scientific literature | * Present a symposium on their research topic * Student initial presentation of dissertation proposal * DAC (Dissertation Advisory Committee) meetings – reports * Research rotations * Course Midterms * Course Finals * Passing other larger course projects * Successful defense of dissertation * Submission of dissertation * Possible course alignment: BMI 652A/B |
| Research advancement | Substantial critical evaluation of recent advancements in the field of research | Some or no critical evaluation of recent advancements in the field of research |
| Research objectives | Systematic approach to address research objectives | Incomplete/disorganized approach to address research objectives |
| Research results | Research results are presented comprehensively | Research results are not presented comprehensively |
| Recommendations for further research | Possible future directions of research are clearly presented | Possible future directions of research are unclear. |
| **Lifelong Learning** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| SLO:   * Engage in lifelong learning through: finding, interpreting and critically appraising scientific literature in order to fill knowledge gaps and stay informed of scientific advances; synthesizing and applying new knowledge to their own research; and connecting with the larger scientific community through participating in scientific conferences and societies. | | | |
| Local/Regional conference participation | Presenting at local/regional conference | Attending Thursday research conference | * Includes Thursday conference, OHSU research week, BioData Club, etc. * NLM trainees attend annual NLM trainee meeting * Attend other meeting as allowed * Attend conferences as interested * Possible course alignment: BMI 653 |
| National/International conference participation | Presenting at national/international research conference | Does not present at national/international research conference |
| Networking | Attend outside conferences to fill knowledge gaps and meet possible future collaborators | Does not attend outside conferences to fill knowledge gaps and meet possible future collaborators |
| **Communication** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| SLOs:   * Effectively communicate and disseminate scientific research in written and verbal form to both peers and non-experts. * Communicate professionally, including during interactions with others, and while giving and receiving feedback | | | |
| Writing skills | Well written dissertation and organization supports the objectives. Content is clear and coherent. | Poorly written and poorly organized, content unclear, lapses in coherence | * Present a symposium on their research topic * Student initial presentation of dissertation proposal * DAC (Dissertation Advisory Committee) meetings – reports * Research rotations * Course Midterms * Course Finals * Passing other larger course projects * Successful defense of dissertation * Submission of dissertation * Glossary of terms is recommended at final presentation defense for non-experts * Possible course alignment: BMI 652A/B, BMI 670 |
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| Speaking skills | Spoken explanations are complete, clear and concise | Spoken explanations are not complete, clear and/or concise |
| Audience awareness | Audience knowledge was considered in presentation of topic | Audience knowledge was not considered in presentation of topic |
| Response to feedback | Actively listens and responds appropriately and respectfully to feedback | Responds inappropriately and/or disrespectfully to feedback |
| Integrating feedback | Documents and addresses feedback; seek out opportunities for feedback | Does not document or address feedback; does not seek out opportunities for feedback |
| Respect for others | Interacts respectfully with all peers, faculty, and staff | Does not interact respectfully with all peers, faculty and staff |  |
| **Professionalism and Ethics** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| SLO:   * Apply fundamental knowledge of ethics in research and implement solutions that assure confidentiality, security and integrity while maximizing the availability of data, information, and knowledge. | | | |
| Academic integrity/Research ethics | Current principles of ethics and academic integrity are incorporated into all aspects of research. | Lack of awareness, or lack of application, of current principles of academic integrity and research ethics | * Student initial presentation of dissertation proposal * DAC (Dissertation Advisory Committee) meetings – reports * Research rotations * Course Midterms * Course Finals * Passing other larger course projects * Successful defense of dissertation * Submission of dissertation * Possible course alignment: BMI 635, BMI 646, BMI 665, BMI 669, BMI 676 * Course Midterms * Course Finals * Passing other larger course projects |
| Manage data | Record data in prescribed format in timely, accurate and complete manner. | Record experimental results with flaws in timeliness, accuracy and organization |
| Data security | Conform to current standards of data security as determined by University policy and practice | Does not conform to current standards of data security as determined by University policy and practice |  |
| **Interprofessional Teamwork** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| SLO:   * Function as a productive member of a multidisciplinary collaborative team of biological and related scientists, informatics, information technology, clinical, administrative, and other experts. | | | |
| Teamwork | Works professionally, collegially and effectively as team member/collaborator | Does not work professionally, collegially and/or effectively as team member/collaborator | * Student initial presentation of dissertation proposal * Annual Review * DAC (Dissertation Advisory Committee) meetings – reports * Research rotations * Successful defense of dissertation * Submission of dissertation * Possible course alignment: BMI 652 A/B, BMI 653, BMI 669 * Course Midterms * Course Finals * Passing other larger course projects |
| **Safety and Quality Improvement** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| SLO:   * Demonstrate and promote informatics solutions that help to ensure patient safety within relevant clinical settings. | | | |
| Safety Standards | Complies with safety and regulatory standards | Does not comply with safety and regulatory standards | * Research rotations * Possible course alignment: BMI 676 * Passing other larger course projects |
| **Systems** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| * Appraise applicable bioinformatics concepts, methods, and tools to solve challenging problems in their focus area. * Apply the principles of team science to solve complex information problems. * Have experience and training utilizing modern frameworks for rapid prototyping, and how to extract information from a wide variety of databases, as relevant. | | | |
| Critical Thinking | Able to evaluate relevant concepts, methods and tools within their focus area | Unable to evaluate relevant concepts, methods and tools within their focus area, or evaluation not presented | * Student initial presentation of dissertation proposal * Annual Review * DAC (Dissertation Advisory Committee) meetings – reports * Successful defense of dissertation * Submission of dissertation * Research rotations * Course Midterms * Course Finals * Passing other larger course projects * Organizational Behavior Course Assignments * Project management course assignments * Internships * Possible course alignment: BMI 646 |
| Priorities | Able to integrate stakeholder priorities into solutions to complex health and health information problems | Unable to integrate stakeholder priorities into solutions to complex health and health information problems |
| **Social Justice** | **Meets expectations** | **Does not meet expectations** | **Possible Measurements** |
| SLO:   * Integrate the culture and diversity of a population when developing research ideas, conducting research, evaluating implementation, and/or interpreting research findings. | | | |
| Empathy toward others | Demonstrates empathy toward the culture and diversity of all stakeholders | Treats others with respect; follows standard practices | * Student initial presentation of dissertation proposal * Annual Review * DAC (Dissertation Advisory Committee) meetings – reports * Successful defense of dissertation * Submission of dissertation * Research rotations * Course Midterms * Course Finals * Passing other larger course projects * Internships * Possible course alignment: BMI 676 |

Adapted from: Western University, Ontario, Canada: Learning Outcomes: Evolution of Assessment and Van Andel Institute