OHSU – Biomedical Informatics Graduate Program

Core Competencies for PhD in Bioinformatics and Computational Biology

Rubric

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| **Professional Knowledge and Skills** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| Describe key concepts in biomedical science | Describes general concepts with gaps and errors | Describes general concepts correctly and clearly | Explain concepts with expanded historical and contextual detail | Recognize and apply key concepts as they appear in new settings | Evaluate new challenges or controversies relevant to concepts |
| Obtain knowledge of the biomedical science literature  | Review of the biomedical science literature is limited | Synthesis of recent advancements in the field of biomedical science is weak | Some synthesis of recent advancement in the field of biomedical science | A careful synthesis of recent advancements in biomedical science | A thorough review and synthesis of advancements in the biomedical science literature |
| Engage in best authorship practices | Complete small assigned writing tasks on time for editing by others | Participate in design, writing and editing of collaborative proposals or papers | Develop planning process for authoring projects; complete outline and initial draft; effectively edit drafts from others | Negotiate scope and structure of project or manuscript with multiple contributors; work out timeline/writing responsibilities | Lead collaborative writing team; serve as submitting author; conduct quality peer review of manuscripts or proposals; resolve authorship conflicts |
| **Reasoning and Judgement** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| Apply critical analysis and thinking | Accept current models as accurate and sufficient | Describe experiments that generate current model | Observe limits of current models; identify gaps in knowledge | Compare contrary results, yielding multiple new hypotheses | Defend position or hypothesis-driven research to expand the field of biomedical science |
| **Evidence-based Practice and Research** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| Frame appropriate hypothesis | Accept Hypothesis from others | Contribute to formation of hypotheses | Generate independent but incomplete hypotheses | Independently generate testable hypotheses coupled with specific aims | Recognize alternative and testable hypotheses |
| Apply appropriate experimental design | Execute experiments designed by others | Collect and employ appropriate approaches | Seek expert advice and glean novel approaches from literature | Critically evaluate and modify approaches | Invent and apply alternative strategies and troubleshoot potential outcomes |
| Integrate outcomes into relevant models | Related outcomes are oversimplified | Related outcomes compare new data with prior results from self, others | Related outcomes are identified and logical flaws in current model are explained clearly | Revise existing models based on new data from self, others | New models are created, integrating experimental findings with external data, critiqued data and analysis of others |
| **Lifelong Learning** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| Maintain awareness of advancements in the field | Curiosity and ability to see common problems from other fields |  | Comfort with learning new concepts given basic review literature | Ability to translate problems from other fields and applying to bioinformatics | Present and discuss new concepts and new findings in bionformatics |
| **Communication** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| Speak effectively  | Plan and present short oral summaries in trainee meetings or mentor meetings | Plan and present research-in-progress talks for trainee meetings and/or presentations | Present clear, well-organized research talks and/or posters with effective use of schematics, data/figures and conclusions | Present effective poster or research presentations at conferences; handle questions concisely and effectively; manage logistics and disruptions | Skilled communication in multiple settings (conferences, seminars, classroom, ad hoc, etc.) |
| Write effectively | Write sentences, paragraphs and essays using established structure and English language standards | Use standard structures of scientific communication with accurate attribution of citations (poster, manuscript, grant formats) | Build coherent and logical argument describing or proposing research studies | Present complex models or rationale in cogent, convincing and concise language | Present complex models or proposals using elegant language in multiple formats (essay, grant, research or review article) |
| Communicate to diverse audiences | Describe experimental purpose and outcomes to peers and mentors | Convey goal, rationale, approach and outcomes to scientists beyond program | Describe research purpose and outcomes to small audience of lay adults | Communicate research effectively to larger and diverse audiences, wider age ranges | Communicate one’s own or others’ science effectively to varied audiences |
| **Professionalism and Ethics** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| Feedback | Understand basics of receiving and responding constructively to feedback | Document and address issues raised in feedback |  | Ability to participate in a productive dialogue about feedback  |  |
| Manage data with scientific integrity | Record experimental results with flaws in timeliness, accuracy and organization | Record data in prescribed format in timely, accurate and complete manner | Coordinate multiple formats for data collection and storage (notebooks, efiles, artifacts, etc.) | Correct issues where data were not handled or recorded appropriately; revise record-keeping methods to prevent issues | Demonstrate integrity in shared data; mentor others in appropriate data management |
| Display appropriate citizenship | Treat others with respect; follow standard practices | Understanding implications of one’s behavior/attitude in regard to interpersonal interactions | Seek guidance from peers and mentors with regard to interpersonal interactions | Serve as role model and mentor in professional behavior | Serve effectively in leadership role in institute initiatives |
| Address ethical problems in scientific research | Recognize that ethical problems can arise in science | Recognize ethical problems in case studies; describe processes to discuss, advise or resolve ethical issues | Identify the various stake holders in ethical dilemmas; identify key ethical principles relevant to given situations | Apply effective approaches to address ethical problems; utilize support structures for best outcome | Counsel others effectively on ways to identify, work through and resolve ethical problems |
| **Teamwork** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| Work collegially and effectively as team/collaborator | Work on individual projects; accept direction and oversight from others | Work with team members on shared project with defined individual responsibilities assigned by others | Take individual initiative in obtaining input or collaboration form colleagues for specific projects | Present and accept honest and professional feedback in setting with multiple individuals; share primary project responsibility | Design and lead collaborative projects to successful outcome |
| **Safety and Quality Improvement** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| Comply with safety and regulatory standards | Complete minimal safety training as required and apply safe practices | Complete training for animal, human, recombinant DNA, hazardous research as appropriate | Seek counsel from regulatory staff to improve studies and protocol | Write protocols compliant with regulatory standards for anima, human, hazardous or recombinant DNA research as appropriate | Serve on institutional safety or research review committees |
| **Systems** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| Understand tools and techniques | Lack of awareness of the complexity of scientific problems and limitations of existing tools and techniques to address them | Acknowledge the limitations of research tools and systems used and basic explanation of its consequences on the research outcomes | Reasonable awareness of the complexity of scientific problems and limitations of existing tools and techniques to address them | Fully acknowledge the limitation of research tools and systems used and detailed explanation of its consequences on the research outcomes | Fully aware of the complexity of scientific problems and limitations of existing tools and techniques to address them |
| **Patient/Client centered care** | **Beginning** | **Intermediate** | **Advancing (TARGET LEVEL)** | **Heightened** | **Exceptional** |
| State core concepts in relevant clinical context | Describe research and disease association in general and limited terms | Describe clinical context of biomedical informatics as presented by others | Connect clinical issues and biomedical informatics accurately and broadly | Recognize and apply key biomedical informatics concepts as they appear in new clinical settings | Use clinical information to elicit gaps in collective knowledge of field |