

Biology Meets Computer Science: DNA Project

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Context: Out of class; Biology and Computer Science majors

Keywords: interdisciplinarity, communication, research experience

Student Activity Time: 10 minutes

In an ongoing research project, students reflect on their interdisciplinary project experience and set goals for their participation in the project.

Introducing the Reflection Activity

Interdisciplinary learning experiences in a research setting can challenge students in unique ways unlike their classroom experiences. In an ongoing project, volunteer student researchers work in a collaborative and interdisciplinary environment to build a database of gene fragments. Early in students' participation in the project, an educator gave the students a reflection questionnaire about what they have learned and their goals for the project. The purpose of this activity was to support students' awareness of the skills they gained and prompt them to develop their own goals for the project.

Biology and Computer Science students were recruited to participate in an ongoing research project. Biology students researched gene fragments from a National Institutes of Health database and collected the annotations associated with each fragment. Computer Science students then would create a database to identify similar stretches in different microorganisms. After a few weeks of working on the project, each student was asked to complete a questionnaire with the following prompts:

1. What was the DNA Project about and what skills were you able to apply to the project?
2. What new knowledge and skills did you learn from this interdisciplinary, collaborative project?
3. What were the areas that you faced challenges and felt you need improvement?
4. How well were you able to adapt to the research project's ambiguity?
5. What near term goals can you set for the project?

Many of the students participating in the project completed this activity and provided detailed explanations of their understanding, skills gained, challenges, strategies, and goals. Ideally, the activity prompted students to consider reflection in research and work experiences as well as their classroom experiences. The final question related to students' goals for the project aimed to prepare them for the next

stages of their participation in the project, or other related research opportunities that they may pursue.

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CONTENT**

6.1 Reflection
Questions for the
DNA Project

Recreating the Reflection Activity

	Description
1	Support student recruitment and on-boarding to the research project.
2	Administer reflection questionnaire.
3	Collect and evaluate student responses by term, project team, and academic year.

In the words of the Educator: Tips and Inspiration

Include peer-to-peer interaction. Another way to organize this activity is to socialize it within the group versus having students submit their reflections just to you. Have the students sit in two concentric circles and discuss with a partner their reflections for a few minutes and then rotate. It's a nice way to have group interaction, save time, and it gives students a chance to talk to each other about the project experience, not just task oriented communication that they regularly have.

Support students' face-to-face exchange. In reality, the students can work on this project without being together in person. By doing something as simple as setting up time to work with each other and supporting it, students actually learn from each other and understand the bigger picture of the project overall. Students develop a better understanding of bioinformatics, and how to use their content knowledge in biology or computer science can help counterparts in the other discipline.

What was the inspiration for the reflection activity? We wanted to see what students were learning in this interdisciplinary experience that was happening outside of their classes. Also, we wanted to find out what kinds of skills did they learn from the project – was it learning to code? Developing soft skills? We wanted to see what they were learning from working with each other – what skills or knowledge were they learning from their peers? The activity is very new, but it has helped us improve the student experience in the project overall. A pleasant surprise was how students started to think out-of-the-box in their attempts to complete the project. It is exciting to see how students have come up with innovative approaches. One striking revelation was that their problem-solving approaches could be fundamentally divided into two broad categories: either starting from the scratch (re-inventing the wheel) or finding the shortcuts and building up on the existing knowledge.