

# External Evaluation

## Year 2 Summary Report for NRT-HDR: Intersecting computational and data science to address grand challenges in plant biology

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## Year 3 Summary

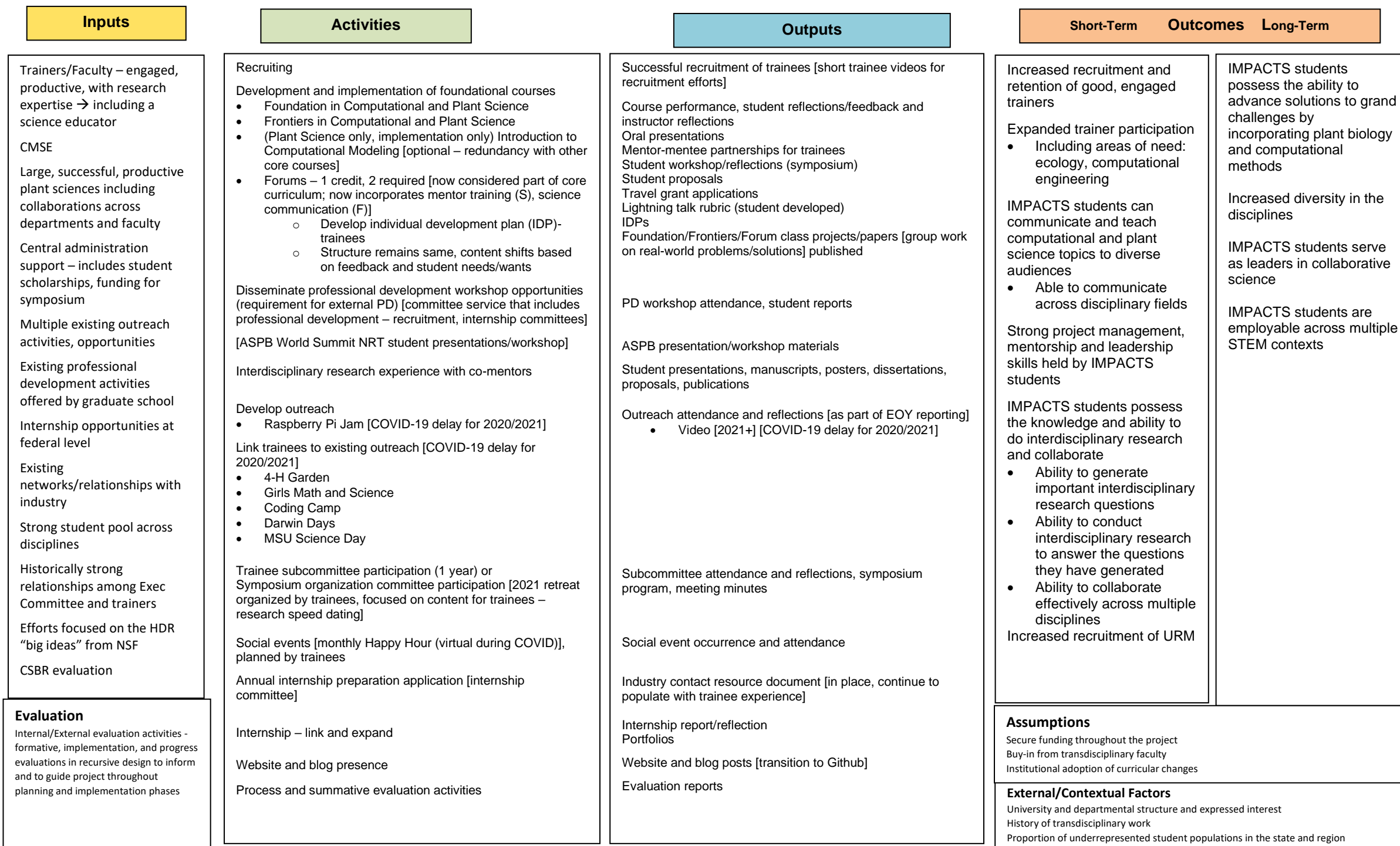
During Year 3 of grant activities, the external evaluators at the University of Northern Iowa Center for Social and Behavioral Research (CSBR) consulted with the IMPACTS leadership team on their internal evaluation activities and observed internal processes. The project leadership team has shown a high level of engagement and enthusiasm and has used their evaluation activities as an integral part of their programming and planning. An inventory of all internal evaluation activities has been created and shared with the external evaluators, and is maintained by the project coordinator. Assessments have been conducted regularly for courses and activities, and have been constructed with consultation from the external evaluators. The leadership team has also held regular check-ins with the evaluators via video conference to receive feedback on specific elements of evaluation assessments, which have also led to meaningful conversations about the strengths of the program as well as areas for improvement. The logic model was updated in a virtual meeting with project leadership in May 2021 (see Figure 1). In addition, in-depth interviews were held with the leadership team for the 2020-2021 year (Kumar, Long, Morris) in May 2021 to ask about successes, challenges, and any changes implemented or planned for the coming year.

Overall, project activities are going well and the program is on track to meet its goals for project outcomes. The leadership team has embraced the recursive design of their evaluation assessments, which has served as a guide while navigating unanticipated issues and challenges. Assessments have been used to solicit course feedback at key points in the semester for the three program-specific courses offered: Foundations in Computational and Plant Sciences (Fall 2020); Frontiers in Computational and Plant Sciences (Spring 2021); and Forum in Computational and Plant Sciences (Fall 2020; Spring 2021). Feedback from each of these has allowed for adaptive planning to incorporate student suggestions regarding the pace and content of the course, as well as the direction of the Forum courses. Using course feedback and instructor reflections from mid-course assessments and semester-end surveys, the courses build upon one another and incorporate program-specific content as well as the professional development skills that the program seeks to support. The students have shown initiative in the Forum class by identifying issues they are most interested in, and have shown creativity and ambition in developing products that serve their goals as well as align with the greater goals of the program.

The Executive Committee EC continues to stress engagement of the trainers to increase faculty buy-in, both to support current trainees and to set the program up for sustainability. EC members have also been reaching out to other departments, groups and organizations (e.g. the Black Doctoral Network, historically black colleges and universities, and Research Experiences for Undergraduates (REU) programs) to help spur diversity in both trainee discipline (with an emphasis on engineers) and demographics (with an emphasis on women and underrepresented minorities (URM)). The leadership team along with the EC have responded to and prepared for

changes for the coming year, both planned and unplanned. The PI (Shiu) was on sabbatical for the 2020-2021 academic year. Co-PIs Tammy

Figure 1. IMPACTS NRT – Michigan State Logic Model DRAFT 5/20/21



Long and Daniel Morris stepped in to oversee the day-to-day tasks and activities of the program with significant assistance from Program Coordinator (PC) Jyothi Kumar. PC Kumar has also taken on significant teaching responsibilities (in tandem with faculty trainers) for the program-specific courses, continues to check in with trainees to ensure they are managing under pandemic circumstances, and is also co-chairing the NRT Program Coordinators group that is comprised of PCs from NRT projects across the country.

The broader impacts of the program continue to expand through faculty and student activities. Leadership, with assistance from EC member Dan Chitwood, have applied for additional NRT grant funding to expand the program model through virtual training for a cooperative program with students in Mexico. In July 2021, trainees presented a workshop about their NRT experience at the American Society of Plant Biologists' World Summit. The trainees also continue to engage with one another beyond program-required courses and adapt to a more virtual environment. With pandemic restrictions making an in-person symposium impractical, trainees instead organized a virtual retreat that paired new trainees with others farther along in the program. This allowed them to share their Individual Development Plans (IDPs), discuss how to use them to consider internship plans, and develop SMART goals for their progress.

While the ongoing COVID-19 pandemic has interrupted some outreach and internship plans, the leadership team continues to adapt their strategies as needed to maintain as much consistency as possible in both programming and communication with student trainees.

#### Key Themes of Internal Evaluation Assessments

Throughout the year, student trainees participated in several surveys and reflections to provide feedback on the three courses and associated activities offered throughout the year. Overall, student feedback was positive about the classes provided in the 2020-2021 school year, and students were able to identify a number of strengths for each course. They also provided constructive feedback for areas that could be improved and this feedback was shared with course instructors. Feedback from the leadership team during end-of-year in-depth interviews suggests that this feedback was integral to deciding on course adaptations to better enhance student progress, and the feedback will be used to adjust class content and/or structure for future years. Several key themes came from these assessments:

- Student comments emphasized an appreciation for working in groups with colleagues from different backgrounds and overall peer interactions.
  - This was noted as a strength of the Foundations courses in Fall and Spring, with a focus on the benefits of collaboration and an appreciation for the perspectives brought by an interdisciplinary group.
  - As in the previous year, students appreciated that the Forum was driven by student needs and interests.

- Students felt they had achieved their professional development goals through the Forum class, which had elements related to science communication, project management and leadership skills
  - Comments from the Fall Forum suggested the course was well-aligned with student goals of gaining experience in presenting to an audience of diverse disciplines, leading discussion, and communicating with peers to understand research questions and topics.
  - Spring Forum students appreciated the ability to focus on issues of importance to them, including designing a workshop on diversity, equity and inclusion (DEI), and felt that learning about mentoring and developing a mentoring philosophy was much needed and consistent with their goals.
- The internal evaluators followed up on conversations with the external evaluators about assessing self-perceptions of content expertise by implementing self-assessments during the Fall Foundations class, which uncovered two important streams of findings.
  - Their analyses showed that not only did self-perceptions of expertise improve as the course went on, but that the gap in perceptions between biology students and computation students closed throughout the semester; in other words, biology students became more confident in their coding skills while the computational students became more confident in their knowledge of biology.
  - The findings also showed that computational students learned the most biology skills after the class project, while the biology students showed the largest gain in computational skills following the Plants & Python module.
- Each student survey asked about the impact of Covid-19 and the associated need for an online format.
  - Some students said that it made it harder to connect with peers and they would prefer to meet in-person; however, most found that the format worked well for the classes.
  - A majority of the students noted their appreciation for the course instructors, especially for being helpful and understanding of the difficult situation students faced in the pandemic circumstances.

Conversations between the leadership team and external evaluators as well as semi-structured interviews at the end of Spring semester also provided several key takeaways:

- The leadership team continues to be engaged, cohesive and passionate about the program and its continued improvement.
  - The external evaluators met with leadership periodically throughout the year, and each time leadership came with requests to review internal evaluation activities and asked for feedback on how to elicit the most

thoughtful and productive feedback from trainees that would allow them to make it as useful for trainees as possible.

- Leadership used these discussions and the resulting ideas and recommendations to adjust their approaches and have found ways to identify strengths to build on (peer collaborations) as well as areas to improve (assessing skill self-perceptions).
- The area identified as having gone particularly well in 2020-2021 was the curriculum.
  - Leadership was pleased with instructors and committee members coming up with new ideas and being willing to change some aspects of the courses based on student feedback.
  - Courses are set up to feed into and build on one another, and are resulting in publishable products as outcomes of the course.
- Leadership was also impressed with the trainees: their cooperation and engagement, their willingness to volunteer, and their ability to adapt.
- The ongoing Covid-19 pandemic created challenges for faculty and trainees alike, including disruptions at home, problems with technology and struggles with motivation and engagement.
  - In addition, the pandemic disrupted plans for outreach activities. These were not done in the first year of the program because the structure was not yet in place, and pandemic restrictions have not allowed for them in subsequent years. Leadership expressed a hope that they would be able to implement these in the 2021-2022 year.
  - Internships have also been delayed for the most part; one trainee participated in a remote internship, but others have opted to wait for in-person opportunities.
- Challenges unrelated to the pandemic were trainer engagement and recruitment.
  - There continues to be a disconnect between the program's purpose and outcomes and faculty acting as trainers, regarding the level of involvement and the understanding of overall program goals and approaches. Leadership continues to brainstorm ways to communicate in a way that will incentivize engagement, make it easy for trainers to be involved, and ensure the trainers understand the expectations for their students that are trainees.
  - Recruitment of women and URM students is a frequent issue with NRT programs and is often linked to broader institutional concerns, as is the case at Michigan State and other state universities; instructors and trainers are doing more to reach out to organizations and groups affiliated with women in STEM and underrepresented minorities. The leadership team has set a goal of recruiting at least two women in the computational and engineering fields for the next cohort and identify 1-2 URM students through university-wide spring recruitment activities and through trainer recommendations.



This is an ongoing conversation, particularly within the Recruitment Committee.

- Recruiting engineering students is still a challenge, the perception being that engineering and plant sciences do not have an overlap in career prospects; leadership, instructors and members of the Executive Committee are working to change that perception by reaching out to engineering faculty to provide more information about the project and its potential benefits.

#### Plans for Year 4

The IMPACTS program is on track for the stated goals of the program, and activities will continue as scheduled for Year 4. The leadership team and committees will continue to meet on a regular basis. The external evaluation team will continue to consult with leadership on a regular basis (at least quarterly) to review evaluation activities and findings, and will continue to provide feedback on specific issues if and when needed. Given the uncertainties surrounding the ongoing COVID-19 pandemic, the external evaluation team will work with leadership as needed to adapt activities and assessments going forward, and reconsider specific measures and outcomes as the situation warrants. It is hoped that the external evaluation team can make a site visit during Year 4 if safe to do so.