

Assessment Metrics Used in the Science Education Initiative (SEI)

Source: Stephanie Chasteen, Warren Code, and Wieman (2017)

PDF and editable Word version: <https://pressbooks.bccampus.ca/seihandbook/chapter/supplemental-documents/>

This handout lists the types of metrics used to document the impact and outcomes in the SEI. The specific measures used will necessarily evolve over time for similar projects, as more assessments are developed. This list provides the types of outcomes measured and some sample assessments to serve as a starting point for other initiatives.

Outcomes expected in the SEI

The main goal of the SEI was to increase the use of evidence-based teaching practices and ultimately improve student learning. Thus, the types of outcomes which were expected included:

- Increased number of faculty using evidence-based teaching practices.
- Increased number of courses using evidence-based teaching practices.
- Increased student learning in these courses.

Another goal of the SEI was to test a valid model for scaling up educational improvements at a large university. Thus, the project tested some additional outcomes regarding the viability and impact of the SEI as a whole:

- Sustainability of changes for courses and faculty.
- Changes in attitudes and normative teaching behavior among faculty in STEM departments.
- Positive career trajectories for Discipline-Based Education Specialists (DBESs).

Measurements used in the SEI

Course-level indicators

Rich information about student learning and experiences, as well as faculty practices and engagement, was gathered about course transformation projects. Such indicators were used as part of the iterative course transformation process to inform decisions and practices. They included:

- **Actual student learning:** Student performance on validated conceptual assessments or custom-designed assessments (e.g., data from exam questions that are identical or similar across courses or time).
- **Perceived student learning:** Student self-assessment of learning and the extent to which they connect/value the chosen instructional practices for their learning, collected via surveys, focus groups, or student interviews.
- **Student feedback:** Surveys, focus groups, interviews and other measures beyond the standard student course evaluation measures. This can offer valuable feedback on how well course elements have been implemented.
- **Teaching practices:** Structured classroom observations (such as Classroom Observation Protocol for Undergraduate STEM; COPUS or the Teaching Dimensions Observation Protocol; TDOP), faculty surveys of teaching practices (such as the Teaching Practices Inventory).
- **Course metrics:** Structured spreadsheet to gather information about each transformed course, such as when transformation began, who was on the project team, the role of the DBES, use of TAs, and a list of materials developed/methods deployed. Here is a [simple table](#) from the CWSEI, but often more complex Excel versions were developed.
- **Required resources:** Track student workload (to ensure students aren't overloaded in the new course) and other required resources (such as TA time and duties).

Faculty-level indicators

- **Teaching practices:** Structured classroom observations (such as COPUS or TDOP), and faculty surveys of teaching

practices (such as the Teaching Practices Inventory).

- **Interviews:** Faculty interviews to gather feedback about the course transformation (e.g., feedback on learning goals), their use of SEI-developed materials, and their experience in the initiative.
- **Faculty metrics:** Structured spreadsheet to gather information about each involved faculty, such as their interaction with the DBES, their involvement in the course transformation, and their use of new teaching techniques.

Department-level and initiative-level indicators

In order to compare impacts across departments and between institutions (UBC and CU Boulder) in terms of practices, impact, and use of funds, we used several common measures. These measures provide useful guidance in the creation of scalable, institutionally-supported models of educational change.

- **Collection of impact metrics:** The structured spreadsheets for course and faculty metrics allowed cross-initiative metrics such as number of projects, number of faculty involved in course transformation, number of faculty involved in educational scholarship and research, number of courses transformed, student enrollment in those courses, and the level of research-based teaching practices used in those courses. Repeated gathering of this information (on an approximately annual basis) allowed for an investigation into sustainability of changes.
- **Teaching practices across departments:** The use of structured observation protocols and faculty surveys on their use of various teaching methods enabled the SEI to see shifts in practice within and across departments.
- **Case studies:** A comprehensive case study of the Earth, Ocean and Atmospheric Sciences Department at UBC was conducted, allowing insight into the process and features of a highly-functioning SEI. This case study provides a qualitative description of the trajectory of a department within the SEI. See: Huber, M., Hutchings P., *BVA Case Study #2, RAC 1: The Carl Wieman Science Education Initiative in Earth, Ocean and Atmospheric Sciences, University of British Columbia*, Report, Fall 2014.
- **Contributions to scholarly work:** Publications and white papers arising from the SEI were carefully catalogued on the SEI website (see http://www.cwsei.ubc.ca/SEI_research/index.html). This collection demonstrated the contribution of the SEI to the scholarly literature.
- **Career trajectories for DBESs:** As possible, the career trajectories of DBESs were tracked; these showed that DBESs were successful as a group in finding post-SEI employment.
- **Inspiration of other change programs:** An attempt has also been made to track the number of institutions who have adopted the SEI model. These SEI-inspired programs are a hallmark of the transportability of the model.

For more detail about the outcomes in the SEI, please see *Improving How Universities Teach Science: Lessons from the Science Education Initiative* (Wieman, 2017).