Innovations in Science Map, Assessment & Report Technologies

I-SMART

I-SMART Project Brief: Designing an Actionable Score-Reporting Dashboard for Teachers

CAST

Preferred Citation: CAST. (2022, January). Designing an actionable score-reporting dashboard for teachers (I-SMART Project Brief No. 22-1). Wakefield, MA. Retrieved from https://ismart.works/resources.

I-SMART is a collaboration among five states (MD, MO, NJ, NY, OK), the University of Kansas Accessible Teaching, Learning, and Assessment Systems (ATLAS), CAST, and BYC Consulting.

The contents of this brief were developed under a grant from the Department of Education. However, those contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.

Introduction

I-SMART is a research and development project that develops learning map model-based assessments and reporting tools to improve achievement of multidimensional science standards for students with and without disabilities. One of I-SMART's goals was to design and evaluate a prototype reporting dashboard for teachers to support score interpretation and formative assessment.

Key Points

- I-SMART researchers worked with teachers in partner states to conduct a needs assessment and codesign an actionable score-reporting dashboard prototype to support formative assessment by leveraging learning map models.
- Although teachers expressed initial skepticism about use of learning map models, they found that with scaffolding, incorporation of maps were valuable for understanding student progress and supporting instructional decision-making.
- Application of Universal Design for Learning (UDL) principles resulted in a flexible dashboard design that supports teachers' varied approaches to data interpretation and instructional planning.
- A usability study of the codesigned dashboard prototype was conducted during the summer of 2020 to further evaluate its utility in supporting testlet score interpretation and formative assessment.

Need for Clear and Actionable Score Reporting

Student results from I-SMART testlets can support both summative and formative purposes. Of the two, formative assessment has the potential for more significant immediate impact on student learning and is the more challenging to implement.

> Formative assessment is a planned, ongoing process used by all students and teachers during learning and teaching to elicit and use evidence of student learning to improve student understanding of intended disciplinary learning outcomes and support students to become more self-directed learners. (Formative Assessment for Students and Teachers [FAST] State Collaborative on Assessment and Student Standards [CCSSO SCASS; 2018]).

To the extent that results from instructionally embedded assessments—such as I-SMART testlets—can support formative assessment practices in the classroom, they must be made available *clearly* and *actionably*.

Clarity

Results from I-SMART testlets could occur frequently and be rich with information; without clarity, teachers are likely to feel overwhelmed by the data. Clarity can be

addressed by applying UDL framework in much the same way as it has been applied to I-SMART testlet development: by providing flexible options. Given the variety of approaches that teachers bring to score interpretation and instructional planning, one-size-fits-all approaches rarely succeed. UDL provides a framework for considering a diversity of approaches and offers a design strategy to promote clarity.

Actionability

To the extent that information about students' knowledge, skills, and understandings (KSUs) can shape subsequent instruction, teachers require a grounded pedagogical framework with supports for data-driven decision-making. Actionability may be addressed by leveraging the learning map models used to develop I-SMART testlets, which specify options for evaluating students' achievement of Next Generation Science Standards (NGSS). By providing access to the pedagogical framework supplied by learning map models—and the option to overlay student testlet results atop the models—the dashboard allows teachers to identify student-specific instructional pathways and alternatives. As this further increases the complexity of the dashboard, we again rely on UDL to help ensure clarity and usability. In addition, since formative assessment must directly involve students, an effective teacher dashboard must allow sharing of interactions and information with students, as well as other key stakeholders, including parents, guardians, and other educators.

In order to design a prototype score-reporting dashboard that meets these design criteria and that can be evaluated for usability and utility, the I-SMART team conducted a needs assessment and then codesigned the dashboard with educators from I-SMART partner states.

Needs Assessment

Our design process began with an initial needs assessment through a series of four focus groups with a total of 21 teachers from I-SMART partner states. Based on findings from the first and second focus groups, we developed initial dashboard design sketches which we shared during the third and fourth focus groups. Collectively, the focus groups provided insights and evidence reflecting the needs and wants of educators using I-SMART results formatively. The most salient findings of the needs assessment were:

1. Teachers need to know what students have and have not mastered.
2. Teachers need support in understanding the standards on which students are being evaluated.
3. Teachers want dashboards with clear overviews of each student's progress.
4. Teachers have mixed reactions to using learning map models in interpreting student testlet results; some think they will be useful for instructional decision-making, and others find them overwhelmingly hard to use.

Our synthesis of these data informed the prioritization of new feature development for a second iteration of the dashboard design, which seeded subsequent codesign efforts.

Codesign Process

We convened a cadre of 11 educators from I-SMART partner states to codesign the score-reporting dashboard iteratively and collaboratively with our design team. In this way, we collected practitioner feedback and recommendations at each stage of the dashboard design process and responded to their guidance and concerns through rapid prototyping and retesting. The resulting prototype design consists of the following four functional areas:

1. The **Student Overview** area (Figure 1) provides an at-a-glance view of individual students' instructional status and testlet performance across multiple Essential Elements (EEs) and within individual EEs. As with the Class Overview area (described below), it uses a card layout to visually distinguish EEs and was designed to provide a familiar and straightforward layout as a "gateway" into more detailed information provided by Learning Map Model and Essential Element List views (described below). It also included a simplified map preview that pares down the complete set of KSU nodes within a learning map model neighborhood to only those included within testlets.

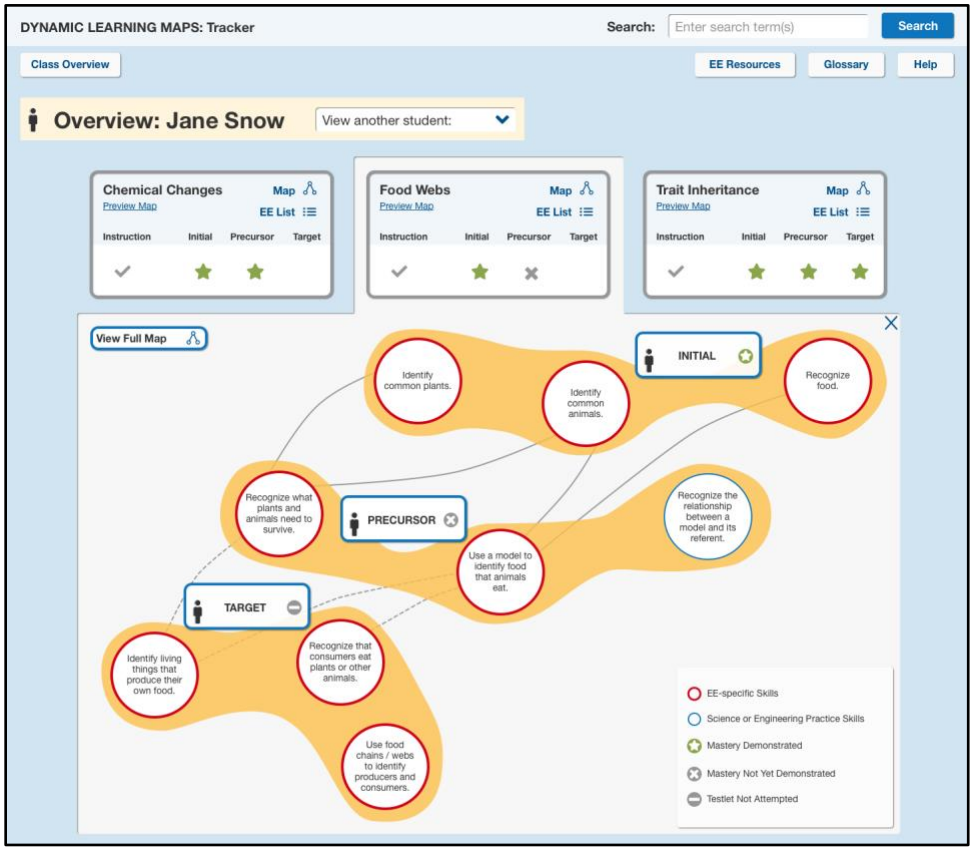

Figure 1. The Student Overview area, showing an individual student's instructional status and testlet performance across EEs, and a map preview depicting a simplified learning map model for one EE.

2. The **Class Overview** area allows teachers to view testlet results for multiple students simultaneously. While we initially envisioned the dashboard as supporting single student-data views only, teachers considered viewing of aggregate data across multiple students essential to help spot patterns among student performance, such as when multiple students all struggled with one concept, and to plan instruction accordingly. The Class Overview became the landing page for the dashboard—cadre members described it as a "jumping off point"—and provides the dashboard with a home base that fulfils the need for a navigational fulcrum.
3. The **Essential Element List** provides teachers with access to EE content, including detailed node-level KSUs, as a backdrop for interpreting student testlet results. While the linearity of a list format cannot effectively depict the interconnectivity that learning map models offer, it can assist teachers in building familiarity and comfort with the map view. To further decrease complexity on the page and highlight salient information, teachers can expand and collapse the node observations.
4. The **Learning Map Model** area (Figure 2) allows teachers to view student- and class-level testlet results superimposed on learning map models. Teachers initially expressed confusion about using learning map models, noting that it "didn't feel user-friendly" and "seemed messy." As such, our design iterations focused both on making their use intuitive and in allowing teachers to easily toggle between map views and the more traditional data views. For example, teachers can call up detailed score reports within the map view and directly connect student performance with the content being assessed. In this way, we can scaffold teachers' introduction to and use of learning map models. In the end, teachers appreciated the autonomy and control the maps provided them with respect to the pathways and corresponding content they chose to cover with their students.

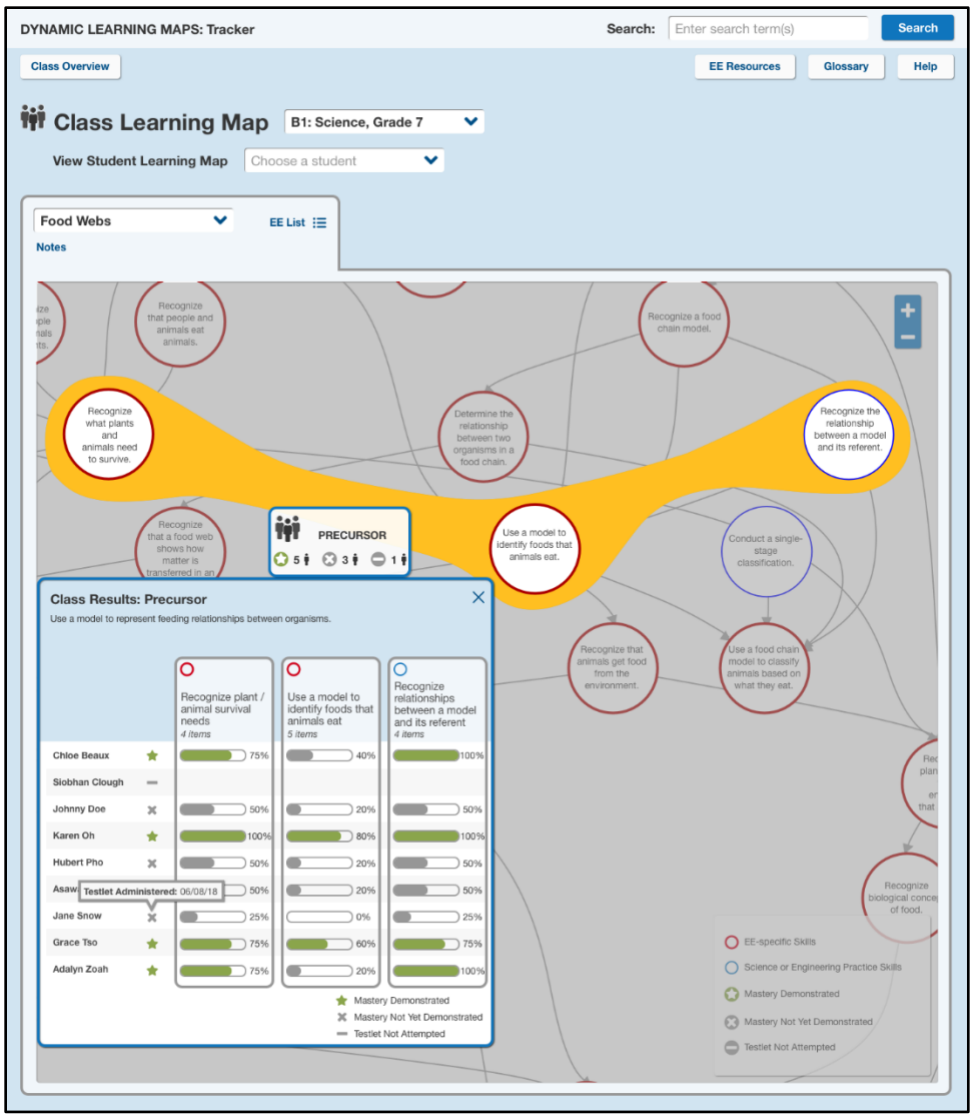

Figure 2. The Learning Map Model area, showing aggregate student testlet results superimposed on a view of the entire learning map model neighborhood in which testlet nodes are highlighted (in yellow).

Usability and Utility Study

During the summer of 2020, I-SMART researchers conducted a usability and utility study of the dashboard with teachers from partner states. The results of the focus group are described in a separate report. The study explores the extent to which our dashboard design approach holds promise for supporting teachers in interpreting and making use of science test score results during formative assessment.

Further Information

- CAST. (2018). *Universal design for learning guidelines version 2.2*. https://udlguidelines.cast.org
- Dolan, R., Gilbert, S., Ducharme, K., Wojcik, C., & Posey, A., (2022). I-*SMART Goal 3 Technical Report: Teacher Dashboard Usability and Utility Study* (Technical Report). CAST: Wakefield, MA. Retrieved from https://ismart.works/sites/default/files/documents/Publications/I-SMART_Dashboard_Report.pdf
- Dolan, R., Wojcik, C., Ducharme, K., & Starr, E., (2020) Innovations in Science Map, Assessment, and Report Technologies (I-SMART) Goal 3: Teacher dashboard design (Technical Report). CAST. Retrieved from https://ismart.works/sites/default/files/documents/Publications/I-SMART_Goal_3%20CAST_Technical_Report_FINAL.pdf
- State Collaborative on Assessment and Student Standards. (2018). *Revising the definition of formative assessment*. CCSSO. https://ccsso.org/resource-library/revising-definition-formative-assessment