Improving the Effectiveness of Digital Educational Tools in Increasing Student Achievement and Reducing Achievement Gaps

https://my.vanderbilt.edu/digitaled/

Study findings: Classroom observation ratings of student 1:1 laptop use compared to student tablet (Kindle) use in Dallas Independent School District, Spring 2015 and 2016

August 30, 2016

In the Spring of 2015, Dallas Independent School District (DISD) delivered new 1:1 instructional devices (laptops) to students in elementary, middle and high school grades on 33 campuses as part of the DISD Imagine 2020 initiative to increase digital instruction and blended learning opportunities across the school district. The 1:1 laptops were used primarily in 3rd-5th grade classrooms (on 23 of the 33 campuses) during the day, as well as on six middle school campuses and four high school campuses. During the Spring of 2015, our research team conducted 74 observations of classroom/student use of these instructional devices.

In the 2014-15 school year, the Jiv Daya Foundation began introducing tablets (Kindles) to students in elementary grades, and in 2016, the distribution of the tablets expanded to include 3rd, 4th and 5th grade students in seven elementary schools (115 classrooms). Our research team began working with the Jiv Daya Foundation in the Spring of 2016 and conducted 102 observations of DISD classroom/student use of the tablets.

The results presented here are a simple summary of observation rating data collected using the observation instrument (see a summary of the dimensions rated in the Appendix; the full instrument can be viewed at our study website: https://my.vanderbilt.edu/digitaled/). We also present some descriptive analysis of the functionality of the devices, student time off task, and live instructor engagement in the observations.

Descriptive summary of analyses comparing student 1:1 laptop and tablet use

The 1:1 laptops were described as functional for students in 90% of the observations in the Spring of 2015. This compares very similarly to the functionality of the tablets used in Spring 2016 (87% were functional). In terms of technology access, the tablets were rated more highly—92% rated 3 or 4 vs. 86% of 1:1 laptops rated 3 or 4 last year (see the results graphically below).
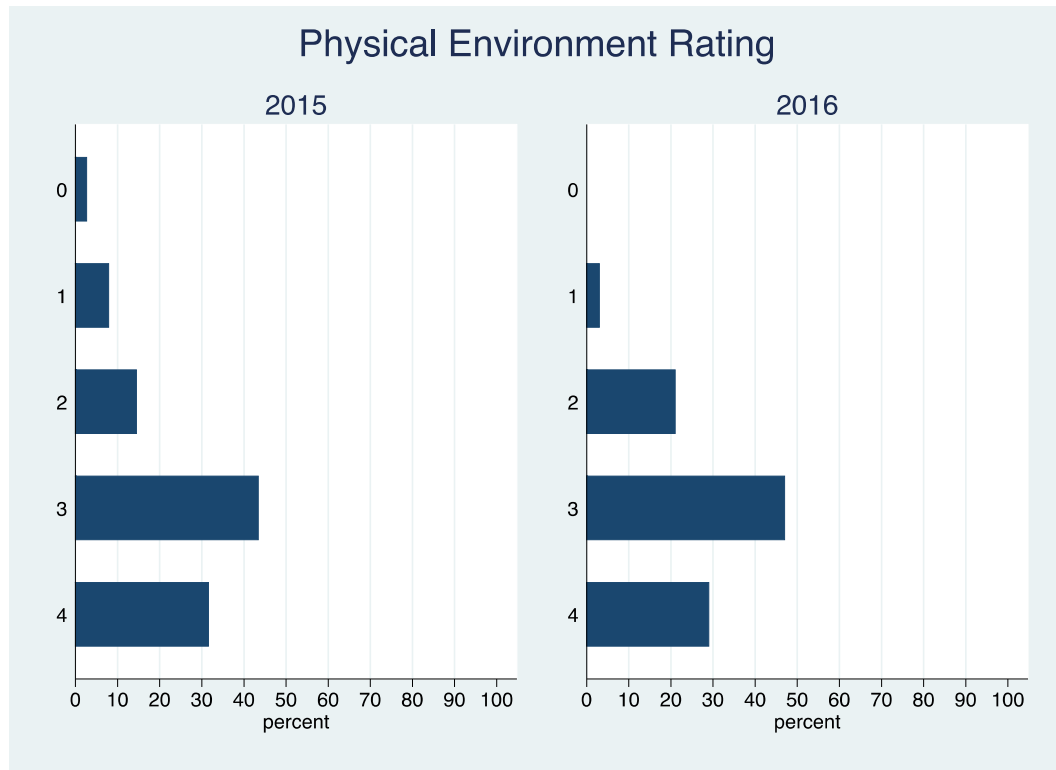
On average, students using the tablets were off task 3.2 minutes (or 11.9% of the total time observed); approximately one quarter of students were off task 5 or more minutes in the sessions observed. Time lost due to problems with the functionality of the tablets was 2 minutes on average (7% of the total time observed). This compares to an average of 6.4 minute off task for students using the 1:1 laptops in DISD in Spring 2015 (or 14% of the time observed), and 3.66 minutes (8.5% of time observed) lost due to problems with the functionality of the laptops.

There was some live instructor driven instruction in 76.5% of the observations of tablet use in the DISD classrooms observed in the Spring of 2016. In 20.6% of the observations, the instructor interacted with students face-to-face in their use of the technology. The comparable percentages for students using the 1:1 laptops last year were 76.1% and 36.3%, respectively.

In terms of the other dimensions of digital tool use rated in the observations and shown below, in general, the tablets were more highly rated than the 1:1 laptops, and there were several dimensions for which the researcher ratings of tablet use vs. 1:1 laptop use differed more starkly. In particular, interactions between students, instructors and the devices, student engagement, and instructor engagement were all rated significantly more highly in student tablet use (compared with students using the 1:1 laptops). Although these analyses do not adjust for student grade or other characteristics of students using the devices, in the Spring of 2015, the large majority of students observed using 1:1 laptops were 3rd, 4th or 5th grade students, as in the Spring of 2016 observation of tablet use.

These findings are salient given that the average cost of the tablets is about 5% of the cost per laptop per student. In a recent teacher training meeting in DISD (August 2015), teachers offered commentary on the relative advantages and disadvantages of the two types of devices for elementary student use. They commented on the greater ease of handling of the tablets by younger students, including in moving around the classroom. Alternatively, they noted that the smaller size of the tablets makes typing somewhat more difficult, and there is also less storage space and processing power on the tablets. Although they also pointed out that there are more applications available on the 1:1 laptops and more capabilities, this was not necessarily seen as an advantage in terms of students staying on task in classwork with them.

Summary of Observation Ratings

Physical Environment Rating

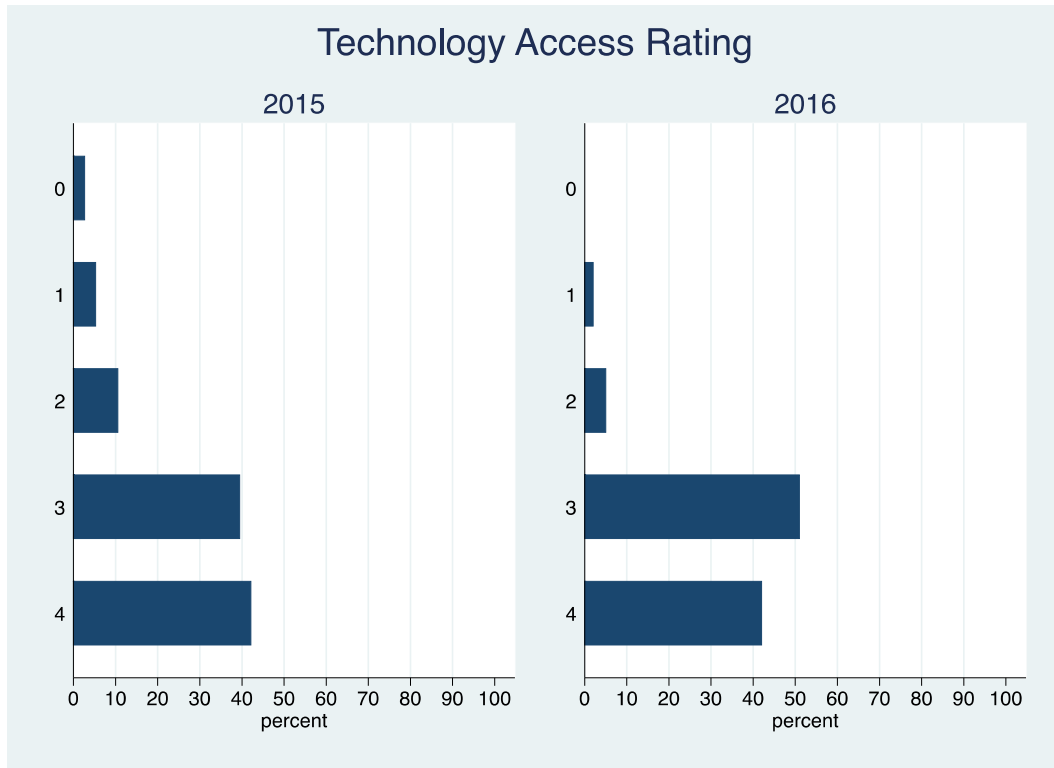N=176; laptops were used in 2015, tablets in 2016

[4] Students have full access to the instructional setting throughout the session.
[3] The physical environment presents occasional or partial enhancements to quality learning opportunities
[2] The physical environment does not get in the way of quality learning opportunities, but does not contribute to them.
[1] The physical environment presents occasional or partial barriers to quality learning opportunities.
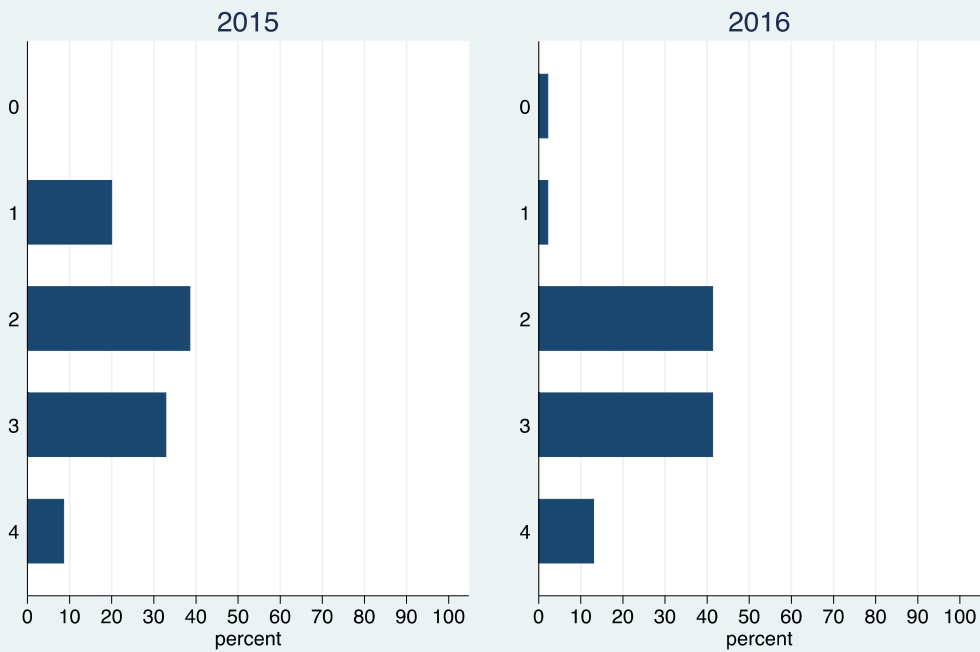[0] The physical environment is a significant barrier to quality learning opportunities.

Technology Access Rating

2015

2016

N=176; laptops were used in 2015, tablets in 2016

[4] Students have full access to the instructional setting throughout the session.

[3] Students have access to the instructional setting throughout most of the session.

[2] Students have access to the instructional setting throughout some the session.

[1] Students had multiple problems accessing the instructional setting throughout the session.

[0] No students were able to access the instructional setting.

Curricular Content and Structure Rating

N=67; laptops were used in 2015, tablets in 2016

[4] Curricular content and structure observed to create quality learning opportunities throughout the session.
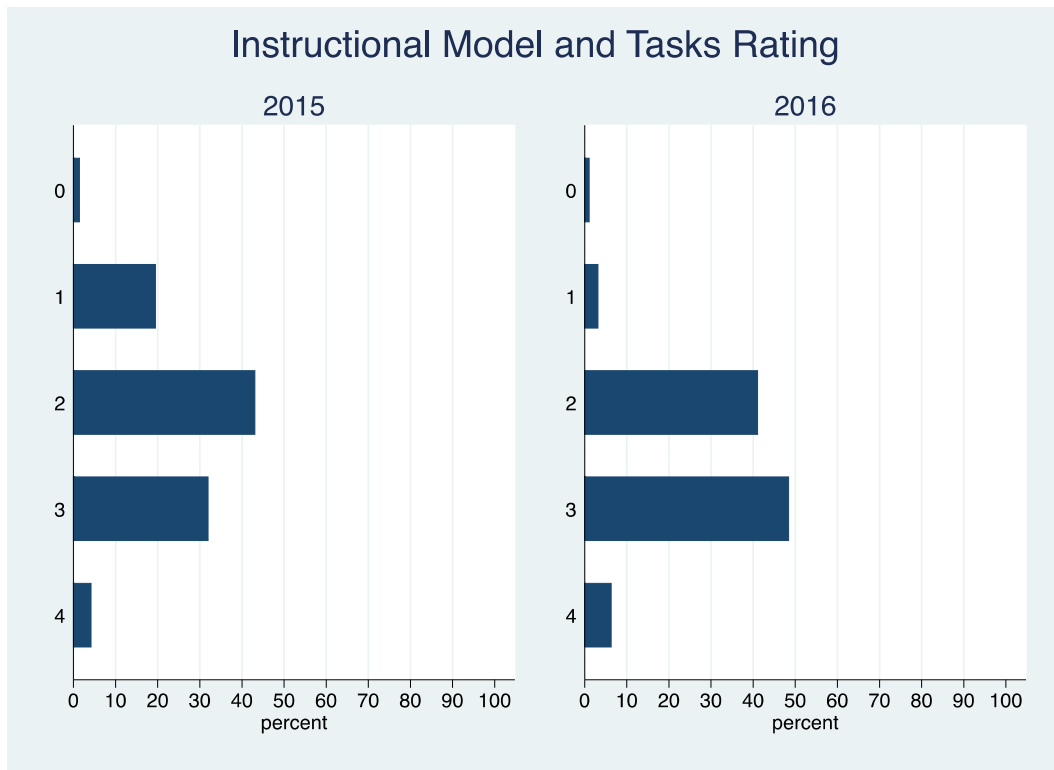
[3] Curricular content or structure observed to create quality learning opportunities throughout the session

[2] Curricular content or structure observed to create quality learning opportunities occasionally during the session.

[1] Neither curricular content nor structure observed to create or inhibit quality learning opportunities.
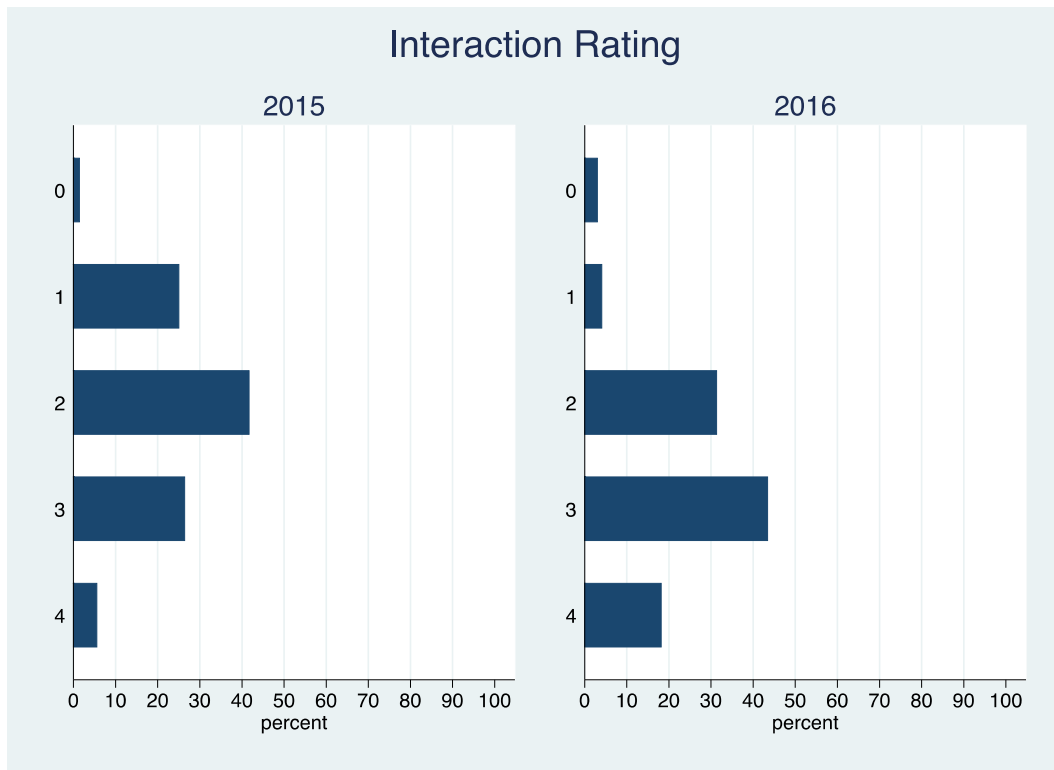
[0] Curricular content or structure inhibit quality learning opportunities throughout the session.

Notes on what is rated in this dimension: content and skill focus; clearly stated learning objectives, clear sequence and structure, level of rigor or intellectual challenge it presents to students, relevance to students' lives (e.g. culturally relevant, own interests and experiences, community context). *If content could not be observed on the device, this dimension was not rated by the observer.*
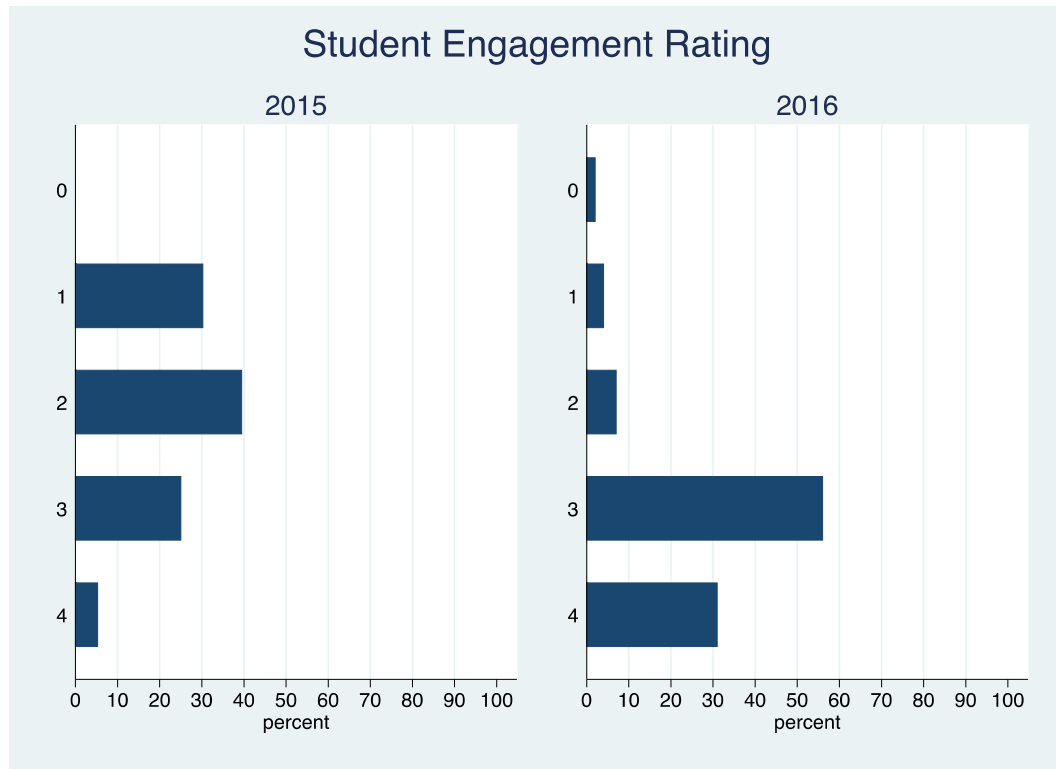
Instructional Model and Tasks Rating

2015

2016

N=170; laptops were used in 2015, tablets in 2016

[4] The instructional model and tasks consistently facilitate quality learning opportunities and adapts to observed (or known) student needs.

[3] The instructional model and tasks mostly facilitate quality learning opportunities and adapts to observed (or known) student needs.

[2] The instructional model and tasks facilitate some quality learning opportunities but do not adapt to observed (or known) student needs.

[1] The instructional model and tasks do not facilitate quality learning opportunities and do not adapt to observed (or known) student needs.

[0] The instructional model and tasks inhibit quality learning opportunities and do not adapt to observed (or known) student needs.
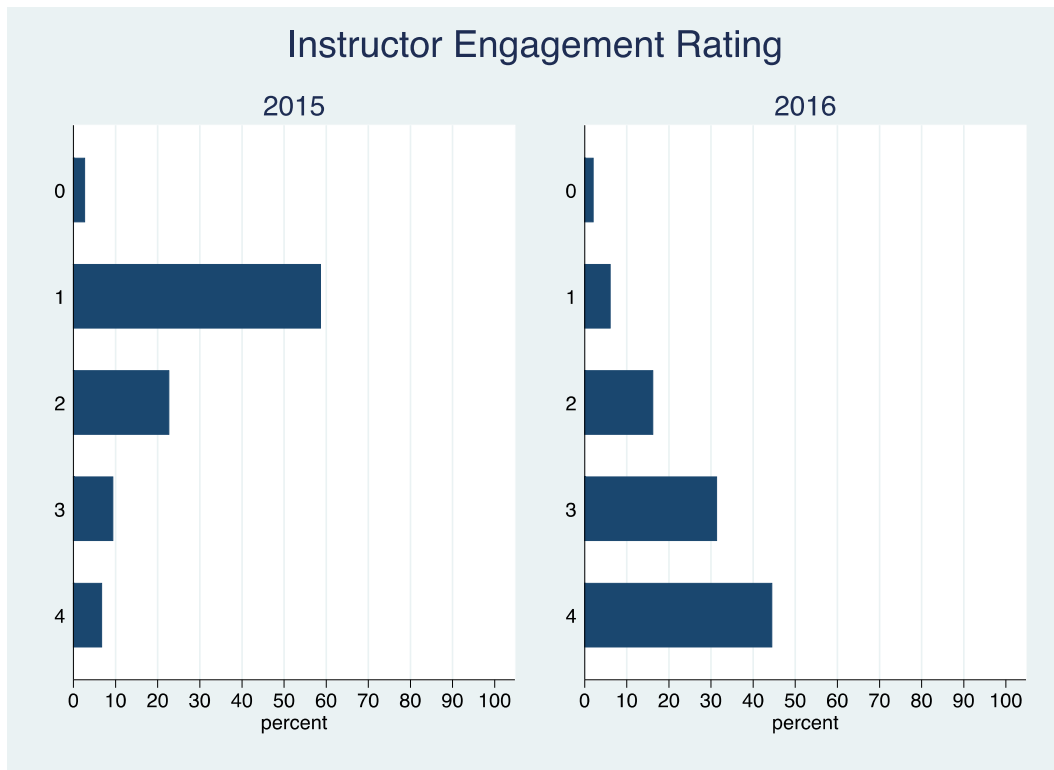
Interaction Rating

N=175; laptops were used in 2015, tablets in 2016

[4] Instructors and resources have constant, constructive interaction with students.
[3] Instructors and resources mostly have constant, constructive interaction with students.
[2] Instructors or resources have some constructive interaction with students.
[1] Instructors and resources have no constructive interaction with students.
[0] Students, instructors or resources have destructive interaction with one another.

Student Engagement Rating

2015 | 2016

N=175; laptops were used in 2015, tablets in 2016

[4] Students have full engagement in instruction.
[3] Students are engaged in most of the instruction.
[2] Students are engaged in some of the instruction.
[1] Students rarely are engaged in instruction.
[0] Students are not engaged in instruction.

Instructor Engagement Rating

N=175; laptops were used in 2015, tablets in 2016

[4] All instructors have full engagement in instruction.
[3] Instructors are engaged in most of the instruction.
[2] Instructors are engaged in some of the instruction.
[1] Instructors rarely are engaged in instruction.
[0] Instructors are not engaged in instruction.

Appendix: Dimensions of digital and blended instruction rated in observations

The following dimensions of digital and blended instruction and the settings in which they are used are rated by the observation instrument we employ in this study.

- *Physical environment*: How and where students access the instructional setting, including the technological setting and any associated limitations, and who else in the same physical environment as the student could assist with technological problems and support learning;
- *Technology and digital tools:* How students access instruction, including internet connectivity, hardware and software in use, and the safety, operability and accessibility of the technology;
- *Curricular content and structure*: Content and skill focus, who developed it and where it is located (e.g., software loaded onto a tablet, paper workbook), stated learning objectives, sequence and structure, level of rigor or intellectual challenge, and ability to meet and adapt curricular content to student needs;
- *Instructional model and tasks*: Role of instructor and software in instruction (what drives instruction); purpose or target of instruction; student/instructor ratio and grouping patterns, multimodal instruction; order of thinking required and application of technology in instructional tasks, and ability to meet/adapt instructional model and tasks to student needs;
- *Interaction:* How much interaction with a live person, and does the technology affect the ability of the instructor or student to positively interact with one another and the instructional resources?
- *Digital citizenship*: Are students using the technology as intended by the instructor and/or instructional program?
- *Student engagement:* Overall student engagement levels, level of student self-regulation and persistence, and level of community within the instructional setting;
- *Instructor engagement:* Overall instructor engagement levels (passive or active) and instructor efforts to encourage engagement;
- *Alignment*: Alignment of instruction and curriculum to state or district standards and to other instructional settings, and alignment of instruction and curriculum to stated learning objectives (including within the session and between in-person and digital instruction);
- *Assessment/feedback*: Who develops and manages the assessment (instructor, provider via software), structure, and whether it is individualized to student learning and relevant to stated learning goals.

Ratings of the ten core elements of digital and blended instruction listed above are on a 0-4 (or 5-point) scale. The instrument also records narrative comments and vignettes, total instructional time and total time on task; total time a student interacts with a human instructor; whether the format facilitates live interaction between instructors and students around instructional tasks, and the functionality/operability of the technology or device. The instrument is designed to capture instructional opportunities and the use of digital tools in fully digital, face-to-face and blended settings, as well as for various units of analysis within an instructional setting (i.e., individual student, small group of students, or whole class).