Research Findings from the StEP Evaluation

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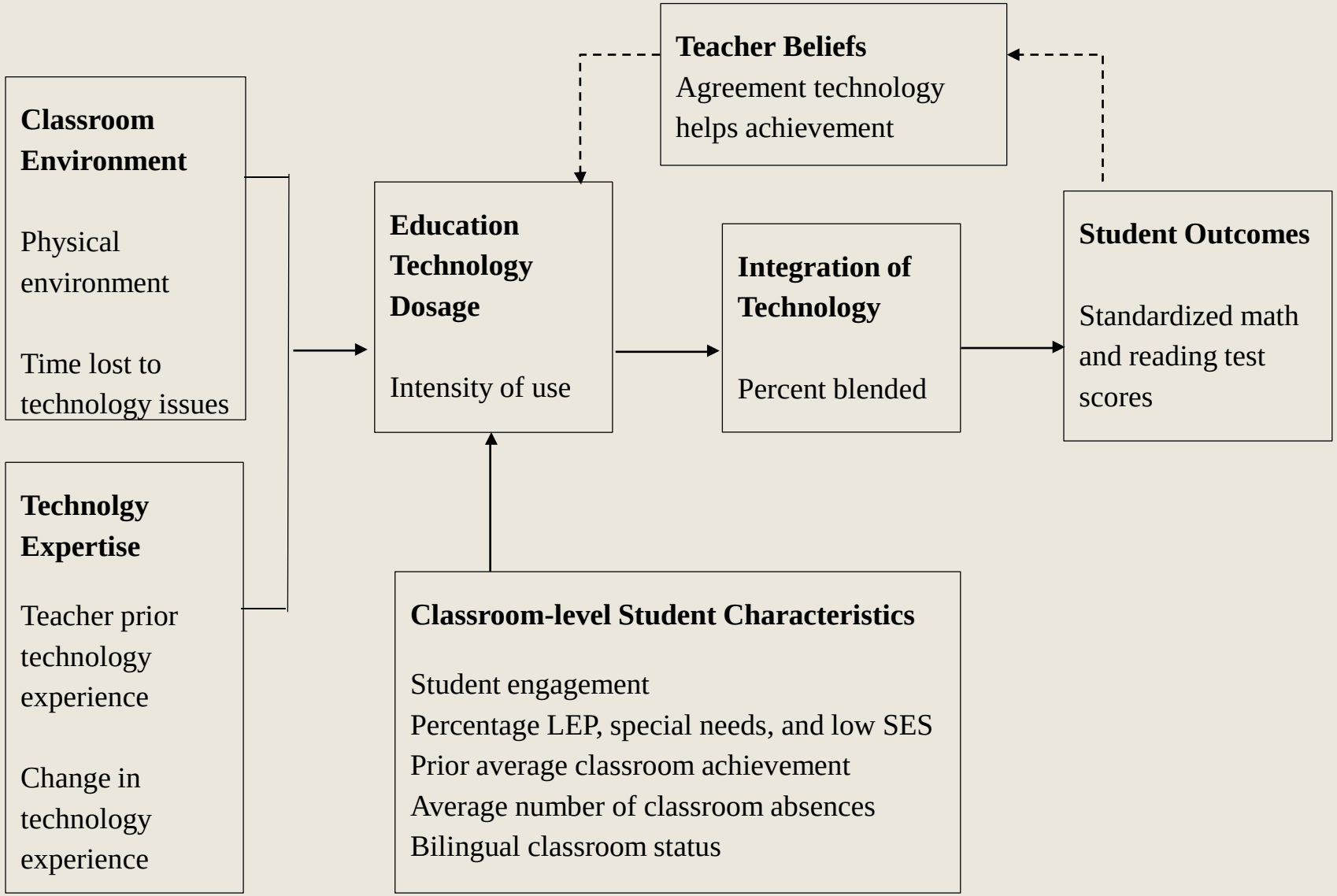
Evaluation of StEP program implementation, school years 2015-16 and 2016-17

- 1:1 tablets (Kindles) distributed to 3rd – 5th grade students in Dallas ISD
  - *Seven elementary schools in Spring 2016 (six included in classroom observations)*
  - *Six Bryan Adams Feeder elementary schools in Fall and Spring, 2016-17*
- Evaluation data sources
  - *Classroom observations (n=102, Spring 2016; n=184, Fall 2016 and Spring 2017)*
  - *Teacher and student surveys (n for linked Spring 2016 sample=1,272 students)*
  - *DISD administrative data (currently available for 2015-16 school year)*
- Sample size for fully linked, Spring 2016 data analysis: 818 students
  - *324 students were in classrooms not observed and 130 students had no prior year achievement data*

StEP evaluation analysis

- Descriptive analysis of StEP program implementation using observation data and teacher and student reports
- Regression analysis of StEP program effectiveness and mediating factors using Spring 2016 linked data:
  - *To what extent is the use of educational technology associated with improved student outcomes?*
  - *What role does instructor capacity play in the use of educational technology in the classroom?*
  - *How do teacher beliefs influence how and to what extent technology is integrated into classroom instruction?*

Logic model for estimating the association between education technology use and student outcomes



Tablet use in the classroom

- Kindles were functional for students in 85% of observations in Spring 2016 and 87% of observations in Fall 2016/Spring 2017
  - *Time lost due to problems with functionality = 2 minutes on average in both Spring 2016 and Fall 2016/Spring 2017 (6-7% of total time observed)*
  - *Students were off task 3.2 minutes on average (11.9% of the total time observed) in Spring 2016 and 6.1 minutes (16.0% of total time observed) in Fall 2016/Spring 2017*
- Teacher intensity of tablet use (or "dosage") ranged from 0 hours per week to 30-40 or more minutes per day for 4-5 days on average per week
  - *Dosage measure [0-11] generated from teacher-reported measures of minutes per day and days per week of use*
  - *On average, teachers used the tablets for about 60 minutes per week*

Methods for estimating the relationship between technology use and student outcomes

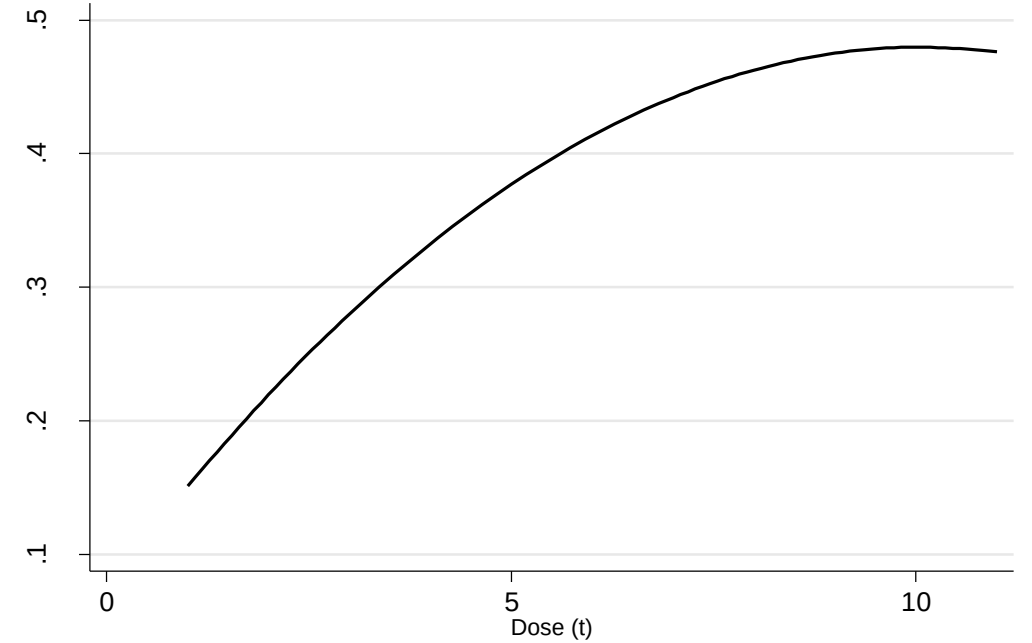
- Ordinary least squares (OLS) dose-response regression used to examine the association between student outcomes (standardized math and reading test scores) and the intensity of tablet use and type of use in the Spring 2016 pilot schools
  - *Controlling for prior year academic achievement and other student characteristics: percentage of low-income students, students identified as Limited English Proficient (LEP), students receiving special education services, the average number of classroom absences, and whether the classroom provided bilingual instruction*
  - *Examining the role of student engagement, teacher beliefs, percent of time lost to technology issues, blended instruction and teacher technology expertise*

Findings on the relationship between Kindle use and student achievement

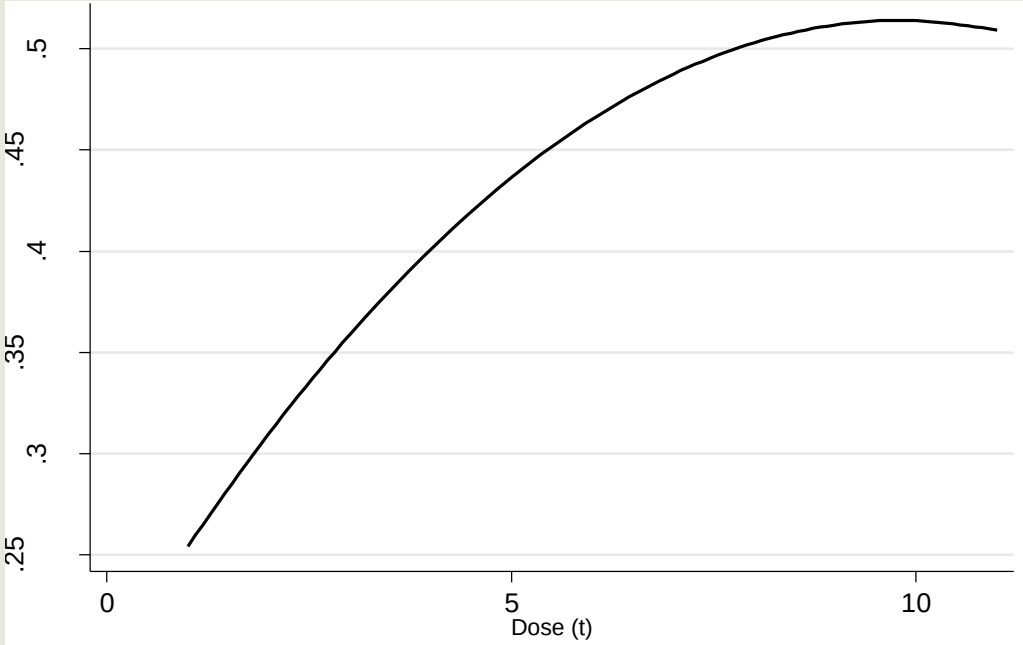
- Students achieved higher math and reading scores in classrooms using tablets (controlling for prior year scores and instructor capacity)
  - *Students taught in classrooms using tablets scored 0.40 standard deviations (SE = 0.08) higher in math and 0.45 standard deviations (SE = 0.08) higher in reading*
  - *Average treatment effects correspond to a 47 percent reduction in the math achievement gap by free/reduced lunch status and a 62 percent reduction in the reading achievement gap based on fourth grade NAEP scores*
  - *Students in classrooms with greater tablet usage experienced higher achievement gains, with some evidence that students from historically lower-achieving populations benefited the most*

Relationship between *intensity* of Kindle use and student achievement

Math

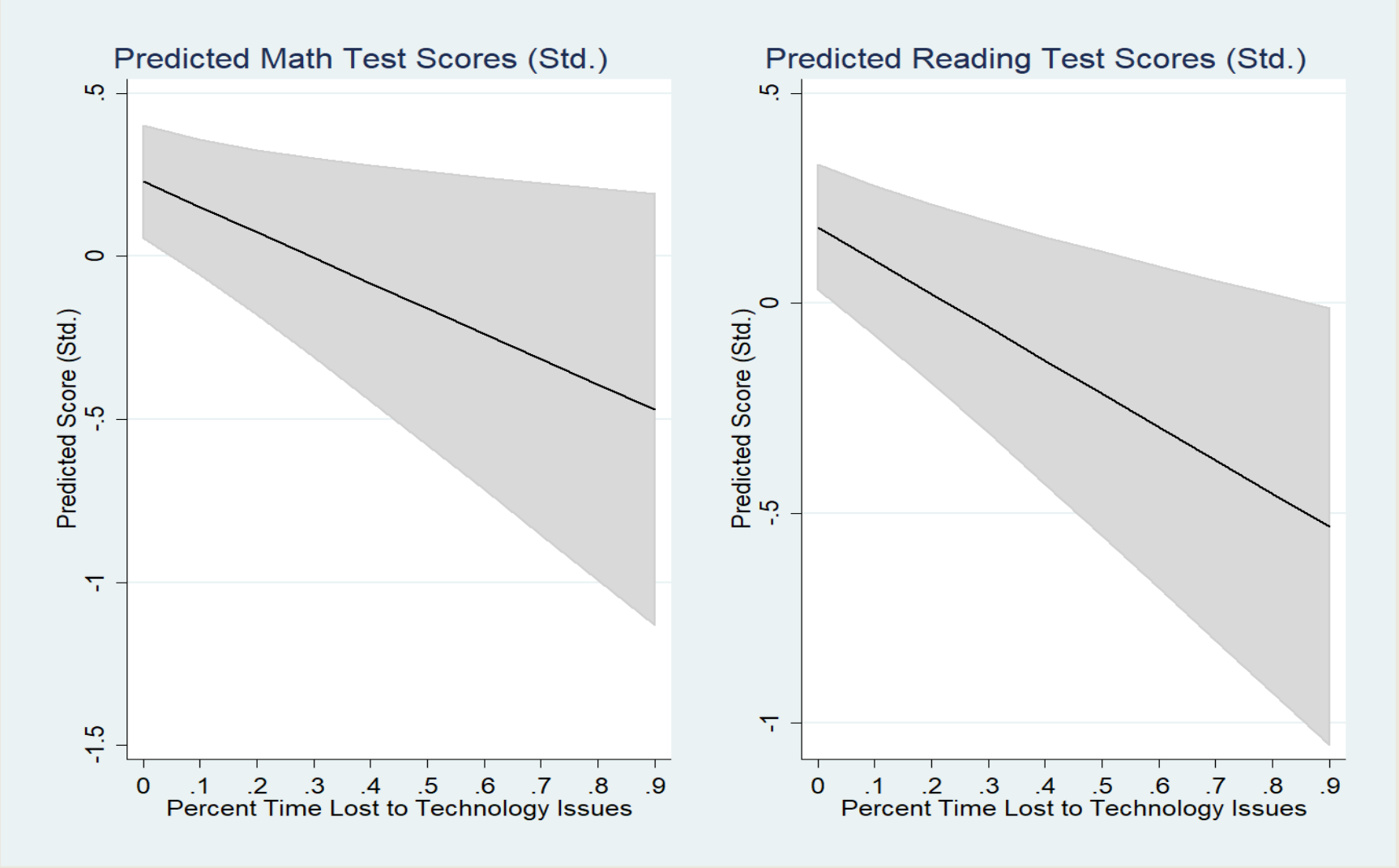


Reading



Average treatment effects for the highest intensity classrooms were approximately 0.49 s.d. in math and 0.51 s.d. in reading, correspondng with a 52 percent reduction in the math achievement gap and a 65 percent reduction in the reading achievement gap .

Percent of time lost to technical issues was negatively associated with student achievement



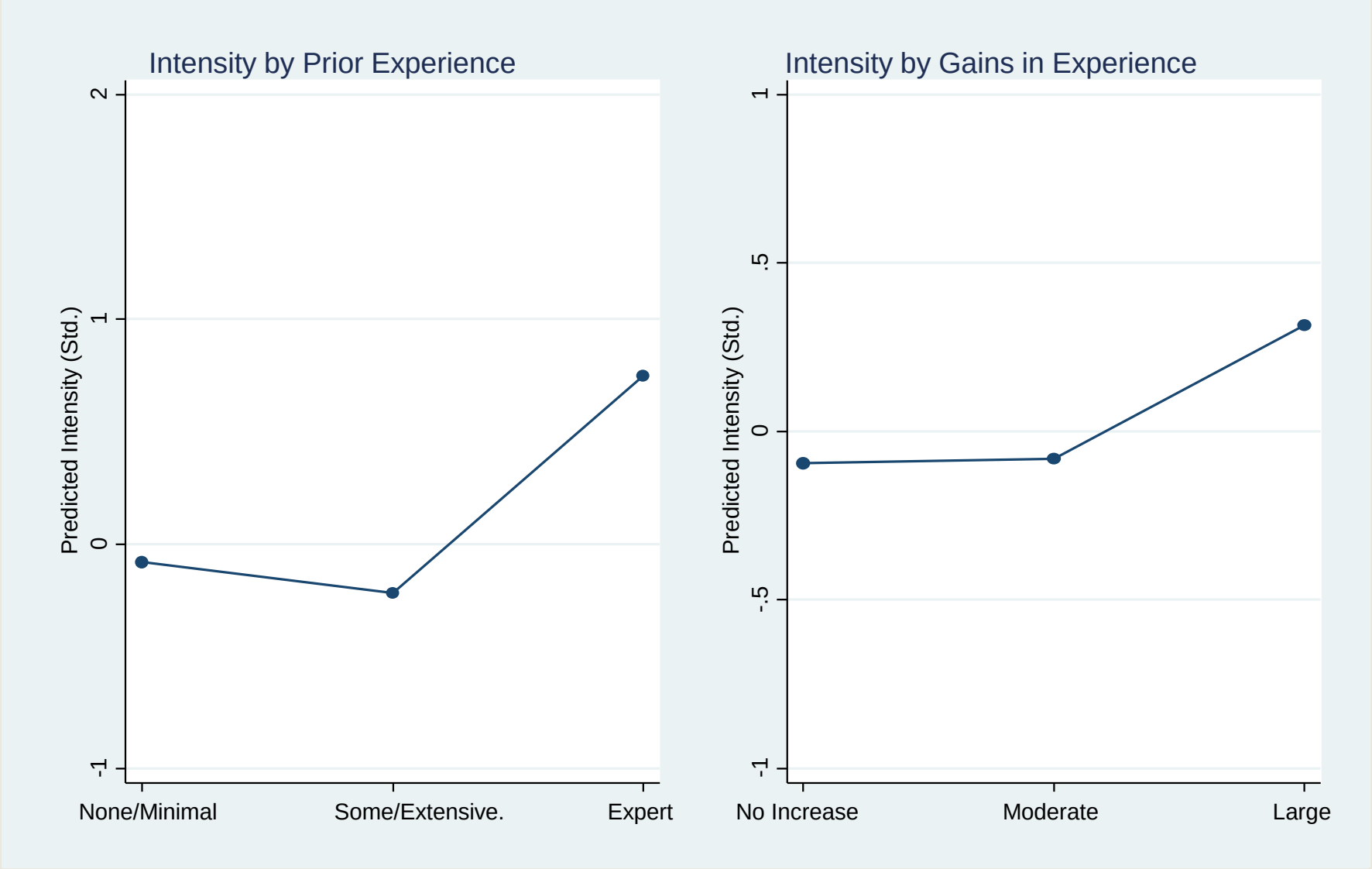
Example of an observation with low-rated technology access

- *Students were to complete an assignment using the Kindle, but there were technical issues, classroom management issues, etc., and the maximum amount of time that any student in the class was working was five minutes out of thirty. One student didn't have a device at all the entire time we were there. The instructor was the only person to sort through technical problems and the classroom was so chaotic that he was constantly turning around to deal with another problem. He told us when we walked in that this class is particularly disrespectful of him and that he has a lot of difficulties with them and wanted to know if we could reschedule. The language barrier also contributed to me not knowing how much of the problems were due to instructional/technical issues vs. classroom management. All connections are wireless. Kindles were the hardware, but it was unclear what software was involved. Technology is safe, operability of the devices wasn't in question as much as logging into the software. One student didn't have a Kindle the entire time and was left to sit by himself the entire time.*

Other regression analysis findings

- Greater intensity of technology use was associated with higher student engagement, and greater student engagement is positively associated with student math and reading achievement
  - *Students in classrooms where we observed blended learning were 40% more likely to be engaged, on average*
  - *Teachers' prior technology experience and increases in self-reported expertise over the year were positively associated with student engagement*
- Teachers who rated themselves expert technology users at the beginning of the school year and who strongly agreed that technology helped student learning used the Kindles more
- Student outcomes were associated with both teachers' capacity to enhance classroom environment and their technology expertise, particularly teacher ability to minimize technical issues during instruction

Intensity of Kindle Use by Teacher Technology Experience



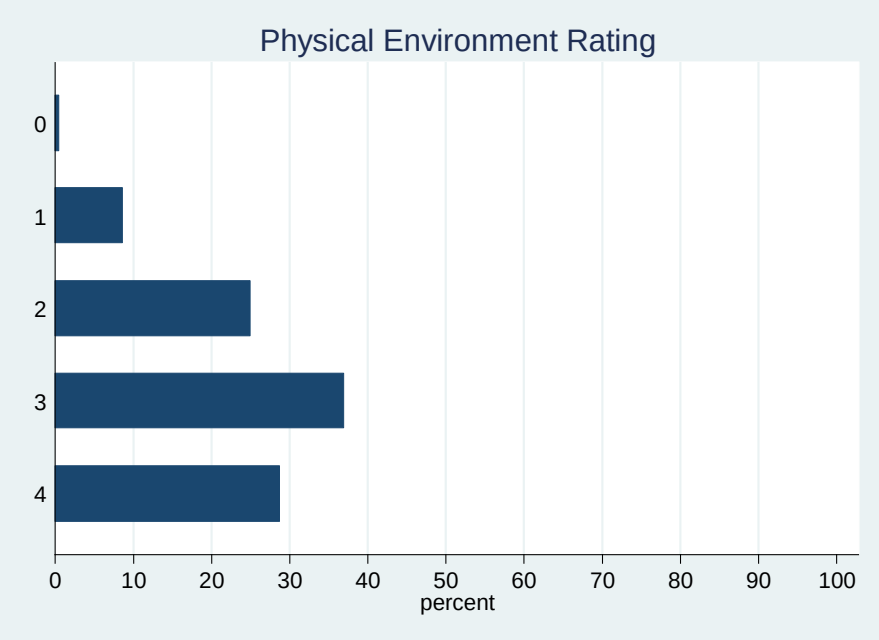
Comparative analysis of classroom observation data on tablet use in StEP

- Standardized, well-tested observation instrument capturing 10 core elements of digital and blended instruction, rated on a 0-4 scale
  - *Instrument also records narrative comments, total instructional time and time on task, time students interact with live instructor, functionality/operability of technology, etc.*
- Comparative analysis shows differences in ratings of observed classroom use of tablets (between Spring 2016 and Fall 2016/Spring 2017) on the following elements:
  - *Improvements **(instructor-facilitated)** in the implementation of curricular content and structure, instructional model and tasks and the use of assessment for creating quality learning opportunities with technology*
  - *Improvements in student digital citizenship (use of technology as intended)*

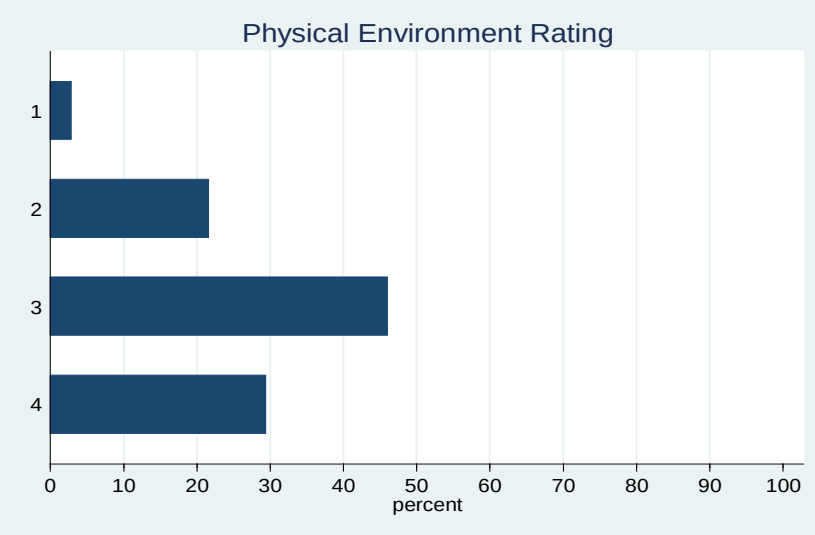
Physical Environment Observation Ratings

[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.

Academic year 2016-17 (n=184)



Spring 2016 (n=102)

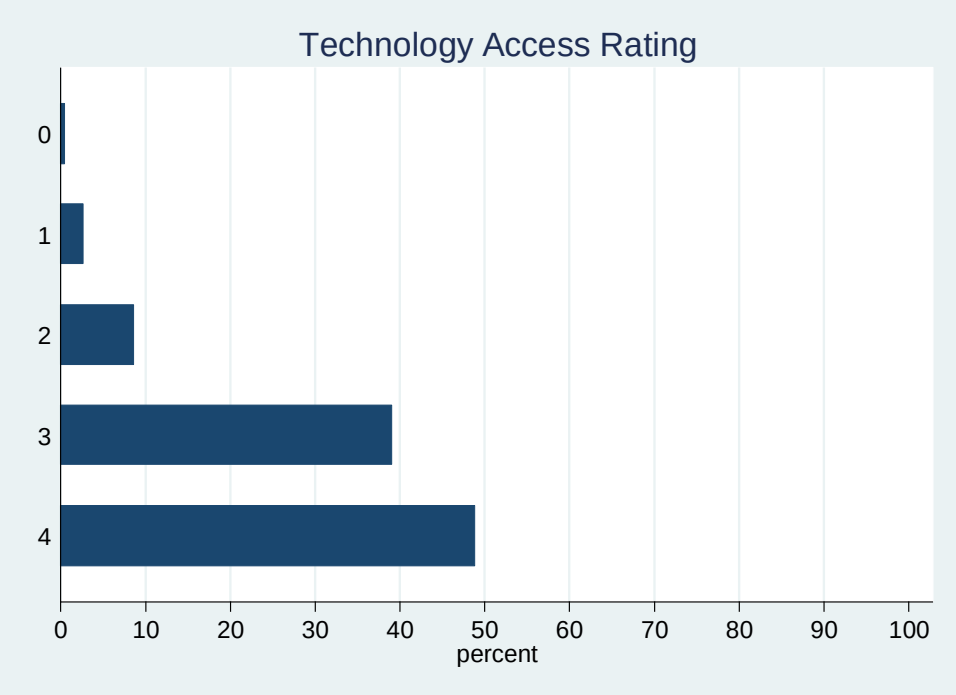


Differences in ratings between years are not statistically significant (allowing 5% Type I error).

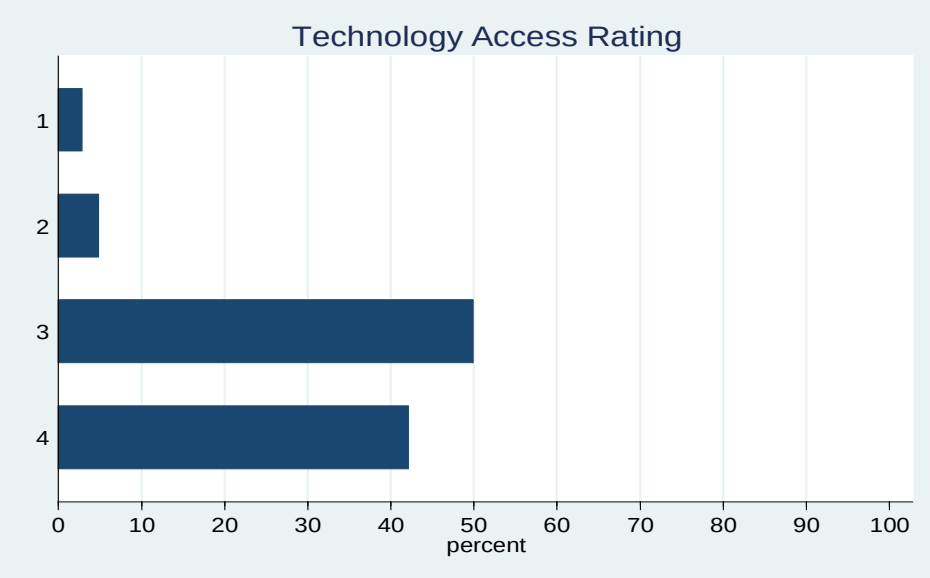
Technology Access Observation Ratings

[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.

Academic year 2016-17 (n=184)



Spring 2016 (n=102)



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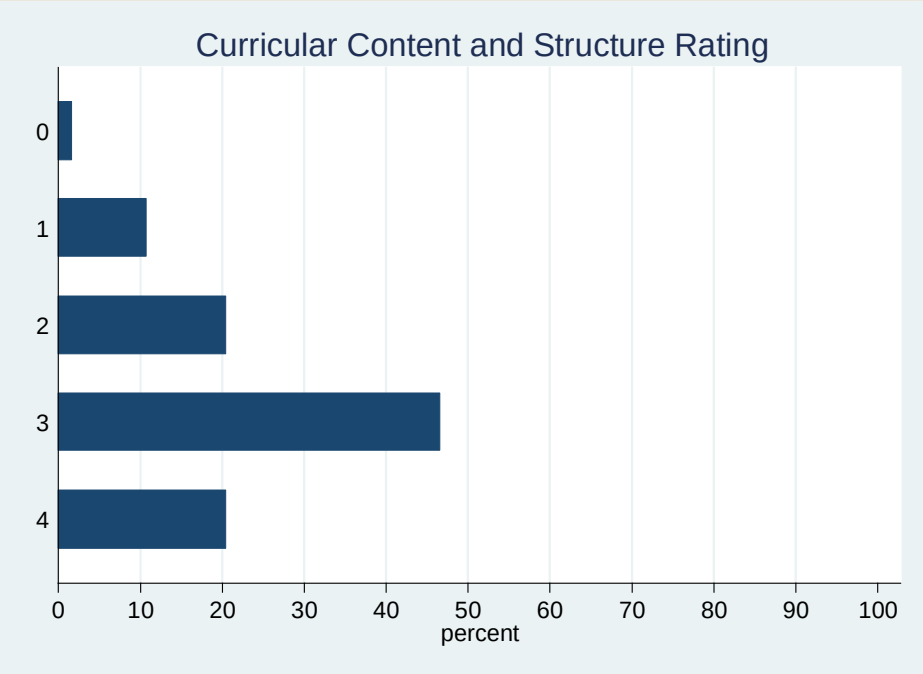
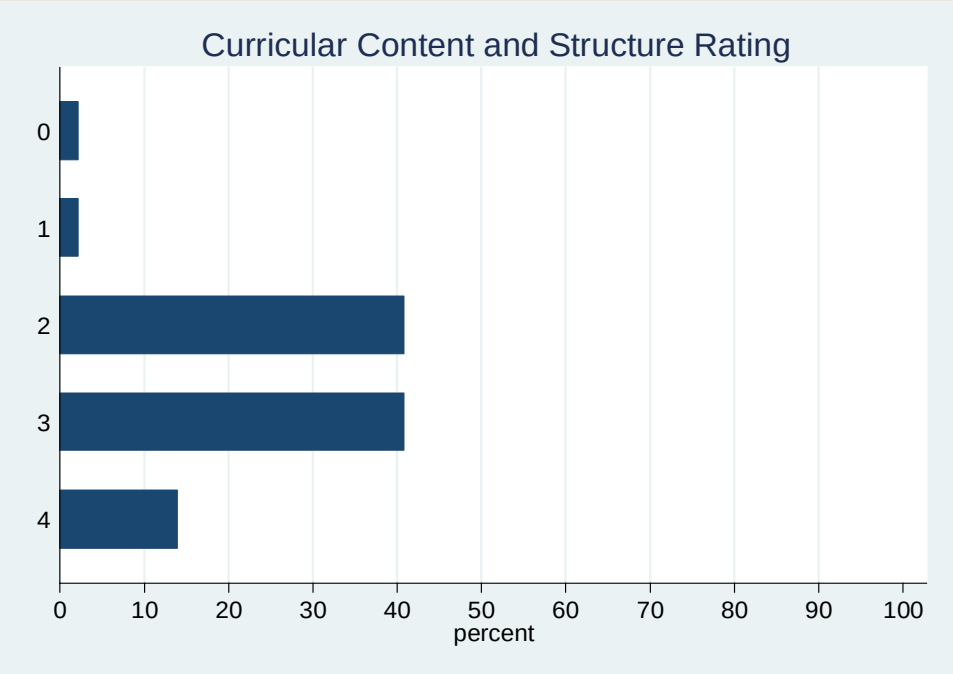
Curricular Content and Structure Observation Ratings

[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.

Academic year 2016-17 (n=176)



Spring 2016 (n=93)

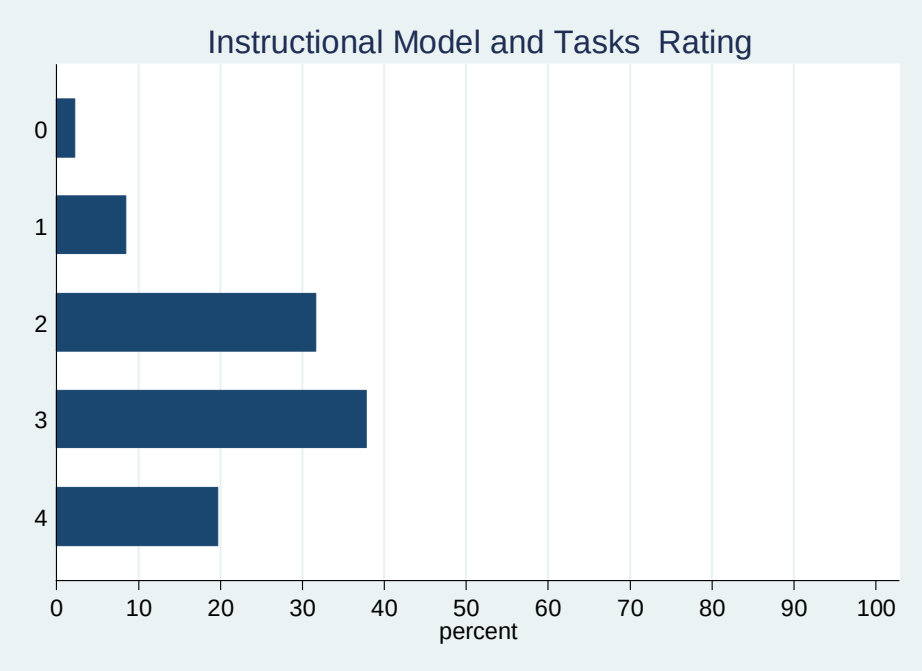


Differences in ratings between years are statistically significant (allowing 5% Type I error).

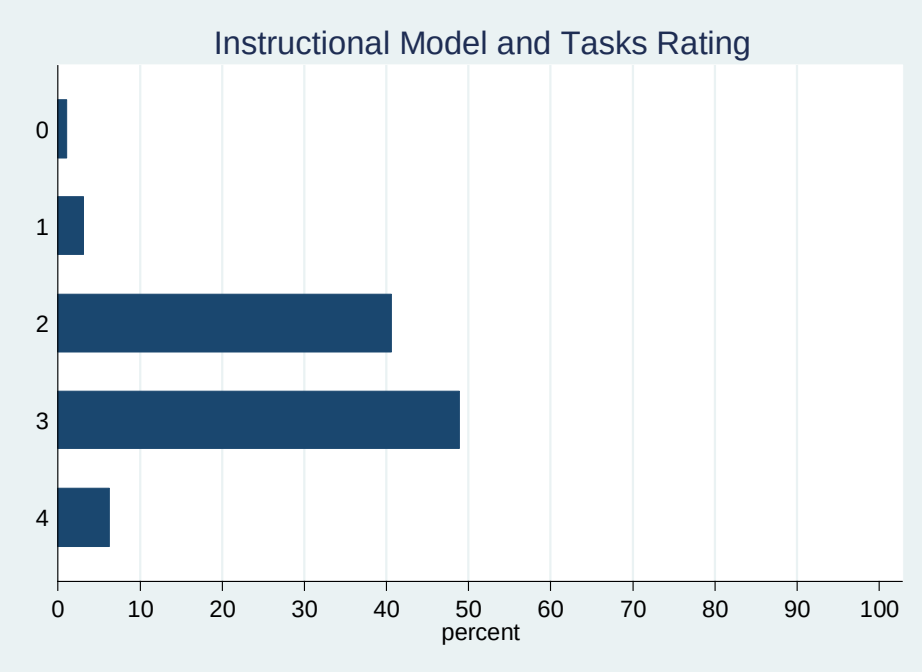
Instructional Model and Tasks Observation Ratings

[4] Instructional model and tasks consistently facilitate quality learning opportunities and adapts to observed (or known) student needs.
[3] Instructional model and tasks mostly facilitate quality learning opportunities and adapts to observed (or known) student needs.
[2] Instructional model and tasks facilitate some quality learning opportunities but do not adapt to observed (or known) student needs.
[1] Instructional model and tasks do not facilitate quality learning opportunities and do not adapt to observed (or known) student needs.
[0] Instructional model and tasks inhibit quality learning opportunities and do not adapt to observed (or known) student needs.

Academic year 2016-17 (n=177)



Spring 2016 (n=96)



Differences in ratings between years are statistically significant (allowing 5% Type I error).

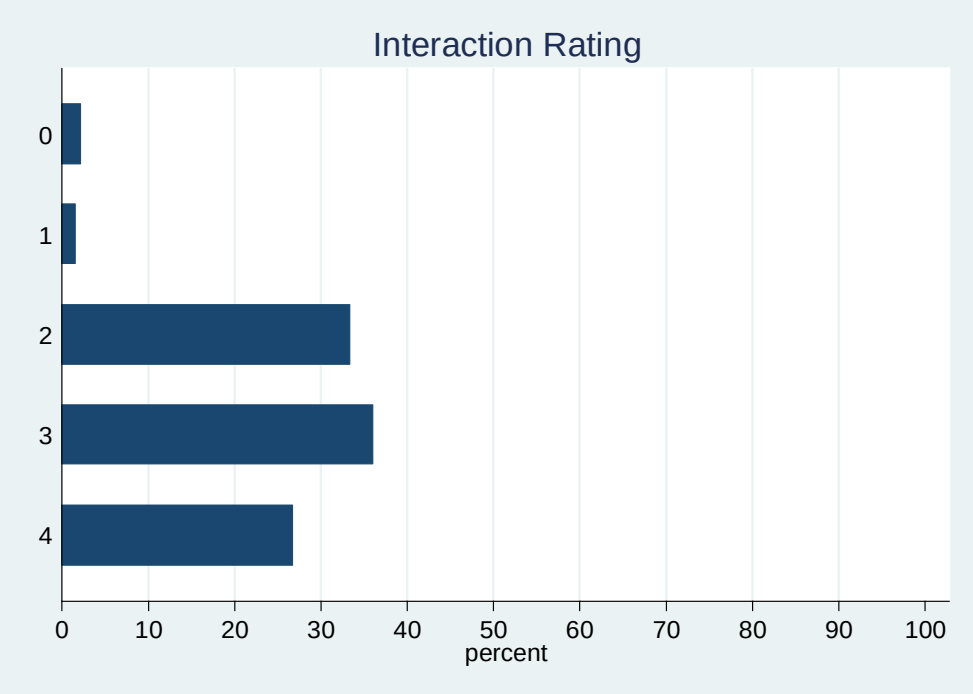
Highly rated (exemplar) observation

- *The classroom was laid out in 4 clustered stations of desks, of which two were in constant, rotating use. Another u-shaped cluster around the teacher's desk provided a station for small group instruction. Students worked diligently on their assignment individually and in small groups. The volume of the instructor and students speaking was at such a quiet level as not to be distracting, and other students were teaching each other after having worked with the instructor. The classroom was ideally situated for student learning, and the instructor created an environment for seamless transition between station assignments. While many of the observations we have completed under-utilize the technology, the instructor has a knack for employing RMCity as it is intended: to deepen student understanding with the instructor, while students work individually on tailored curriculum. The movement of students between stations was crisp and without delay. When students completed their rotations (after the first 30 minutes of the observation), they were assessed on a DOL problem set. They worked on this quietly and individually for the last 15 minutes of observation, while the instructor rotated around the room gauging progress and set up the laptop to project answers to the questions on the DOL. This was an incredibly well-structured classroom that made good use of digital classroom technologies.*

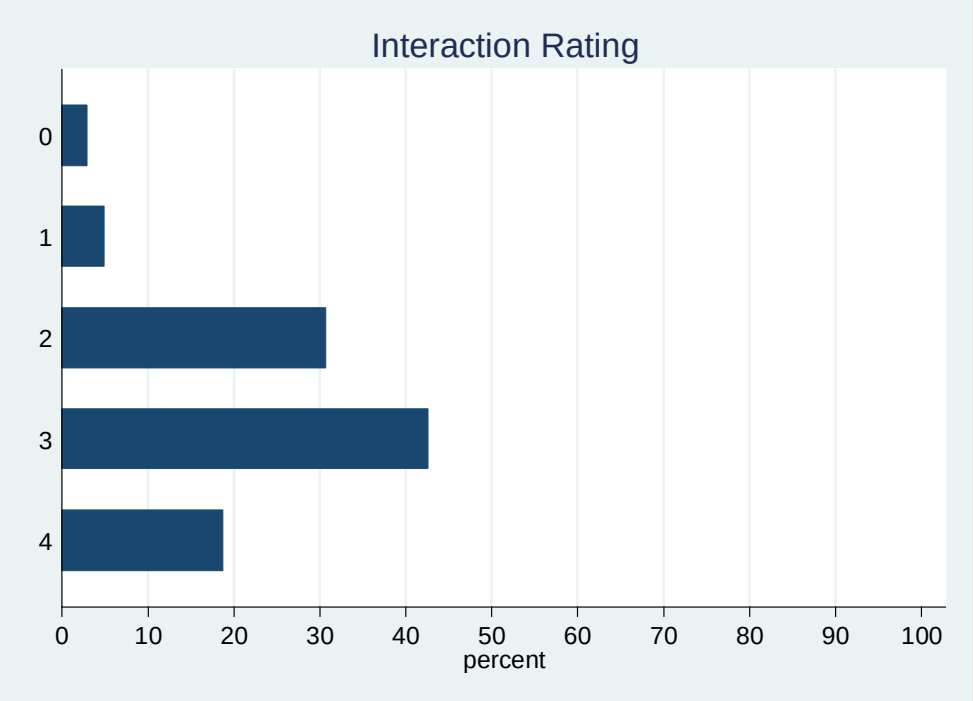
Interaction Observation Ratings

[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.

Academic year 2016-17 (n=183)



Spring 2016 (n=102)



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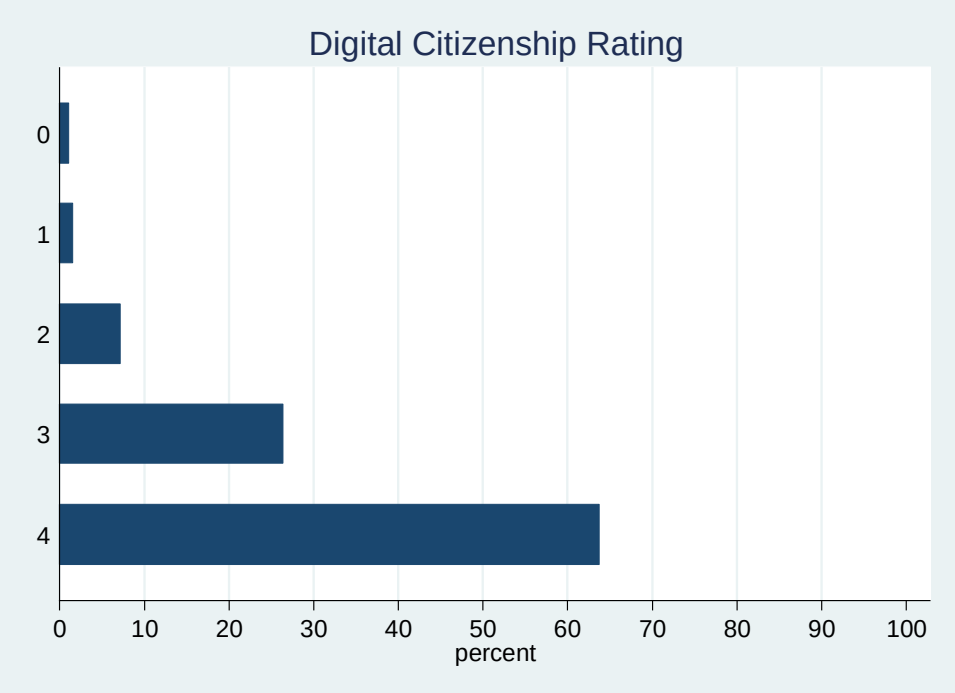
Interaction exemplar

- *As the observation began, students were entering the room and picking up tablets. Students were coming in from another classroom, too (due to another teacher's absence that day), so the physical environment was especially crowded. The teacher effectively worked through this limitation, using pairing and small groups to facilitate learning. He gave the students 5 minutes to practice their vocabulary and told students to quiz each other, which they did; he had a 5-minute timer projected on the screen. The instructor moved around the room, checking on students and encouraging them. The students were quizzing each other on the meaning/translation of vocabulary words (Spanish to English and vice versa). The students logged into Quizlet Live, and the instructor logged in at the front of the room (on the screen). Students got a code to join and entered screen names that were projected on the screen. The students were placed into groups and worked together to answer the questions projected on the screen (they needed to match words and definitions, putting their tablets together). There was a competition for points; students would go backwards if they selected an incorrect answer. The instructor walked around the room guiding and encouraging the students. The winners received a prize. The instructor used a short clapping routine to bring the students back to group discussion. In the whole group instruction that followed, they examined character interactions in the literature. The instructor passed out a reading in print and worked through the reading with the students on his screen. They continued pair-sharing times, where the instructor would pose questions to students and ask them to discuss them with a partner (using the clapping routine to bring them back to group instruction).*

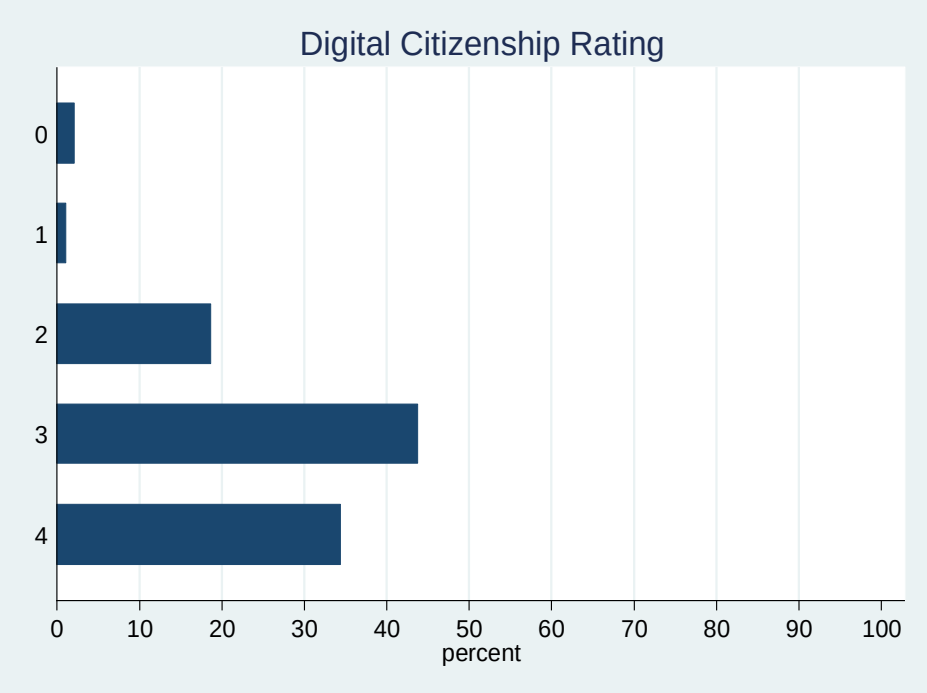
Digital Citizenship Observation Ratings

[4] All students are using the technology as intended by the instructor and/or instructional program.
[3] Most students are acting responsibly and using the technology in intended ways, and there are no apparent distractions.
[2] Some students are using the technology in unintended ways but distractions are minimal.
[1] A sizable fraction of students are using the technology in unintended ways and creating distractions in the environment.
[0] Most students are violating intended uses of the technology (e.g., switching to games, using for inappropriate material) and creating distractions in the environment.

Academic year 2016-17 (n=182)



Spring 2016 (n=96)

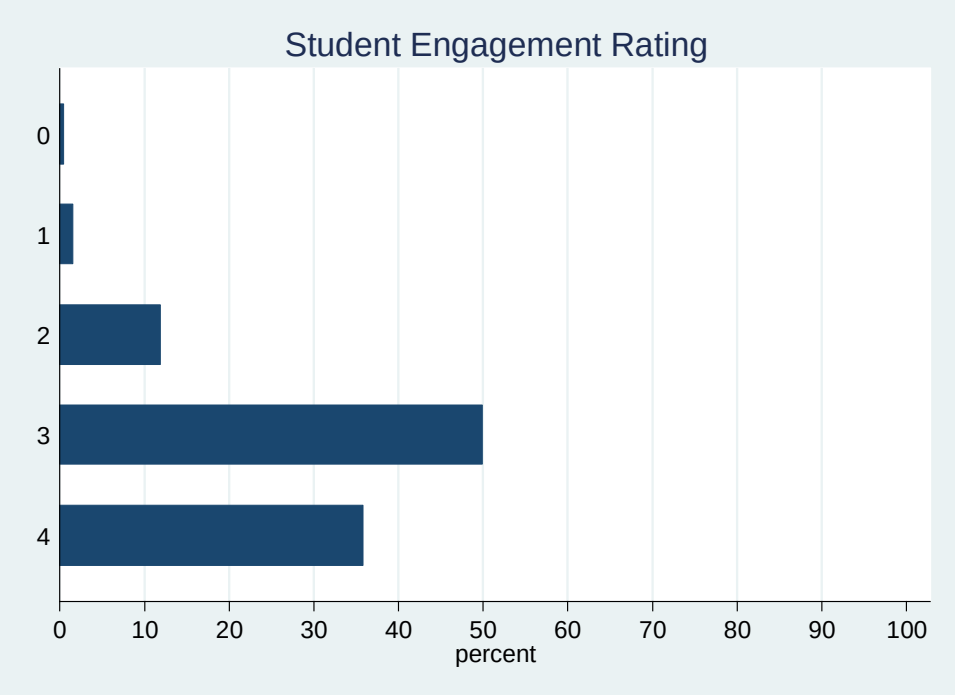


Differences in ratings between years are statistically significant (allowing 5% Type I error).

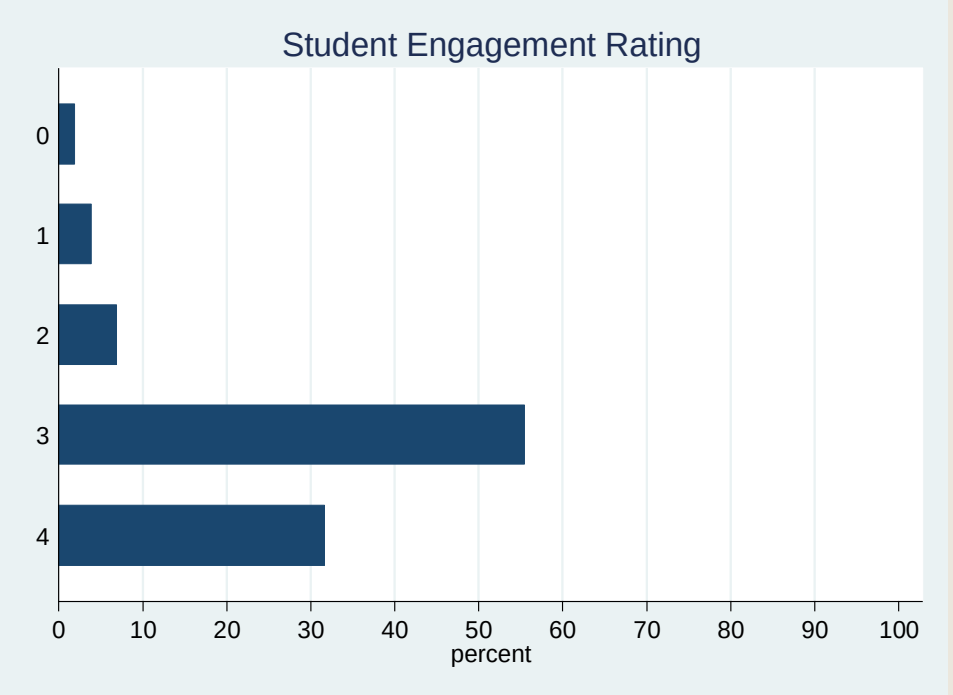
Student Engagement Observation Ratings

[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.

Academic year 2016-17 (n=184)



Spring 2016 (n=101)

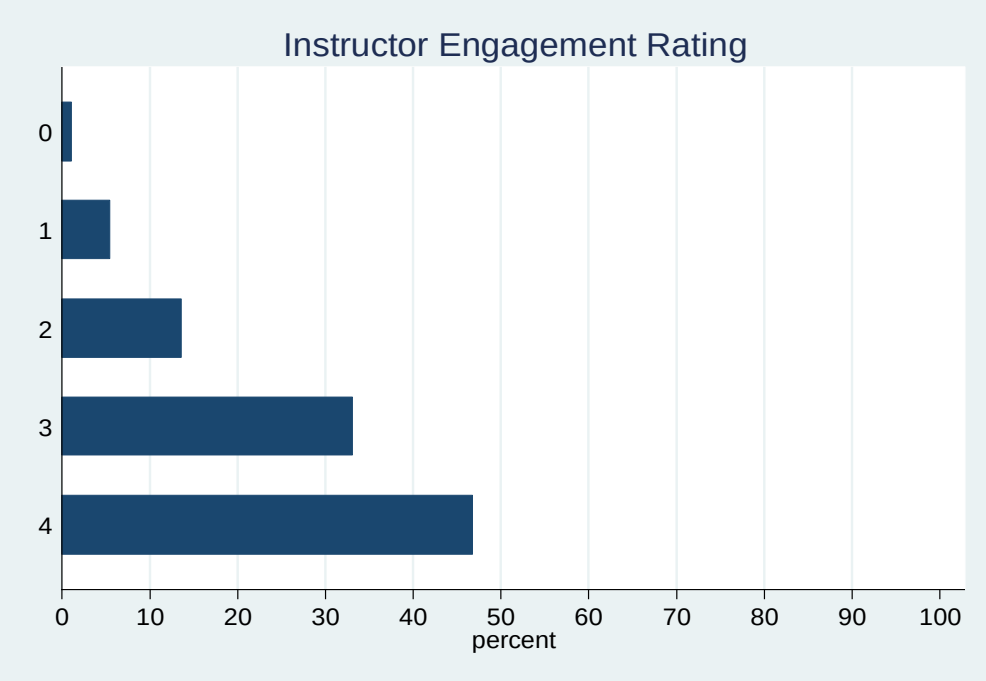


Differences in ratings between years are not statistically significant (allowing 5% Type I error).

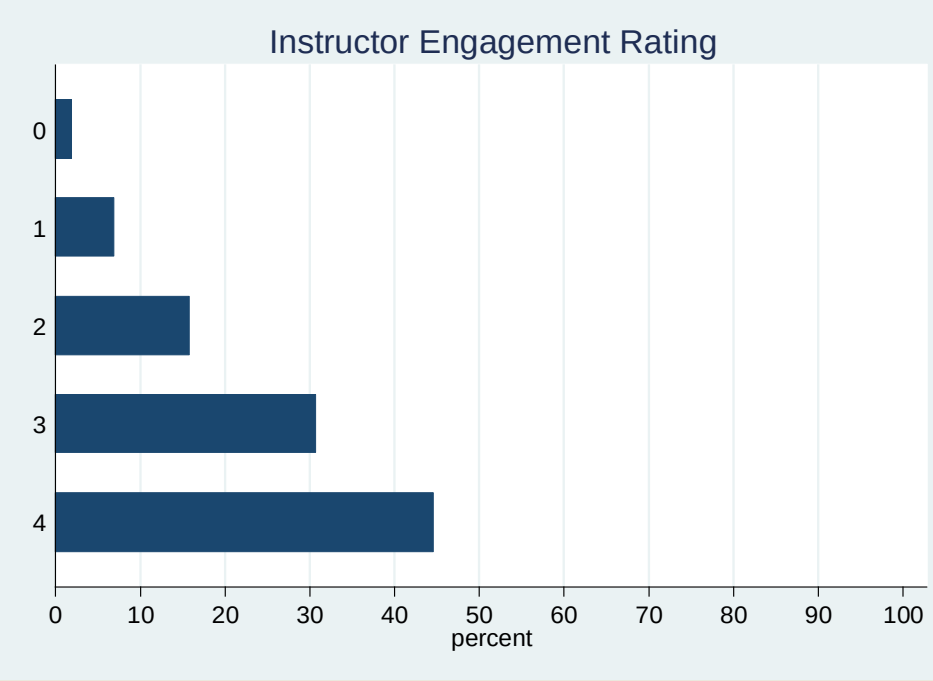
Instructor Engagement Observation Ratings

[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.

Academic year 2016-17 (n=184)



Spring 2016 (n=101)

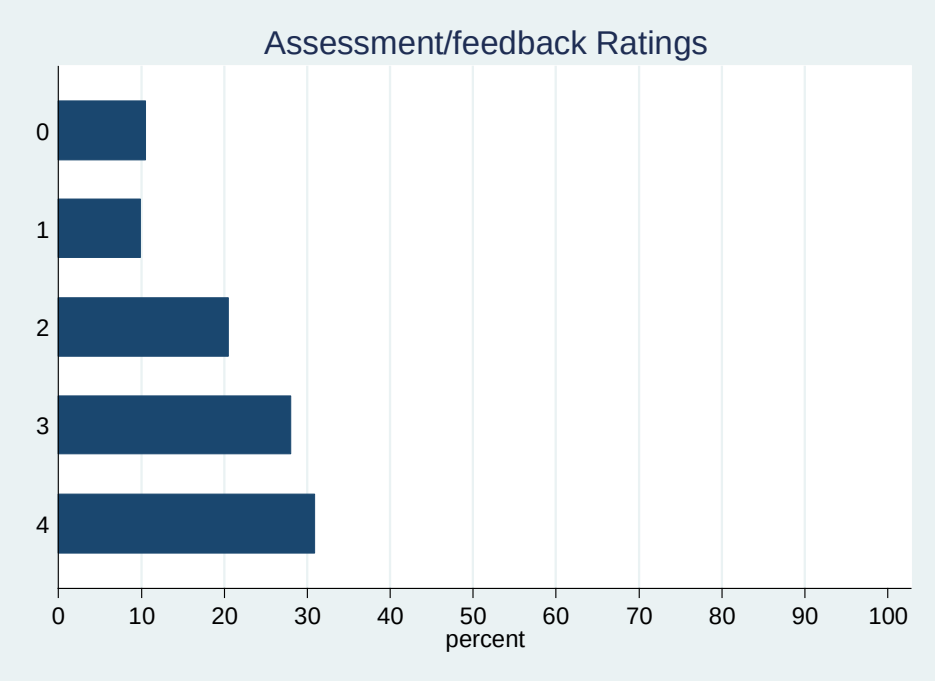


Differences in ratings between years are not statistically significant (allowing 5% Type I error).

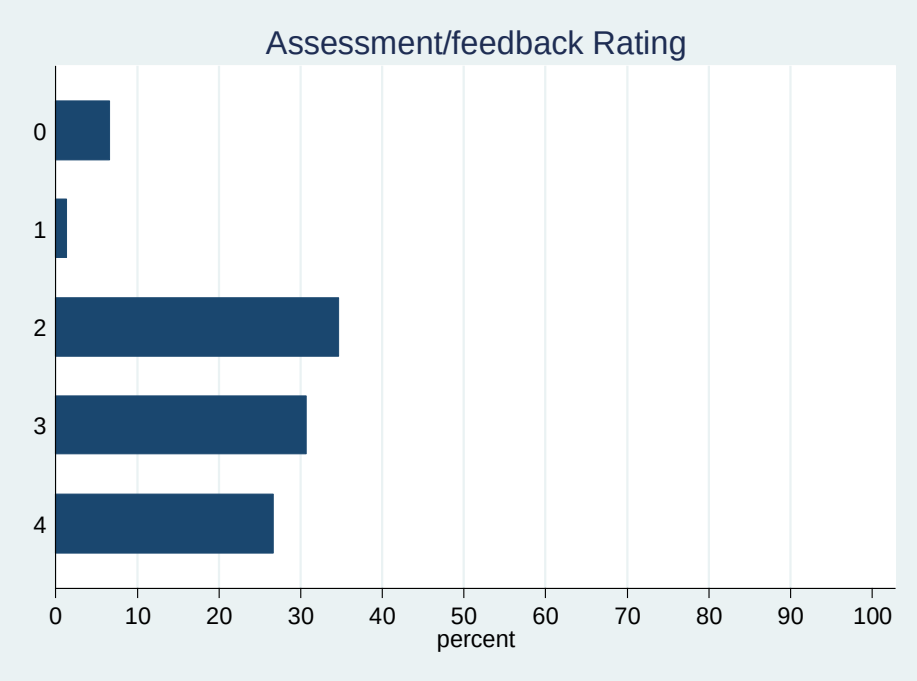
Assessment/feedback Observation Ratings

[4] Student learning is assessed frequently in varied formats that facilitate learning opportunities.
[3] Student learning is assessed frequently in a single format that facilitates learning.
[2] Student learning is assessed once in a way that facilitates learning opportunities
[1] Student learning is assessed during the session but is not constructive towards learning.
[0] Student learning is not assessed during the session.

Academic year 2016-17 (n=171)



Spring 2016 (n=75)



Differences in ratings between years are statistically significant (allowing 5% Type I error).

Teacher views expressed in 2016 surveys

- Teachers reported the Kindles were valuable tools, facilitating individualized student learning and enhancing student engagement
- Teachers requested access to more applications relevant to course content and learners
- Teachers described a range of technical problems, particularly network connectivity, with some concerns about the small size of Kindles for reading
- Many teachers were largely satisfied with current technology support and draw on support specialists and other teachers for assistance
  - *About two-fifths of teachers would like more support staff available on site*

Findings from “walk-throughs” of Spring 2016 Kindle classrooms at four schools

- Many teachers are enthusiasts about the use of the Kindles and are using them every day or most days in the week
  - *Teachers made comments such as “I can’t imagine teaching without them”*
  - *Teachers were observed using them in a range of ways, such as in stations, in blended instruction, for assessments, etc.*
- Teachers would benefit from additional technology support but are also developing their own strategies to troubleshoot problems, such as providing technical support to each other or sharing Kindles when a teacher is short the number needed for instruction
  - *Some specific issues include wireless access, devices locking, Whispercast problems, accessing specific applications*
- Of 58 classrooms visited at four schools (Nathan Adams, Henry Gonzales, Stephen Foster and Stevens Park), only three teachers reported no use of the Kindles

Implications and discussion

- Technology use has the potential to improve student achievement in schools serving predominately low-income, Hispanic students.
  - *The program model and professional development implemented in the pilot schools increased teacher-reported technology experience for 80% of teachers*
  - *Teachers also appeared to improve their instructional approaches and use of the digital content in the 2016-17 school year*
- Teachers require sufficient, timely technology support or the capacity to address common technology issues themselves
  - *Various models may fulfill this need, including providing teachers who are expert technology users time to support other teachers or allocating funds for technology specialists on-site or via other mechanisms*
- In expanding and sustaining technology initiatives, schools should consider the interrelatedness of educational context and teacher capacity, including the role of teacher beliefs and practice (e.g., blended instruction)