Teaching Practices of Faculty Adopting Adaptive Courseware

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Teaching Practices of Faculty Adopting Adaptive Courseware

The **Every Learner Everywhere** network was established to help institutions of higher education improve course success rates for racially minoritized students and poverty-impacted students by improving teaching and learning with the support of digital learning tools. Starting in 2019, network members involved in **Achieving the Dream (ATD)** and the **Association of Public and Land-grant Universities (APLU)** worked with a set of two-year colleges and four-year universities, respectively, to support these "Lighthouse" institutions as they implemented adaptive courseware into selected gateway courses. **Digital Promise** administered a survey to participating instructors at Lighthouse institutions in fall 2020, and this report describes their responses.

Report Highlights

- During this pandemic semester, more than three-quarters of faculty survey respondents taught entirely online.
- Nearly all faculty using adaptive courseware at Every Learner Everywhere Lighthouse institutions employed four of the evidence-based teaching practices during fall 2020: practice with immediate feedback (96%), clear statement of learning objectives (96%), information on how to improve (96%), and use of low-stakes formative assessments (94%). These are all practices directly supported by adaptive courseware.
- Most instructors (70%) looked at the courseware's instructor dashboard at the whole-class level at least once a week, primarily to determine what topics to concentrate on in upcoming class sessions (43%) or whether course content should be modified in future terms (41%). Instructors were somewhat less likely to seek student input on how the course could be improved; 52% reported soliciting anonymous student feedback while the course was running.
- Instructional practices outside of the courseware tended to be fairly conventional: two-thirds of faculty (68%) reported providing lectures (in person, live online, or recorded) of 30 minutes or more in duration at least once during most weeks.
- The least frequently used practices associated with evidence-based teaching were project-based learning (14%), peer learning or think-pair-share routines (54%), mastery learning (34%), and activities to allay anxiety, stereotype threat, or imposter syndrome (38%). The first two of these are elements of active learning and the last is key to creating an inclusive learning environment for racially minoritized and poverty-affected students.
- Nearly all Every Learner Everywhere courseware instructors (96%) believed that the adaptive courseware helped them improve student learning and allowed them to better monitor progress and to hold individual students accountable for consistent engagement in the class.
- When asked how likely they would be to recommend the courseware product they had used to a friend or colleague teaching the same course, 56% of instructors gave a numerical rating of 9 or 10 on a 10-point scale, resulting in a net promoter score (NPS) of 46.

Contents

Introduction

The **Every Learner Everywhere** network was established in 2017 to help institutions of higher education address achievement gaps for racially minoritized students, first-generation students, and poverty-impacted students, by improving teaching and learning with the support of digital learning tools. This network of 12 organizations focused initially on implementing a Bill & Melinda Gates Foundation strategy of working with two- and four-year colleges to promote effective implementations of adaptive courseware in high-enrollment gateway courses. This work is one component of the foundation's larger Postsecondary Success strategy "to ensure that all students who seek the opportunity are able to complete a high-quality, affordable postsecondary education that leads to a sustaining career."

Every Learner Everywhere network activities address a key aspect of postsecondary transformation — the improvement of teaching and learning. Difficulties that many first-generation students, poverty-impacted students, and students from minoritized racial/ethnic groups encounter in the introductory courses they take in their first two years of postsecondary education can lead to discouragement and abandonment of college plans (Bloemer, Day, & Swan, 2017). This insight led the foundation's postsecondary team to focus on gateway courses. If students have higher success rates in these courses, they will accumulate more credits toward graduation in their freshman year and be more likely to persist in their academic program (Adelman, 2006; Doyle, 2011).

Research has demonstrated that learning is enhanced when instruction adapts to (1) students' prior knowledge levels, (2) students' learning strategies and errors, (3) student affect and motivation, and (4) differences in students' ability to regulate their own learning (Aleven, McLaughlin, Glenn, & Koedinger, 2017). Digital learning systems can not only provide differentiated experiences to different learners but also generate learning data to instructors that can be used to identify students who need additional support and to pinpoint topics with which many students are struggling so that they can be covered further (and differently) in class.

By working initially with a set of 12 "lighthouse" colleges and universities serving large numbers of Black, Latinx, Indigenous, and poverty-impacted students (see institutional characteristics in Table A-1 of the Appendix), the Every Learner Everywhere network aimed to uncover a concrete set of practices and tools that other higher education institutions could use. The network also sought to produce effective learning at scale regarding the organizational change needed to implement adaptive courseware, and to generate objective evidence of the impact of such efforts on student course outcomes.

During the first phase of the Every Learner Everywhere work, network members involved in Achieving the Dream (ATD) and the Association of Public and Land-grant Universities (APLU) worked with two-year colleges and four-year universities, respectively, to support the implementation of adaptive courseware in gateway courses. This work entailed inviting, convening, and advising faculty and staff teams led by a senior administrator from a dozen Lighthouse colleges interested in using adaptive courseware (the Lighthouse institutions and their enrollment demographics are listed in Table A-1 of the appendix).

Lighthouse institutions began piloting new versions of gateway courses incorporating adaptive courseware in fall 2019. Experiences in the first implementation of the revised courses by almost 90 instructors during this pilot phase have been described in a previous Digital Promise report. These instructors were joined by some of their colleagues in using adaptive courseware in the spring of 2020, when the COVID-19 pandemic shut down most face-to-face instruction, and courseware use at Lighthouse institutions continued in the fall of 2020. This report describes findings from a survey administered to a sample of Lighthouse institution instructors in fall 2020. It focuses on the nature of their teaching practice and the ways in which they are using adaptive courseware with their students.

Methodology

Data Collection

Digital Promise revised the instructor survey used in the first year of Lighthouse institution activity for administration at the end of the fall 2020 term. The project lead for each Lighthouse institution provided Digital Promise with names and contact information for (a) instructors who had participated in design and professional learning activities in relation to implementing adaptive courseware supported by the Every Learner Everywhere network, and (b) instructors who were teaching the same courses at the same institution but had not worked with Every Learner Everywhere. The group not implementing adaptive courseware was used as a comparison group, but only 8 of 57 instructors identified for the comparison group completed the survey. Because such a low response rate and count of respondents would not support a reliable comparison, this report includes survey results only for those instructors who implemented adaptive courseware as part of Every Learner Everywhere work with Lighthouse institutions.

Response Rates

A total of 167 Every Learner Everywhere instructors from 12 institutions received initial electronic survey links via email and two reminders to complete the Digital Promise Instructor Survey between November 20, 2020, and January 17, 2021. To increase survey participation rates, an anonymous link was provided to project leads on January 4 requesting assistance in recruiting additional adaptive instructors to complete the survey. The survey closed on January 17, 2021.

Survey responses were received from 56 instructors implementing adaptive courseware and participating in Every Learner Everywhere activities on their campus. The overall response rate was 34%.

Response rates differed for instructors who participated in Every Learner Everywhere activities at two-year and four-year institutions, as shown below. Because of the relatively small sample sizes, survey data are shown for the entire adaptive courseware sample in the remainder of this report. Readers should keep in mind that instructors at two-year colleges comprised more than two-thirds of the overall instructor sample.

Table 1. Survey sample and response rate of respondents implementing courseware

Institution Type	Count Received Survey	Count Responded	% Response Rate
Two-year (5 institutions)	108	39	36
Four-year (4 institutions)	59	17	29
Total	167	56	34

Respondent Characteristics

As noted above, survey respondents came predominantly (70%) from two-year colleges. Most respondents (71%) were in full-time faculty positions, likely because Every Learner Everywhere college team leaders made efforts to recruit faculty with decision-making authority with respect to course design for the course improvement work. Table 2 shows the distribution of academic positions for the instructor survey sample.

Table 2. Academic positions for survey respondents

Instructor Position	% of Sample*	Number
Full-time faculty member	71%	40
Full-time adjunct or instructor	4	2
Part-time adjunct or instructor	21	11
Graduate assistant	2	1
Emeritus faculty	2	1
Administrator & adjunct faculty	2	1
Total	100	56

** Numbers do not add to 100% due to rounding.*

The survey respondents were teaching a variety of subjects, as shown in Table 3, but mathematics was the most commonly taught subject by far (39% of the survey sample).

Table 3. Subject areas for survey respondents' adaptive courses

Subject	% of Sample	Number
Math	39	22
Reading & Writing	18	10
Chemistry	13	7
Business	9	5
Statistics	5	3
Biology	5	3
Anatomy & Physiology	5	3
Psychology	4	2
Physics	2	1
Total	100	56

Math courses taught by these instructors were Developmental Mathematics (3), Quantitative Reasoning (2), Algebra (15), Pre-Calculus (2), and Calculus (1).[1]

In terms of teaching load, instructors taught between one and five sections of the course in which they were using adaptive courseware, with an average of two sections. The number of students in a section varied widely, from 10 to 253, with an average of 40 students per section and a median of 30 students per section. Only six instructors (11% of the sample) had courses involving more than 50 students.

1 One instructor taught both Algebra and Pre-Calculus courses.

Findings

The COVID-19 pandemic had a major impact on the nature of postsecondary instruction in fall 2020, with many campuses teaching entirely or mostly online, some opening for in-person instruction and later sending students home, or utilizing various combinations of in-person instruction and online learning. The great majority of Lighthouse institution instructors responding to the survey were teaching entirely or primarily online in fall 2020, as shown in Table 4. Instructor interviews conducted by Digital Promise in the spring of 2020 (Means et al., 2021) suggested that use of courseware made online instruction relatively easy to implement.

Table 4. Teaching modality for fall 2020 adaptive courseware classes

Modality	% of Sample	Number
Fully or primarily online instruction	79	44
Highly flexible model with some students attending in person and some participating online	9	5
Hybrid model	5	3
Fully or primarily face-to-face instruction	5	3
Transition from in person to online	2	1

Note: Some instructors taught sections in two different modalities.

For those who taught fully or primarily online, there was a fairly even split between primarily or fully asynchronous (17 instructors) and primarily or fully synchronous (22 instructors) teaching. Eight instructors combined asynchronous and synchronous instruction, while two instructors allowed students to choose asynchronous or synchronous instruction.

Table 5 shows the distribution of courseware products by course subject area for the adaptive courseware instructor survey sample.

Table 5. Courseware products used by course subject area

	Math	Statistics	Biology	Chemis-try	Physics	Business	Anatomy & Physi-ology	Psychol-ogy	Reading/ Writing	Total
ALEKS	14			3						17
Critical Chemistry				2						2
RealizeIt					1					1
Knewton Alta	2		1							3
Lumen Waymaker								2	7	9
McGraw-Hill Connect / LearnSmart			1	2		5	2			10
Pearson MyLab	6								2	8
Pearson Mastering	1		1				1			3
IMathAS	1									1
WileyPlus		3								3
Total	24	3	3	7	1	5	3	2	9	

Notes: Color intensity represents frequency category.
Some institutions implemented more than one adaptive courseware product in a given subject.

As might be expected in the third academic term after Every Learner Everywhere started working with Lighthouse institutions, a large majority of adaptive courseware instructors responding to the survey had used courseware prior to fall 2020. In fact, slightly more than half of them had four or more prior terms of using adaptive courseware, as shown in Table 6, but some of this experience was with courseware products other than those they were using in fall 2020. Roughly a quarter of the instructors said they had never previously used the particular product they were implementing in fall 2020.

Table 6. Prior courseware teaching experience for fall 2020 adaptive courseware instructors

Number of Terms	% of Sample	Number
Never	9	5
One term	16	9
Two terms	16	9
Three terms	7	4
Four terms	7	4
Five or more terms	45	25

Courseware Implementation

Most of the instructors responding to the survey reported that they had felt well prepared to teach with the courseware at the start of fall term. The majority of those who had used the product before felt very well prepared, while the modal response of those who were using the product for the first time was “adequately prepared” (see Table 7).

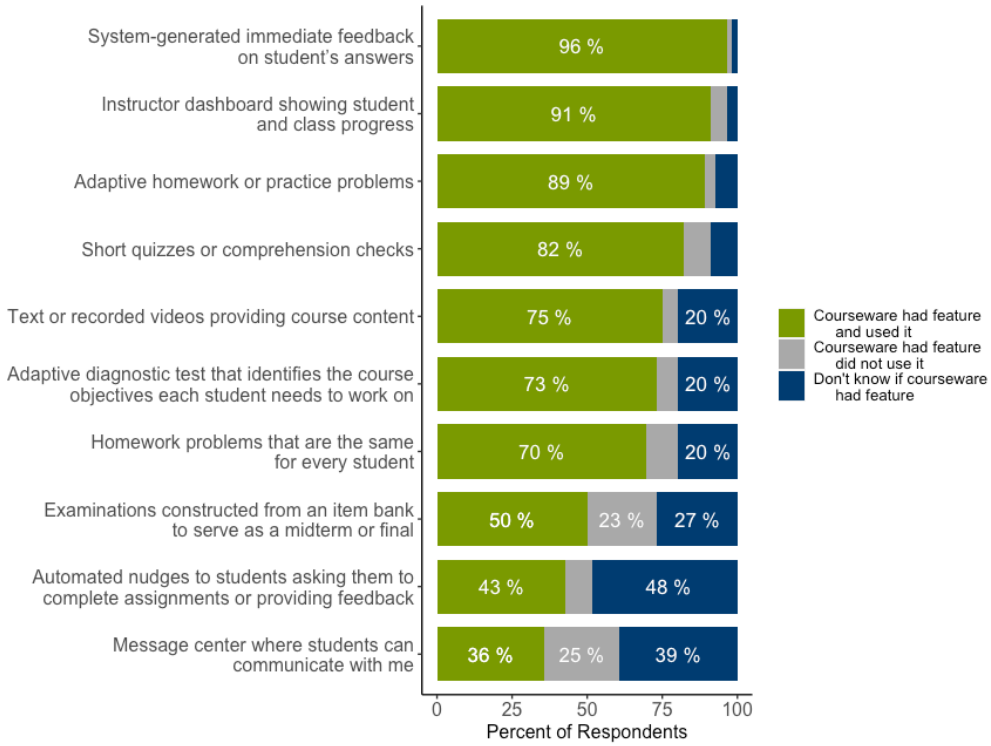
Table 7. Level of preparation for teaching with adaptive courseware

Self-assessment of level of preparation	Had used product prior to fall 2020 % [n]	Had not used product prior to fall 2020 % [n]
Not at all prepared	0% [0]	8 [1]
Somewhat prepared	7 [3]	23 [3]
Adequately prepared	31 [13]	39 [5]
Very well prepared	62 [26]	31 [4]

n = sample size

The survey asked Lighthouse faculty using adaptive courseware which courseware features they had used or knew to be present in the courseware but chose not to use. Their responses are shown in Figure 1 below.

Figure 1. Instructor awareness and use of adaptive courseware features

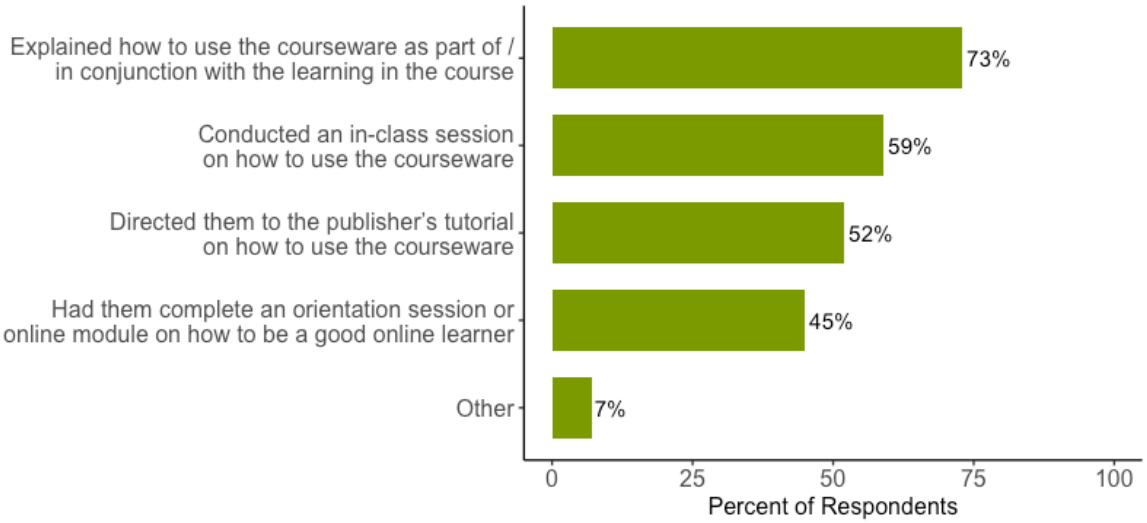


The most frequently used courseware feature was system-generated immediate feedback on student's answers, which 96% of instructors said they used in their course. Also used nearly universally were the instructor dashboard (91%) and adaptive homework or practice problems (89%). Most instructors used the courseware's short quizzes or comprehension checks (82%) but only about half drew on the courseware for their midterm or final examination. The least used courseware feature was a message center for student–faculty communication (36%). Some courseware products may not have this feature, but it is also likely that instructors chose to use their learning management system rather than the courseware for this purpose. The only two features that a sizable portion of faculty knew the courseware had but chose not to use were a built-in message center (25%) and an item bank for constructing midterm or final examinations (23%). In general, the faculty who were supported by Every Learner Everywhere appear to be making robust use of adaptive courseware capabilities.

Preparing Students to Use the Courseware

Instructors used a variety of methods to prepare their students to use the courseware effectively. Almost half included a module on how to be a good online learner in their course, and almost three-quarters included explicit instruction on how to use the specific courseware used in their class (see Figure 2).

Figure 2. Steps instructors took to prepare their students to use courseware



Other student preparation activities instructors described included both how-to instruction embedded in the courseware product and explanatory materials created by the instructor.

> *"Students used ALEKS to test into [the course]. ALEKS also provides an intro as the student begins."*
>
> *"Only provided a written explanation of adaptive courseware; discussed during optional introduction session at the beginning of the semester."*
>
> *"I created a video explanation for the students."*
>
> *"Students completed a module specifically about the courseware and how to use it."*

Plan for Student Hours in Class and Outside of Class

As noted earlier, the survey sample was split fairly evenly between those teaching primarily or fully asynchronously and those teaching primarily or fully synchronously. In describing courses that included synchronous class sessions, instructors said students were expected to spend an average of 2.85 hours per week with the instructor (either in person or synchronously online) and an average of 6.80 hours completing work independently (asynchronously), for a total of 9.65 hours. Instructors whose courses were taught fully or primarily asynchronously said they expected their students to spend an average of 8.50 hours per week learning on their own schedule. (In cases where instructors provided a range of the number of hours expected, the mid-point was entered for data analysis.)

Sequencing Courseware and Independent Activities

Instructors were asked how they sequenced coverage of course topics in class in relation to work on the same topic in the courseware. As shown in Table 8, most faculty implemented courseware using the traditional "homework" model, in which they explain new content first and then have students work with corresponding portions of the courseware.

Table 8. Sequencing of courseware and in-class work on course topics

Sequencing	Percentage	Number
Students are exposed to material in class and then use the courseware to learn more about it, practice applying the material, or do quizzes on it.	47	26
Students learn or practice content using the courseware before attending the class time covering the same learning objective.	20	11
Students use the courseware during synchronous class time, and may return to it during independent learning.	9	5
There is no consistent pattern.	5	3
Not applicable. There are no synchronous class sessions.	18	10

Faculty explanations of why they sequenced course activities the way they did suggested differences in how they think about learning and their students. Sample responses of instructors who like to lecture first suggested concerns about students' ability to comprehend the courseware explanations and an implicit assumption that only items the instructor describes are fair game for grading.

> *"I like to introduce a topic first and then offer students the option to work on the skill on their own as homework."*
>
> *"While ALEKS has excellent adaptive assessment, the explanations are perfectly correct and textbook, but too obtuse for many beginner learners to use on their own. This however is true of most math textbooks."*
>
> *"Our courseware had a lot of text. I wanted students to hear the 'language' of the content in class prior to struggling through them in the reading. My thought was that a second exposure to the content might help to support their success on the quizzes."*
>
> *"We have tried to use the courseware to get the students a preview before class, but they push back on that. I also feel bad grading them on something I didn't yet explain."*

In contrast, instructors who were "flipping the classroom" by having students study topics using the courseware before they were covered in class emphasized the value of having information from the courseware that could enable them to dig deeper in class.

> *"I allow them to read and test over the material before lecture so I don't spend time lecturing on material they understand, which leaves more time to make activities/ lecture on confusing topics."*
>
> *"I think students absorb my lecture material better if they have some previous exposure to the content. The adaptive software is a good opportunity to do that."*

Some teachers sequenced synchronous class sessions and courseware activities differently depending on the topic being covered.

> *"I actually did both before and after synchronous class time depending on the topic. For topics they learned before, I needed to gauge their understanding to adapt my teaching practice to them and see what questions they had. For after, I*

> *wanted to explain first and then have them apply the skills they learned in class to the courseware content."*

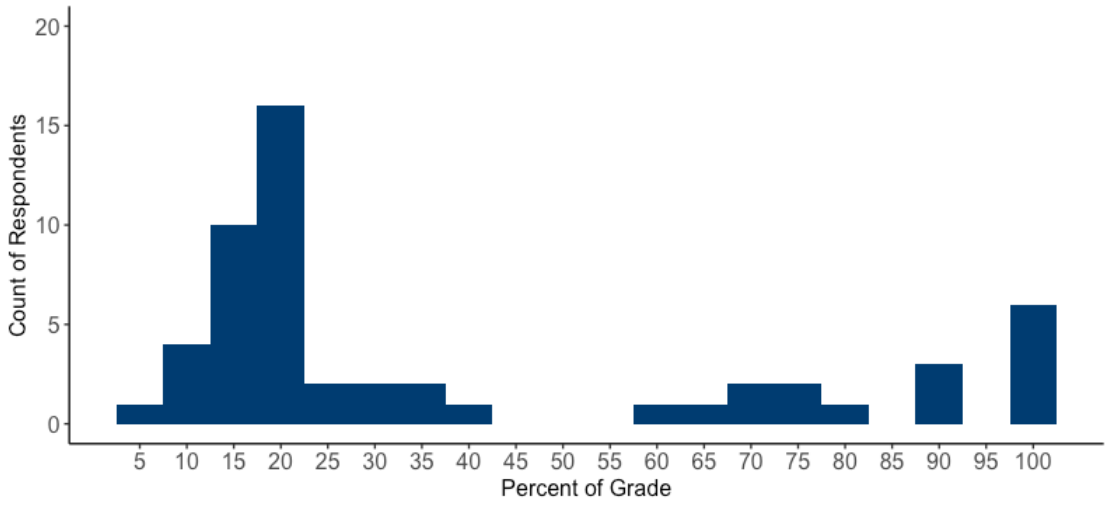
One instructor liked to give students the choice of how to sequence the two kinds of activity.

> *"Students learn at different paces. Some students are able to learn independently and want to finish the course ASAP, and they can if they work ahead, while others prefer or need to have that 'in-person' explanation with further details during class time before proceeding."*

Percent of Each Student's Grade Based on Courseware

Instructors were asked what percentage of a student's final grade in their course was based on the courseware. On average, instructors in the fall 2020 survey reported that 39% of a student's grade in their classes was based on work with the adaptive courseware — a significantly higher number than the 28% reported by courseware-using instructors taking the survey in fall 2019. However, the mean is misleading given the wide range of instructor responses — from 4% to 100% of the course grade — as shown in Figure 3. In addition, it is quite possible that the shift to more fully online courses in response to the COVID pandemic led to an increased weighting of students' courseware activities that may not persist once more courses include in-person class sessions again.

Figure 3. Histogram of percent of grade based on adaptive courseware



Use of Evidence-based Teaching Practices

Improving learning and course success rates for students requires more than simply inserting adaptive courseware into an existing course. Course design decisions and teaching practices with respect to how students are asked to use courseware and the nature of non-courseware activities are equally important. The Postsecondary Success Team at the Bill & Melinda Gates Foundation has been working to identify and define a set of evidence-based teaching (EBT) practices, grounded in the research literature on the learning and course success rates of undergraduate students. The version of these practices as of March 2021 is described in Table 9, along with some examples the foundation provides of different ways in which each practice might be operationalized.

The Digital Promise Instructor Survey used in fall 2020 was developed before the EBT practices were defined and did not use the exact same terminology. In addition, when developing the instructor survey, Digital Promise tried to make those survey items concerning instructional practices as concrete as possible to minimize the likelihood that different respondents would have vastly different interpretations of the item and to lessen social desirability bias (for example, in terms of questions like whether they implemented an "inclusive" learning environment). However, the survey was inspired by the same research literature as the EBT practices and included a number of multi-part items asking whether specific practices were used in the instructor's course. Some of these items asked for simple binary responses (included/did not include), while others asked for some indication of the frequency with which a practice had been employed (at least once most weeks/a few times a term/not at all) to distinguish between occasional and consistent use of a practice. Retrospectively, we found mapping the items on the Digital Promise Instructor Survey to the foundation's EBT practice dimensions to be fairly straightforward.

Table 10 shows the instructor responses with respect to the practices they implemented in their course, categorized by the relevant evidence-based teaching practice. To provide a point of comparison, the second column of the table shows the reported frequency of implementing each EBT dimension on a separate faculty survey administered by Tyton Partners, also in fall 2020 (Fox et al., 2021).

Table 9. Evidence-based teaching (EBT) practices

Dimension of Evidence-based Teaching	EBT Components
Active Learning Instructors use pedagogical practices that are rooted in constructivist theories, involve students engaging deeply with course content, and encourage "learning by doing."	• Discussion-based approaches • Contextualization • Higher-order thinking (activities that develop students' mental models and analytic/evaluation skills) • Simulations and animations • Think-pair-share or peer learning
Transparency Students are provided with a clear understanding of the course's content, learning outcomes, and assessment criteria.	• Use the syllabus or other mechanism to ensure that students are aware of the course content and learning outcomes they are expected to master • Specify learning goals and rationale before each assignment • Provide rubrics or other approaches to clarify for students the grading expectations and criteria upon which they will be assessed
Formative Practice Students are given the opportunity to practice skills in ways that provide timely and targeted feedback to nudge them towards mastery.	• Spaced/distributed practice • Timely, targeted, and formative feedback • Self-checks and debriefed assignments/assessments • Practice testing • Adaptive learning (instruction and assessment that adapts to what a student knows and needs) • Scaffolding and gradual release
Data Analytics Instructors use real-time data to inform teaching and engage in ongoing course improvements to optimize student success.	• Responsive instruction (revising instruction based on real-time assessment) • Personalized learning (customized instruction based on individualized learning plans) • Use of instructor dashboard
Metacognition Instructors use practices that help students learn to be a better learner and take control of the learning process.	• Self-assessment • Reflective practices • Instructor running commentary and think-aloud • Supports for self-regulation
Inclusive Learning Environment Instructors use practices that enable all students to feel that they and their unique background have a place in the life of the classroom.	• Culturally responsive pedagogy • Values affirmation and growth-mindset activities • Community-building activities • Personal messages or nudges

Table 10. Teaching practices used in fall 2020 Lighthouse courses

Dimension of Evidence-based Teaching	% Indicating Used Practice on Tyton T4C Survey [a]	Related Digital Promise Instructor Survey Items	% of Lighthouse Instructors Using	% of Lighthouse Instructors Using at Least Weekly
Active Learning Instructors use pedagogical practices that are rooted in constructivist theories, involve students engaging deeply with course content, and encourage "learning by doing."	69	Having students work on new material as homework prior to discussing it or working on problems in class	76	52
		Project-based learning	14	NA
		Instructor-led discussions	74	38
		Peer learning or think-pair-share activities	54	25
		No lectures over 30 minutes [reverse coded]	32	25
Transparency Students are provided with a clear understanding of the course's content, learning outcomes, and assessment criteria.	81	Detailed descriptions of learning outcomes	96	NA
		Detailed descriptions of quality criteria	87	48
Formative Practice Students are given the opportunity to practice skills in ways that provide timely and targeted feedback to nudge them towards mastery.	69	Adaptive or digital learning	98	NA
		Mastery learning	34	NA
		Immediate feedback	100	88
		Feedback with information on how to improve	96	64
		Low-stakes formative assessments	94	77
		Opportunities to re-do assignments to improve	82	48

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Dimension of Evidence-based Teaching	% Indicating Used Practice on Tyton T4C Survey [a]	Related Digital Promise Instructor Survey Items	% of Lighthouse Instructors Using	% of Lighthouse Instructors Using at Least Weekly
Data Analytics Instructors use real-time data to inform teaching and engage in ongoing course improvements to optimize student success.	36	Use of whole-class performance dashboard	83	63
		Use of dashboard for individual students	86	50
		Modification of what is covered in class based on student performance data	75	25
		Referrals to tutoring/SI	84	NA
		Personal messages to students about how they're doing on the course	96	46
		Solicitation of anonymous student feed-back while the course is underway	52	16
Metacognition Instructors use practices that help students learn to be a better learner and take control of the learning process.	66	Explicit teaching of study skills	70	NA
		Routines that include some independent learning	89	77
		Having students reflect on what they have learned and what they still need to learn	87	34
		Activity organizers or hints	80	48
Inclusive Learning Environment Instructors use practices that enable all students to feel that they and their unique background have a place in the life of the classroom.	44	Activities to build classroom community/sense of belonging	66	NA
		Content relevant to students' cultures/ identities	61	20
		Content relevant to each student's future career / job / goal attainment	89	25
		Activities to allay anxiety, stereotype threat, or imposter syndrome	34	NA

[a] From 408 faculty using adaptive courseware who responded to the fall 2020 Time for Class survey.
NA = not asked on survey

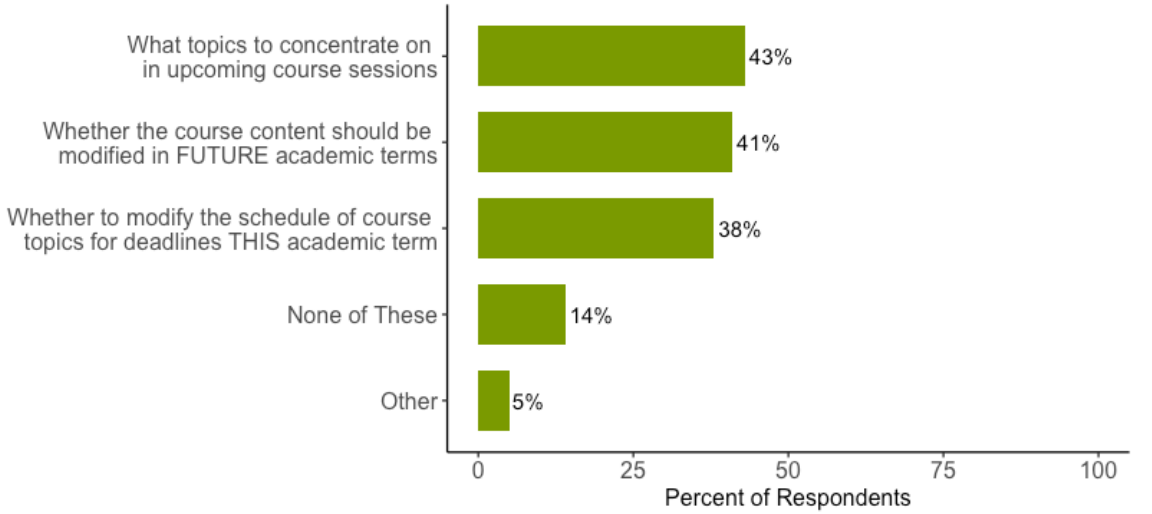
Comparing responses from the Every Learner Everywhere Instructor Survey in the fourth column of Table 10 to those from the Tyton Faculty Survey reveals that the former reported using some of the specific practices related to the EBT practices at a higher level than that suggested by the Tyton faculty sample when asked about the EBT practice dimensions by name. This difference is particularly striking for the Data Analytics dimension. In part, this difference in survey responses may reflect real differences in practice, as the Lighthouse faculty were all using adaptive courseware and had multiple semesters of involvement in teaching and learning improvement efforts.[2] But the differences between Lighthouse instructor data and the Tyton faculty survey data are substantial enough to suggest that the different approaches to probing instructional practices and the nature of the EBT concepts were influencing responses as well. Some survey respondents may have been uncertain what was meant by "data analytics" or "transparency" even after reading the definitions provided in the survey, and they may or may not think of things such as avoiding lengthy lectures as a technique for promoting active learning. More fundamentally, there are multiple different ways to execute most of the EBT practices, and instructors may employ some of them but not others. While uniformly employing formative practice by using adaptive courseware in their classes, for example, Lighthouse instructors usually did not use the mastery learning aspect of formative practice.

An additional complication is that some of the instructional practices are built into the course design (for example, specifying the course learning objectives or incorporating culturally relevant content) while others are more ephemeral and may be actioned on some days or weeks but not others. With this in mind, the Every Learner Everywhere Instructor Survey asked instructors to indicate how frequently such practices were used. The last column of Table 10 shows the proportion of Lighthouse instructors stating they used each practice at least once during most weeks for those practices that were included in a question about frequency. This is a stricter criterion than simply asking whether the practice was ever used and arguably provides a clearer picture of what students experienced as the dominant instructional approach.

With respect to Data Analytics, the Digital Promise survey responses suggest that more than 80% of the Every Learner Everywhere Lighthouse instructors are examining the data dashboards built into their courseware. Additional survey questions explored the decisions these instructors made based on courseware dashboard data. Figure 4 shows the decisions they reported making based on whole-class dashboards.

2 Tyton also reported survey data for the subset of faculty who said they were using adaptive courseware, and percentages were generally similar to the overall response rates shown in Table 10 with the exceptions of two of the EBT practices; adaptive courseware users had a 5 percentage point higher rate of reporting use of formative practice and a 10 percentage point higher rate for reporting use of data analytics.

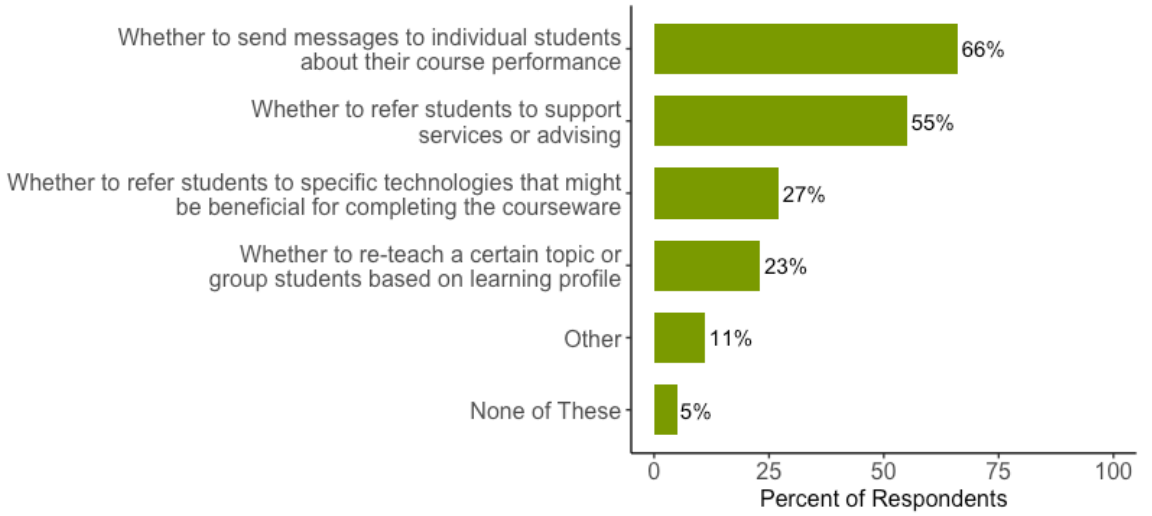
Figure 4. Decisions made based on whole-class dashboard



A sample "other" response explanation was "Added problems to the set I had anticipated covering with students in class."

Figure 5 shows the kinds of decisions instructors reported making based on data in dashboards for individual students.

Figure 5. Decisions made based on individual student dashboards



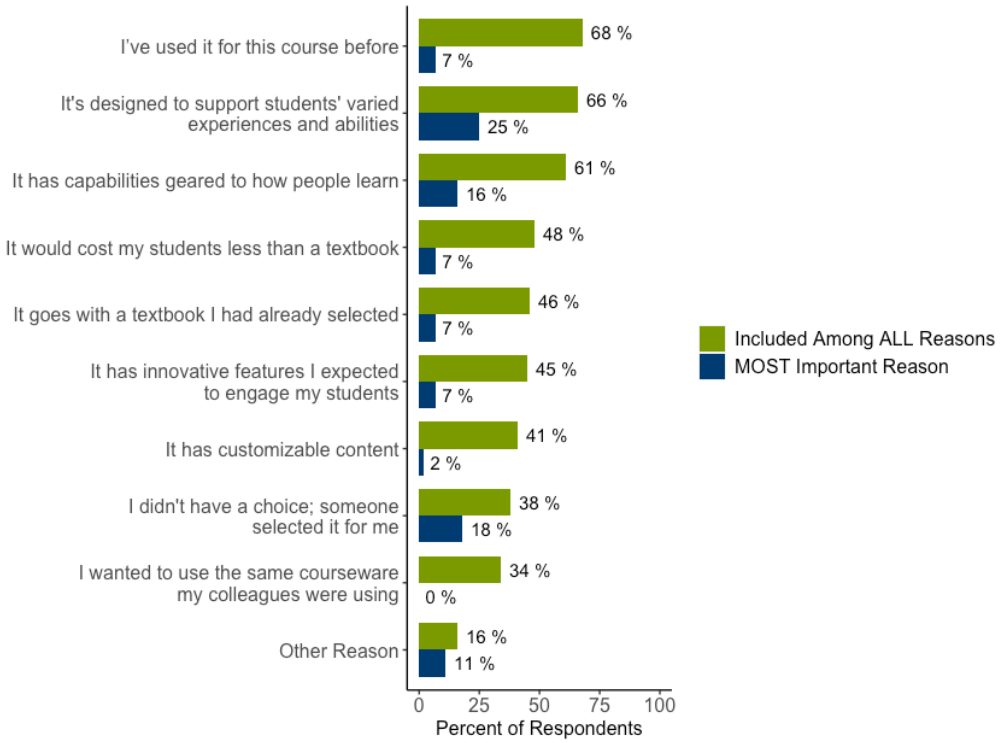
Taken together, the survey responses in Table 10 and Figures 4 and 5 suggest robust use of data from individual student dashboards on the part of Every Learner Everywhere Lighthouse institution instructors and frequent inspection, but less frequent action, based on data from whole-class dashboards.

Perceptions of Courseware

As might be expected for faculty who have volunteered to implement adaptive courseware and continued to do so for multiple terms, respondents to the Every Learner Everywhere Instructor Survey expressed very positive perceptions of courseware.

Instructors were asked why they selected the adaptive product they used in fall 2020. They were asked both (1) to indicate all the reasons they chose that product, and (2) to select the most important reason behind their choice. While prior use of the product was the reason cited most frequently (68%), it was rarely selected as the most important reason (7%). The belief that the product would provide appropriately differentiated instruction ("It's designed to support students' varied experiences and abilities") was the courseware selection rationale cited most frequently as most important, as shown in Figure 6.

Figure 6. Reasons for selecting their courseware product: all possible reasons and most important reason



Respondents were also able to identify other reasons for selecting the courseware product. Open-ended responses stressed low cost to students, product quality, and decisions made by a department or group of faculty working together.

> *"It was the courseware selected by a committee and represents the best of our instructional goals."*

"It is free to my students (OER)."

"Best of what I've seen."

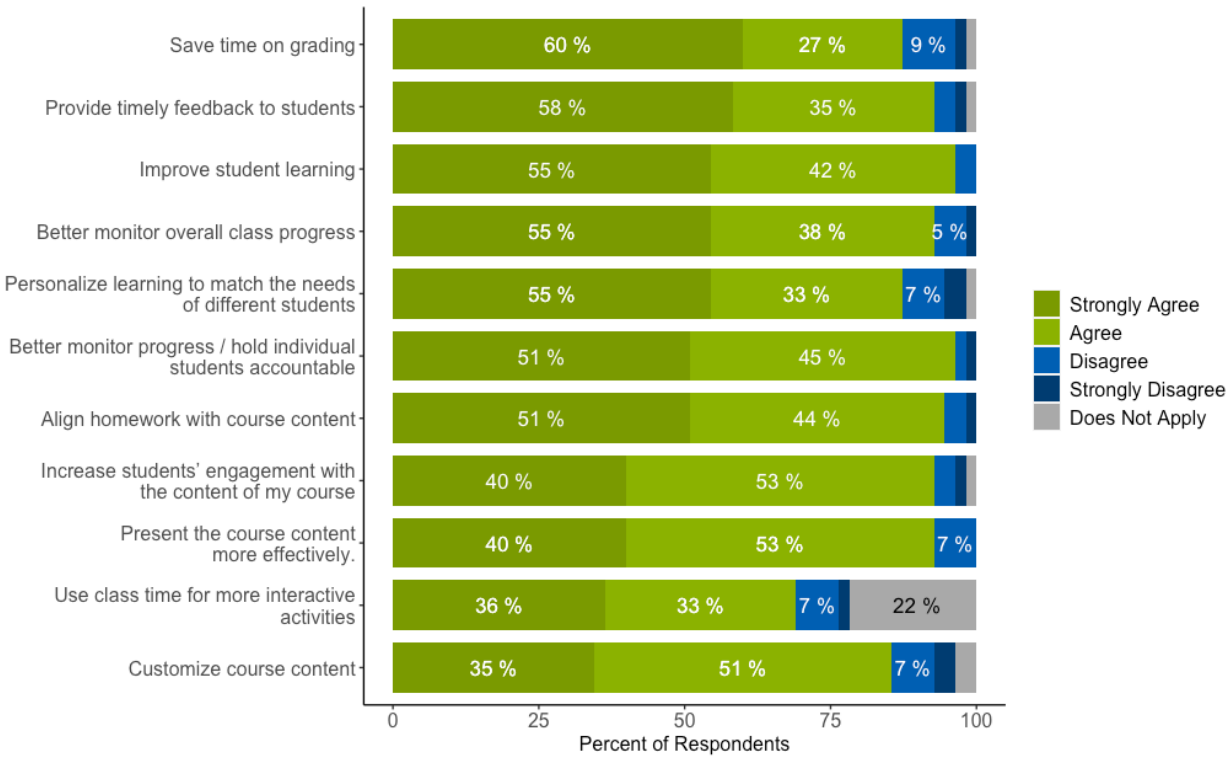
"Faculty chose this product."

"It is used in subsequent courses. / Course path alignment."

"I was part of the committee that identified this courseware, but it was adopted by the English Department as a whole."

Lighthouse instructors' positive views of adaptive courseware were also evident in their responses to survey items concerning ways in which courseware enhances teaching. Instructors were asked to indicate their level of agreement (Strongly agree, Agree, Disagree, Strongly disagree) with a series of items starting with "The courseware helps me… ." As shown in Figure 7, nearly all of the Lighthouse instructors responding to the survey indicated that adaptive courseware (1) improves student learning, and (2) allows instructors to better monitor progress / hold individual students accountable.

Figure 7. Ways in which courseware helps teaching, level of agreement



When asked, if given a choice, whether they would use the same courseware product again the next time they teach the course, 91% said they definitely or probably would (see Table 11).

Table 11. Instructor reports of likelihood they will use the same courseware for their course in the future

Response	Percentage	Number
Definitely will	71	39
Probably will	20	11
Might do so	7	4

Note: does not include one respondent who checked "Definitely won't use" but provided the explanation "ALEKS meets all my expectation for my students."

The explanations respondents gave for their answers to this question about using the product again provide further indication of the advantages they believe courseware offers.

> *"It is more efficient for grading, distribution of materials, and tracking progress."*
>
> *"In very large classes it gives students more opportunities to practice and get feedback."*
>
> *"The courseware material is self-graded. It provides me with analytics that I can use during the semester. I can also show future students its importance to their overall success."*
>
> *"It helps to gauge where students are struggling so we use class time the most efficient way possible. It also allows for a more student led and active learning environment."*
>
> *"I would definitely use it. It helps me make the students read the content. I can ask questions which I want students to know. It helps me make students' foundation strong so that they take the next course in the sequence with confidence."*
>
> *"The reason is that students can practice topics with immediate feedback and unlimited attempts. I can't provide that much time investment to each student with each topic."*
>
> *"Great tools for both students and faculty. Enhances learning. Ability to review individual student growth and needs as well as entire class."*

> *"Because this is an intro course, the students vary greatly in their background/base knowledge. It is nearly impossible to teach at a level that is appropriate for everyone! Adaptive courseware at least gives a chance to level the playing field a bit ... ."*
>
> *"I think it lessens the equity gap by meeting students exactly where they are. It also helps me identify early students that will need additional support ... to be successful."*
>
> *"I think it's beneficial since it works with each individual student to meet their needs. Some students have taken this course before and mastered certain topics, but need extra help with other areas."*

Although they were a minority of respondents, those instructors who were not sure they'd use the same courseware product again gave some explanations, suggesting ways in which they thought the product they had used could be improved.

> *"It works well but I would like to find one that is a little more interactive."*
>
> *"As far as online homework goes, ALEKS is very good. But ultimately believe online homework is an excuse for teachers to not grade. The feedback to students normally given by this grading is essential. I would love to use ALEKS to assist in learning, but online scoring of homework is frustrating to students, encourages cheating and believe should not be used. The extremely high percentage of the grade determined by ALEKS was heavily inflated because of Covid this semester. Quizzes and tests were in person, but taken online, so we would not be passing papers back and forth."*
>
> *"The adaptive quizzes are good in theory, and I believe they could be something worthwhile in the future. Unfortunately, at this point, they are more show than substance. From what I have seen, the questions become unreasonably difficult and lengthy. Watching my students struggle with the software consistently makes it hard for me to justify requiring it. It appears as though the writers of these content questions are more concerned with crafting elegantly written paragraphs than motivating student learning."*

Similarly, several respondents suggested areas for improvement when asked whether they had additional feedback.

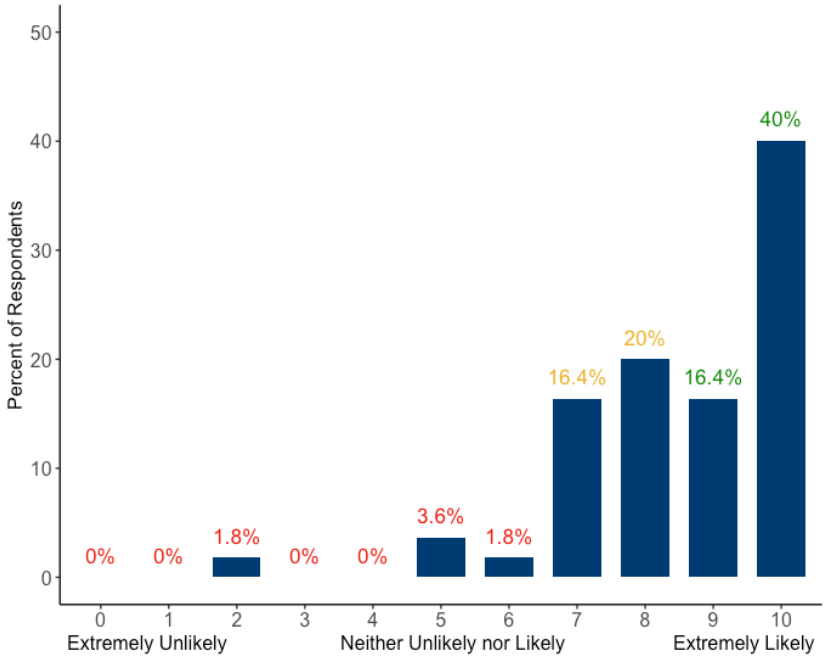
> *"I wish this courseware would provide more adaptive features."*
>
> *"Some students rush through assignments when they learn grading is based on completion."*

> *"While I enjoy the courseware and think it's great for the students, it is expensive and I'd prefer to use a less expensive alternative, or preferably OER courseware."*

Finally, instructors were asked how likely they were to recommend the courseware product they used to a friend or colleague teaching the same course. A net promoter score (NPS) is calculated by subtracting the total percent of detractors (i.e., participants who responded with values between 0 and 6, denoted in red in Figure 8) from the percent of promoters (i.e., participants who responded with values between 9 and 10, denoted in green in Figure 8). Values range from +100 to −100, where higher values indicate greater likelihood of promotion by users.

> ***NPS=(.4000+.1634)-(.0182+.0364+.0182) = .4606 × 100 = +46***

Figure 8. Likelihood of recommending the product to a friend or colleague teaching the same course



Although interpretation of this NPS is clouded by the fact that different respondents were thinking about different courseware products, the Lighthouse instructor NPS score of +46 is very high for a digital learning product. By way of comparison, the Tyton Partners' faculty survey referenced earlier found an NPS of +13 for faculty who had used the same courseware product for three or more terms (and negative NPS scores for first- or second-term courseware users).

Summary and Implications

In terms of the Bill & Melinda Gates Foundation's six EBT practice dimensions, these survey responses suggest that faculty involved in Lighthouse course improvement efforts believe they are making extensive use of four of them (transparency, formative practice, data analytics, and metacognition). Results with respect to a fifth EBT practice — providing opportunities for active learning — were mixed. Courseware-using instructors frequently report having students work independently on new material prior to dealing with it in class — a practice that in theory can allow class time to be spent on more problem-solving and critical-thinking activities — but they reported making little use of the collaborative learning and discussion-based pedagogies that are most closely associated with active learning in the research literature (Freeman et al., 2014). It should be kept in mind, however, that fall 2020 was a pandemic semester, and many courses did not hold any face-to-face sessions. Instructors who did not use these active learning pedagogies in their online classes in fall 2020 may well have used them previously during in-person class sessions.

Faculty reports with respect to the final evidence-based teaching practice — establishing an inclusive learning environment — were similarly mixed. Only 38% of Lighthouse faculty said they implemented specific activities designed to create a classroom community or sense of belonging in fall 2020. Consideration of students' cultural backgrounds and interests was more common, with 61% of Lighthouse faculty reporting that they included course content reflective of students' cultural and social identities and experiences, but only a third of Lighthouse faculty said their course incorporated activities designed to allay student anxiety, stereotype threat, or imposter syndrome. Establishing an inclusive course environment was not a major focus of the early technical assistance provided by the Every Learner Everywhere network, and **these data underscore the importance of the network's decision to place greater emphasis on equity-oriented teaching practices going forward.**

In general, the instructional practices most consistently used by the Lighthouse instructors were those that are well supported by courseware products. Courseware products are designed for independent student use and hence do not support active learning approaches involving collaborative learning and learning through discussion. Few courseware products contain activities designed around building a sense of inclusion and belonging in the class. As Every Learner Everywhere sharpens its focus on equity, greater attention should be given to these practices because they have been found to improve learning outcomes for minoritized students in past research (Jordt et al., 2017; Walton & Cohen, 2011).

While the Every Learner Everywhere survey of Lighthouse institution instructors using adaptive courseware was conducted at roughly the same time as Tyton's Time for Class survey in fall 2020, instructor-reported use of some of the EBT practices differed, as noted above for inclusive learning environment. The differences were even greater for the use of data analytics, which is a practice adaptive courseware supports and is emphasized in professional learning offered to Lighthouse instructors by Every Learner Everywhere. While only 36% of Tyton's adaptive courseware-using sample reported engaging in data analytics, 83% of the Lighthouse instructors said they used the courseware's whole-class dashboards and 86% said they used the dashboards for individual students. Furthermore, 75% of Lighthouse instructors reported having modified what they covered in class on the basis of student performance data, which is the essence of the data analytics EBT practice defined by the Bill & Melinda Gates Foundation. **These survey data suggest that the experiences supported by Every Learner Everywhere have influenced participating Lighthouse faculty's use of data analytics substantially** and reinforce the argument that teaching and learning transformation will require professional development in addition to leveraging the capabilities of digital learning systems. Still, there is room for further growth. While 75% of Lighthouse faculty reported changing what they covered in class on the basis of student performance data at least a few times during the semester, only 25% reported that this had become a weekly practice.

Finally, it was clear from their intention to continue using their courseware products, along with the unusually high NPS score, that **Lighthouse survey takers are very positive about the adaptive learning courseware they are using.** Compared to faculty in the Time for Class survey, Every Learner Everywhere Lighthouse faculty were more positive about the courseware they were using (an NPS of 43 compared to 13 for third-term courseware users in the Tyton data). This NPS may be related to receipt of a high level of support from their Every Learner Everywhere teams. In the Tyton survey, instructors using adaptive courseware who reported having access to a center for teaching and learning had an NPS of 21 compared to −26 for those who said they did not have access to such a center (Fox et al., 2021). In any event, these Every Learner Everywhere Lighthouse faculty are poised to become enthusiasts, both among other faculty at their own institutions and across colleges nationally in their respective disciplinary communities.

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Appendix

Table A-1. Every Learner Everywhere Lighthouse Institutions

Institution	Type	Enrollment[a]	% Black, Latinx, and Indigenous Students[b]	% Pell Grant[c]	Prior Experience with Adaptive Courseware
Broward College	2-year	38,976	67	62	Broward had used ALEKS for the first 6 weeks of a course to get students "up to speed."
Cleveland State University	4-year	11,564	21	44	Adaptive courseware had been used in undergraduate mathematics and chemistry instruction, and the College of Science and Health Professions had indicated interest in broadening use beyond these departments. The Math Emporium, which uses courseware, raised the pass rates in developmental courses from 48% to 70%.
Cuyahoga Community College	2-year	23,655	31	60	One faculty member had extensive experience using different adaptive courseware products, and several others had some experience but needed more information about the products available and their quality.
Florida International University	4-year	49,326	76	47	Adaptive modules using the open-source platform iMathAS had been used to remove the need for an Intermediate Algebra course prior to College Algebra.
Houston Community College	2-year	56,151	64	54	A few individual instructors had used adaptive courseware as one-offs, but there had been no systematic or large-scale implementation.
Indian River State College	2-year	16,942	40	56	IRSC were not familiar with adaptive course products beyond ALEKS (where they weren't using the adaptive component). No systematic process was in place for selecting courseware or digital learning tools.

[a] Total undergraduate enrollment in fall 2019 from the Integrated Postsecondary Education Data System (IPEDS).

[b] Percentage of African American, Hispanic, Native American and Pacific Islander students in fall 2019 enrollment from IPEDS.

[c] Percentage of full-time, first-time, degree/certificate-seeking undergraduate students receiving Pell grants in 2018–19 from IPEDS.

Institution	Type	Enrollment[a]	% Black, Latinx, and Indigenous Students[b]	% Pell Grant[c]	Prior Experience with Adaptive Courseware
Lorain County Community College	2-year	10,206	20	54	No systematic process was in place for selecting digital learning tools. Any course revisions and use of adaptive courseware were isolated and driven by individual faculties. LCCC had used other adaptive software in the past, but once that software contract had ended, did not work to update to the newest software.
Miami Dade College	2-year	51,679	85	71	Use of adaptive software or other technology, to some degree, was common, but varied greatly based on the individual faculty member.
University of Central Florida	4-year	59,371	38	30	UCF was familiar with customized adaptive, rather than off-the-shelf adaptive, courseware products.
University of Texas at El Paso	4-year	21,427	84	64	Only a handful of instructors used adaptive learning (Business). No systematic process was in place for selecting courseware and other digital learning tools.
University of Texas Rio Grande Valley	4-year	24,965	90	67	Adaptive courseware had been used in mathematics and chemistry. Courseware was used mainly to enhance consistency across sections.
University of Toledo	4-year	15,568	14	33	Adaptive courseware (ALEKS) was used in the first-year mathematics course sequence as part of a state-supported initiative to use co-requisites rather than remediation in math. Adaptive courseware was used for placement in chemistry, and to some extent in an optional co-requisite course, but not in the gateway courses themselves. Faculty using adaptive courseware were not fully utilizing its capabilities.

[a] Total undergraduate enrollment in fall 2018 from the Integrated Postsecondary Education Data System (IPEDS).

[b] Percentage of African American, Hispanic, Native American and Pacific Islander students in fall 2018 enrollment from IPEDS.

[c] Percentage of full-time, first-time, degree/certificate-seeking undergraduate students receiving Pell grants in 2017–18 from IPEDS.