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Constance Johnson
Colorado Technical University

Emma Zone
Faculty Guild

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ACHIEVING A SCALED IMPLEMENTATION OF ADAPTIVE LEARNING THROUGH FACULTY ENGAGEMENT: A CASE STUDY

Constance Johnson *Colorado Technical University*
Emma Zone *Faculty Guild*

INTRODUCTION

During the last decade, there has been an increased interest in the engagement of faculty with online learning and use of digital tools, including, but not exclusive to, adaptive learning, simulations, and video chats. Digital tools and courseware are being utilized in online courses as well as blended and flipped classrooms, and faculty are being asked to employ in new pedagogies incorporating digital tools into their classroom experience. Faculty are faced with the challenge of determining the level of knowledge of each student in the class and how best to support each student. When a cohort of students with a wide-range of base knowledge about a topic begin a course, faculty are seeking ways to personalize the experience while increasing student success (Tyton Partners, 2017).

Adaptive learning has been utilized to provide a student with a personalized learning experience, while, at the same time, providing the faculty member with insight into a student's learning process. While research about the efficacy of adaptive learning is in early stages, the interest and study of adaptive learning and digital tools in the classroom is growing. Also expanding is interest in the effective methods to engage faculty to use adaptive technology in the classroom.

Adaptive learning and digital tools provide an alternative education structure (Dziuban, Moskal, Cassisi & Fawcett, 2016) that offer students and faculty the opportunity to interact and engage in teaching and learning outside of a traditional classroom. From a faculty view, there is additional insight about a student's level of knowledge in a topic as well as the content areas that students in a class may be struggling with mastering. Nakic, Granic & Glavinic (2015) argue that adaptive learning can facilitate improvements in student retention, student satisfaction, and the achievement of student outcomes. Dziuban, Moskal, Johnson & Evans (2016) outlined student satisfaction with adaptive learning technology with two different student populations, traditional 18 to 22-year-old students and adult students with an average age between 30 and 39. In this study, survey data indicated that student satisfaction with technology was markedly similar despite

the different demographic characteristics of both student populations. Adaptive learning provides both the student and the faculty member to shift time to areas of learning that may not be explored in a traditional classroom setting (Dziuban, Moskal & Hartman, 2016).

Research indicates that faculty are reluctant to engage in online teaching due to concerns with change, technology, student outcomes, and workload (Betts & Heaston, 2014). Tyton Partners identified specific barriers to adoption of platforms that promised to personalize the student experience including additional time required for faculty, efficacy of digital courseware in improving student outcomes, and reduced control over course content and student experience (Tyton Partners, 2015).

Wingo, Ivankova & Moss (2017) advocate for training and support as well as affirming the importance of the faculty who is using digital tools as essential ingredients for success adoption of digital tools. Kennedy (2015) studied faculty perception of online professional development and determined that perceptions were positive if development activities were supported by release time and if faculty believed that the training was of value. Likewise, Buchanan, Sainter & Saunders (2013) stressed the importance of an institution's structural support for faculty adoption of technology.

Lowenthal, Wray, Bates, Switzer & Stevens (2012) outlined a number of tools that were preferred by faculty for training, including videos, noting that it was important for developers of training to assess the methods that are effective with faculty, considering both full-time and adjunct. The literature indicates that the types of professional development and training provided, as well as the community surrounding the training and instructional support as key elements that should be considered when working with faculty to adopt online learning and digital tools in a classroom environment.

BACKGROUND

Colorado Technical University's (CTU) mission is to provide industry-relevant higher education to a diverse student population through innovative technology and experienced faculty, enabling the pursuit of personal and professional goals. Programs are offered in career-focused disciplines including engineering, computer science, healthcare management, business and management, criminal justice, information technology and nursing. In addition, concentrations are offered within selected programs to provide students with options for specialization.

CTU serves a diverse population and the average age for online students is 36, with female students accounting for 60 percent of the population. CTU is an open enrollment institution, and students enter CTU with varying levels of

academic and professional experience in addition to transfer credit. Open enrollment institutions who focus on adult learners face a set of challenges around learning readiness. Adult students may be first generation students, students who have some transfer credit from years ago, students who have failed at other institutions and military students. Using adaptive learning allows for adult students to review prerequisite skills as they work through content, while still working within credit bearing courses.

CTU, therefore, sought to better meet the needs of their student population through a personalized courseware solution while addressing the known faculty barriers to this type of courseware adoption. The drivers for CTU's commitment to wide-scale adoption of adaptive learning were student outcomes, student feedback, and faculty feedback. Given the needs of its non-traditional, open enrollment student population, CTU began piloting adaptive learning in 2012. Hall (2013) argues that "the single most important step in developing a viable technology implementation strategy is to link the role of learning technologies with the mission and vision statements of the institution. CTU's mission aligned with adaptive learning which was chosen specifically because its feature sets, including learner autonomy, appeals to the adult learner.

PILOT

Pilots began with implementing adaptive learning in three general education courses, including two Math courses and one English course. Approximately 100 students were involved with the initial pilots in these three first-year courses, traditionally seen as courses that are barriers to student success.

CTU's implementation team understood the barriers to adoption, specifically those that related to faculty. CTU's approximately 800 faculty consists of 68 full-time faculty; however, the majority of the faculty population are adjunct faculty. The adjunct faculty consist of a large number of working professionals, consistent with the mission of CTU to provide industry relevant information to the classroom.

Choosing an adaptive learning platform that allowed CTU faculty to be involved in the course design process was one key element in infusing faculty into the implementation process. For that reason, CTU chose the Realizeit adaptive learning platform. The platform offered a large amount of control on content creation and course development, thus allowing robust faculty input in the course design process. It was critical to CTU's strategy that faculty be involved in the creation of the learning maps and the content within the system, and Realizeit's system supported that vision. In addition, CTU branded the platform as intellipath, adding to the consistent, unified approach to the implementation.

While a seemingly minor detail, the branding helped faculty and other CTU staff see the launch of intellipath as a unique differentiator for CTU.

Early in CTU's adaptive learning adoption process, it became evident that a one-time training demonstrating the technology was not sufficient for faculty to use the technology effectively or to feel comfortable using the technology in the classroom. Faculty were required to successfully complete an asynchronous training module before teaching using adaptive technology. Survey results and faculty feedback indicated that faculty thought the training was effective and sufficient. However, continued faculty feedback indicated that subsequent support was critical to the continued use of the technology. Interestingly, faculty expressed preferences for a variety of follow up support protocols; for example, some preferred Frequently Asked Questions (FAQs), while other preferences included group phone call meetings with other faculty as well as individual training sessions.

The end result of this faculty feedback throughout the first year of scaling the use of adaptive technology was a commitment of CTU academics to support faculty throughout the stages of technology adoption, which required continued engagement with faculty to understand the issues encountered during different times throughout a course. Central to this work were two core beliefs:

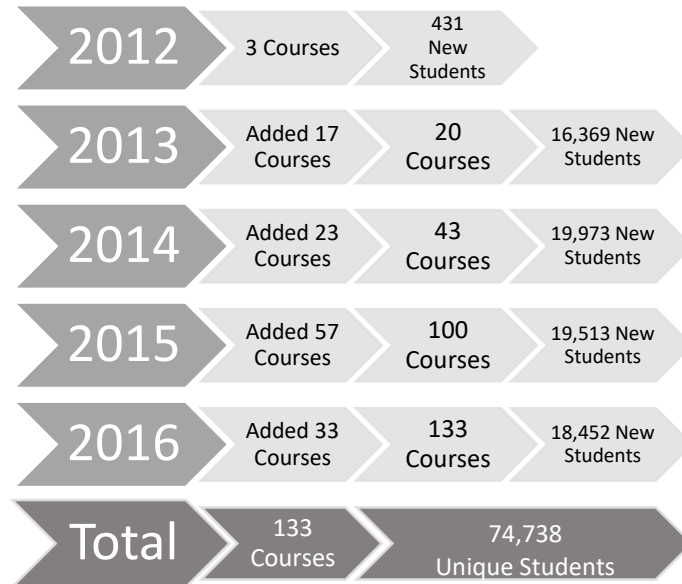
1. Faculty are better equipped to define the training protocols needed to effectively use technology in the classroom.
2. Technology adoption by students in a course is greatly influenced by the faculty experience of the technology.

EXPANSION

From the early stages of the implementation of adaptive learning at CTU, there has been a focus on keeping faculty central to the development, launch, measurement, and revision of the courses. Known barriers to adoption include faculty control of course content, therefore, CTU intentionally integrating the faculty perspective in various facets of the implementation strategy. This ultimately allowed CTU to expand beyond General Education courses to include varying disciplines and degree levels. For example, faculty, working through college committees, determined the expansion of courses utilizing adaptive learning technology and faculty integrated adaptive learning technology into a course as was deemed appropriate for the content in the course. From 2013 to 2017, courses were added in each college incrementally using pilot protocols prior to launching in all sections of a course. During this process, CTU's commitment to faculty focus groups, surveys to evaluate courses and to evaluate training provided became the norm and not the exception. Currently, there are

approximately 500 CTU faculty who are utilizing adaptive technology in the classroom.

Figure 1. CTU yearly expansion of adaptive learning 2012-2016



*Online Student Head counts represent new, unique students and are calculated annually

*Course Count is calculated based on the # of courses offered cumulatively

FACULTY INVOLVEMENT

Faculty are responsible for the development of course content, and at CTU, the process can include individual faculty creating a course or a group of faculty working on a course collaboratively. The development of learning maps for adaptive courses can be time consuming and initially, the hours that faculty needed to commit to development were time prohibitive. At CTU, faculty are provided the ability to work with an instructional designer; this allows faculty to focus solely upon course content as a subject matter expert.

The process for faculty to develop an adaptive learning map includes the initial generation of questions needed to achieve defined course outcomes. The dissection of course content to create an adaptive learning map can be a daunting task for faculty and, as a result, CTU created a number of templates to guide faculty through this process. The process of developing a course has changed over time, now incorporating templates and explicit instructions that were created as a direct result of faculty feedback about the time commitment of developing a course. Templates serve to provide an efficient process for faculty who work with an instructional designer to create the online and adaptive content. Statements,

taken from recent faculty survey, about the course design process include continued feedback about course content:

- I like the submission nodes but I think they could be better designed to reflect where our students are academically. For example, when revising sentences for conciseness, I think it would be helpful if the sentences sounded more like what our students write and encounter on the discussion boards in the course.
- I would like the submission nodes to have a text field so that separate upload is not required, thereby removing a technological barrier for the students.
- Integrate course discussions beyond the initial introduction to get the students interacting with each other and with me at a deeper level.

The system is structured for optimal learning and verification of mastery, so while students have control over aspects of their experience, they must demonstrate competency with prerequisite concepts prior to certain material being available to them. Within the adaptive system, students have the ability to choose an alternative path through the content, to attempt new content, or alternatively review and practices previous concepts. Likewise, faculty can identify learning objectives for students, and the analytics data provided by the system can improve the faculty member’s interaction and intervention with students. The faculty view of the system shows the real-time view of student progress and mastery. At a glance, faculty can determine the concepts with which the whole class is struggling or excelling, allowing for intervention. Similarly, this data is available at the student level, and faculty can engage with the adaptive system to assign practice material to students who need to focus in particular areas. Figures 2 and 3 display faculty views of students’ progress and a course level learning map.

Figure 2. Faculty View of Objective Mastery and Progress

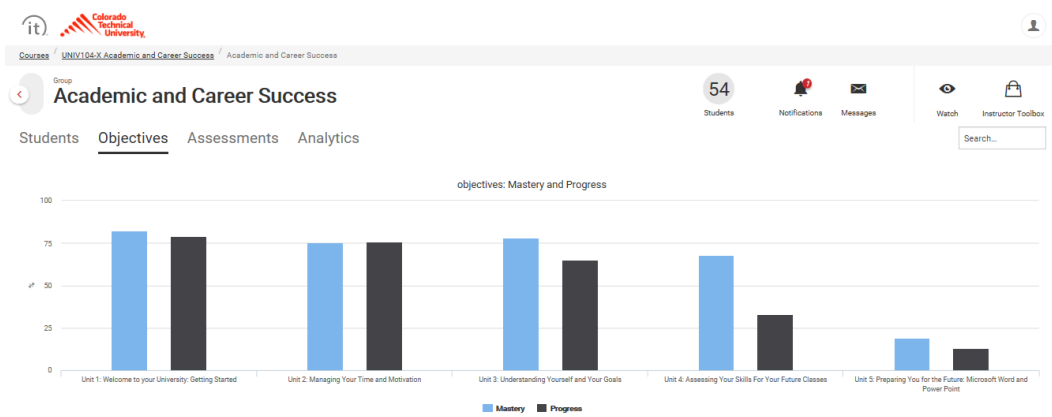
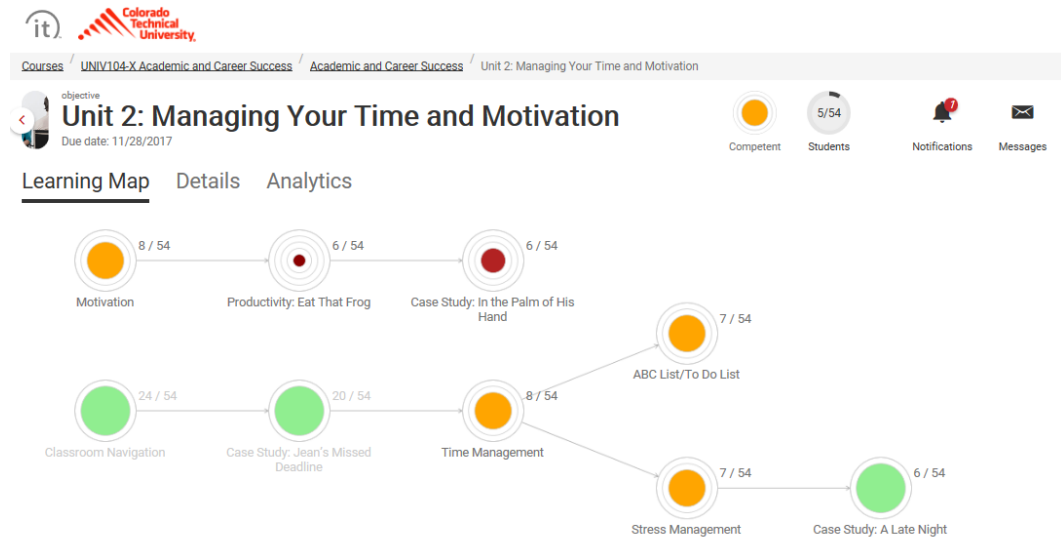


Figure 3. Faculty View of Course Level Learning Map



Integrating the faculty perspective throughout the implementation of adaptive learning has been paramount in building a culture of inclusivity at CTU. This included adhering to a disciplined model, including quarterly review by each college, that included both faculty and student feedback after the completion of each course that used the technology.

Barriers to faculty adoption of technology have been defined as time spent in courses using technology, efficacy of technology in meeting student outcomes and lack of alignment with curriculum design principles (Tyton Partners, 2017). Important to the scaled expansion of adaptive learning at CTU, however, is that the attention to the faculty experience has not wavered. There is also a defined process for faculty to submit feedback on content or other concerns. This process allows for immediate curriculum intervention by the Program Directors, and, depending on the severity, issues can be addressed swiftly. It is important for faculty to have an escalation process where questions and concerns can be addressed in real-time by CTU leadership.

FACULTY SUPPORT AND TRAINING

CTU's faculty training and ongoing support takes into consideration Davis' (1989) Technology Acceptance Model (TAM). Davis argues that two key factors that relate to the level of technology acceptance include perceived usefulness and perceived ease of use. As noted previously, faculty complete faculty surveys to provide feedback after each course and included in this survey is a Net Promoter

Score question: “How satisfied overall are you with your experience using the adaptive learning component?”. Recent survey results indicate a very high level of satisfaction with the adaptive learning experience evidenced by an NPS score of 79 (where a NPS percentage of 50 or better is considered very strong).

As CTU launched training in 2012 to support the adaptive learning implementation, attention was paid to defining the benefit for faculty, whereby both the usefulness of the technology and the ease of use was central. Specialized training was created which included an asynchronous module and accompanying assessment. This training highlighted the intuitive nature of the adaptive learning platform (ease of use) while also demonstrating the data available via the system, thus allowing real-time intervention from faculty throughout the course (usefulness). No longer did a faculty member have to wait until the first assignment was turned in to begin formatively assessing student progress and performance. An academic operations team managed a process of tracking completion of the training, confirming all faculty who were assigned to teach a course that included the adaptive technology were trained prior to starting class.

Table 1. CTU Faculty Trained on intellipath 2012-2016

	# of Faculty Trained
2012	132
2013	418
2014	212
2015	246
2016	83
Total	1091

In addition to the asynchronous specialized training, the faculty training team also hosted regular office hours using a video conferencing and screensharing platform, where faculty could login, ask questions in a synchronous environment, and work with a faculty trainer who provided demos or walkthroughs of features. Surveys were used to collect feedback on the effectiveness of the training, and, as the implementation grew, so did the collection of resources available to faculty. Besides the initial specialized training and office hours, faculty had specific requests on need-it-now resources to highlight functionality, terminology, and how-to guides. Those items were created and refined as the comfort level with the technology grew.

As the use of adaptive learning has expanded, CTU has continued to revise the faculty training and resources. In 2016, after gathering feedback from full-time faculty, an adaptive learning taskforce was created to inform next steps with training.

What became noticeable was the desire for next level training. No longer satisfied with training that focused on the user experience and system functionality, faculty who had adopted the practice of teaching using the adaptive system wanted a new level of training that focused on improving their teaching. These faculty were reporting high levels of self-efficacy with the technology, and, thus, desired training that allowed for exploration of more complex concepts, including how to optimize the use of the technology in their teaching practice. Kleisch, Sloan, & Melvin (2017) noted that a focus on not only the functionality of the technology, but also the instruction is a desired part of any faculty development model for adaptive learning.

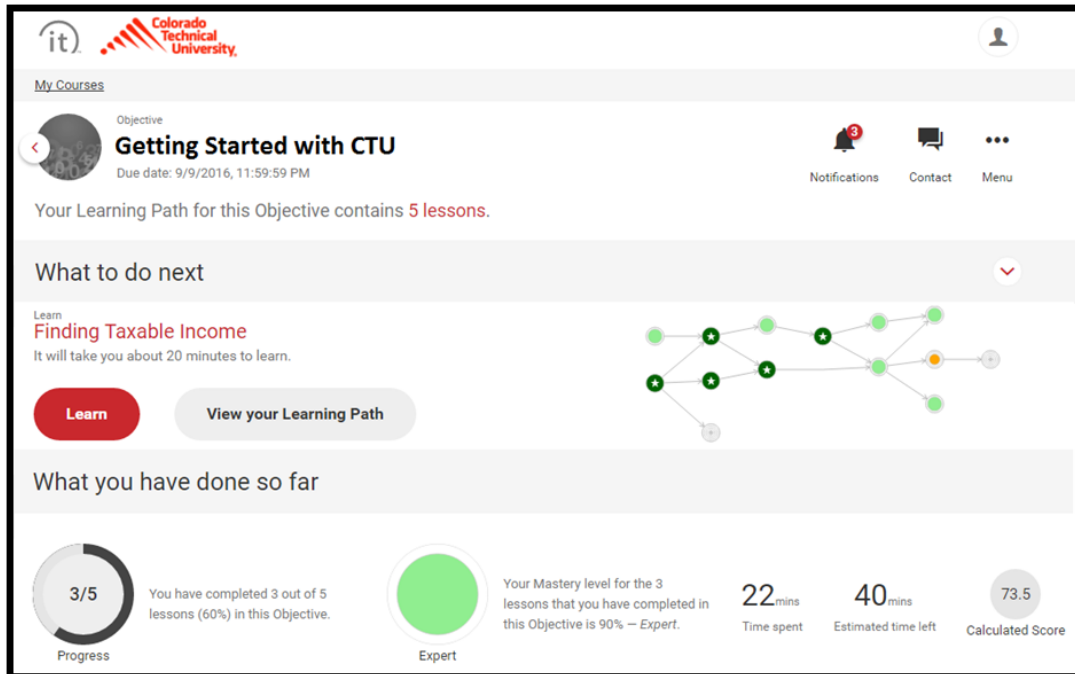
Because CTU's faculty model relies not only on full time faculty but also adjuncts, CTU had to be nimble and consider the disparate needs of both the new and experienced user. In this way, the training model is not transactional, and the training strategy is not linear.

USE OF FACULTY DATA AND FEEDBACK

Data-driven decision making, while critical to accreditation, state regulations, and budget considerations, has not been the primary focus for faculty. At CTU, review of data for courses is a part of faculty expectations, as well as a prerequisite for any faculty who request changes to course content. Admittedly, this data-centric cultural change took time and intentional discussion, in addition to training and support for reviewing data.

The adaptive learning platform provides a view of learning maps, class progress related to specific content in the course, and individual student progress. Students are provided data about their progress in a course with a number of dashboards to which the faculty have access, as well as additional data about the progress of the entire class. Figure 4 displays an overview page that CTU students are provided when logging into intellipath.

Figure 4: Student View of Objective Overview Page



Because faculty feedback about all elements of designing and teaching an adaptive learning course are evaluated, faculty survey comments, from a survey administered in 2017, about the adaptive platform are noted below. As with any teaching tool and methodology, faculty provide a wide range of comments and perspectives, and it is important to note that all feedback is considered and reviewed. While the majority of faculty comments about adaptive technology in the classroom are positive, a number of comments indicate areas for consideration for improvements. CTU's process includes the incorporation of these comments into a regular course review process, and if a faculty member requests direct follow-up, this will occur as well.

- The intellipath learning system is superb. The students love it because it gives them hands on experience.
- Some MATH106 online students believe that Intellipath does not provide adequate examples and detailed tutorials to solve the required problems. I suggest to provide similar example for each problem solving question with detailed tutorial in order to help online students learn how to solve the related problems correctly and to avoid students' confusion.
- I think that the Intellipath really helped the students to understand the concepts that they were practicing in their assignments

DISCUSSION

Student outcome improvement with CTU's adaptive courses has been measured by improved course retention, final grades, and student persistence to the next course. Admittedly, there has not been success in all courses; however, the majority of courses have demonstrated improvement in one of the variables previously noted.

The process of CTU's wide-scale adoption was, in many respects, driven by the students and faculty using the technology. Initially, a number of faculty were champions of the technology and assisted with the creation of faculty development and training tools. Also, at the onset, CTU surveyed students and conducted focus groups to ensure that usability was ideal from a student perspective. Student advising also played a key role in the adoption of adaptive learning technology in several ways: providing feedback from students that was not captured in surveys or focus groups and participating in usability groups as adaptive learning was implemented.

Additionally, academic leaders and faculty review dashboard data from courses on a regular basis. Review of course data includes course completion, persistence into the next course as well as failure and withdrawal rates from courses. If additional analysis of a course is warranted, review of the adaptive learning map or specific nodes within the course are completed as well. As a result, adaptive learning has resulted in the improvement of student outcomes and student engagement in a number of CTU courses. Data also indicate that students' engagement in adaptive learning technology during orientation can lead to increased participation and engagement in courses during the first session.

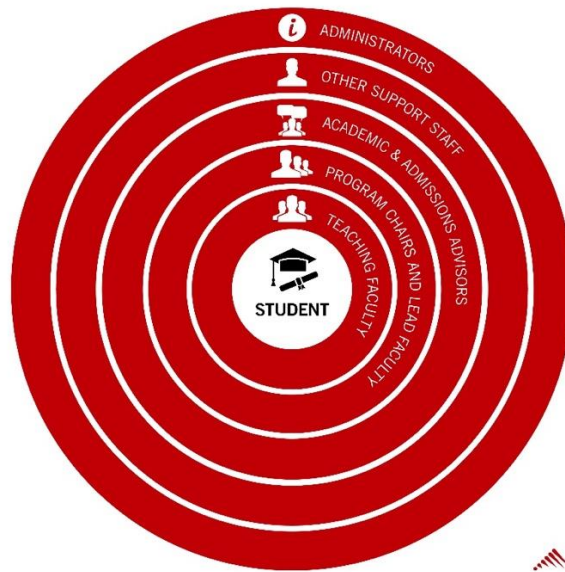
Common feedback from faculty when implementing technology in the classroom is the concern that faculty are being replaced by technology, but the faculty culture at CTU embraces the use adaptive learning technology. Important to this cultural norm has been the emphasis of the role of the faculty, which shifted from seeing the technology as a threat to understanding the benefit—a focus on engaging with students using the adaptive learning technology. Over time, faculty have seen how CTU students have embraced the use of the adaptive technology, and the faculty perceptions of their role to shepherd this technology has been paramount in the success of the adoption. It has been equally important that faculty are active participants in the development and revision of course content, which establishes a critical sense of ownership. Courses are developed both by teams of faculty as well as individual faculty, and, once a course is launched, all faculty teaching the course have the opportunity to suggest course content revisions. Allowing for faculty engagement in both instructional and curricular activities surrounding the implementation of the adaptive technology establishes a balance between a bottom-up and top-down approach, which is

paramount to faculty embracing technology. Additionally, a focus on instructional approaches as well as control over course content help engage the majority of users by encouraging opportunities for success to occur. Hall (2013) notes that “the ongoing reporting of success stories will further enhance the opportunities to engage and energize the majority.”

Students have indicated satisfaction with adaptive courses as well as the desire to take another adaptive course (Dziuban, Moskal, Johnson & Evans, 2016). Faculty have also indicated satisfaction with the adaptive learning technology, including a preference to teach with adaptive technology versus without adaptive technology. Finally, because CTU’s population is primarily adults with varying education and experience, adaptive learning technology provides insight into the mastery of course content for both faculty and students.

CTU’s success with scale has resulted from what Buchanan, Sainter, & Saunders (2013) discuss regarding the need for more than just training—a commitment to optimizing institutional structures and infrastructure is critical. At CTU, that commitment has come in the form of leadership support from the executive team, investment in full-time faculty to manage faculty, defined processes and meetings that focus the efficacy of the use of adaptive learning in courses, and an institution-wide acknowledgment on the benefits of adaptive learning for CTU students. CTU’s philosophy supporting the wide-scaled adoption is depicted in Figure 5

Figure 5. CTU’s Adaptive Learning Adoption Model



CONCLUSION

The purpose of sharing CTU's case study of the implementation of adaptive technology is to address how known barriers to adoption were overcome. Significant barriers were overcome during CTU's project resulting in faculty embracing adaptive courseware. Further, this implementation resulted in using adaptive technology at scale, a significant accomplishment.

CTU has two core beliefs from this work: 1) Faculty are better equipped to define the training protocols needed to effectively use technology in the classroom, and, 2) Technology adoption by students in a course is greatly influenced by the faculty experience of the technology.

As the literature indicates, engaging training content, continued support at various stages of the adoption cycle, and openness to both positive and negative feedback to improve the faculty experience are integral. The usability of Intellipath, from both a student and faculty perspective, has also added to the wide-scaled adoption.

Recent (2018) faculty survey comments reflect the feedback that is received after each course has been completed. It is noteworthy that while a majority of comments are positive, constructive feedback from faculty are also included in the comments.

- The students loved the Intellipath and I gave them study guide info on each Intellipath to assist them. Those who read the information and followed it, did awesome. You can tell which students actually read the announcements or listen to the chat archives because they were the most successful in Intellipath.
- Great way to teach the basics and allow the students to go at their own pace. Excellent
- The Submission Nodes don't seem to be doing too well – there is a rapid drop off after the first assignment. It would be good if we could come up with some strategy to improve submission rates

Return on investment for CTU has included improved outcomes in a large number of classes as well as the enculturation of data as a driver for decisions about courses. While initially resistant to data in some instances, faculty now embrace data as a tool to improve student experience with course content. Central to the commitment of CTU to adaptive technology was to support faculty in teaching and facilitating to an open enrollment, adult student population. While this has taken time and resources of the university, the benefit for students, particularly those struggling with course content or those requiring more advanced content, has been well worth the time and effort. Finding a balance between engaging the

student and faculty perspective with institutional support and resources has resulted in a scaled implementation that continues to grow in a sustainable, measurable way, ultimately resulting in a technology adoption that meets the need of the university's student population.

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