

PEDAGOGY

Adapting: A Study of Implementing Adaptive Personalized Instruction, Innovation, and Technology From an Instructor's Perspective

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Abstract

As time transforms education, methodology also needs to adapt to course instruction. However, instructors face a challenge to be effective while meeting each student's learning needs. One such need for students today is the implementation of technological approaches to learning. The purpose of this study was to determine the perceptions of a new instructor in higher education of implementing adaptive learning into their coursework, curriculum, and instruction. Data were collected quantitatively through the Stages of Concern Questionnaire, which showed the participant's concerns about the implementation of adaptive learning. Qualitative data were collected via interviews with the participant that followed the Levels of Use protocol. The interviews allowed the participant to provide their views and beliefs about adaptive learning. Results show the participant was curious and interested in learning more about adaptive learning and its benefit in their classroom. Future research should focus on how universities can develop approaches to help faculty effectively learn and implement new instructional strategies.

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From the very beginning, instruction has continually developed to help meet the multiple learning styles of students. Instructional approaches have been researched, leading to new advancements in instruction and continual change in the presentation of information in the classroom. As learning and instructional material and courses have evolved through time, so has the technology used. For some instructors though, it can be a daunting task to use technology or work with the extreme effort needed to personalize their instruction for every student. As technology continues to evolve, today's instructors must continually seek ways to improve the delivery of content for the benefit of students.

This study observes an instructor's feelings and concerns about implementing adaptive learning technology that allows students to learn at their own pace, not to simply know information, but to be able to retain it and apply it. Incorporating some aspects of the Concerns-Based Adoption Model (CBAM; Hall et al., 2011) with a Stages of Concern Questionnaire (SoCQ) and Levels of Use (LoU) interview protocol can provide insight into possible areas of concern and focus areas that instructors may have pertaining to technology implementation. Furthermore, implementation of technological approaches could follow the RIPPLES model (Surry et al., 2005) in allowing faculty the opportunity to begin the process of personalized learning.

Adaptive Learning

The basic principle of instruction is to facilitate learning (Guilbert, 1998). Instructional strategies continually evolve with the goal of meeting the learning needs of students. Instructors can choose an instructional approach based on personal experience or the influence of other teachers (Layne et al., 2016). Although technological strategies may be innovative, they present an effective way of meeting the needs of learners today. One such instructional approach is known as adaptive learning. Lavieri (2015) defined adaptive learning as “a type of learning instantiated by computer software that adapts,

in real-time, to learner actions in order to maximize learning outcomes” (p. 5). Students can review course material that is presented using technological strategies (i.e., pictures, charts, videos) and then answer questions about the content. Next, students receive the opportunity to implement their knowledge through course activities. This approach engages the student with the materials and prepares them for more in-depth discussion when returning to the classroom.

Research has touched on the topic of adaptive learning and how to implement adaptive learning as a medium or framework. Ruiz et al. (2006) described adaptive learning as a revolution in education and the ultimate learner-centered experience. Wolf (2002) explained that adaptive models are built around a central learner model. However, despite there being information on what defines adaptive learning, research specifically describing faculty perceptions of implementation was not found.

Concerns-Based Adoption Model

The CBAM allows for a person to understand the reality of implementation and how some follow a pattern of concerns that must be addressed for change and innovation to be properly implemented. “CBAM offers several research-based constructs and tools that can be used to understand, facilitate, and evaluate the more complex efforts entailed with introducing technology innovations in classrooms and schools” (Hall, 2010, p. 234). Those tools are the SoCQ and LoU. Some believe change needs to happen immediately, whereas Hall believes differently, as noted in previous research (Hall et al., 1973):

An important beginning point with the CBAM perspective is the assumption that change is a process, not an event. Rather than assuming use is dichotomous (use/nonuse), in this perspective becoming a competent and confident innovation user is a developmental phenomenon that takes time. (Hall, 2010, p. 234)

CBAM takes four simple questions about implementation and develops them to be more specific to the innovation. To begin, CBAM (Hall, 2010) asks the following questions:

Simplicity	More complex
1. Is it [the innovation] being used?	1. How can the change process be facilitated to achieve high levels of implementation in classrooms and across a school?
2. How well is it being used?	2. What factors and approaches can be applied for achieving widespread use?
3. What factors are affecting its use/nonuse?	3. What is the extent of implementation with each individual and school?
4. What are the outcomes?	4. How do outcomes vary with extent of implementation?

These questions help the focus of this study transform from simple usage to the thought of how implementation can become a reality for courses and spread throughout a program. In this study, the more complex questions allow for a glimpse of how more faculty can implement adaptive learning and what questions about adaptive learning need answers.

Stages of Concern Questionnaire

The SoCQ is a well-used tool for consultants who observe attitudes and feelings faculty could have toward innovation (Roach et al., 2009, p. 304), or more plainly put, “The Stages of Concern describe ‘the affective dimension of change: how people feel about doing something new or different, and their concerns as they engage with a new program or practice,’” according to Horsley and Loucks-Horsley (as cited in Roach et al., 2009, pp. 304–305).

Levels of Use Interview Protocol

Another instrument for gathering insight on implementation is the LoU protocol. LoU allows for the description of actions through

verbiage. The primary focus of the LoU is on the actions within the classroom and the LoU allows for accountability for decision makers, according to Ellsworth (as cited in Roach et al., 2009, p. 309). The SoCQ focuses more on quantitative aspects and data, whereas the LoU examines “the behaviors and actions of teachers and other educators as they implement a research-based practice” (Roach et al., 2009, p. 309).

RIPPLES Model

Once the concerns and usage of the innovation are identified, there needs to be a method to implement technology based on results, thus the RIPPLES model. RIPPLES stand for the elements identified: Resources, Infrastructure, People, Policies, Learning, Evaluation, and Support (Surry et al., 2005). Sometimes there are barriers to overcome so that innovation can be implemented in higher education settings. Therefore, the RIPPLES model provides an outlook into what areas to pinpoint to smooth out implementation and reduce the concerns of oneself and move more toward the concerns of student engagement with the innovation. This section provides a description of each element. Although the RIPPLES acronym suggests a linear order, the elements do not need to occur in a specific order.

Resources

Surry and Ensminger (2006) believe that instructors would need to secure resources, or financial backing, to support innovation. The RIPPLES model looks more broadly at integrating technology, but with technology comes the expense of purchasing new supplies. There needs to be adequate funding to obtain the resources needed to implement a variety of instructional approaches. New technology comes at a cost. Some faculty and even administration could have concern, but for innovation, financial situations should be accounted for within the department or school.

Infrastructure

Infrastructure refers to the hardware, software, facilities, and network capabilities and “should include five components - teaching resources, production resources, communication resources, student resources, and administrative resources” (Surry & Ensminger, 2006,

p. 9). In implementation, there may be some familiarity regarding the software and system specifications, but training may be required. The resources listed are necessary to faculty, categorizing how they can facilitate a classroom or maximize potential student learning. For example, classrooms that come with desks for students, modern technology, and a projector would serve students in a different capacity than those that are more exploratory in nature (i.e., without desks; more books and tangible manipulatives).

People

To incorporate use of the innovation, faculty will need to believe if the innovation is worth it. They will also need to be committed to having it help students in their learning.

Policies

An effective measure for increasing technological usage in the classroom could be related to school policy. To encourage learning of new technology for faculty, policy may need to be written to incentivize faculty to begin innovative teaching. Policy can exhibit the priority for an administration and help faculty share in the possible urgency and importance of interacting with students through personalized instruction.

Learning

Teachers today are faced with the challenge of implementing technological innovations in the classroom with the goal of accomplishing learning goals (Flanagan & Jacobsen, 2003). This area represents an important piece pertaining to the student–teacher relationship. Adaptive learning, and the included technology, involves how students absorb and retain information. Surry and Ensminger (2006) outlined two principles to the learning aspect, in which all apply to implementation and its importance:

First, technology can have pedagogical benefits. Technology can allow teachers and students to interact in dynamic new ways, resulting in increased cognitive or motivational outcomes. Second, technology can have access benefits. Technology can allow a college of education to reach new student populations or to serve current students in new ways. (p. 12)

Evaluation

Although the RIPPLES model is not linear, evaluation should come subsequent to learning. Evaluations here would be in the form of one main question: “Is web based learning allowing faculty members to do a better job teaching their students or to reach new populations?” (Surry & Ensminger, 2006, p. 12). Innovations, methods, and technologies should always be evaluated and compared to the goals pertaining to the implementation. As Surry and Ensminger’s (2006) question exhibits, evaluations of the innovation should be done to further strengthen the teaching, which will result in strengthened learning.

Support

With proper support and encouragement, instructors can feel as if they can implement adaptive technologies and understand the task at hand. Faculty can receive support through their administration, other instructors, and experts in the field, whether it be subject matter or technology.

Based on the needs of implementing technological instructional approaches, the purpose of this study was to determine the perceptions of a new instructor in higher education of implementing adaptive learning into their coursework, curriculum, and instruction. By doing this, the instructor will express their concerns and levels of use as measured by a pre- and postcourse assessment. Results from this study could provide a framework for preparing new faculty for implementing adaptive learning in higher education.

Method

Research Design

The participant was a first-year instructor in higher education and at the university. Regarding adaptive learning, this was the participant’s first time implementing such a program. The participant was chosen to be involved in this study because it was their first opportunity to teach in higher education and it provided a new method of instruction. Therefore, the data could predict the participant’s concern in trying something new and teaching at a new level (higher education).

The method of study for this analysis was a case study. A case study was chosen because the data received was from a selected class, mainly highlighting the perceptions of the participant and their view of adaptive learning. This approach allowed for an investigation in more detail of the benefits and potential difficulties of implementing adaptive learning (McLeod, 2014). Horner et al. (2005) stated that single-subject research is “appropriate when one wishes to understand the performance of a specific individual under a given set of conditions” (p. 172). The criteria for this case study were the following: They must be employed by the university conducting the study, be teaching Psychosocial Aspects of Sport, and be willing to implement the adaptive learning model in their course. The study design used qualitative and quantitative methods, also known as a mixed-methods design. Data were collected quantitatively through the SoCQ, which showed the participant’s concerns about implementing adaptive learning into Psychosocial Aspects of Sport.

Qualitative data were collected via interviews with the participant that followed the LoU protocol (Hall et al., 2006). Through the interviews, the participant provided their views and beliefs about adaptive learning.

Approval was obtained from the Institutional Review Board (IRB) of the university from which the study was conducted. We retained the data on our computer for one year from the date the data were first obtained.

Procedure

In the beginning of the study, we assigned the participant based on being new faculty. The participant was approached about the study and then agreed to participate and provided consent. Before the course began, a SoCQ was sent to the participant to answer to the best of their ability; as well, an interview was completed in the format of the LoU protocol. The same was done for a postcourse assessment, and the views of the participant were compared from before and after the course. The SoCQ provided percentiles for the different stages in which those responses were compared with percentiles in the corresponding stage to see if the responses were aligned or not.

Instrumentation

Concerns-Based Adoption Model

In the 1970s, the CBAM was developed by the University of Texas at Austin's Research and Development Center for Teacher Education. George et al. (2008) believed that CBAM was one of the leading programs for measuring how new technology brings about the way teachers teach and learners learn in their classes. There are three tools involved with CBAM and assessing the level of faculty concern regarding implementing new technology: (1) SoCQ, (2) LoU interview protocol, and (3) innovation configuration. For the purpose of this study, innovation configuration was not necessary, because the participant was not the course developer nor making changes within the adaptive aspect of the course.

Stages of Concern Questionnaire

The SoCQ survey is made up of 35 questions with answers on a Likert scale from 0 to 7. The closer an answer is to 0, the more likely the participant is unconcerned with the subject matter or with the question asked. Likewise, the closer an answer is to 7, the more likely the participant is extremely concerned with the question asked. Upon completion, the answers are placed into an area of concern for the participant (0, unconcerned; 1, informational; 2, personal; 3, management; 4, consequence; 5, collaboration; and 6, refocusing) and can then give researchers a better understanding of where that concern lies. Participants complete the questionnaire twice: once at the beginning of the course and once after the course has been completed. This survey was administered online and took the participant about 10 to 15 min to complete.

Levels of Use Protocol

We conducted interviews with the participant to gather information on implementing adaptive learning in their course. Using the LoU protocol (Hall et al., 2006), we asked questions in the correct order and verbatim. Other questions to probe, or gather more information, were also used. The responses from the participant provided data on the eight components of this protocol: nonuse, orientation, preparation, mechanical use, routine, refinement, integration, and renewal.

Trustworthiness

The participant was asked to check if their responses were accurate for the SoCQ and the LoU interviews. Data for this study were collected through a questionnaire (SoCQ) and interviews (LoU).

Researcher's Perspectives and Biases

As this was our introduction to adaptive learning, there were no biases. Without prior knowledge, no opinions or views were formed influencing the outcome of this study.

Ethics

The participant was made aware of the study and understood their participation was voluntary. Because of the extent of the law, confidentiality was maintained, and the participant signed an informed consent form prior to participation.

Results

Stages of Concern Questionnaire

The composite scores were placed into a percentile and into the stage of concern for the participant (see Table 1).

Table 1

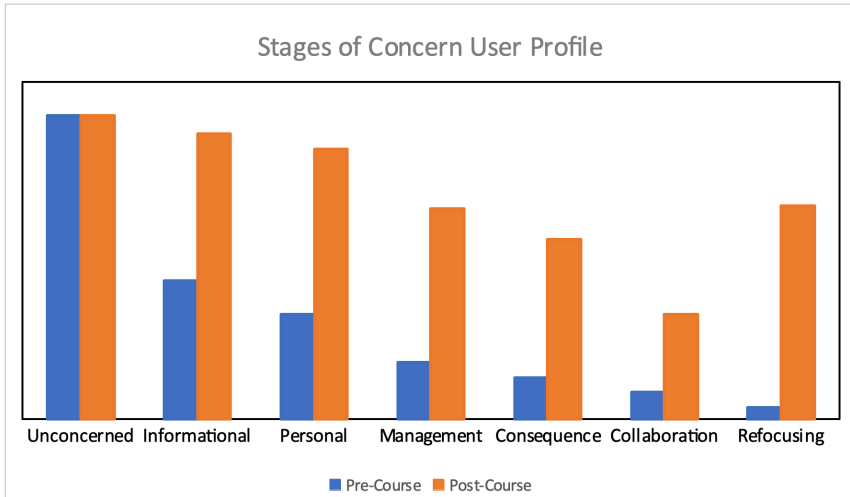
Stages of Concern Questionnaire Percentiles

Stage	Criteria	Precourse	Postcourse
0	Unconcerned	81	81
1	Informational	37	76
2	Personal	28	72
3	Management	15	56
4	Consequence	11	48
5	Collaboration	7	28
6	Refocusing	3	57

Pre- and Postcourse Profiles

Figure 1 provides a visual representation of data for each assessment and a clearer picture of how the concerns changed.

Figure 1
Stages of Concern User Profile



Stage 0: Unconcerned

A high score in this stage indicates there are other priorities in terms of presenting instruction, whereas a lower score represents a desire for implementing adaptive learning for this course. The participant registered their highest scores in this stage for pre- and postcourse assessments, suggesting their priority would not have been with adaptive learning, but rather with another method of instruction.

In the precourse LoU interview, the participant stated it was their first semester to use adaptive learning, meaning it was more of a learning process than a process of implementation. As the course finished up, the participant plainly stated, “Yes, I used adaptive learning for my future class.”

Stage 1: Informational

The higher the score in this stage indicates a strong desire to know more about adaptive learning. In the postcourse assessment, the participant’s desire to learn about adaptive learning more than doubled.

When asked about seeking more information in the precourse interview, the participant stated, “Other than what I will be working with for this class, I am not.” This aligns with the evidence from the precourse SoCQ. After the course finished, the response to the same question was “Not at the moment,” which was not supported by the postcourse SoCQ, because there was no change in interview responses, yet a significant difference in percentiles.

Stage 2: Personal

A high score in this stage indicates the participant would have questions and uncertainties pertaining to things such as status or rewards and the effect of adaptive learning on those. The participant scored a 28% on the precourse and a 72% on the postcourse. Even though the participant had no experience with adaptive learning, there were no questions from the participant in the beginning. But, by the end of the course, the participant developed curiosities and raised concerns based on the overall change in percentiles.

Stage 3: Management

The higher the score in the stage of management indicates concerns for management, time, or logistics that involve adaptive learning. The score from the participant’s precourse assessment was a 15% and the postcourse assessment was at 56%.

Although there were no direct LoU questions that pertained to this stage, the response was practically the same when the participant was asked if they would make any changes or modifications to this course: “No” (pre-course) and “No. I plan to use it for the same class in the fall” (postcourse).

Stage 4: Consequence

A high score translates to concerns about the potential consequences and effects of adaptive learning on students. The participant’s precourse assessment score proved to be low (11%) and only increased moderately (48%). The increase in percentile expresses that over time the participant became more concerned for the consequences.

This stage was addressed in the LoU precourse interview with a question about the participant seeing the effects of adaptive learning. The participant responded,

I think one of the effects I will see is how the students will respond to this type of learning. So much of our time is spent in front of the computer, tablet, or phone that this is how students want to learn.

This response seems to be a general observation of learning for the culture and how technology is involved, which correlates to the small percentile recorded for the precourse assessment.

For the postcourse assessment, after being asked the same question the participant said,

One of the effects I see is how the students respond to using this tool. Students do not want to spend hours in a classroom when they can do the same work from their phone or tablet. I determined this from the comments I receive from students on how they like using RealizeIt. Another effect is possibly negative. One-on-one time with students and even face-to-face time with students is so important. Using adaptive learning takes away from building relationships with your students and it also doesn't allow you to get to know your students. Many of the people I teach are future teachers and building relationships as well as getting to know your students are [two] important characteristics of effective teachers.

The concern about the class wanting to get only one source of information (i.e., face-to-face versus online) is cause enough for a jump in percentile. However, the consequence of losing face-to-face time from the perspective of the teacher would be enough to raise the percentile even more, which does not describe the SoCQ data of only being in the 48th percentile.

Stage 5: Collaboration

This stage focuses on how to collaborate and work together with others when implementing adaptive learning. The higher the score, the more concerned the participant is about working with others. The participant scored a 7% in the precourse and a 28% in the postcourse questionnaires.

In the LoU interview, when asked if they were working with others, the participant replied, "I do have a coworker that I can ask for help when I come across an issue or have a question" (precourse) and

“*Not currently*” (postcourse), which would coincide with the scores for this stage. One reason for the low scores could be the availability of someone with adaptive learning experience. If someone is navigating a teaching approach for the first time without the availability of an experienced teacher, there is greater potential for concern.

Stage 6: Refocusing

Within the stage of refocusing, a high score indicates the participant has thought about ideas and ways to improve how to use adaptive learning in their course. The score jumped from 3% precourse to 57% postcourse, which was the largest jump in any of the stages from pre- to postcourse.

The extremely low score in the precourse indicates the lack of experience of the participant in implementing adaptive learning; a person does not have many ideas if they do not have prior experience or knowledge in dealing with that technology. When asked in the precourse LoU interview, the participant had a succinct “*No*” pertaining to any changes or modification they would make. However, in the postcourse, the participant responded to a question about looking ahead to the next time they would teach the course: “I plan to focus more of my time on the student outcomes of RealizeIt. I plan to familiarize myself more with the program.” This comment confirms that the participant is planning for future semesters and having a better focus when implementing adaptive learning.

Discussion

The results, as pertaining to implementing adaptive learning, show that there was not much change in the SoCQ or the LoU. The participant had more curiosity when it came to adaptive technologies and implementing those; however, the percentile from the SoCQ indicates the participant is still in the beginning stage of implementation. Upon the completion of this study, we believe that over time faculty are curious and have a desire to implement adaptive learning into their higher education courses. From the onset, instructors, like the participant in this study, are new to the process and trying to figure out the correct way to implement adaptive technologies. In the postcourse LoU interview, as related to strengths and weaknesses of the innovation, the participant said,

I used it to view students' progress with each chapter and take a grade from the quizzes they took after each chapter. There was so much more I could have done, and I am disappointed I did not. [The weakness is] that I did not use RealizeIt like I should have to look at the student data. I could have looked at what topics they struggled with from week to week. I found teaching a new course and developing material to be overwhelming at times and did not use the information like I could have.

Seeing a problem but wanting to rectify it in the next iteration does not show the participant's desire or willingness to give up on adaptive learning. It does help explain an increase in postcourse scores and the spike in the Refocusing stage.

The lack of face-to-face interaction among the students and the participant was an important aspect to implementing adaptive learning. There needs to be a balance in technology and face-to-face time, as both exemplify that any faculty member cares about the student's learning through social interaction and using tools that can go beyond a lecture or overall assignment. However, solely relying on one style could hinder the experience rather than help it. On the basis of the data, the participant was willing to change their course to implement adaptive learning, although they had no experience with the innovation of adaptive learning. The feelings expressed by the participant indicate a desire for technology to help students learn, but the participant could also learn about themselves and how willing they are to make sure students get the complete learning experience.

With the findings from this study, implementing adaptive learning and technologies can help teachers as well as students, but it will take training and time. In discussion with an expert in adaptive technologies at the university, it was revealed that the participant had no prior training, nor was offered, which was opposite of other colleagues in the School of Health Studies. Furthermore, training on new methods, such as implementing adaptive learning, is an asset for instructors in making sure students are receiving the best learning experience possible.

As introduced, the RIPPLES model (Surr et al., 2005) can assist with introducing new aspects for implementation across a whole program, which will benefit teachers and students. The rest of this section gives examples, based on this study, of how implementation can occur.

Resources

Final decisions dealing with fiscal resources are out of the hands of teachers, but they can make requests to their administration. If faculty are adamant about new ways of teaching and helping students learn the subject matter, then administration will make efforts to acquire the resources needed. Administration is more likely to champion a movement, such as implementation, when well informed. Educating the decision makers (providing examples, seeing it live, etc.) can allow informed decisions and more curiosity, as seen in research with instructors. If administrators can see adaptive learning in action, they too might be more inclined to further research the benefits of implementation.

Infrastructure

The participant was a nonuser before the course began and moved toward beginner, with greater or equal percentiles on every level of the SoCQ. One-on-one training with the software engineers was provided to other faculty members so they could become familiar with the schematics. A familiarity with the technology allows faculty to show less concern for self (Stages 1–3) and more for students' needs with learning (Stages 4–6). The results can pinpoint a correlation between training and effectiveness in using the technology. As a nonuser, the participant spent more time exploring the innovation, as opposed to someone who had experience with the program.

People

The stakeholders would need to work as a team for successful implementation and for concerns to be taken from self to student performance. From students to instructors, deans to software engineers, every person involved has a vital role. Having experts within a faculty provides for troubleshooting and can allow other instructors to brainstorm ideas to enhance the learning process.

Policies

Some instructors are set in their ways and can resist any type of change. Furthermore, the implementation of technology cannot necessarily be forced, but should be encouraged through policy created by school administrators. If the reasoning behind instructing in higher education is about preparing students for a future professional career, policy should push for implementation of a learning style that is personalized to meet individual student's needs.

Learning

Adaptive learning, and the technology around it, involves how students absorb and retain information. For instructors (and administration), this should be at the forefront of implementation. Allowing students to have personalized benefits to learning is paramount and should be the overall goal of professors, instructors, and teachers.

Evaluation

Like any lesson, the use of technology should be evaluated for reliability and validity. For the participant, they were in an evaluation frame of mind, especially coming off their first iteration of the course and trial with adaptive learning. While the results show the participant is a beginning level teacher, there is hypothetical growth based on the rise in the Refocusing stage of concern, which shifted the concern from self (meaning more comfortable with the technology) to student use.

Support

Regardless of experience, higher education instructors will need support to help improve instructional strategies for their classes. More importantly, new teachers will need an environment that provides encouragement, instructional tips, and an abundance of resources to help them succeed. Most new faculty will have a learning curve, some bigger than others; however, implementation can be more efficient with proper supports in place, whether they come from inside or from a third party, such as a contracted software company.

How Results Benefit

RIPPLES is not designed to be linear but can be inferred to start with resources and move through the process. Results from this study show teachers can implement adaptive technologies and help students succeed in their academic career. The process takes time and requires proper training and support. The goal each year is for growth to occur. As teachers reflect on their classes and evaluate their productivity and effectiveness, they can consider and implement new ideas. Over time, the product will improve with continued effort given to their approach to teaching the class with adaptive learning. Again, if learning is the goal, then the motivation for doing something to benefit students will be present.

Future Research

With results of this study now present, further research can help organizations in implementing adaptive learning. Another study to help explore implementation and faculty perceptions could examine faculty perceptions of training. As mentioned, policy change can help in progressive implementation; however, the response from instructors may be mixed. Some may welcome the change in approach, whereas others will want to continue with their current teaching approach. Another possible study could examine potential incentives for implementing adaptive learning. Researchers would need to determine what would increase faculty motivation to consider the program. Finally, examining administrators' point of view and line of reasoning would provide researchers with an understanding of how leadership help improves their overall faculty effectiveness. With their knowledge of the fiscal situation and what would make their programs better for students and instructors, measuring their willingness and curiosity could generate some interesting findings. Nevertheless, more research surrounding implementation and the concerns of those implementing programs needs to be done to further promote the value of a personalized learning experience.

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