TECHNOLOGY-ENHANCED LEARNING

ENGAGE ♦ DEVELOP ♦ GROW ♦ EMPOWER

E.D.G.E.

" I was curious about adaptive learning technology that provides personalised educational experience for students."

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Adaptive Learning Technology for Personalised Learning

In this issue of E.D.G.E., CTE caught up with Swee Liang to discuss the use of adaptive learning technology and data analytics to enhance teaching and learning.
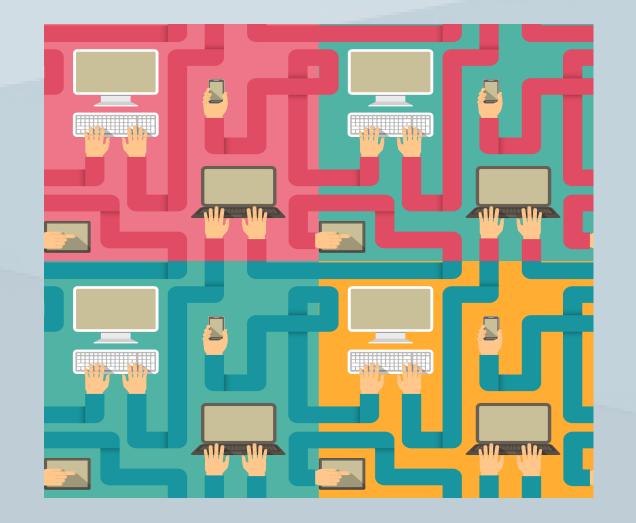
Consider
Classroom Context

In her International Economics course, students learn to analyse and apply international economic issues such as trade, factor mobility and finance to real world events. Her students are non-economics major, who have different levels of prior knowledge and confidence in approaching economics concepts. Swee Liang was curious to find out if she could harness advances in learning science and technology to provide her students with a personalised educational experience.

Think
Reflections

What is personalised learning and why does it matter?

Personalised learning is often used interchangeably with adaptive learning. These terms refer to the tailoring of learning to learning needs, learning preferences, specific interests, and progression of different learners. On the other hand, a "one-size-fits-all" teaching approach has the same type of instruction, and the same assignments and assessments, with little modification from student to student, regardless of strength or weakness in their knowledge, and confidence around their knowledge.

Explore
Interpretations and Tools

Can we harness 21st century technology capability and advancement in learning sciences, to create a personalised educational environment that supports a student-centric approach to learning? Swee Liang's students subscribed to the digital version of the course textbook (SmartBook) by the educational publisher McGraw-Hill Education, and the accompanying adaptive learning technology (Learnsmart®). They read the content and completed the quizzes in the digital textbook. See Figure 1 for screenshot of a sample multiple choice question (MCQ) quiz in the digital textbook. Before the students submit their response to the quiz, they indicate their confidence around the knowledge by choosing one of the four options: "I know it", "Think so", "Unsure", and "No idea". After they submit their response, they receive immediate feedback, with explanations and answer to the quiz.

Students attempt the MCQ which tests their understanding of the concept of Demand and Supply.

Students indicate their confidence level of their responses to the MCQ by selecting one of these four options.

Students can revisit the concept of Demand and Supply in the text.

Figure 1. Screenshot of a sample MCQ in the SmartBook quiz

Table 1 explains four categories of students' confidence of their knowledge ("I know it" and "No idea"), for correct and incorrect responses. Based on students' strengths and weaknesses of the knowledge, and confidence around that knowledge, the adaptive learning technology adaptively provides learning content to students.

Table 1. Combinations of meta-cognitive levels "I know it" and "No idea", with response accuracy

Confidence and Accuracy	Descriptions
"I know it" with Correct Answer (correct/aware category)	Students answered the quiz correctly, and knew they would, putting them in an ideal state, in comparison to the other three categories. It means students are not overconfident or underconfident; they are knowledgeable.
"I know it" with Incorrect Answer (incorrect/unaware category)	Students answered the quiz incorrectly, but thought they knew the answer, putting them in the worst state in comparison as they have no higher level of awareness of their learning. This indicates students who are overconfident in their abilities, and without intervention or adaptive support, at high risk to perform poorly.
"No idea" with Correct Answer (correct / unaware category)	Students got the quiz correct but weren't sure they would, hence they are potentially guessing. It indicates students who are under confident about their abilities. They are not high risk, but need to understand more about their learning.
"No idea" with Incorrect Answer (incorrect, aware category)	Students answered the quiz incorrectly, and knew they did not know it. It means students are realistic that they do not know the answer. Even though they don't know the answer they are conscious of their own knowledge. They are actually on a good path, in terms of self- awareness and the capacity to improve when they acknowledge where they need to improve.

The students are informed that they can generate reports on their progress and areas for additional reinforcement. This engages them in the learning process and enable them to self-evaluate their progress. As a form of self-directed learning, students are encouraged to take charge of their learning.

Findings

Swee Liang studied the impact of adaptive learning technology on student progress and achievements of students in two sections of the International Economics course, in Term 1, AY 2016-17. She will be using the findings to fine tune the design, facilitation and assessment of her class in the coming semesters. See Figure 2 for preliminary findings of the study.

Qualtrics survey:
- SmartBook was perceived by students to raise their comprehension and motivation levels for this course.
- Majority of students reported that they would recommend SmartBook to other students.

Focus group:
- Students shared that the practice and quiz questions were useful for helping them prepare for the multiple-choice question component in the final exams , but not the essay questions.
- Students also shared they may not be fully informed about the purpose of indicating their metacognitive level before answering each question in the SmartBook quizzes.

Figure 2. Summary of findings from Qualtrics survey and focus group study

Swee Liang's students are non-economics major, who have different levels of prior knowledge and confidence in approaching economics concepts. The findings in the survey suggest that students in the course perceived SmartBook has raised their comprehension and motivation levels. When asked to explain why they rated the SmartBook as useful in guiding them to learn, students' commented:

- *The specific content to learn is highlighted and hence we can quickly grasp the concept without wandering too much over the entire chapter. Also, the quizzes helped me reinforce what I learnt and refer back to areas I had doubts. As such improving my understanding.*
- *The quizzes help to validate that I've properly understood the concepts.*
- *I felt that digital textbook further explained the materials given in the Prof's lecture slides.*

For the Term 1, AY 2016-17 study, about 71% of responses are in the first category of correct and aware, and 23% of responses are in the second category of incorrect and unaware (see Table 1). The results showed a positive correlation between student academic performance with responses in the correct and aware category, and a negative correlation with responses in the incorrect and unaware category.

For more details on Swee Liang's study about the impact of adaptive learning technology on students' motivation and self-directedness, and hence academic progress and achievement, please contact her at slian@smu.edu.sg.

TIPS

Instructors can approach

- the CTE team to apply for the President Incentive for Blended Learning (PIBL)* fund to cover first-time subscription cost, subject to approval by the Dean and Vice Provost (Undergraduate Matters).
- the eLearn team to inquire about features in the learning management system that support personalised learning.
- the Library team to explore freely accessible, openly licensed text, media, and other digital assets that are useful for teaching and learning (open educational resources, OER).

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