2014 William Campbell Felch Award for Outstanding Research in Continuing Education (CE)

Improving the Effectiveness of CME through a Technology-Enabled Adaptive Learning Assessment Platform

Authors:

KARYN D. RUIZ-CORDELL, MA, PHD (ABD); STEVEN HAIMOWITZ, MD; BRIAN LEE PHARMD; ANTHIA MANDARAKAS

THE AUTHORS ALSO ACKNOWLEDGE MARC MOSIER, MD OF PRI-MED FOR HIS CONTRIBUTIONS TO THE CURRICULUM.

Introduction

Educators are increasingly challenged to create curricula that effectively address the needs of a healthcare provider audience that is diverse in their mastery levels, treatment approaches, years in practice, and patient population. Ideally, educators would be able to create scalable, individualized curricula for a large audience using available, often limited, resources. The goal of this study was to assess a technology-enabled CME platform, the "Learner Assessment Platform" (LAP), which was designed to help educators efficiently provide an individualized educational experience that targets identified learning gaps.

The LAP methodology evaluates learners' proficiency on specific parameters in a set of "Tier 1" activities, from which learners are directed to "Tier 2" activities designed to address the identified learning gaps. Using a curriculum focused on the management of atrial fibrillation and a validated quantitative marker of clinician performance, the LAP method was evaluated by comparing the performance gains resulting from LAP learning with non-LAP learning.

Our results show that the LAP learners achieved significantly higher performance gains across the curriculum than non-LAP learners, and that this improvement extended to the follow-up assessment ten weeks after curriculum participation. LAP learners achieved additive incremental gains during each activity they participated in and overcame the learning saturation threshold experienced by non-LAP participants, suggesting a mechanism for the impact of the LAP methodology.

Methods: LAP methodology

In a LAP-based curriculum, an evaluation of learner deficits on designated parameters is conducted in one or more Tier 1 activities and used to direct learners to a second set of Tier 2 activities designed to target identified learning gaps. This assessment involves an automated mapping system and proficiency filters to measure learners' scores in Tier 1 activities and identify the appropriate remediation Tier 2 intervention(s). An automated alert system provides learners with the recommended Tier 2 activities via email, and re-contacts them after a specific time period with a post-curriculum assessment to measure learning retention.

All activities in tTier 1 and Tier 2 include the same performance metric (Moore's Level 5) called the RealIndex. The RealIndex is a multidimensional question that presents participants with a clinical scenario related to the curriculum's learning objectives that is followed by a series of statements

Felch Award for Outstanding Research in CE Recipients (L to R): Jennifer Thompson, Alliance Awards Committee; Steven Haimowitz, Karyn Ruiz-Cordell, Anthia Mandarakas, Brian Lee.

that learners categorize as either consistent with, or inconsistent with, their current practice approach. It is administered prior to the first activity of the curriculum (baseline), following each completed activity of the curriculum, and then in a follow-up assessment (on average, ten weeks after curriculum completion). For each subsequent administration of the RealIndex question, learners are given the opportunity to refine their responses based on their progressive learning. Additionally, because the identical RealIndex is utilized in all activities of a curriculum, the different activity sequences or tracks learners take to their final intervention can be compared, allowing for learner gains to be measured progressively from Tier 1 to Tier 2 and enabling a direct comparison of LAP vs. non-LAP performance.

Curriculum Studied

"Advances in the Treatment of Atrial Fibrillation (AF): Integrating Current Guidelines and Novel Therapies to Optimize Patient Outcomes" was a curriculum focused on safety and efficacy guidelines and specific treatment approaches for AF, and was targeted towards cardiologists and primary care providers (PCPs). Tier 1 of the LAP (the assessment tier) consisted of five activities; Tier 2 (the remediation tier) consisted of two activities. One of the Tier 2 activities was designed to remediate deficits in learners' proficiency on safety and efficacy guidelines for AF management; the other Tier 2 activity was designed to remediate deficits on specific treatment approaches. All activities were available on the Pri-Med website (www.pri-med.com), and data was collected over the course of twelve months (from January 2012 to January 2013).

Results: Comparison of the Performance of LAP and non-LAP learners

When the total population of learners was separated into LAP (n = 989) and non-LAP (n = 1,635) learner groups, both showed statistically significant gains (p < .0005) on the RealIndex performance metric from baseline to their final intervention; however, the LAP learners demonstrated a greater improvement (41%) compared to non-LAP learners (23%). The baseline performance score of the LAP learners was slightly lower than that of the non-LAP group; however, due to their greater improvement, the LAP group earned a significantly higher (p < .001) final score compared to the non-LAP group. When the performance of different specialty cohorts (cardiology and primary care) was analyzed, the results showed that cardiologists demonstrated a higher initial proficiency than PCPs across both LAP and non-LAP methodologies. In contrast, the PCPs from the LAP learner group demonstrated substantially greater improvement on the RealIndex when compared to the non-LAP group of PCPs and achieved a comparable level of mastery as cardiologists. These findings demonstrate the efficacy of the LAP methodology for targeting the learning deficits of initially less proficient learners.

Comparison of the Performance Retention of LAP and non-LAP learners

The difference between the performance gains of LAP and non-LAP learners also extended to the follow-up assessment that learners completed ten weeks after their participation in the curriculum. A 36% net gain (baseline vs. follow-up assessment) was measured for LAP learners and an 18% net gain for non-LAP learners. Again, the LAP learner group demonstrated an average baseline score that was lower than the non-LAP group; however, the LAP group showed higher average scores by their final activity and the PCA.

Comparison of LAP and non-LAP learners based on number of activities completed

To distinguish whether the impact of the LAP methodology is due to the multiple-activity participation and serial learning as opposed to the directed and individualized sequence of activity progression, LAP and non-LAP learners were compared based on the number of activities they completed (see Table 1). Among learners who completed two interventions, LAP learners showed a 40% improvement in performance score from baseline; non-LAP learners showed a 24% improvement. And among learners who completed three interventions, again, LAP learners demonstrated the greater improvement—41% vs. 32% by non-LAP learners. These findings indicate that the impact of the LAP methodology is related to the specific activities learners participate in, and not simply a reflection of multiple-activity participation.

TABLE 1: PERFORMANCE SCORE PROGRESSION OF LAP AND NON-LAP LEARNERS

Parameter	N	Baseline Average Score (SD)	1st Average Score (SD)	2nd Average Score (SD)	3rd Average Score (SD)	4th Average Score (SD)	5th Average Score (SD)	% Change (BL-Final)
Baseline Only	1,479	28.32% (23.44)						
LAP – 2 Interventions	315	36.05% (22.05)	45.68%* (20.35)	50.53%* (16.49)				40.17 (< .0005)
LAP – 3 Interventions	194	36.69% (20.54)	45.82%* (18.86)	48.26%* (19.91)	51.55%* (17.60)			40.50 (< .0005)
LAP – 4 Interventions	208	39.24% (20.28)	47.63%* (20.00)	50.45%* (18.41)	52.31%* (18.44)	54.09%* (18.19)		36.84 (< .0005)
LAP – 5 Interventions	272	37.80% (21.59)	44.75%* (20.06)	49.64%* (19.80)	52.16%* (18.94)	53.14%* (17.72)	54.99%* (16.83)	45.48 (< .0005)
Non-LAP – 1 Intervention	1,204	39.59% (19.93)	48.64%* (17.24)					22.85 (< .0005)
Non-LAP – 2 Interventions	304	39.62% (20.03)	47.46%* (18.67)	49.18%* (17.32)				24.13 (< .0005)
Non-LAP – 3 Interventions	127	38.13% (22.25)	47.13%* (19.18)	50.22%* (20.60)	50.35% (19.95)			32.05 (< .0005)

* indicates that the difference between consecutive values is significant at the p < .05 level

Performance progression of LAP and non-LAP learners

To better understand how the LAP methodology impacts learning outcomes, learners were separated into seven distinct groups (see Table 1), based on the number of activities completed (one to five) and whether they were in accordance to the LAP methodology or not. The individual Performance scores of these groups were then compared as they progressed through the curriculum.

As shown in Figure 1, at baseline, no significant differences were observed among the scores of the LAP (in red) and non-LAP (in blue) groups, and during their progression through the curriculum, all tracks showed progressive incremental gains from baseline to learners' final activity, with the greatest gains achieved during the first intervention. However, following the first intervention, differences in the incremental gains of LAP and non-LAP learners were observed as LAP learners' performance scores continued to increase while non-LAP learners plateaued. The findings show that the greatest impact of the LAP methodology occurs after learners' initial intervention when LAP learners appear to overcome the learning saturation threshold observed for non-LAP learners. The findings suggest a mechanism for why LAP learners gained the maximum benefit from multiple activity participation and explain the increased performance score gains of the LAP learner groups (37% to 45%) compared to non-LAP learners (23% to 32%).

Discussion

This curriculum utilized a technology-enabled adaptive Learner Assessment Platform (LAP) that assessed learners' proficiency in tier 1 activities and then automatically directed them to one or multiple activities in tier 2 based on their scores. The number of learners who participated in the LAP indicates that learners are receptive and responsive to this type of "guided engagement" through a curriculum. The results indicate that while all learners (LAP and non-LAP) earned statistically significant and progressive gains on the RealIndex performance metric (Moore's level 5) from baseline, learners who completed the LAP pathways achieved greater serial performance gains over the curriculum through follow-up (ten weeks after curriculum participation) when compared to non-LAP learners who also completed multiple activities. These findings show that the Learner Assessment Platform is a successful methodology for not only substantially improving learner performance and maximizing the impact of serial learning, but also for sustaining this improvement.

The data highlights the importance of individualizing curricula for improving performance outcomes and that technology can greatly assist in achieving this goal. Individualizing pathways can help learners achieve greater value from the time that they spend engaging in a curriculum, and extend the benefits of serial learning. Furthermore, the concept of an individualized pathway appears to be a motivating factor for learner engagement. As educators are increasingly responsible for planning curricula for the entire care team, the model demonstrated in this study should contribute to their success.

FIGURE 1: LAP AND NON-LAP LEARNER PROGRESSION PATHWAYS