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JOINT AAPM | COMP MEETING

Radiation Oncology Physics Learning Platform

An Adaptable Mobile Application Designed for Active Learning

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ABSTRACT

Objective:
To address the lack of interactive, on-the-go educational tools in radiation oncology physics by developing a cross-platform Web Application integrates evidence-based learning science into busy clinical workflows.

Methods:
A browser-based web app was developed based on the ABR Core Physics Curriculum. The platform features five integrated modules: Lectures, Review Summaries, Flashcards (with spaced repetition), Randomized Quizzes (with immediate feedback), and a Learning Analytics Dashboard. A centralized backend allows for real-time content updates without requiring user installation.

Results:
The deployed web app successfully includes the source material of 16 lecture topics, 184 flashcards, and 179 quiz questions. It supports active recall, just-in-time micro learning, and personalized progress tracking. A phased evaluation strategy is currently underway to assess system usability, user engagement, and overall educational impact.

Conclusion:
This web app provides a highly scalable, low-cost educational infrastructure that bridges modern learning science with clinical accessibility. It offers a viable framework to standardize radiation oncology physics training across institutions while supporting self-paced, individualized learning.

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INTRODUCTION

The Educational Gap: Traditional medical physics education relies on dense, static textbooks. These are poorly designed during busy clinical rotations.
The Clinical Constraint: Residents physicians enter training with highly varied physics backgrounds, yet must rapidly master the rigorous American Board of Radiology (ABR) Core Physics Curriculum.
The Infrastructure Barrier: Institutional hospital firewalls routinely restrict native application installation, blocking access to cloud-based learning systems.
Study Objective: To develop and deploy a responsive, zero-install Web Application that converts flat medical physics literature into interactive, mobile-optimized active learning modules.

METHODS AND MATERIALS

Curriculum Source: Content was systematically extracted from 16 core chapters of the IAEA *Radiation Oncology Physics Handbook*[1] and institutional slide decks.
To eliminate manual software engineering bottlenecks, we developed an LLM parsing pipeline to process unstructured resources, complemented by automated validation rules and expert clinical review to guarantee content accuracy.

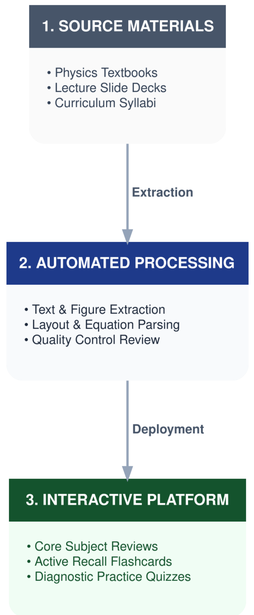

Figure 1. Data Pipeline Flowchart

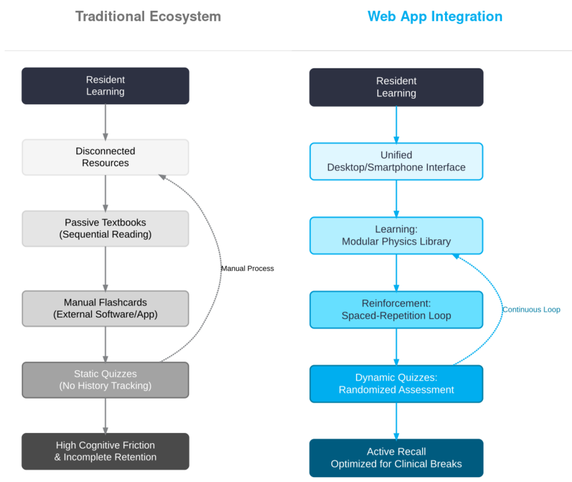

Figure 2. Traditional vs. Web Integration Flowchart

METHODS AND MATERIALS

The platform translates static text into three modalities: Review Summaries; Flashcards; Quiz, and Summarize. The user interface is split into distinct modalities to support different phases of study.

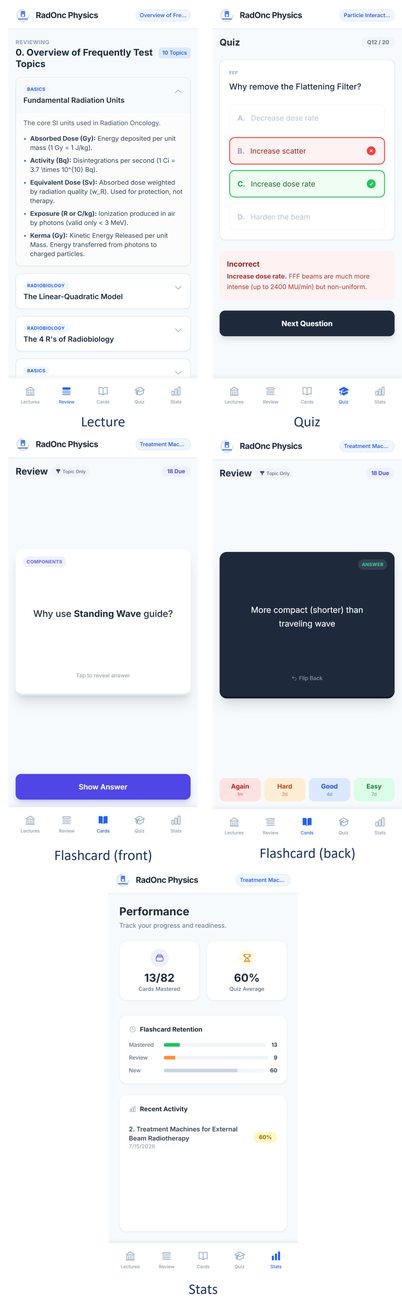

Figure 3. Screenshots of App UI

The flashcards are generated from the IAEA curriculum, covering domains including reference dosimetry, and radiation biophysics. Instead of a static deck, the interface includes self-rating buttons (Again, Hard, Good, Easy). This dynamically adjust the review schedule, pushing concept while prioritizing weak areas. The quiz module offers randomized testing with immediate response.

RESULTS

Preliminary source materials:
- 16 Comprehensive Chapters
- 184 Flashcards
- 179 Quizzes

RESULTS

Platform performance:
- The web app platform once initialized, all chapters, flashcards, and quizzes execute locally on the client's browser with zero network queries overhead.
- All Learning analytics, spaced-repetition metrics, and quiz histories are cached locally and synchronized with a secured database.
- The application is built using modern, lightweight HTML5/JavaScript standards. The platform scales fluidly across smartphones, tablets, and desktop workstations.

Table 1. Infrastructure Comparison Table

	Our Mobile App	Native App (iOS/Android)	Traditional LMS (Canvas/Moodle)
Hospital IT barriers	None (URL-based)	High (blocked/restricted)	Medium (requires login/VPN)
User onboarding	Instant (no install)	App store download required	Complex login portals
Content updates	Real-time (silent push	Delayed (app store approval)	Manual server uploads
Hosting cost	Negligible (online or local Hosting)	High (developer license)	High (enterprise license)

The platform successfully bypass App Store barriers, allowing instant, URL-based deployment across all mobile and desktop operation systems (iOS, Android, Windows, macOS, Linux).

DISCUSSION

Our platform is built upon evidence-based cognitive psychology principles rather than passive review.

Future Plans:
Phase I (current) - Usability:
- Testing the tool with physics and radiation oncology residents using System Usability Scale. Target score > 80

Phase II - Measuring User Activity:
- Tracking basic usage habits like session length, repeat visits, card flips per minute, and quiz accuracy.

Phase III – Testing Effectiveness:
- Comparing how well users learn using our app's active recall features against traditional static document reading.

Phase IV - Expanding to Other Programs:
- Rolling the tool out to external residency programs to see how it performs on a broader, national scale.

CONCLUSIONS

- We designed and launched a website app that delivers medical physics curriculum, directly to mobile devices without app store installation
- This engineering architecture represents a highly scalable, low-cost framework for modernizing professional residency training across institutions

REFERENCES

1. Podgorsak EB, ed. *Radiation Oncology Physics: A Handbook for Teachers and Students*. Vienna, Austria: International Atomic Energy Agency; 2005.

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