ENHANCING NURSING EDUCATION WITH AI

DEPLOYING QIMETA AT CAPITAL HEALTH SCHOOL OF RADIOLOGIC TECHNOLOGY

MAY 2025

EXECUTIVE SUMMARY

AI ISN'T A LUXURY—IT'S A LIFELINE FOR HEALTHCARE WORKERS

The Challenge

Workforce development is a national priority—especially in healthcare, where shortages threaten the quality and accessibility of care. The U.S. faces an urgent gap in skilled professionals, particularly in nursing, where more than 100,000 positions remain unfilled across the country[4].

Despite rising demand, many students struggle to complete the academic path to these careers. Courses like Radiation Technology are often cited as bottlenecks: they require mastery of difficult scientific concepts that can discourage students from continuing. These challenges are especially steep for learners facing systemic barriers like low adult literacy rates, under-resourced schools, or a shortage of qualified instructors.

Without intervention, these barriers slow down progress toward growing a more inclusive, well-prepared nursing workforce.

Real World Problem

Radiation Technology is one of the most demanding courses in nursing programs. It covers complex material like radiation physics, ionization energy, and cell biology—all critical for working with imaging equipment like MRIs and CT scanners. Many students report feeling overwhelmed by the volume and complexity of content, leading to lower retention and increased dropout risk.

AI tools are becoming more common in classrooms, but not all of them are built with student comprehension in mind. A review of 69 studies (Deng et al., 2024) found mixed results: while AI can improve motivation and understanding, it can also lead to confusion when not implemented thoughtfully. Most of this research focused on college-level learners—86% of studies—with little data on early-stage training or nontraditional students.

If students continue to struggle with foundational science courses, many may never reach clinical training. That's why tools like QiMeta must be carefully designed and evaluated—with a focus on actually helping students succeed in nursing education.

Results and Impacts

Rather than offering shortcuts, QiMeta turns standard lecture materials into interactive, student-friendly learning experiences. It highlights key concepts, defines unfamiliar terms, and lets students ask contextual questions—all within the course content they're already using.

The overwhelmingly positive student feedback and strong satisfaction ratings highlights QiMeta's potential to make education more accessible and engaging.

While we're still evaluating long-term outcomes, early results show that thoughtfully applied AI tools like QiMeta can:
- Bridge Learning Gaps
- Keep Students on Track
- Empower the next generation of healthcare professionals

BACKGROUND

CHALLENGES IN WORKFORCE READINESS AND NURSING EDUCATION

Across the United States, institutions are facing mounting challenges in workforce development, particularly in the healthcare sector. Persistent labor shortages, low literacy rates, and training bottlenecks have created systemic barriers to economic mobility and workforce readiness. The situation is particularly acute in nursing education.

Nursing Shortages in the US

- 1.2 million additional nurses will be needed by 2030 to meet healthcare demand[1].
- There is currently a 10% shortage in Registered Nurses (RNs), translating to approximately 350,540 unfilled positions[2].
- Between 2022 and 2024, over 138,000 nurses exited the workforce[3].
- Nearly 40% of remaining nurses report plans to leave the profession by 2029.
- Education pipeline constraints: Nursing schools are unable to scale due to faculty shortages and limited clinical placements[4].

US Literacy Challenges

- 21% of U.S. adults are considered illiterate[5].
- A staggering 54% read below a 6th-grade level, impacting their ability to complete training and certification programs[5].
- Among adults lacking proficiency, 34% are foreign-born, underscoring the need for targeted literacy solutions.
- Estimated annual economic cost of low literacy: $2.2 trillion[6].

Workforce Development & Job Market Gaps

- 7.6 million job openings reported in the U.S. as of February 2025[7].
- 3.8 million new manufacturing jobs expected by 2033[8].
- However, 1.9 million of those roles may go unfilled due to lack of qualified workers.
- Many Americans require retraining to bridge the skills gap and fill high-demand roles[9].

These challenges demand innovative, scalable solutions that address both the supply of qualified professionals and the barriers to accessibility in education. **QiMeta was developed as a tool to bridge these gaps—making complex material more digestible, reducing dependence on instructor time, and boosting comprehension and confidence across varied literacy levels.**

NURSING CHALLENGES

ADDRESSING THE NURSING SHORTAGE AT ITS CORE: EDUCATION AND INCLUSIVTY

The Equity Problem

Nursing education remains difficult to access and succeed in for many students. Courses like Radiation Technology demand a strong foundation in subjects like physics and cell biology—topics that are essential for work with MRIs and CT scanners, but which many students haven't mastered by the time they enter nursing programs. These challenges are especially steep for students from under-resourced academic backgrounds, where these subjects may not have been taught in depth. For them, courses like this often become roadblocks.

Diversity in STEM

Women and students from underrepresented racial and ethnic backgrounds remain disproportionately excluded from many STEM pathways, particularly in technical fields. According to the NSF, women earned just 35% of STEM bachelor's degrees in 2022—only 21% in engineering and 19% in computer science. Racial gaps are just as stark: Black workers made up 11% of the total U.S. workforce but only 6.9% of STEM roles, while Hispanic workers made up 18% of the workforce but held just 13.5% of STEM jobs.
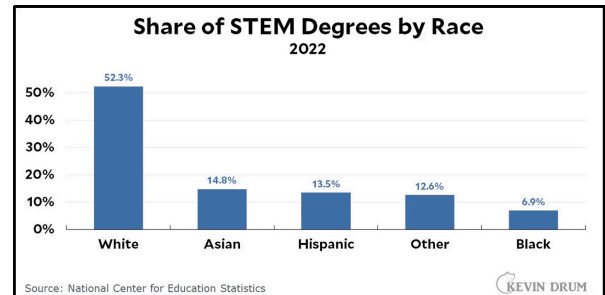

Figure 1: Underserved communities face greater difficulty in entering STEM fields.

While nursing draws more women overall, technical subfields like radiologic technology often reflect the same barriers seen across STEM—gaps in prior academic preparation, limited exposure to advanced science coursework, and structural filters that make it harder for marginalized students to persist through the most difficult parts of the curriculum.

Why This Matters

A lack of diversity in nursing and related technical fields not only limits who gets to participate in these careers, but also reduces the range of ideas and innovation within healthcare. Bridging these education gaps—especially in foundational science coursework—is critical to developing a workforce that is both inclusive and prepared to meet future healthcare demands.
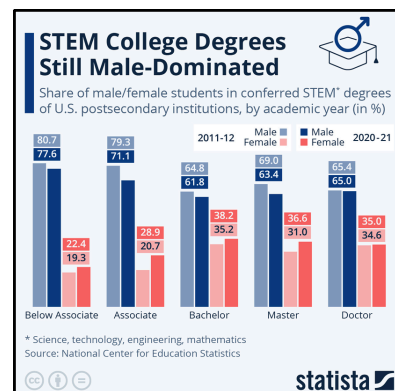

Figure 2: Female students continue to be disproportionately represented in STEM college degrees

SOLUTION

The Radiation Technology course has been taught by an experienced instructor who has developed her own slides to simplify and present the material effectively. *An example of the slides is given to the right in Figure 3.*

Key Enhancements

QiMeta integrated seamlessly with existing course materials to make difficult concepts easier to grasp and faster to review. These tools helped reduce student frustration, increase engagement, and improve study efficiency.

Clarifies Difficult Concepts Instantly

- QiMeta's Intelligent Highlighting draws attention to complex terms and essential facts, helping students focus on what matters most. Students reported that this saved them time during review and helped them feel less overwhelmed.

Makes Content More Approachable

- With Interactive Definitions, students could click on highlighted terms to see simplified explanations, tailored to their learning level. This gave them the confidence to keep up—even when core science topics felt intimidating.

Provides On-Demand Support

- The Ask QiMeta chatbot allowed students to ask questions directly from within the slides. It provided fast, accurate responses using real course content—like having a tutor available anytime, without needing to schedule extra help.
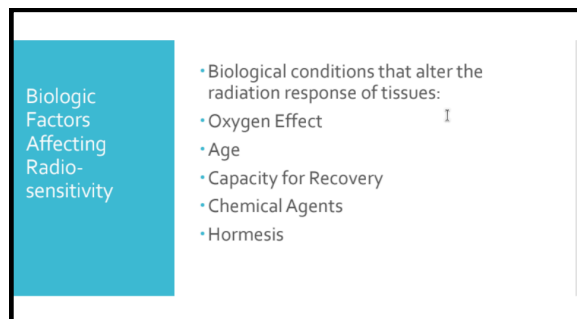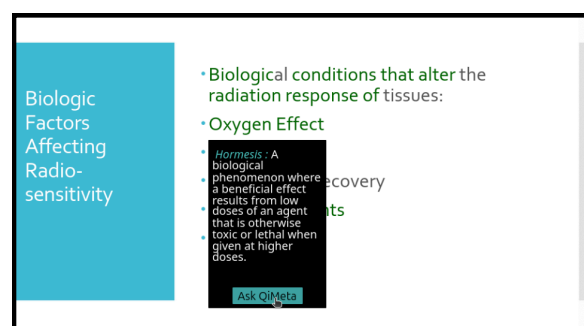

Figure 3: Original slide

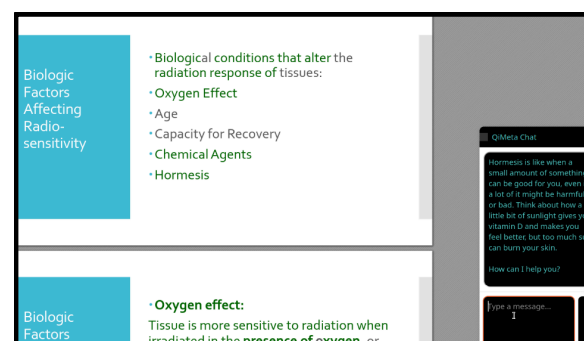Figure 4 - QiMeta enhanced slide, highlighting difficult concepts. A sample definition is shown for "Hormesis"

Figure 5 - Users can use "Ask QiMeta" to support deeper comprehension and more personalized learning

DEPLOYMENT PROCESS

Structured Deployment Approach

The implementation of QiMeta in the Radiation Technology course followed a clear, five-step rollout that minimized disruption and maximized student benefit:

Content Selection:
The instructor selected existing lecture slides and reading materials to be enhanced—no need to redesign or rewrite content from scratch.

AI Enhancement:
QiMeta automatically identified complex terms and inserted learning tools. The instructor could quickly review and approve suggested highlights and definitions.

LMS Integration:
Enhanced materials were provided as links that were added to the school's learning management system (LMS), keeping all resources in one familiar place for students.

Classroom Introduction:
In the first week, students received a 10-minute walkthrough on how to use the enhanced slides—no special training required.

Student Support & Feedback Collection:
QiMeta staff visited again the following week to answer questions and gather feedback. At the end of the course, students completed a survey on their experience.

1	Content Selection
2	AI Enhancement
3	LMS Integration
4	Classroom Introduction
5	Support & Feedback
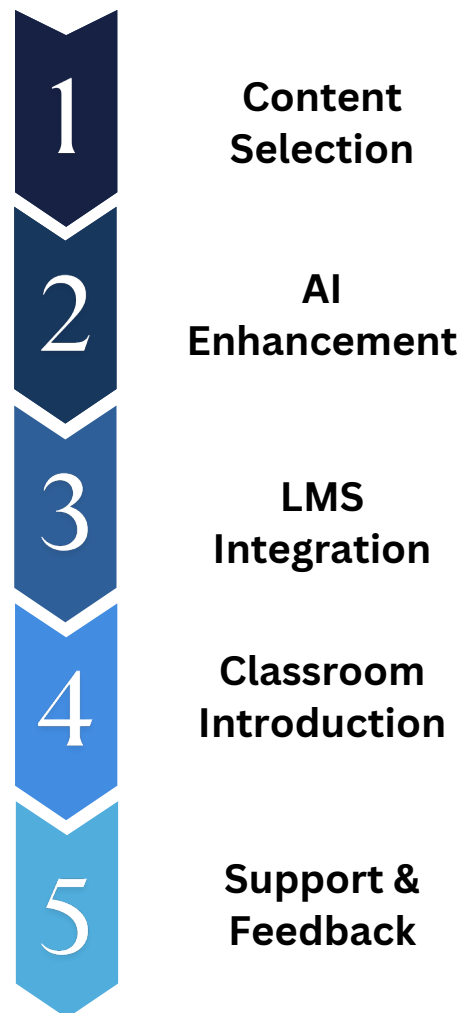
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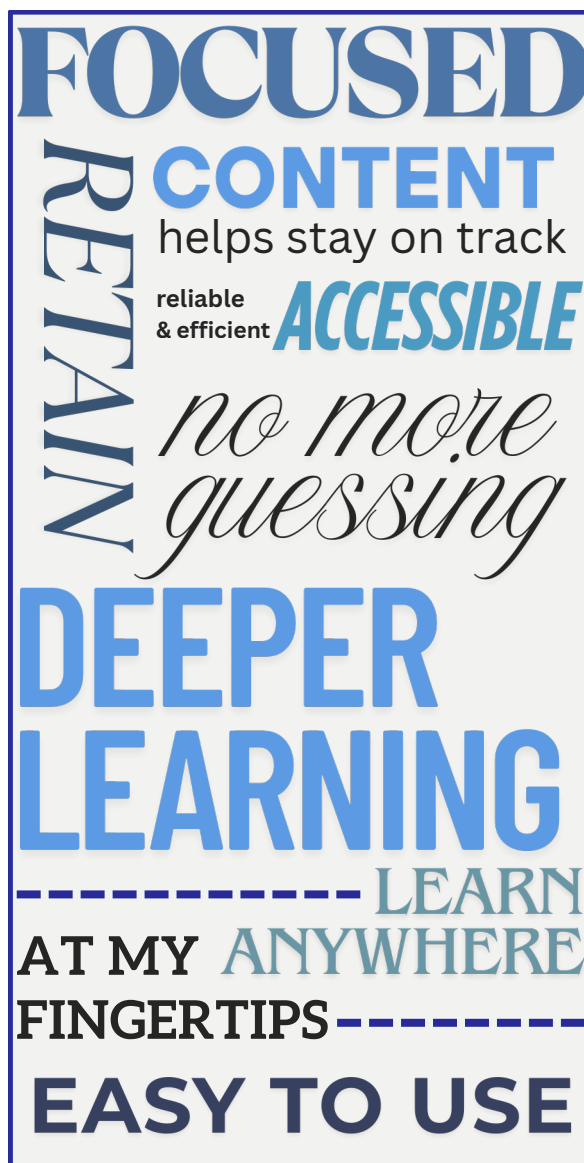
Student Feedback

Students consistently highlighted how QiMeta helped them better understand complex concepts and study more effectively. Many appreciated its simplicity, responsiveness, and accessibility across devices—making it easier to focus and retain material in a demanding course. Below are direct testimonials:

"For the first time, I really saw firsthand just how much it helped me retain the content. Specifically, it helped me remember not to mix up the steps of the Cell Cycle and Cell Division (mitosis)... I get very easily distracted while studying, so I'm grateful to have this tool at my fingertips."

"QiMeta helped a lot with better explaining somatic cells vs. genetic cells and how they divide into daughter cells. I also appreciated that I was able to use QiMeta on my laptop, phone, and iPad... which can be inconvenient if I don't have my computer with me."

"Rather than get distracted trying to scan my books for specific material, QiMeta allowed me to gain a deeper understanding without overwhelming me... It filtered the content down to the core concepts, and if I needed further information, it provided more details."

"I liked that difficult concepts were already highlighted with definitions/explanations readily available."

At a Glance: What students valued most — focus, clarity, access, and ease of use.

Teacher Feedback

Teachers also shared how QiMeta helped their students stay focussed, understand complex materials more easily, and engage more deeply with the content. Below are direct testimonials:

"The embedded links kept the students more interested in the material because they could instantly explore an idea they were curious about." -Karen D. Wheeler, MS, MMP, DABR - Medical Physicist

"Students did not have to leave the content they were reading to "google" a topic for further explanation. AI certainly kept them more focused and less distracted. When students "google" topics for further explanations, it is difficult to assess the authenticity of the referenced material. Ultimately, I believe this will result in better long term retention of course content." -Theresa Levitsky, MA, RT - Program Director

"Being able to "engage" with the AI enhanced material is a great feature since it enables students to ask specific questions based on their current level of understanding and their learning styles." -Theresa Levitsky, MA, RT - Program Director

Survey Results

A student survey conducted at the end of the course showed strong satisfaction with QiMeta's learning tools:
- **Overall satisfaction: 4.3 out of 5**
- **Perceived effectiveness as a learning tool: 4.0 out of 5**

These scores reflect how students valued the accessibility, clarity, and support QiMeta provided throughout the course.

Student Survey Results

Figure 6 - Student satisfaction and effectiveness of learning were rated high.

Academic Performance

Student test scores were analyzed to compare outcomes between cohorts using standard materials and those using QiMeta. The results are still early — no statistically significant differences yet — but test conditions were consistent (no AI assistance), and the Class of 2025 (AI assistance used for learning and studying) performed comparably to prior years.

With only 12 students in this pilot group, more data is needed to assess long-term academic impact.
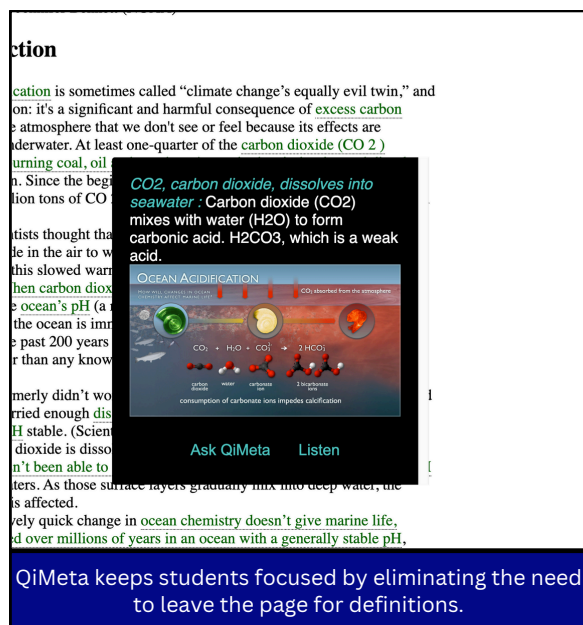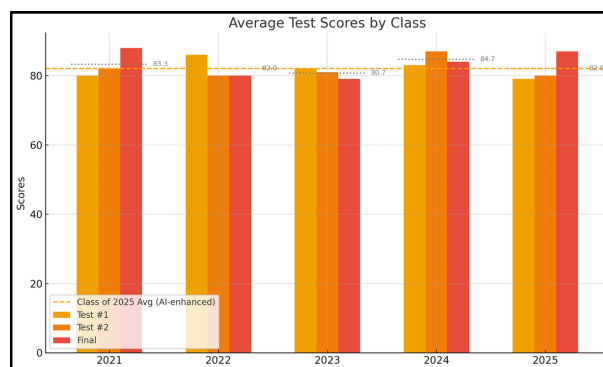
Data is pictured in Figure 7

Figure 7 - 2025 test performance after learning with QiMeta were comparable, but more data needed

Analysis

QiMeta may not dramatically change test scores in the short term, but students consistently reported that it made content easier to understand and less frustrating to review. For academically rigorous courses, even modest improvements in comprehension and accessibility can be meaningful.

Student feedback also suggested that QiMeta helped simplify dense material and potentially reduce the time needed to study effectively. While not yet measured formally, these are promising areas for future research as we continue to evaluate the tool's long-term impact on student performance and engagement.

QiMeta keeps students focused by eliminating the need to leave the page for definitions.

QiMeta was designed to help students overcome some of the most persistent challenges in education—especially in complex, technical subjects. While test score impact is still being studied, students consistently report that it makes reading easier, studying more focused, and learning more engaging.

Overall, QiMeta supports students in becoming more active, independent readers. Its core benefits include:

Keeps Students Focused:
Students often lose focus when they need to stop and look up unfamiliar terms. QiMeta removes that friction by providing in-line definitions and contextual help—keeping students on task and focused on the core concepts.

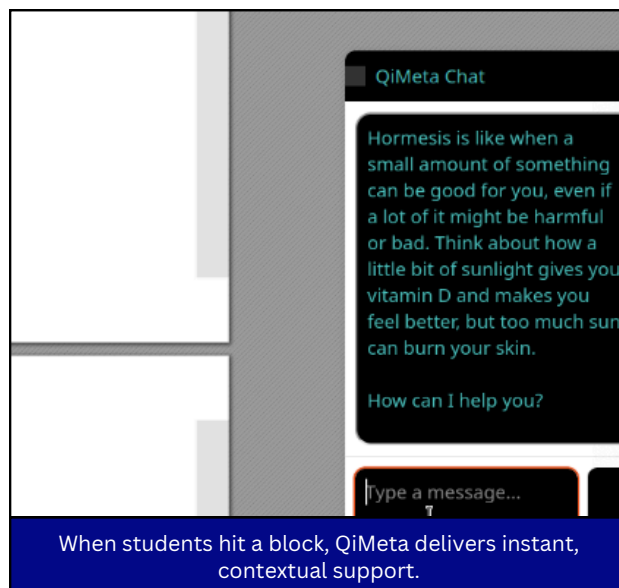**Removing Roadblocks to Understanding:**
When a student hits a confusing passage or unclear concept, QiMeta provides immediate, in-context explanations. This helps them move forward without the frustration of getting stuck or needing outside support.

Sparking Curiosity
As students build confidence in what they're reading, they begin to ask deeper questions. QiMeta supports this by enabling instant exploration—turning confusion into curiosity and passive reading into active engagement.

Lowering the Barrier to Asking Questions
In classrooms, students often hesitate to ask questions publicly. QiMeta's private chatbot gives them a way to seek clarification without judgment—encouraging more frequent and meaningful engagement with the material.

When students hit a block, QiMeta delivers instant, contextual support.

CONCLUSION

Impact on Nursing Education

The deployment of QiMeta at Capital Health School of Radiologic Technology demonstrated the potential of AI-enhanced learning in unfamiliar subject areas such as radiation physics for nursing students. Students appreciated the interactive, accessible, and personalized learning experience, and their feedback suggests QiMeta helped them stay focused and better understand difficult concepts.

By integrating AI into nursing education, Capital Health is taking a proactive approach to enhancing student learning and better preparing the next generation of healthcare professionals.

Workforce Development Implications

While this case study focuses on nursing education, the challenges it addresses—such as low literacy levels, limited instructor capacity, and the need for scalable, high-quality training—are shared by many industries seeking to modernize workforce development. QiMeta offers a flexible, replicable model for institutions looking to enhance training and learning outcomes with minimal disruption to existing operations.

By leveraging instructors' existing content, QiMeta streamlines the process of integrating AI into workforce training. Its intuitive platform transforms static materials into dynamic, interactive learning experiences that promote comprehension, engagement, and accessibility.

The deployment process is designed for ease of adoption:

- Content Selection – Instructors identify existing materials (e.g., slides, readings) that would benefit from AI enhancement.
- AI Integration – Instructors can either apply highlights themselves or opt for QiMeta's support team to enhance content as part of the subscription service.
- Distribution – Students receive direct access to the AI-enhanced content via shareable links, enabling immediate integration into classroom or self-paced learning environments.

Future Directions

Although early test score data has yet to demonstrate a statistically significant improvement, the overwhelmingly positive student feedback signals strong potential for long-term educational benefits. Moving forward, Capital Health is expanding QiMeta's implementation to additional nursing courses and other technical disciplines. Larger-scale evaluations will help assess the platform's effectiveness across broader learning contexts.

Future impact assessments will include quantitative metrics such as:

- Course performance and grade improvement
- Course completion rates
- Student retention and engagement levels

For workforce development institutions adopting QiMeta, relevant metrics may also include:

- Job placement rates among program graduates
- Instructor workload reduction and time reallocation
- Reduced remediation needs for foundational skills

QiMeta's long-term value lies in its ability to address two of the most persistent challenges in education and training: low literacy rates and insufficient representation in STEM. According to the National Center for Education Statistics, 54% of U.S. adults read below a sixth-grade level—a sobering statistic with significant implications for workforce readiness. By making complex content more accessible and less intimidating, QiMeta has the potential to improve literacy outcomes and support equitable access to high-demand STEM fields.

As demonstrated through this pilot, QiMeta offers a scalable, low-friction approach to enhancing content comprehension—empowering learners without encouraging dependency. Its mission is to close educational gaps and uplift communities through AI-powered knowledge enhancement. By reducing barriers to learning, supporting under-resourced educators, and fostering curiosity-driven engagement, QiMeta aims to drive transformational impact across education, employment, and economic equity.

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CAN QIMETA HELP YOUR INSTITUTION?

Institutions across healthcare, manufacturing, education, and beyond can benefit from piloting QiMeta as an AI tool to bridge skill gaps, support instructor capacity, and promote learner autonomy.

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