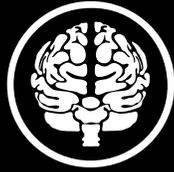


area9
LYCEUM



AREA9



RHAPSODE™

ADAPTIVE LEARNING IN FOUR DIMENSIONS



WORLD-CLASS PERSONALIZED LEARNING

IMAGINE A WORLD WHERE ...

Everyone can unleash their full potential.
Learning is tailored moment-by-moment to the unique needs of every individual.
The content of every course is world-class.

Welcome to Four-Dimensional Adaptive Learning from Area9.

“I have known Ulrik and Area9 for almost 10 years and I consider them to be excellent and very practically oriented entrepreneurs within learning. I suppose they have had a whole decade’s head start in their understanding of education technology, but unlike many other visionaries, they have developed systems that simply work.”



PETER C. DAVIS
Education adviser and former President of McGraw-Hill Education.

Our Mission: To help deliver the world’s best educational outcomes validated by a long-term, scientific approach.

- Area9 provides tools and services to help people learn more effectively.
- We work with learners of all ages, and organizations of all types, to deliver measurable outcomes.
- We expect to be judged on results – both educational and financial.

Our approach is grounded in scientific research and twenty years’ experience. We have already served millions of learners in hundreds of subject areas, gathering billions of data points.

We work with our customers and partners to build complete solutions for creating, curating, delivering and measuring learning. We can help with all parts of the process and are specialists in efficient, agile workflow processes. Alternatively, we can fit in only where you need with open, modular integrations.

We believe that technology is only powerful when designed to work for and with people; it is not an end in itself. Teachers, mentors and learners are not going to be replaced by technology – they are going to be complemented and accelerated. We are passionate about people fulfilling their potential. We believe in having fun while we deliver excellence.

We’d love to start a conversation with you.

The Most Advanced Learning and Publishing Platform in the World

- The world's first four dimensional learning platform
- Personalized and adaptive learning at scale
- Unprecedented support for educators delivering personalized education
- Integrated content development and curation environment
- Industry-grade, scalable production environment
- Cutting-edge use of artificial intelligence and advanced computer science

Alerts

The Publisher Dashboard shows all problem areas and offers easy access to the relevant content.

Authoring

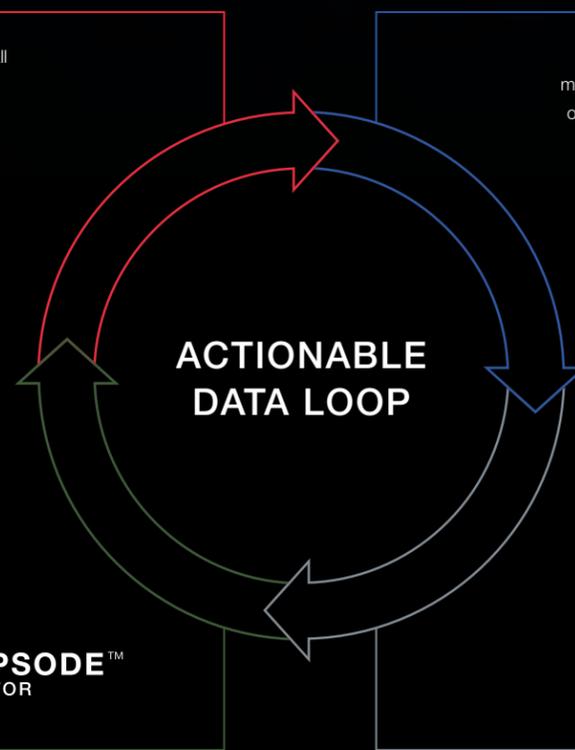
Based on the learner behavior, Area9 Rhapsode™ makes intelligent suggestions to improve the learning outcome for the subject matter expert (SME) to take into consideration while editing the content.

Analytics

Based on actual student usage data, Area9 Rhapsode™ provides real-time data on how well content is performing to improve learning outcomes.

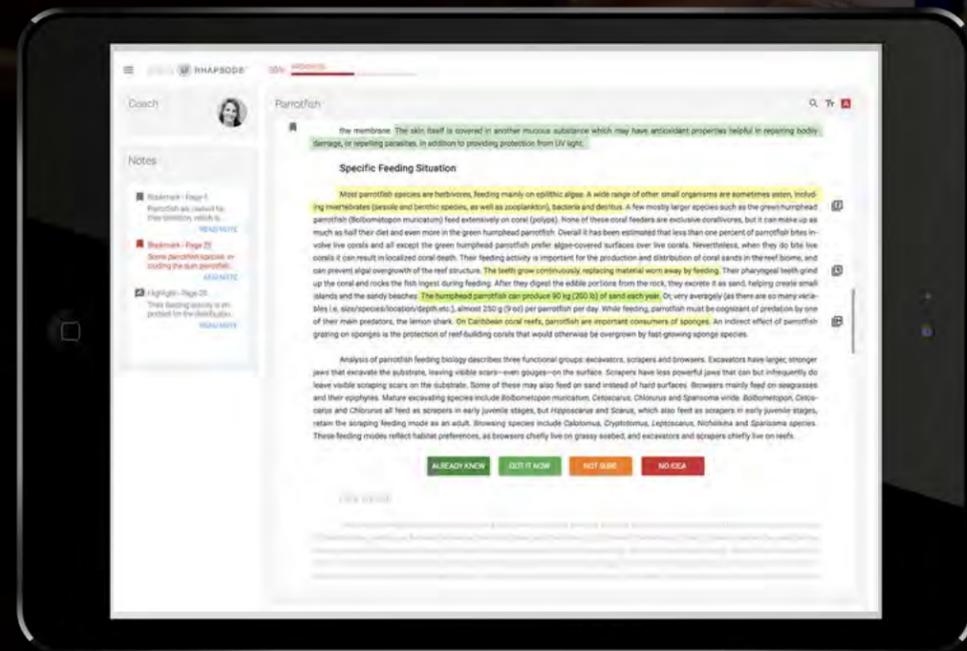
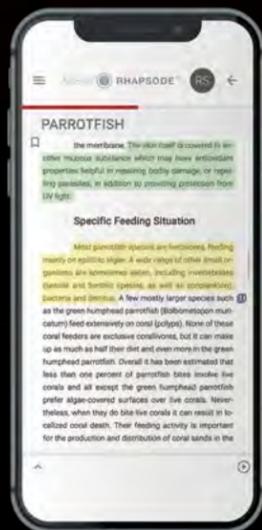
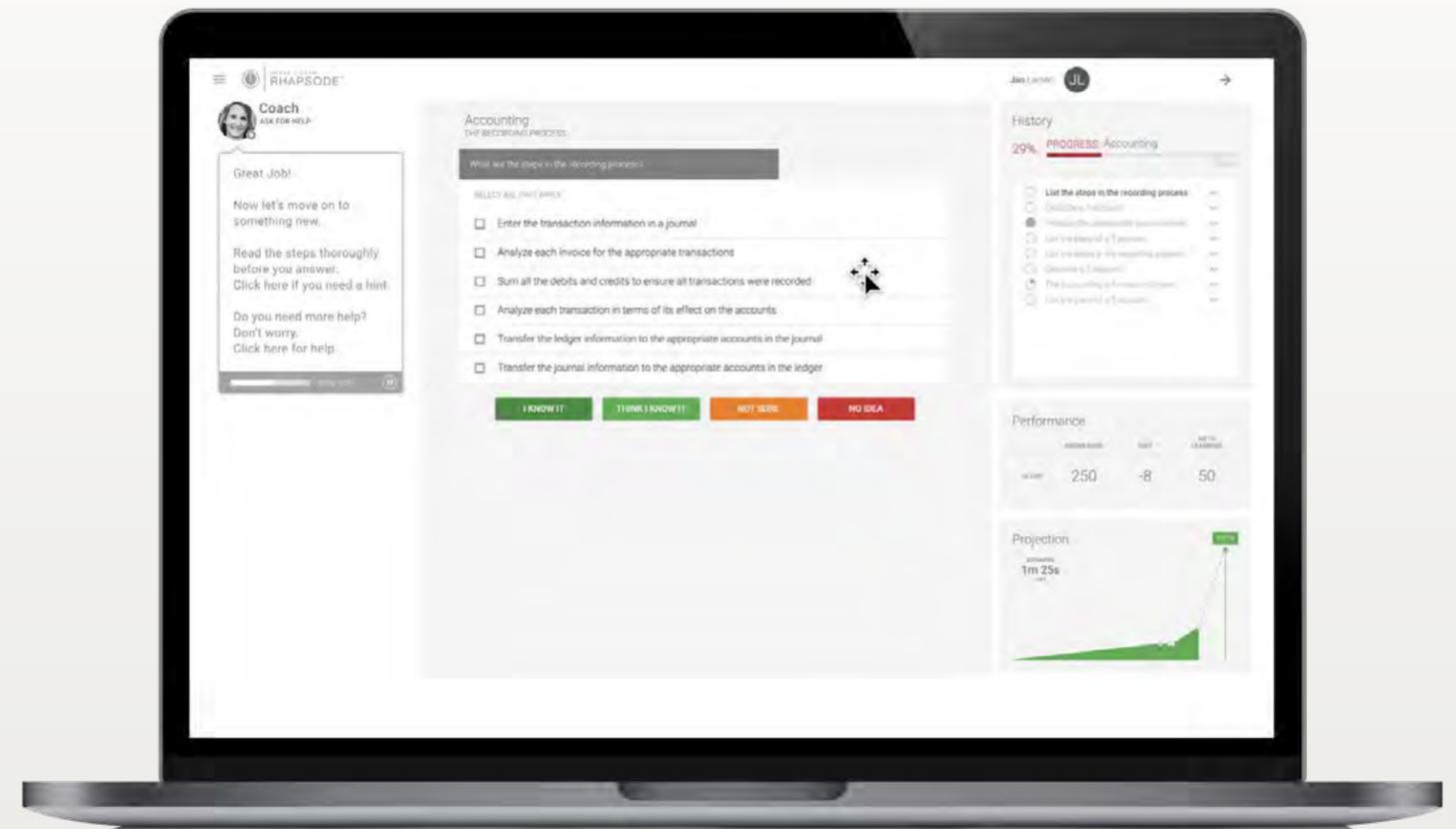
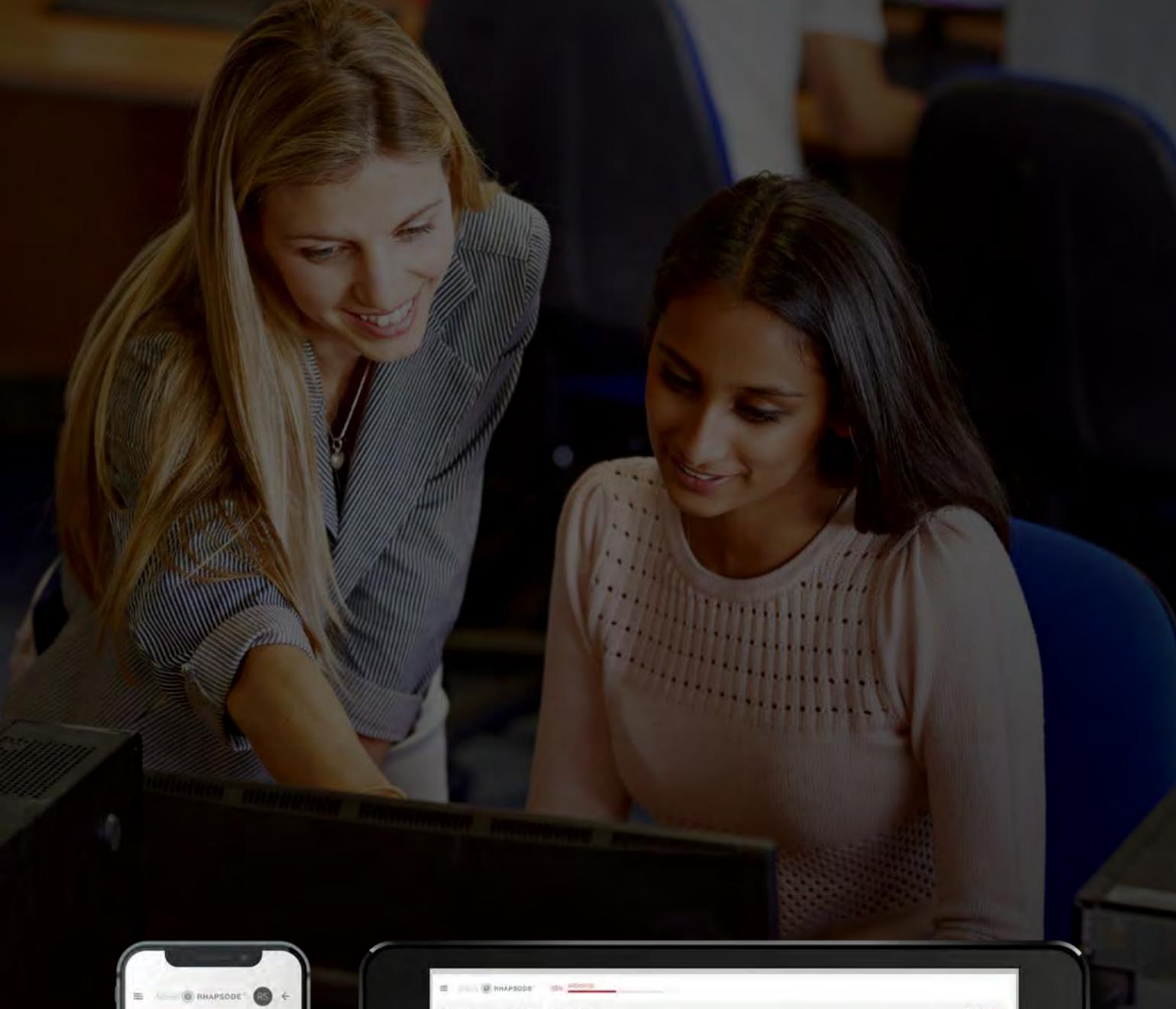
Students

Based on actual student usage data, As student performance generates data, statistics show how well the content is performing in improving learning outcomes.



Next Generation **Artificial Intelligence**

Area9 Rhapsode™ is based on some of the most advanced computer science in the world: **artificial intelligence, deep learning algorithms, domain specific programming languages, statistics and analytics.** The biggest impact is not on predicting what the learner will be encountering. It is on content curation and to a certain extent on educator support. Area9 Rhapsode™ can - based on AI - intelligently suggest content items, analyze large scale data, prioritize where to invest further content curation efforts and many other things. Area9 has a large team of top computer scientists who constantly undertake **translational research** where we translate cutting-edge scientific findings into practical application for education and publishing.



AREA9  **RHAPSODE™**
READER

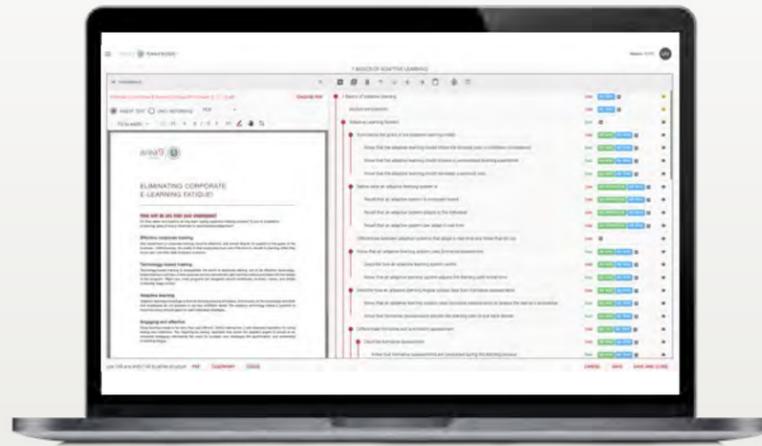
The adaptive e-book bridges the gap between textbooks and personalized learning

A personalized learning experience that combines textual material, such as a textbook or manual, with multimedia such as video or simulation. Accessible through the web or on dedicated mobile apps.

AREA9  **RHAPSODE™**
LEARNER

RhapsodeLEARNER™ is a personalized learning experience that applies science and technology to improve learning

- Each person learns differently – one size training fits no one
- Get to knowledge proficiency faster
- Integrated tools for meaningful learning
- Mobile apps or through an internet browser
- Access RhapsodeLEARNER™ through a custom-branded Learning Management System



AREA9  **RHAPSODE™**
CURATOR

World's most advanced and powerful integrated content development environment

- Content robots
- Advanced math content
- AI generated content
- Workflow management
- Point of authoring quality assurance



AREA9  **RHAPSODE™**
EDUCATOR

The way for educators to manage students – all learning in personalized ways

- The way for educators to manage students - all learning in personalized ways
- Handle assignments and/or learning paths
- Advanced analytics
- Early warning technology to highlight at-risk students



AREA9  **RHAPSODE™**
PUBLISHER

RhapsodePUBLISHER™ is a comprehensive, fully integrated workflow and content development environment that supports both print and digital content production. It is customizable to be able to meet the needs from the smallest partners to the largest publishers and corporate learner departments.

Each company or partner will get a tailored solution that works seamlessly with their methods and existing systems. It is inspired by decades of research in human factors and the experience from building the largest content curation platforms globally.

The platform has been designed to remove the pain of managing from dozens to thousands of projects and publications. From print to digital. From English to Arabic.

- Integrated print and digital workflow
- Intelligent workflows supported by advanced algorithms and AI
- Support for hundreds of tailored workflows
- Workflow builder
- Localization technology
- Roles and permissions management
- Rights management
- Customer support workflows

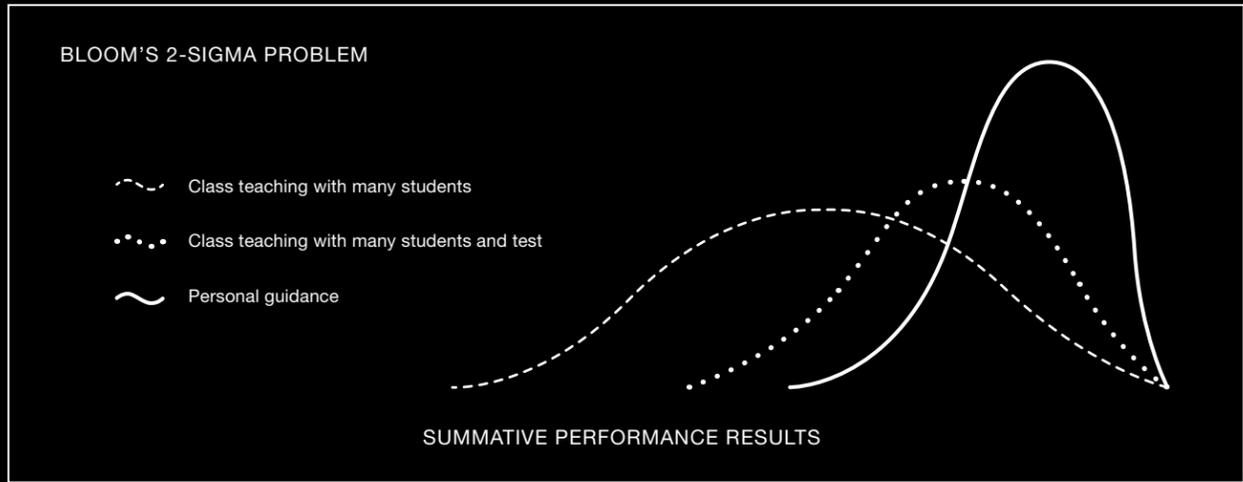
WHAT IS ADAPTIVE LEARNING?

In 1984, Benjamin Bloom's research supported a seemingly obvious claim: one-to-one instruction is dramatically more effective than learning in a classroom. Several studies have come to the same conclusion.

One teacher per pupil ensures that the student is constantly focused on the most important learning goals, that the degree

of difficulty is continuously adjusted to the student's level, and that the student always feels challenged as well as motivated.

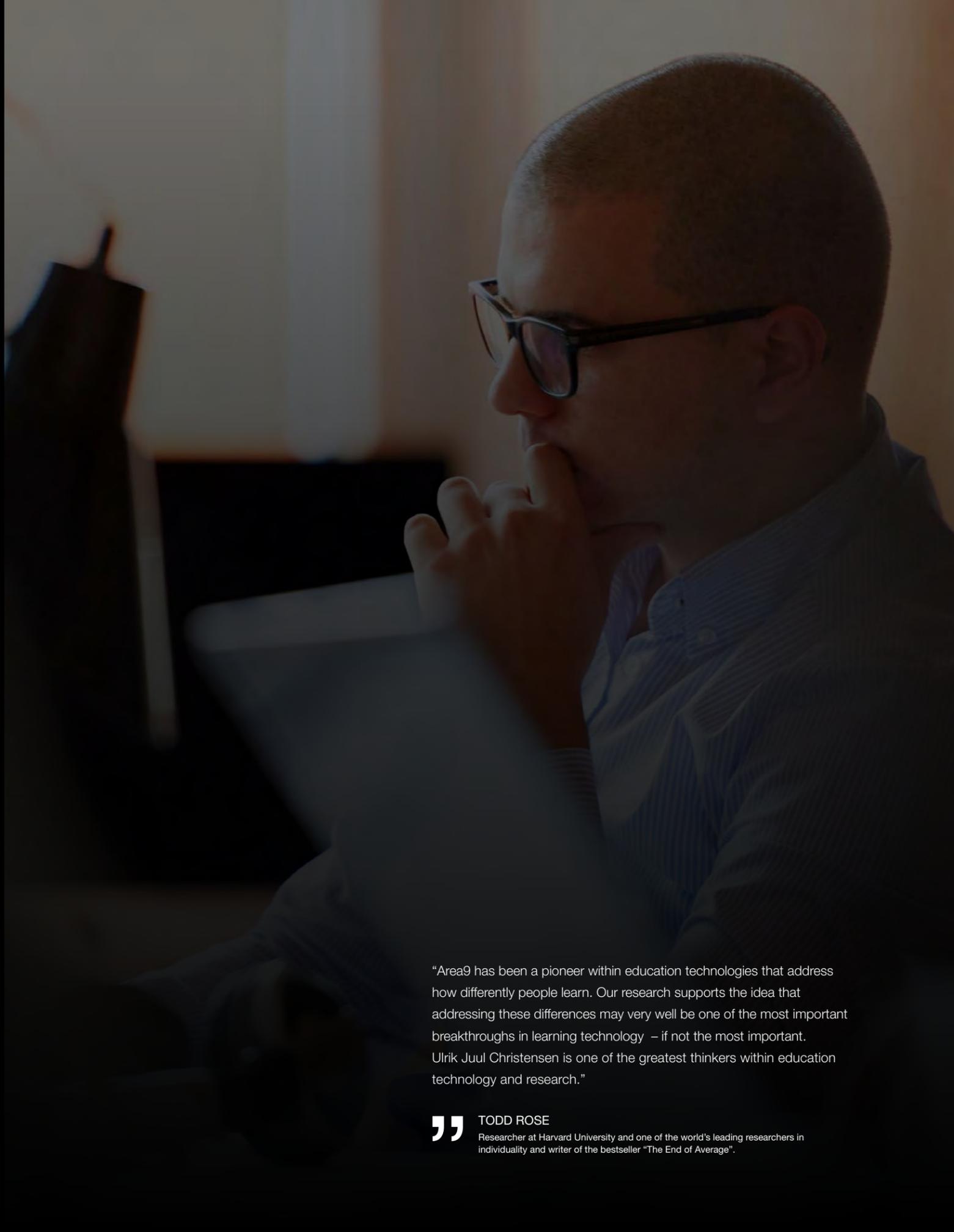
Our adaptive learning approximates this one-to-one interaction, ensuring learning happens more quickly, more deeply, and more securely. Digital delivery allows us to do this at scale and at low cost.



Benjamin Bloom proved that the effect of a 1:1 teacher/student situation has a standard deviation of 2 (2-sigma) or 98% better compared to traditional class teaching. Adaptive learning ensures advantages of personal guidance at a large scale and a low price.

EXAMPLES OF HOW ADAPTIVE LEARNING DIFFERS FROM TRADITIONAL E-LEARNING

TRADITIONAL E-LEARNING	ADAPTIVE LEARNING
THE SAME FOR EVERYONE	ADAPTS TO THE INDIVIDUAL
CONTENT FIRST - THEN QUESTIONS	ONLY SHOWS CONTENT WHEN IT IS NECESSARY
IGNORES WHAT THE STUDENT ALREADY KNOWS	TAKES INTO CONSIDERATION WHAT THE STUDENT ALREADY KNOWS
STARTS FROM THE BEGINNING EVERY TIME	FOLLOWS UP ON WHAT THE STUDENT IS HAVING TROUBLE WITH



“Area9 has been a pioneer within education technologies that address how differently people learn. Our research supports the idea that addressing these differences may very well be one of the most important breakthroughs in learning technology – if not the most important. Ulrik Juul Christensen is one of the greatest thinkers within education technology and research.”

” TODD ROSE
 Researcher at Harvard University and one of the world's leading researchers in individuality and writer of the bestseller "The End of Average".

“By using new as well as thoroughly tested technologies for adaptive and personalized learning, Ulrik Christensen and his team of talented Area9 employees have the potential to radically improve the education sector. The students learn what is most important more quickly and more effectively, and the teachers are able to free resources to act as the counselors and mentors that all students need the most.”

” TONY WAGNER, ED.D
 Senior Research Fellow, Learning Policy Institute.
 Author of 'The Global Achievement Gap' and 'Creating Innovators'.



Critically important to learning for long-term retention is to optimize what a learner needs to come back to – or what we refer to as “refresh.” In Area9 Rhapsode™, the adaptivity works in several ways. Adaptive systems have for a long time been really strong at helping learners practice what they have learned elsewhere. Area9 Rhapsode™ is no exception and is the world’s most advanced platform in this respect - based on our expertise accumulated over more than two decades of research. Even more noticeable is that Area9 Rhapsode™ also has a

brand new technology that for the first time allows learners to learn material from scratch in ways that are significantly different from practicing or refreshing existing knowledge. When a learner finishes a module, Area9 Rhapsode™ has advanced models that will predict when the learner should refresh the material – highly selectively. This way, a learner can keep focusing on learning what will matter the most – with minimal effort – thus saving up to more than 90% of the time to stay current.

HOW DOES IT WORK?

Biological Models

If you were to try to get a computer to behave more like a human tutor, the most intuitive approach would be to map out how students learn, map the optimal pathways through which a student would learn a subject area and over time make a larger and larger map using students’ answers to certain questions to place them on the diagram. Based on where a student is located on that map, they either move forward or backward, following its pathways.

Appealing though this approach appears, **our research shows that this is doomed to failure.** Paths become exponentially complex, learners make unpredictable deviations from paths, and incomplete maps give misguided suggestions. Further, the maps fail to evolve in line with learner development.

Instead, we developed **biological models** that mimic the way viruses behave in nature, evolving moment-by-moment using trial and error as their environment changes. Relationships between individual learning objectives are not exact in terms of order and semantic connections. In other words, there are many pathways to the same learning objective. This has a profound impact on how the content should be made.

Biological adaptive models are multidimensional, and have subcomponents that each “act” continuously. Some of the key concepts and challenges that the models are trying to address include:

Measurement of knowledge	Self-evaluation
Modeling knowledge	Completion
Time and knowledge decay	Competencies
Predicting the “next optimal task”	Motivation
Spaced Repetition	Noise
Chunking	Interleaving

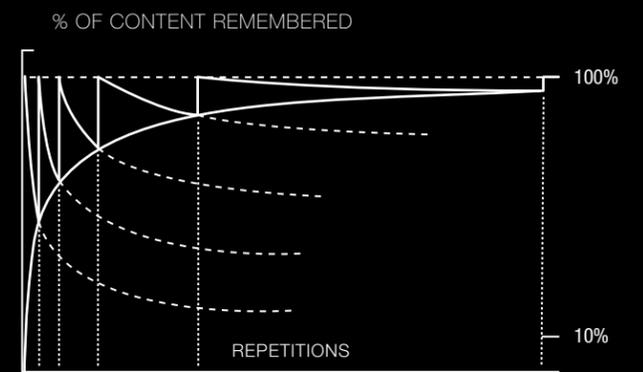
Multiple interdependent biological models gather data from learner interactions moment-by-moment and evolve over time to meet the unique needs of each learner.

These models allow the learner to make mistakes and pursue misconceptions, closely mimicking real-world-cognitive situations, and providing the optimal experience for the learner.

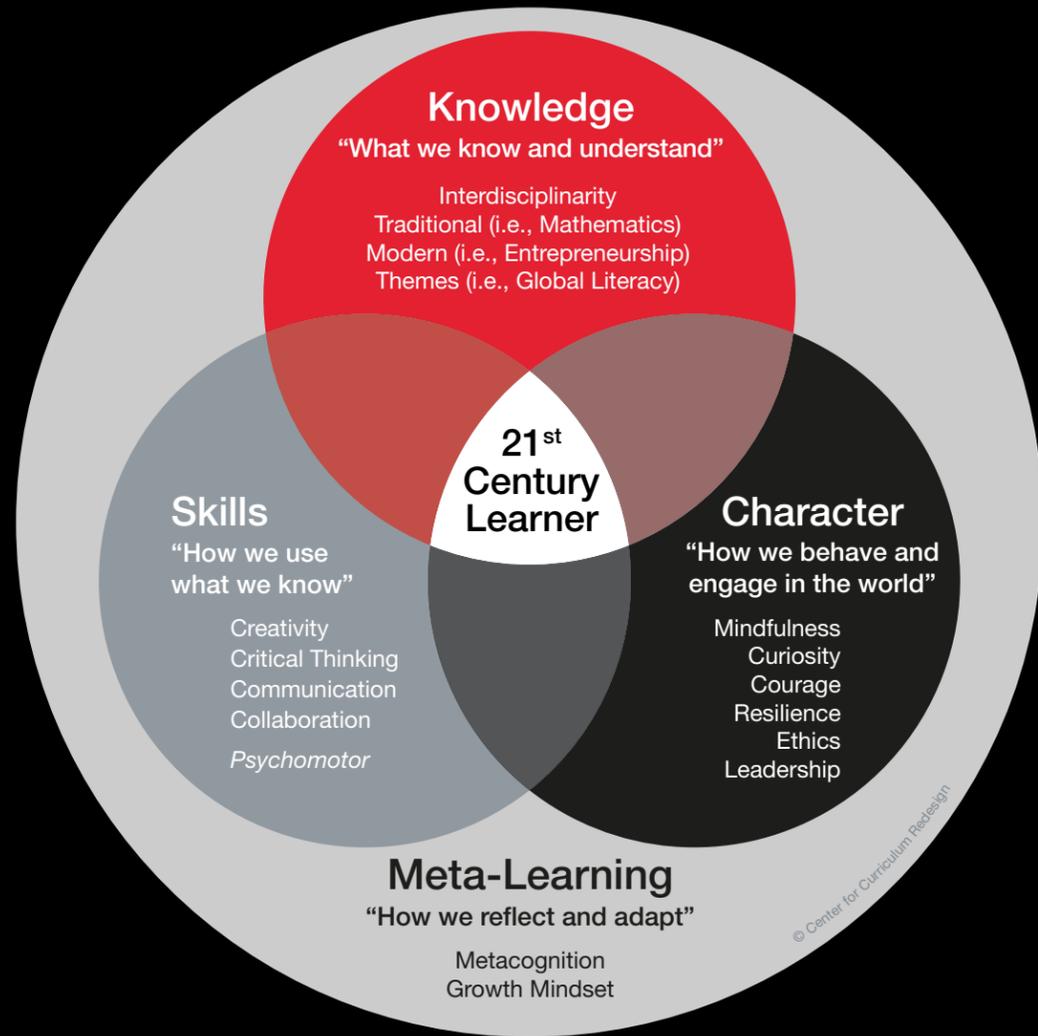
Advanced Modeling of Refresh

We have known for more than 150 years that humans forget up to 70% of what they learn within 24 hours! However, repeating learning can secure it in our minds. Area9 Rhapsode™ uses advanced cognitive models to predict when and what a learner might forget, and builds prioritized refresh activities for each learner for each thing they study.

Refresh is seamless to the learning process. Content is presented right before it might be forgotten, optimizing the learner’s path to proficiency.



FOUR-DIMENSIONAL LEARNING



The digital era is changing learning at all levels of education and training. Skills and character traits such as problem solving, creativity and adaptability are becoming increasingly important at the expense of the time to get to knowledge mastery.

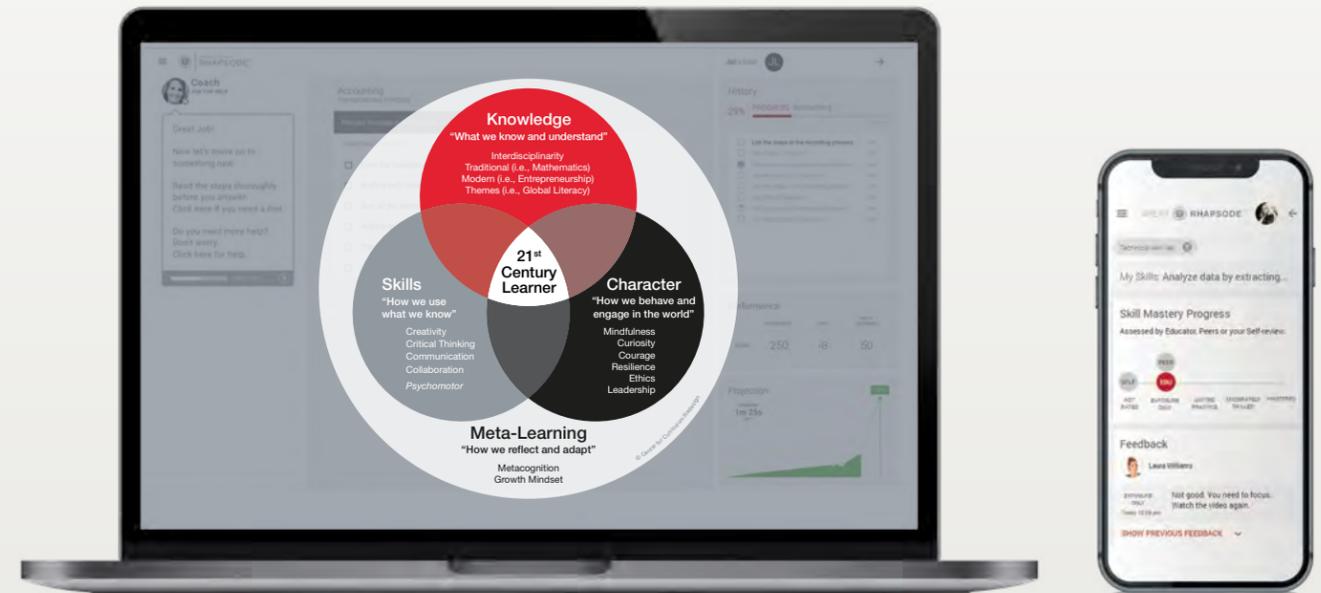
Area9 Rhapsode™ is designed to capture and work with a learner's complete range of competencies; their mastery of skills, knowledge, character and meta-learning (meta-learning can be summarized as "learning about learning").

This improves the chances that students become autonomous, reflective learners. It also means better teaching and decision-making by educators, mentors, coaches and Learning and Development professionals as they are given access to a complete picture of the competencies of individuals and learner populations.

"Four-dimensional education provides a clear and actionable first-of-its-kind organizing framework of competencies needed for this century."

” CHARLES FADEL
 Founder, Center for Curriculum Redesign
 Visiting scholar, Harvard University

AREA9  RHAPSODE™



Rhapsode learning experiences are incredibly data-rich. Each minute of interaction yields 20 or more data points per learner. This data is used to optimize the path to proficiency for the learner, and also carries immense value for our 4D learning needs.

problem solve. The Rhapsode user interface tracks learners' performance and "nudges" their behavior in positive directions.

1 For example **Grit or Perseverance** has been shown to be tightly linked to success in work and at school. Rhapsode monitors how learners respond when struggling to learn something, and through complex algorithms predicts the learners' levels of grit. Using techniques derived from behavioral economics, Rhapsode provides feedback to the learner, rewarding behavior that builds grit.

3 Developing 4D capabilities such as grit and critical thinking is the first step in creating a rich learner experience that covers the full spectrum of 21st century education independent of the focus of the specific subject being learned.

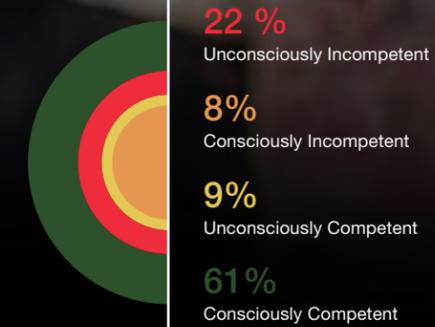
2 Similarly, the learners' responses to questions, problems and exercises give insight into their ability to **think critically and to**

Area9 Rhapsode™, has a very advanced system for doing learning engineering on skills including **psychomotor skills**. Using the **Rhapsode Skills App™**, the educator can give detailed feedback of skills including video recordings, scorings, links to more learning resources, etc.—all tied to the underlying learning engineering. This is the **first integrated, four dimensional learning platform** in the world.

THE IMPORTANCE OF UNCONSCIOUS INCOMPETENCE

Learning is not simply the "filling-in" of missing knowledge or skill. For any given element of knowledge or skill, a learner will be objectively competent or incompetent but may be subjectively unaware of their level of competence. When a learner is *unconsciously incompetent* they believe they possess knowledge or skill when in fact they do not.

Area9's data shows that learners are typically 15-40% **unconsciously incompetent** in any given subject. We hypothesize that this unconscious incompetence is the source of many errors in practice – that damage is most likely to occur when people *think* they know what to do, when in fact they don't.



Automaticity

Automaticity is the ability to do things without occupying the mind with the low-level details required, allowing it to become an automatic response pattern or habit. It is usually the result of learning, repetition, and practice.

The Importance of Automaticity

Automaticity gives us the ability to move through life without suffering **constant and debilitating cognitive overload** – there is just too much going on around us to be able to take it all in, consciously process it and respond.

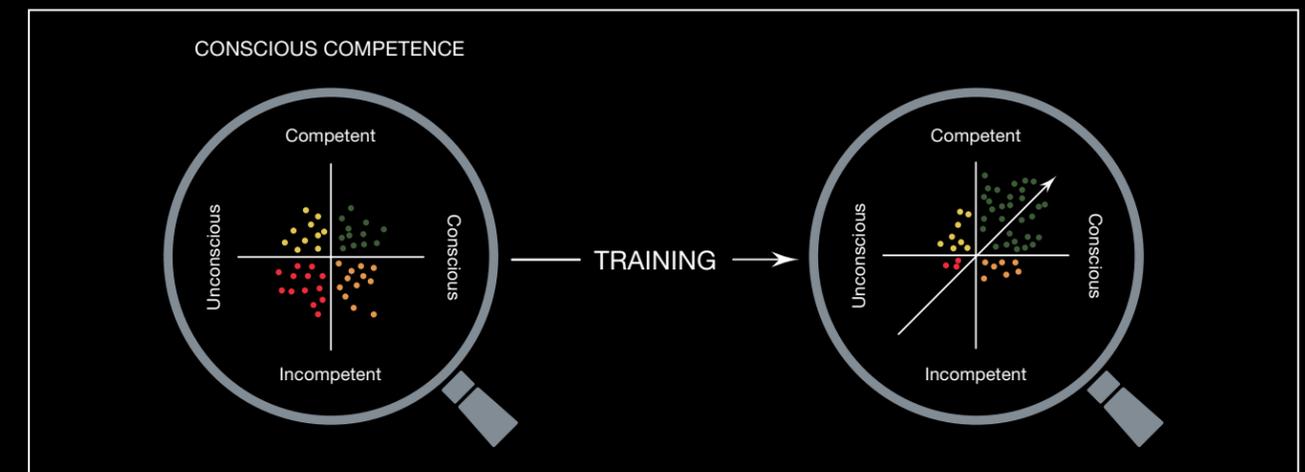
Though it is possible to "force" our response situations – stop, reflect, search for possible answers, parse those answers, select what appears to be the most appropriate, and then act – it is not always probable or desirable. In the most extreme circumstances, it can have life-threatening consequences.

Developing automaticity frees up the limited "working memory" each of us possesses and accelerates our responses. From the trivial ("what is 2 times 2?") to the more complex ("I'm doing 70 miles per hour and a car is pulling into my lane ahead of me"), automaticity provides a necessary coping mechanism.

Conscious development of automaticity at school frees up cognitive processing for more complex study. At work, it makes us more responsive – especially in stressful situations.

When faced with stress, the human brain falls back on things that are "second nature." It is imperative that those fall backs generate the right response. When a sales person is confronted with a difficult customer, he/she should know how to generate the best possible outcome, not to push back. When asked a question, a call-center agent's default response should not be "I don't know, please wait while I look that up."

We do not need to achieve automaticity in every skill or piece of knowledge, but in areas such as core skills, safety-critical behavior, and threshold and differentiating competencies automaticity is a requirement.

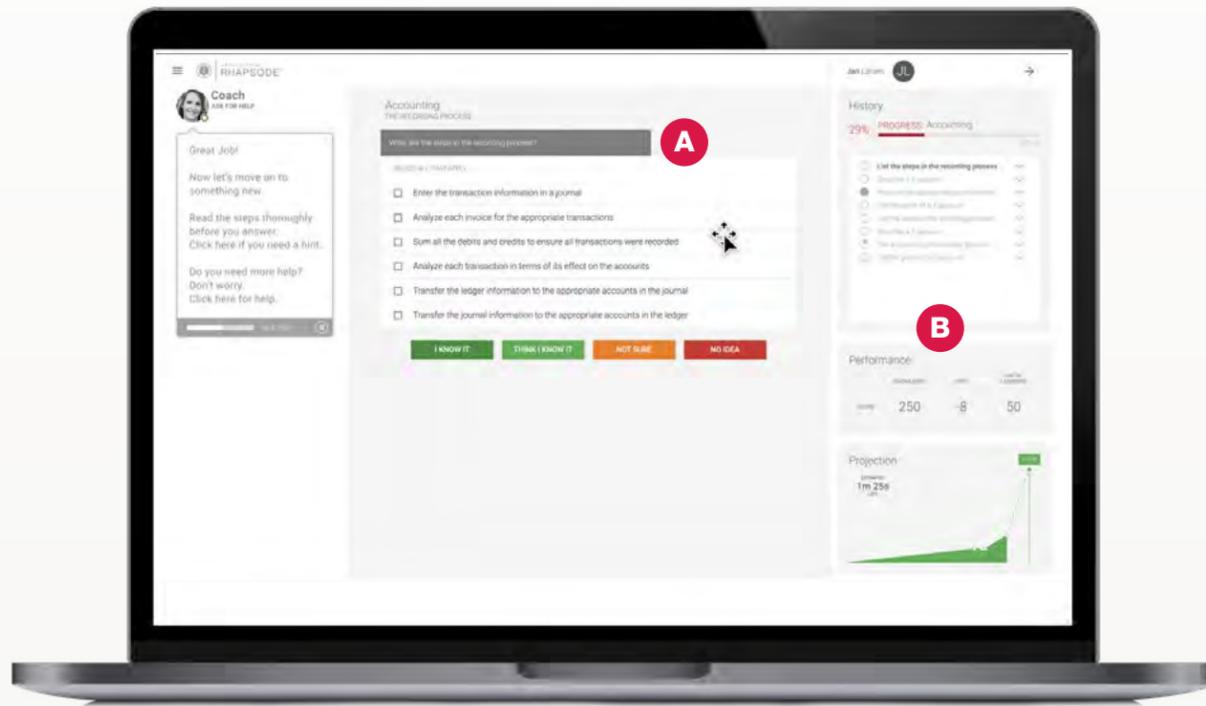


Adaptive learning optimizes the individual's progress towards 'Conscious Competence' and ultimately for some learning objectives even 'automaticity'.

UNCONSCIOUS INCOMPETENCE IN AREA9 RHAPSODE™

Area9 Rhapsode™ uses a seemingly simple mechanism to help the learner become more self-aware: the confidence self-assessment. This apparently trivial mechanism, when paired with the biological model, yields profound insight into the

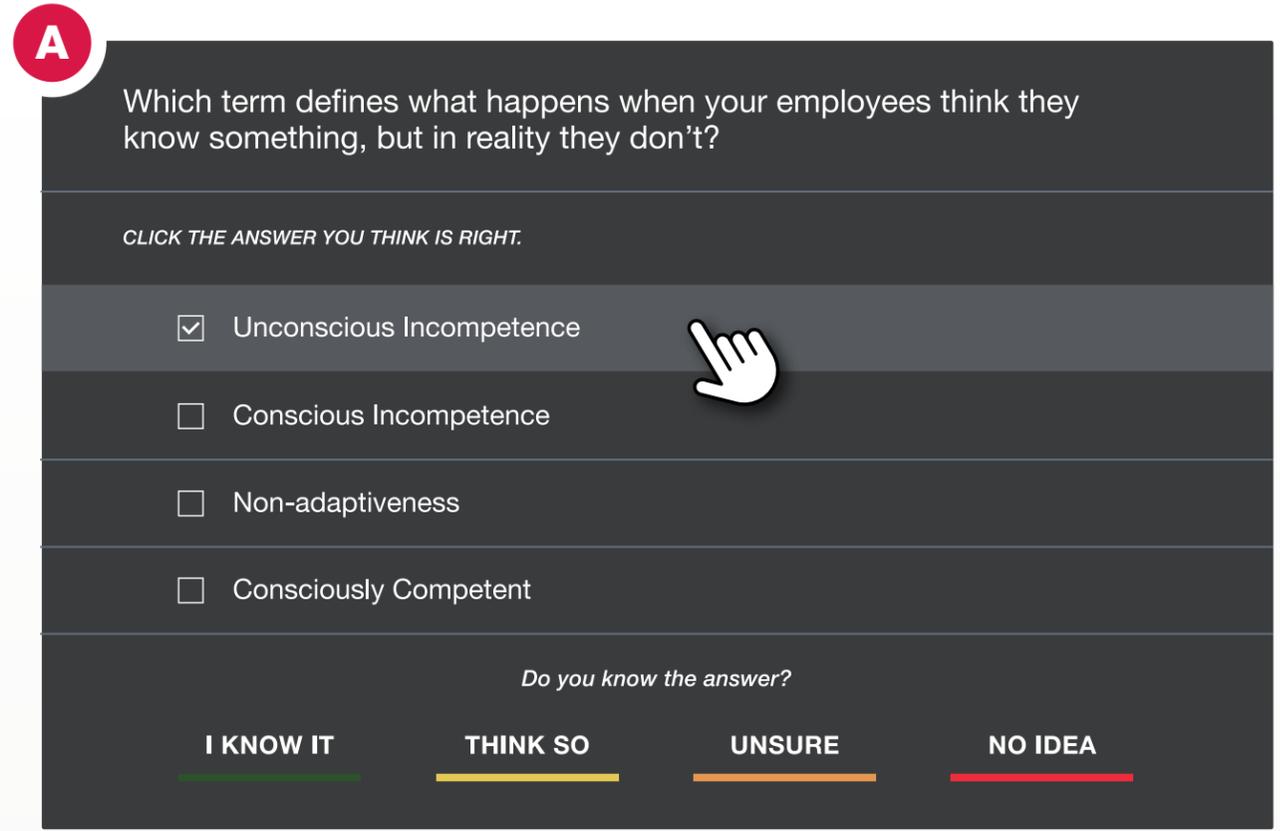
learner's metacognitive state, learning objective by learning objective. By selecting a confidence level for each answer, the learner reflects on their response (immediately improving accuracy and cognition) and generates key data for use by the biological engine.



Advantages

We all need to know what we don't know. Data from an Area9 study within a global technology company revealed that employees can be between 20% and 40% "unconsciously incompetent" in the key areas of knowledge they need to do their jobs.

With Area9 adaptive learning, individuals, educators and managers can get a clear view of what people do and don't know - and whether or not they know it - across entire learning populations.



B

Performance			
	KNOWLEDGE	GRIT	META LEARNING
SCORE	250	-8	50

Self-evaluation

Each exercise in the Area9 system requires students to assess consciously how sure they are of their answer.

The result of this metacognitive input along with multiple other aspects of the learner's interaction with the system (for example, how long they take to respond) is analyzed in real time to establish the next content to be presented.

Meta-learning

Meta-learning and grit: Area9 Rhapsode™ works deliberately on improving learner's ability to learn. This includes advanced models and technologies to assess and reward perseverance – or grit – and a learner's ability to assess what he or she knows and does not. Three different performance measures are provided: A) Knowledge, which is a score for how well knowledge learning has been accomplished, B) Grit, which is a score for the learner's ability to keep working even when something is hard, and C) Meta-learning which is predominantly based upon how consciously competent or incompetent the learner has been.

MILESTONES



1997: Sophus Medical, a ground-breaking, computer-based medical simulation training company, is founded by Ulrik Juul Christensen and others. Develops the official first aid course for the Red Cross in Germany, Great Britain, the Netherlands, France and Denmark.



Laerdal
helping save lives

2002: Laerdal Medical acquires Sophus Medical and thus combines Laerdal's core competences in production and distribution of emergency medicine training with Sophus Medical's strengths in software development.



2005: Laerdal's HeartCode becomes AHA's most important adaptive learning platform for ACLS (Advanced Cardiac Life Support) & PALS (Pediatric Advanced Life Support).

area9

2006: Area9 is founded



2008 - 2014: Area9 partners with McGraw-Hill Education to deploy its adaptive learning technology.

LearnSmart is an intelligent learning system which uses cognitive mapping to identify the student's knowledge within a specific subject area and creates an individually adapted learning path.

SmartBook is a digital version of the traditional textbook. It contains the same material, but in addition and unlike a traditional e-book, SmartBook tailors the material for each individual learner.

Since 2010, more than 15 million learners have used LearnSmart and SmartBook (property of McGraw-Hill Education - acquired in 2014).



2014: Area9 Learning is created, dedicated to corporate training.



2014: NEJM Knowledge+ was launched in partnership with NEJM Group to create the most efficient, effective way for clinicians to prepare for board exams, earn CME and MOC, and engage in lifelong learning.

NEJM Group is a division of The Massachusetts Medical Society, publisher of the New England Journal of Medicine.



Hitachi Data Systems

2014: Hitachi collaborates with Area9 to launch the world's most advanced adaptive learning platform for corporate learning.



2015: Partnership with National Safety Council, the leading safety training organization in the US, offering adaptive courses.



2016: Area9's client list grows to include organizations in a diverse range of sectors, including: energy, oil and gas, retail, automotive, transport, telecommunications, heavy industry, automotive and others.



JANUARY 2018: AREA9 LYCEUM IS FOUNDED



Area9 Lyceum is without a doubt our most ambitious venture so far. We are embarking on a journey where we will build the world's most advanced technology to provide four-dimensional learning for the 21st century.



We have gathered a team of the world's leading experts in order to create a completely new adaptive sequencer (the core of providing adaptive and individualized content). Furthermore, we are creating the world's most advanced content development platform, which is vital for setting new standards within intelligent content.



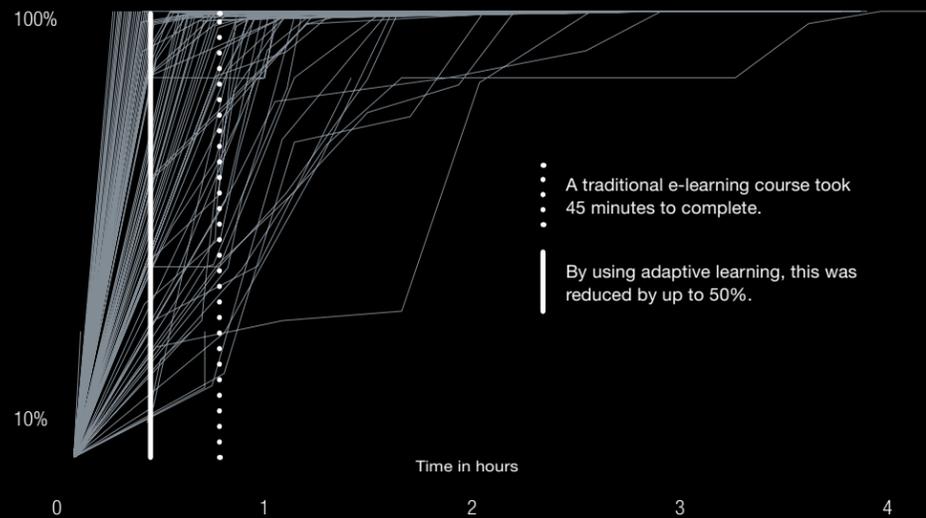
PROFICIENCY

Accelerate The Path to Proficiency

Rhapsode is designed from the ground up to take the learner on a journey to automaticity – where it is needed. This includes both achieving initial proficiency, and by further refreshing the learner on an ongoing basis. Rhapsode identifies the learner’s knowledge and metacognitive state and develops it. Key to this process is measuring and developing the learner’s self-awareness – specifically their levels of unconscious competence, unconscious incompetence, conscious incompetence and competence.

This technology combined with Area9’s latest generation of biological models lead to a break-through in terms of **reduction of time to initial proficiency** (also referred to as first pass learning).

ADAPTIVE LEARNING REDUCES THE TIME SPENT ON LEARNING



Reduction in time achieved by using adaptive learning instead of traditional digital resources.

50%

TIME REDUCTION (FIRST TIME LEARNING)

90%

LESS RETENTION EFFORT

100%

COMPLETION RATES

Accelerate the Path to Retention

Training courses are designed to be sufficiently comprehensive to thoroughly cover the course objectives. A natural but unwelcome consequence of this is that learners are asked to study material that they are already proficient in.

By interleaving questions, problems, exercises and content, and by using self-assessed confidence measures, Area9 Rhapsode™ ensures each learner only refreshes the material that is necessary to achieve long-term retention. The result is up to 90% reduction of effort needed to retain knowledge and skills.

CASE STUDIES

Area9 has over two decades of experience and a long history of partners and clients who trust us for their journey to the future of learning

“We set out to create a truly innovative product that would be relevant and convenient to physicians. Area9, a physician-led company that is an innovator in interactive educational software, asked us to consider them as a partner, not a vendor. We did, and that partnership has been extremely successful.

” CHRIS LYNCH
Vice President for Publishing, NEJM Group

Physician Preparation for Board Certification and CME

NEJM Group and Area9 partnered to create the first-of-its-kind platform with smart technology that adapts to clinicians’ learning goals, pace and knowledge gaps to accelerate proficiency, continuously sharpen skills, and promote lifelong learning. NEJM Knowledge+, built on Area9’s adaptive learning platform, resulted in higher pass rates on ABIM-CE board exam. (95% vs. 89% - see: <https://www.mededpublish.org/manuscripts/1788>)



“In healthcare, accurate knowledge is crucial for an effective sales team. Adaptive learning ensures our team builds the knowledge and confidence they need, in the most optimal way.

” KRISTIAN VILLUMSEN
Executive Vice President, Coloplast



Selling Complex Medical Products

Adaptive learning allowed training on scientific fundamentals and highly complex products to be delivered globally (including in Europe, China, India, and Saudi Arabia) with greater satisfaction and significantly reduced churn when onboarding new employees.

“The Adaptive Platform enables each of our learners to develop the specific competencies he/she needs in the most efficient and effective way possible, while giving me a real-time overview of the organization’s current capability – at any given time.”

” TERRI CASADY
Senior Director, Hitachi Vantara Academy



Enterprise-wide Implementation of Product and Service Training

To train more than 7,000 internal employees and 25,000 third-party resellers and customers on highly complex products, processes, and services, Hitachi turned to Area9’s adaptive learning platform. Increased efficiency reduced time spent on training by 50%.

“As we continue to grow, we want our employees to fully understand our commitment to world-class manufacturing jobs and products that are built to last. The more ways we can effectively tell our story, the better the experience our customer has with our brand.

” JACQUES PANIS
President, Shinola



Solving Retail Growth Challenges for a Luxury Lifestyle Brand

Facing huge growth, Shinola turned to Area9’s adaptive solution as a highly engaging way to onboard its diverse workforce, to ensure product knowledge and instill the company’s mission and values. The result is a consistent customer experience across its expanding store base.

2018 ● AREA9  RHAPSODE™

2010 ● THIRD GENERATION ADAPTIVE LEARNING

- Adaptive eBook (SmartBook)
- Adaptive delivery of learning resource
- Advanced adaptive math - show your work
- Full curriculum adaptive courses

2008 ● SECOND GENERATION ADAPTIVE LEARNING

- Launch of LearnSmart with McGraw-Hill Education
- First adaptive learning platform based on biological models

1998 ● EARLY ADAPTIVE SYSTEMS & SIMULATORS

- Patient simulators
- Intelligent debriefing technologies
- Self-directed, simulation-based learning systems

EXPERTISE IN WHAT IMPACTS LEARNING

Area9 Rhapsode™ - Our Next 4th Generation Adaptive Learning and Authoring Platform

- Through three previous versions of the platform, Area9 has made adaptive learning technologies that have empowered over 15 million learners and collected billions of learning data-points
- Based on over 20 years of research in human factors, learning science and computer science, Area9 has pioneered learning techniques
- Area9 has led in innovating and partnering with leading scientists on learning and education
- Area9 Lyceum has a proven track record in building the teams, processes, architecture, and operational technologies at an unprecedented, high level of impact in the industry
- **Area9 has the expertise in what really impacts learning**

