

BECOMING A FUTURE READY HEALTHCARE ORGANIZATION

Steps to Evolve Your Clinical
Education and Simulation
Training Program





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CHAPTER 1

INTRODUCTION



Patient safety is the top priority for today's healthcare organizations. Executives are focused on improving patient outcomes while reducing costs and recognize clinical education and simulation training can support these objectives. In fact, Johns Hopkins Medicine allocates more than 5% of their entire "strategic plan-driven" annual spending budget for training and education.¹ However, many organizations are still unclear if their training efforts are targeting the correct vulnerabilities, reaching the correct clinical staff or moving the needle.

With hospital networks continuing to consolidate and onboard a predicted one million new nurses by 2022,² clinical educators are faced with increasing pressure to deliver more training at scale and demonstrate a measurable impact.

This can be extremely daunting using traditional content and modalities or relying on expensive high-fidelity simulation for 'hands-on' experience. Educators lack immersive, experiential content as well

as technology solutions that enable the identification of vulnerabilities, easy delivery of targeted training and analytics to track learner progress.

To address this dilemma, healthcare organizations must move beyond the traditional "learn one, see one, do one" model and incorporate experiential learning that can be delivered at scale. Experience drives muscle memory, acts as a reference point to make better decisions and instills clinical confidence. So how can organizations effectively deliver experience based training at scale? The solution lies in Virtual Reality (VR) technology. Its ability to simulate real-life scenarios will define the next-generation of clinical education and healthcare simulation.

This paper examines the limitations of traditional training modalities and provides detailed steps your organization can take now to integrate a modern, blended approach to learning and make sure it's prepared for the future.

¹ "A Look at Our Books: Fiscal Year 2015 Capital Budget and Annual Operating Plan." Johns Hopkins Medicine. 2015. Accessed November 1, 2018. https://www.hopkinsmedicine.org/news/publications/_docs/operating_capital_budget_infographic.pdf.

² Nursing Workforce. Accessed November 1, 2018. <https://www.nursingworld.org/practice-policy/workforce/>.



CHAPTER 2

LIMITATIONS OF TRADITIONAL MEDICAL EDUCATION AND SIMULATION TRAINING



Didactic training methods have a place in medical education, but consider the 70-20-10 Model for Learning and Development, which states that 70 percent of an individual's knowledge comes from experience, 20 percent from peer interactions and 10 percent is derived from formal education.³



Experiential learning and deliberate practice methods are key to improving patient outcomes and ensuring safety.

Manikins, first introduced in the 1960s for training in endotracheal intubation and anesthesia, have become the go-to patient stand-in for training. They allow medical professionals to train without risk and prepare for real-life scenarios, but they're expensive (high-fidelity manikins can cost more than \$70,000 each⁴) and their attempts to recreate lifelike, physiological responses can be unsettling.

Scripted high-fidelity scenarios leveraging these manikins offer engaging and often team-based learning opportunities. However, they are resource intensive and hard to scale. Finding resources, training them properly, scheduling time for pertinent personnel to

attend and finding the right scenarios to run can be time consuming and limiting. Then, once they're complete, they're over. Until the next time, which, after planning, could be months, if not years, away.

Task trainers and virtual task trainers are slightly more scalable than other high-fidelity simulators, but they're narrowly orientated around specific procedures – and expensive.

eLearning has been an effective tool in scaling classroom learning, and screen-based training offers an engaging, interactive, cost-effective experience that bridges the gap between classroom and hands-on experience. However, neither provide a true simulated experience that learners can immerse themselves in repeatedly. And no current solutions currently offer the efficacy and cost savings of VR.

³ "The 70-20-10 Model for Learning and Development." Training Industry. January 28, 2014. Accessed October 02, 2018. <https://trainingindustry.com/wiki/content-development/the-702010-model-for-learning-and-development/>.

⁴ Fink, Jennifer. "Playing a Bigger Part." Johns Hopkins Nursing Magazine. April 06, 2015. Accessed October 05, 2018. <https://magazine.nursing.jhu.edu/2014/11/playing-a-bigger-part/>.

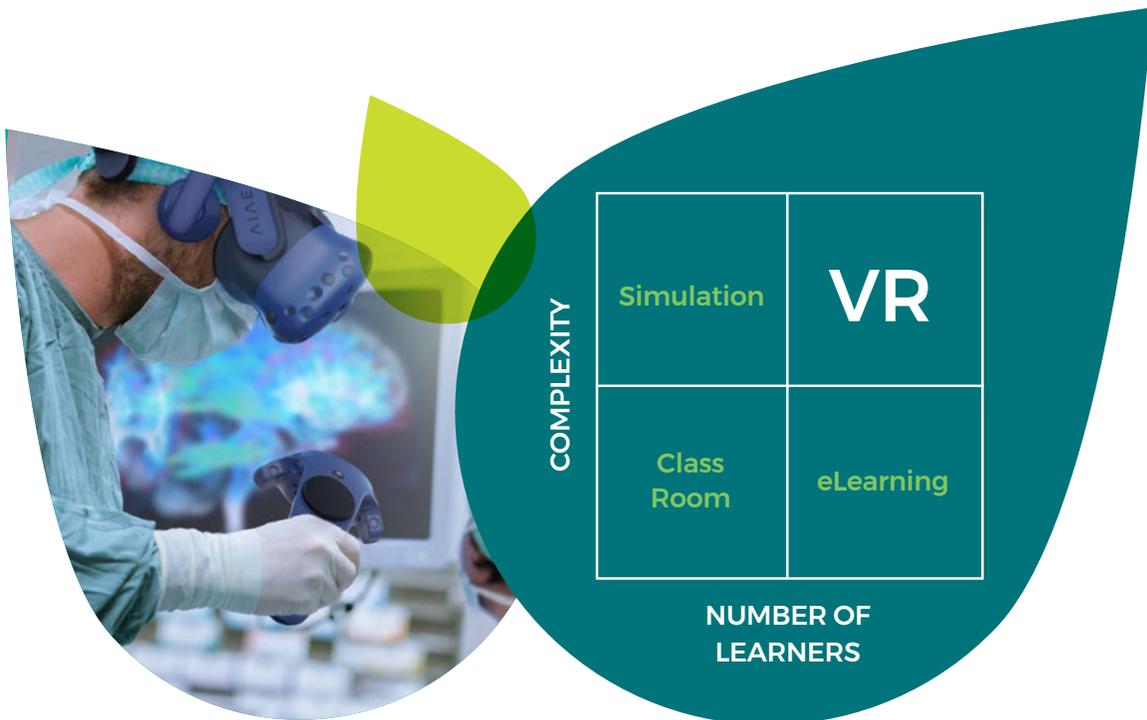


CHAPTER 3

LOWER COST, HIGHER IMPACT, MEDICAL EDUCATION

Simulation directors, nurse educators and others responsible for patient safety and quality measures need to be able to control the environments and content they deliver to learners, providing consistent experiences for all users, no matter their locations or when they're able to complete the trainings.

They need to easily set up simulations with less travel time, resourcing restraints and costs. And finally, they need the ability to provide real-time feedback, and track participants' performance and progress, using it to inform future training and improve patient outcomes at scale.



IT'S POSSIBLE WITH VIRTUAL REALITY

Once seen as a solely entertainment-based technology, VR has practical enterprise applications that can be integrated with other teaching methods to create dynamic, memorable learning experiences.

Simulation experts can use them to create environments and conditions that are unsafe or physically impossible to replicate, given time and money constraints.



THERE ARE SEVERAL WAYS VR HELPS HEALTHCARE EDUCATION PROGRAMS:

Engaging learners

Using VR can help trainees better understand and recall information than traditional learning methods. A recent University of Maryland study compared VR head-mounted displays (HMD) to traditional desktop displays and found that overall average recall performance of participants in the HMD condition was 8.8% higher compared to the desktop condition. Additionally, 70% of users reported that HMD afforded them a superior sense of the spatial awareness, which they claimed was important to their recall success.⁵

Achieving efficiency at scale

A one-time VR equipment expense unlocks the ability to leverage content and applications across a wide variety of training exercises, procedures and scenarios that would otherwise take educators months to prepare for and execute. With VR, they can bring the experience to the learner without instructor dependencies. Less logistics. More learning.

Providing consistency at scale

Health organizations continue to consolidate at an accelerated pace with 1,519 hospital mergers in the past twenty years and 680 since 2010.⁶ Training thousands of clinicians across departments, offices and geographies can make for disparate learning experiences, leading to costly errors. VR lets educators control the content and environments, providing a consistent educational experience for as many learners as they desire at a lower cost than traditional simulation practices.

Meeting learners' technological needs

With employment of healthcare occupations projected to grow 18 percent from 2016 to 2026, adding about 2.4 million new jobs⁷, there will be an influx of new technologically savvy clinicians, doctors and educators who expect to consume the engaging, cutting-edge experiences and content that VR delivers.

Targeting the right scenarios

Educating trainees about specific patient care workflows or never-ever events like a fire in the operating room isn't easily accomplished with traditional training, but with VR, it's not only possible, it's seamless.



Scene from Health Scholars' Fire in The OR application

⁵ Krokos, Eric, Catherine Plaisant, and Amitabh Varshney. "Virtual Memory Palaces: Immersion Aids Recall." Virtual Reality. 2018.

⁶ Gaynor, Martin "Examining the Impact of Health Care Consolidation Statement before the Committee on Energy and Commerce Oversight and Investigations Subcommittee U.S. House of Representatives." February 14, 2018.

⁷ "2017 Median Pay." U.S. Bureau of Labor Statistics. April 13, 2018. Accessed September 25, 2018. <https://www.bls.gov/ooh/healthcare/home.htm>.



CHAPTER 4

HOW VR IMPACTS LEARNING METHODS

While the implications of leveraging VR in clinical education programs are significant and in some cases, glaringly apparent, it's important to understand how the technology engages the brain to learn in more effective ways.

According to Todd Maddox, Ph.D., founder and CEO of Cognitive Design and Statistical Consulting, it's the cognitive, behavioral and emotional learning methods employed by extended realities (xR) like VR, augmented reality (AR), mixed reality (MR) and cross reality (XR) that can improve the training experience.

● Cognitive learning

Attempting to reconcile a 2D environment or structure as a 3D representation in the brain requires a large amount of cognitive capacity and energy. And "any time working memory load and executive attentional demands are taxed, you are more likely to make an error and generate an inferior mental representation."⁸ xR can remove the strain and help users focus attention on rich information with associated visual representations.

● Behavioral learning

Behaviors are learned through repetition, "incrementally via dopamine-mediated, error-correction learning in the basal ganglia of the brain."⁹ xR allows learners to get extensive practice that may otherwise take too much time or money to recreate often. And the responses they receive using technologies with haptic feedback or from real-time instructor critique affect the dopamine level released in the brain, which can impact future behavior.

● Emotional learning

The emotional learning system connects both cognitive and behavioral functions in a given situation and helps process them to provide situational awareness, which is critical in the medical field. Scenario-based training available in xR can help prepare practitioners for routine and catastrophic events they may face, and help them respond in appropriate ways.

Cognitive, behavioral and emotional learning triggers different parts of the brain. Thus, to provide the most comprehensive learning experience, the right types of training need to be given, using the right modalities, to engage the right parts of the brain for specific tasks and objectives.

The proper VR content can help improve psychomotor skills through repeated behavioral practice, and help develop and sharpen interpersonal skills and collaboration with other teams—routinely and during a crisis. An estimated 80% of serious medical errors involve miscommunication between caregivers during the transfer of patients¹⁰ so it's imperative that healthcare workers are experts in procedure, process and communication.

⁸ Maddox, Todd. "Report: Using Extended Reality in Healthcare." Tech Trends. September 07, 2018. Accessed September 25, 2018. <https://techtrends.tech/tech-trends/report-using-extended-reality-in-healthcare/>.

⁹ ibid

¹⁰ "Joint Commission Center for Transforming Healthcare Releases Targeted Solutions Tool for Hand-Off Communications." Joint Commission Perspectives®. August 2012. Volume 32, Issue 8.



HOW CAN MY ORGANIZATION BENEFIT FROM USING VR?



Improved Patient Outcomes

Develop and refine behavior and communication skills for better memory retention and decision making.

Enable continuous practice of procedural and workflow tasks.

Provide real-to-life and immersive reference experience to manage high-stakes, infrequently encountered situations.



Scalability

Roll out large-scale, multi-site training initiatives without escalating instructor costs by automating the education in a way that does not compromise its quality.

Prevent snowballing administrative overhead for system-wide training mandates.



Profitability

Spend less on resource management, travel and expensive training room setup.

Implement impactful training that genuinely changes the behaviors needed to prevent errors that result in non-reimbursable patient complications and prolonged lengths of stay.





VR AT WORK

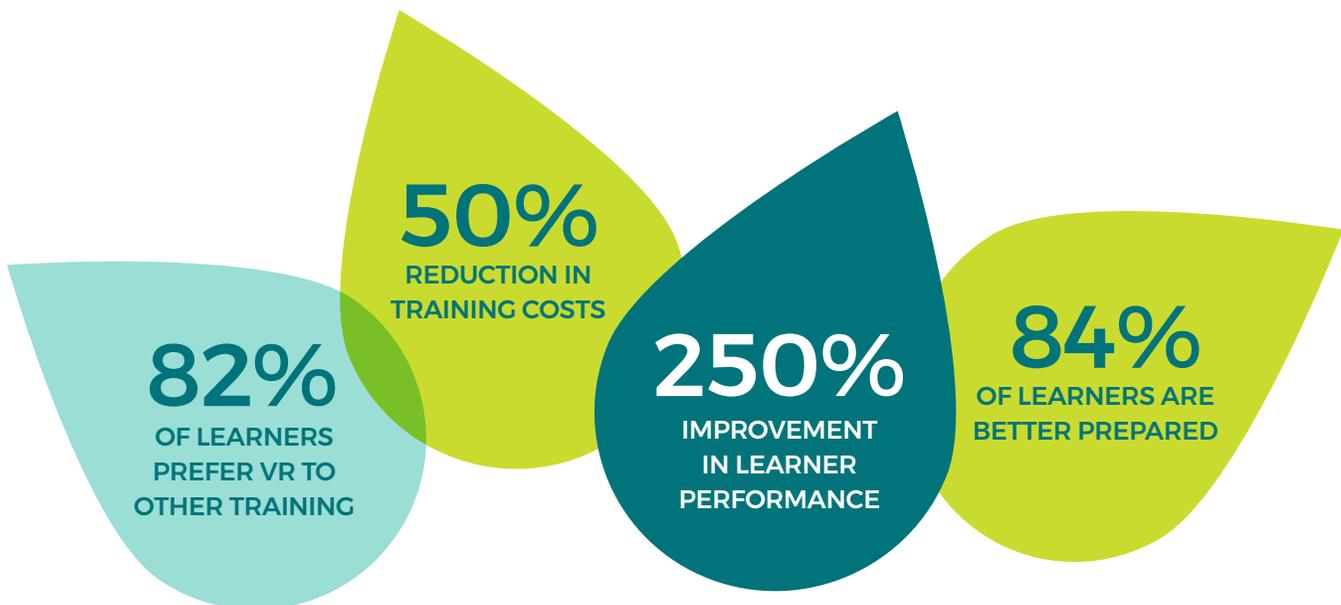
Lowering Costs

Overall, VR can cost up to 50% less than traditional simulation for clinical fire training. For example, traditional clinical fire training techniques could easily cost \$90,000 for a trainee population of 700, excluding facility costs. VR could conservatively cut this cost by 50% – down to under \$45,000 per year. This includes all expenses for software, hardware and trainee labor hours.¹¹

Reducing Errors

VR training has been proven to improve operating room performance.¹² Leveraging it for precise surgical procedures or preparing for high-stress events allows physicians to practice in safe, risk-free environment

multiple times, receiving feedback and progress assessments that can help them master the skills. A 2018 study published in *Surgical Endoscopy* compared a headset-mounted, immersive VR-based operating room fire training simulation system to traditional reading and lecture training, and found that the VR simulation group performed 250% better at putting out a mock operating room fire using the correct order of steps (7/10 participants) versus the control group (2/10 participants). The VR simulation group could also correctly identify oxidizer sources more than the control group. Thus, they demonstrated a superior grasp of the fire triad, which is critical to preventing fires.^{13 14}



¹¹ Health Scholars. Evidence Brief: Health Scholars' Fire in the OR™ Virtual Reality Simulation. July 15, 2018. Accessed November 1, 2018. <https://healthscholars.com/fire-in-the-or-evidence-paper/>.

¹² Seymour, Neal E., Anthony G. Gallagher, Sanziana A. Roman, Michael K. O'Brien, Vipin K. Bansal, Dana K. Andersen, and Richard M. Satava. "Virtual Reality Training Improves Operating Room Performance." *Annals of Surgery*. October 2002. Accessed October 03, 2018. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1422600>.

¹³ Dorozhkin, D; Olasky, J; Jones, DB, et al. "OR fire virtual training simulator: design and face validity." *Surgical Endoscopy*. Sept. 2017. 31(9): p. 3262.

¹⁴ This data comes from user participants who responded to the Health Scholars' Fire in the OR VR simulation user survey (n=34). The survey was completed during beta testing of Health Scholars' Fire in the OR VR Simulation at three major health care organizations in the United States in 2018.



CHAPTER 5

BECOMING A FUTURE READY HEALTHCARE ORGANIZATION

As health systems create strategic plans for the coming years, what training initiatives should they prioritize? Is it organizational change? Strategies to combat burnout? Technology adoption? Future ready organizations would prioritize all three.

Yesterday's training isn't going to work for tomorrow. Technology is moving quickly and the global VR market in healthcare is projected to rise at a compound annual growth rate of 54.5 percent from 2017-2023.¹⁵ The industry is past the point of dipping its toes into the VR space and diving headfirst into creating new content, adopting learning platforms and integrating existing manikin technology with emerging VR capabilities to create a new way of training.



While some organizations don't have the resources of major research universities or large, private hospital systems, they should still be aware of what's ahead in the coming years and how it will affect them. They need to:

- **Adopt a culture of safety.**
Safety culture has a direct positive relationship with financial performance.¹⁶ Tomorrow's training needs to be recurring; address skills decay and updates to workflows; and focus more on communication – not just procedures – to ensure patient safety and meet the financial needs of the organization.
- **Understand vulnerabilities.**
Identify real problems and target training to help. Yes, there are certifications everyone must keep, but they need to also understand the areas that will make the most patient and financial impacts and train to them. Using a system that provides tracking is key to understanding training efficacy.
- **Be open to technology.**
VR isn't going away. In the past, it may have been more of an interesting diversion, but it's a proven technology that will continue to be a major catalyst for industry change.
- **Embrace scientific methods.**
Using available technology is a good start. But targeting training using the right technology for the right task to engage multiple areas of the brain is effective.

¹⁵ Virtual Reality (VR) in Healthcare Market: Global Industry Analysis, Trends, Market Size and Forecasts up to 2023." Research and Markets. March 2018.

¹⁶ Upadhyay, S., R. Weech-Maldonado, C. H. Lemak, A. Stephenson, T. Mehta, and D. G. Smith. "Resource-based View on Safety Culture's Influence on Hospital Performance: The Moderating Role of Electronic Health Record Implementation." *Current Neurology and Neuroscience Reports*. Accessed October 03, 2018. <https://www.ncbi.nlm.nih.gov/pubmed/30157101>.



Take a blended learning approach.

A blended learning approach means integrating traditional educational approaches with technology-enhanced ones, using more than two modalities. Take, for instance, the American Heart Association’s HeartCode® ACLS training program, a “self-directed, comprehensive eLearning program that uses eSimulation technology to allow students to assess and treat patients in virtual healthcare settings.”¹⁷ Trainees begin the course with online assessments and lessons and then move to hands-on training demonstrating the proficiency of the skills they just learned. Using these different training methods engages different parts of the clinicians’ brains and maximizes their learning gains.

The key is ensuring you’re using the right training for the right purpose – with the right people. And measuring the impact to see where you can improve.

Well-executed blended learning curricula that address communication, psychomotor skills and procedural knowledge can decrease the cost of education delivery and increase the quality of care, leading to improved patient safety and outcomes.

Implement a learning system.

Learning management platforms are beneficial, but limited. You need a system in place that will help you automate the creation, delivery, management and tracking of blended learning curricula – from classroom lectures to cutting-edge xR simulations. This allows you to identify areas of vulnerability and target training to address those issues before they become costly catastrophes.



EXPERTS PREDICT: WHAT’S NEXT?

Having systems in place to virtualize and automate immersive education is critical because the types of trainings required are labor intensive and often exceed capital and human resources...there is not enough money for the team size that you need to execute immersive education at scale in a traditional brick-and-mortar model.

– Brian Gillett, MD, Co-Founder & Chief Medical Officer at Health Scholars

We’ll see some sort of interface between task trainers and virtual reality that changes the landscape in terms of being able to integrate all the pieces of healthcare practice in a way that is less taxing on human resource management.

– Matt Charnetski, BS, EMT-P, MS, Director of Simulation Learning at New York Institute of Technology at Arkansas State University

¹⁷ "HeartCode® ACLS." American Heart Association. Accessed October 03, 2018. <https://elearning.heart.org/course/20>.

¹⁸ Medical Simulation Market - Global Scenario, Market Size, Outlook, Trend and Forecast, 2016 - 2025. Report. June 18, 2018. Accessed September 26, 2018. <https://www.giiresearch.com/report/var653505-medical-simulation-market-global-scenario-market.html>.



“ There will be further development of mixed reality environments – moving from a specific learning place to making the learning happen where the learner is... Going forward, how we interact with the virtual environment will change. New technologies like haptic feedback gloves will allow learners to be in a virtual environment and reach out and ‘touch’ an anesthesia machine and ‘feel’ a pulse, with the virtual environment reacting to changes in body mechanics. Efficiency of motion models will show how effective our education is. ”

– Daniel Katz, MD, Assistant Professor, Anesthesiology, Perioperative & Pain Medicine at Mount Sinai School of Medicine

“ I think artificial intelligence – whether it’s conversational AI or machine learning with data, making our decisions smarter, is the future... VR will keep getting better, especially with 5G, being able to do live experiences and having lower latency. There’s potential there that’s exciting to think about. What’s most important is investing in it now. ”

– Nicole Caputo, Director, Experience and Innovation at UCHHealth

“ As the healthcare industry evolves, innovative education will be imperative. More immersive education, including virtual reality experiences, will ensure we can provide the most educated, well-rounded travelers for our clients. ”

– Alan Braynin, President and CEO at Aya Healthcare

TRAINING CHECKUP

Assess if your healthcare education program is where it needs to be to meet future demands.

- Do you have a centralized system for training cross-functional groups?
- Are you piloting or have you implemented VR functionality?
- Are you digitally tracking trainee progress and analyzing it to measure impact?
- Are you delivering multiple-location training from one central area?
- Are you providing targeted training for those who need it most?
- Is your IT department involved in training conversations and decisions?
- Does your education program proactively prepare your learners for adverse events before they happen?



CHAPTER 6

WHAT STEPS CAN MY ORGANIZATION TAKE TO BE FUTURE READY?

Becoming future ready doesn't happen instantaneously, and some leaders may not be ready to venture into next-generation healthcare education. Here are five steps that can help you overcome objections and help your organization make informed decisions:

- **Identify vulnerabilities.**

Debrief after clinical cases to uncover performance gaps and show their impacts. This can be helpful to convince doctors who are accustomed to doing things in a certain way to reassess their willingness to adopt new approaches.

- **Partner with insurers.**

Both payer side and malpractice insurers have a stake in the patient experience. If healthcare workers have unaddressed performance gaps they make mistakes, which could lead to adverse outcomes, longer hospital stays or even lawsuits, costing insurers and hospitals money. Connecting these critical dots can help financial admins realize the importance of prioritizing education.

- **Demonstrate scientific reasoning.**

Leverage brain science experts, research and data to show that there are different types of learning modalities that are best for different types of tasks.

- **Show ROI data.**

As technology improves, the cost of available VR equipment and content decreases, making it an affordable alternative to expensive one-time-only training events that don't offer consistent experiences to all trainees.

- **Propose a pilot program.**

Just do it. Start simple with a single headset and identify a known vulnerability or safety issue important to your organization. Then source a relevant application and conduct a beta program with a dozen or so users. It doesn't have to be an expansive program, the important part is simply beginning the process of adopting, evaluating and measuring a new modality.





TO LEARN MORE

For more insights on future-proofing your clinical education and training [CONTACT US](#). Or visit our [WEBSITE](#) to learn more about Health Scholars One™ Blended Learning Platform and VR simulation content.

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Scene from Health Scholars' ACLS Algorithms application



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