



This Is How We Learn: Cerego's State of Learning Report

Welcome to Cerego's "This Is How We Learn" report, a detailed look at the current state of learning.

Why is learning so important?

It has become a lifelong social and economic imperative, one that doesn't end after we step out of the classroom and into the workplace. In fact, the ability to continue learning new skills as we progress through our careers has become essential in today's world as automation and new technology fundamentally alter the role many humans play in the workforce. And that has never been more true than now, as COVID-19 has decentralized education and further prioritized skill development over traditional degrees.

What we know about what we know plays an important role in effective learning.

It helps correct the misconceptions that hold us back from reaching our full potential.



In keeping with Cerego's mission to help people unlock their full potential, we hope this report illuminates some of the knowns and unknowns of learning.

WHERE WE LEARN

Mobile usage is increasing, and so is mobile learning. Despite concerns about the impacts of increased screen time on learners, mobile users study more frequently and more effectively.

WHEN WE LEARN

People generally answer questions most accurately in the morning, but when it comes to learning efficiency, evenings are the best time to learn.

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Forgetting is far easier than remembering.

In fact, the majority of what we read or see is forgotten within 24 hours.



But just a few minutes of review each day is all that's needed to master knowledge or skills so you can recall what you need from your memory indefinitely. And, **those few minutes can mean not only a stronger understanding of coursework, but also advancement in the workplace, as the market for micro-certifications booms in the wake of COVID-19 lockdowns.**

This report draws on the experiences of more than 1 million individual learners and the more than 1 billion learning interactions they've generated within Cerego's adaptive learning platform—one of the largest learning data sets in the world outside of academia.

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Study habits like cramming and re-reading are actually harmful to learning.

Luckily, years of cognitive science research have helped us understand how the brain works.



Years of cognitive science research have helped us understand how the brain works, and have provided proven methods for how to master learning, like [distributed learning](#), [retrieval practice](#), and the [primacy effect](#). These cognitive science principles form the basis for Cerego's adaptive learning technology and have been proven to increase knowledge and long term retention.

Subjects with **core foundational principles** are generally "easier" for people to master.

**A foundational principle is information used as the base for future learning, such as counting or addition and subtraction in mathematics.*

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Good and bad study habits: Mythbusting

CRAMMING

Cramming is not an effective way to learn. While it *may* help you pass a test or certification exam, these **short-sighted goals will not contribute much to long-term knowledge and retention**. What good is the information if you can't recall and use it?

"LEARNING STYLES"

While people may have preferences when it comes to learning, these preferences don't change how well you actually learn.

Are you a visual, auditory, reading, or kinesthetic learner? Trick question, **the answer is none of the above because "learning styles" are a myth!**

RE-READING

Re-reading is not an effective method for building knowledge and long-term retention. If you're simply reading things you already know, **you're not challenging your brain**. Learning challenges or "speed bumps" are the best way to build knowledge.

DISTRIBUTED LEARNING

One of the most well-studied learning science principles is distributed learning, which **increases long-term retention by spacing out learning episodes across time** rather than into a single session. One of the key reasons that distributed learning has so much potential to impact learning in the real world is that it is not naturally intuitive to learners.

Reviewing material shortly after learning it, while the information is still fresh and available, can give a false sense of fluency that people mistake for learning. Similarly, reviewing material a short time after learning (instead of spacing out reviews) may increase performance a few seconds or minutes afterwards, even while significantly decreasing longer-term retention.

FOUNDATIONAL KNOWLEDGE

Unlike learning styles, foundational knowledge actually affects how you learn. **Having a base of relevant knowledge is critical to further understanding and learning** for three major reasons: It helps us take in new content; it allows us to think and reason more effectively; and it leads us to retain more information.

Why? Subjects with core foundational principles are likely "easier" for students because they can progress through or build upon the material faster once these foundational principles have been mastered.

RETRIEVAL PRACTICE

More than one hundred years of learning science has found retrieval practice, actively attempting to recall previously studied material, is more effective for long-term retention than spending the same amount of time rereading or re-studying that same material.

The benefits of retrieval practice manifest primarily in long-term retention and are not necessarily obvious to learners. Despite the dramatic improvements that stem from repeated retrieval, learners often incorrectly attribute improved learning to studying or re-reading, rather than retrieval practices.

Another reason retrieval practice is important is that it gives both students and instructors **valuable direct feedback on their learning progress**.

We forget a lot (and rather quickly)

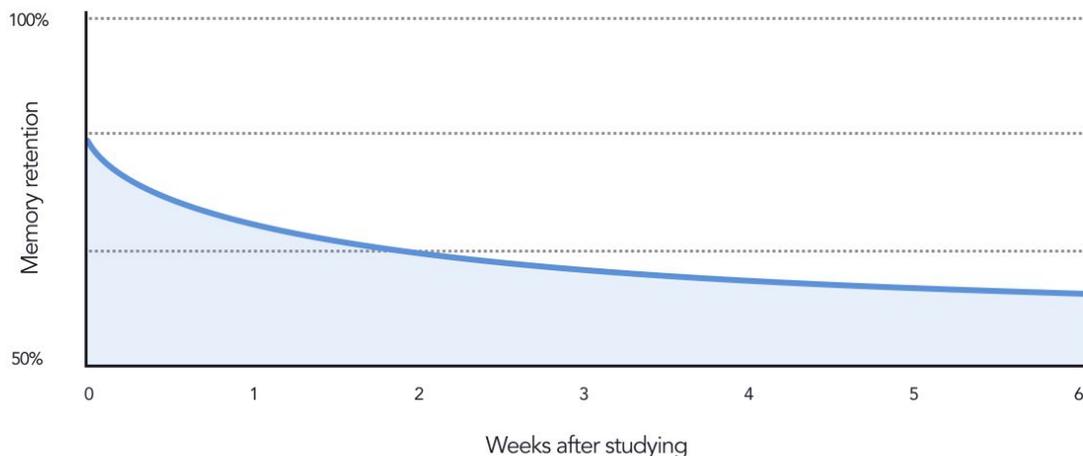
The first graph reveals the retention drop off that occurs when we only review information once. In a few weeks time, **nearly 50% of that information has vanished from memory.**

The second graph shows the impact of reviewing a concept over time. **Learners who reviewed a concept as few as 4 times over multiple weeks showed substantial gains in long-term retention.**

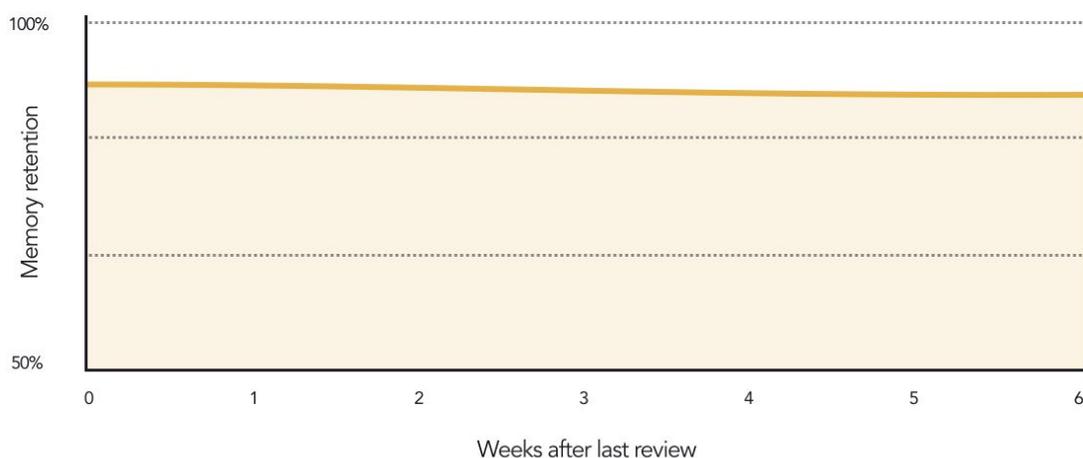
Users completed review at desirable difficulty, or at the moment a memory became challenging to recall, allowing learners to more effectively build knowledge. **Tactically, this looks like multiple. Short review sessions (about 15-45 seconds per concept), spaced out over a few weeks.**

A little effort goes a long way.

Studying just once



After 4 reviews at desirable difficulty



How quickly do we forget information?

How long do we need to study before we retain it?

Contrary to conventional wisdom, shorter study sessions actually lead to more effective learning.

86%

of what we read or listen to is gone from our memory in a matter of days

70%

of training is lost in 24 hours, with up to 90% forgotten after 30 days

3-5 min

of review per day can lead to dramatic improvements in long-term retention

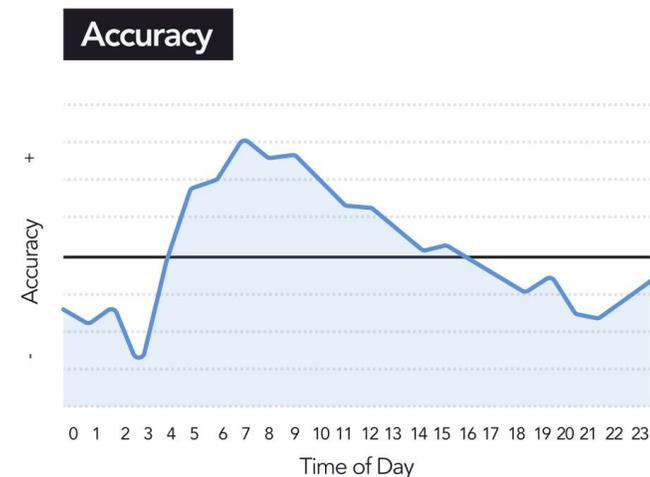
What's the best time of day for learning?

The answer is complicated. And it may surprise you.

Based on Cerego's data, the time of day people are most accurate is not the time of day they learn the most. In fact, it's usually the opposite.

People are generally most accurate answering questions in the morning and least accurate in the late evening. The conventional wisdom that our brains are refreshed and therefore able to more easily recall information first thing in the morning holds up.

- The magic hour for accuracy is 7am - 8am. The early bird gets the worm!
- The worst time of day for accuracy is 3am - 4am. Even the worms are still asleep at this hour. If you're awake and answering questions, chances are you haven't gotten enough sleep or are still awake from the day before, and your brain may be fried. For those of us who aren't nocturnal, 9pm - 10pm is the worst time of day for accuracy.



When it comes to learning efficiency, maximizing acquisition of knowledge or skill, evenings bring the best results. Though it may not feel like it, this is the best time to learn.



The time of day when you're feeling fresh and answering questions most accurately is NOT the same as the time you're actually learning the most.

The best time of day to learn is in the evening, around 8pm to be exact. If building knowledge or skills is your goal, take advantage of this time.

But keep in mind you're more accurate in the morning, around 7am. Once you've acquired the knowledge, the best time of day to accurately recall it is the morning.

Why aren't they the same? More learning occurs when we feel less effective or accurate because we're challenging our brains to recall the information (demonstrating proven cognitive science principles of retrieval practice and desirable difficulty).

Mobile usage is on the rise, is mobile effective for learning?

Not surprisingly, the increase in mobile users and mobile usage has led to an increase in mobile learning. **The increased usage of mobile for learning is ultimately positive for learners.** Despite the concerns about increased screen time, not all screen time is created equal.

Mobile users learn more efficiently each time they practice, so [they actually learn more than 2x as much as desktop users!](#)

Access to study sessions on a mobile device makes it easier to learn in a scientifically proven way - **mobile alerts allow you to review information at precisely the right moment** and the little and often strategy of spaced learning keep the sessions short and manageable.

Mobile User Growth on Cerego Year over Year



Does a larger class size negatively impact student learning?

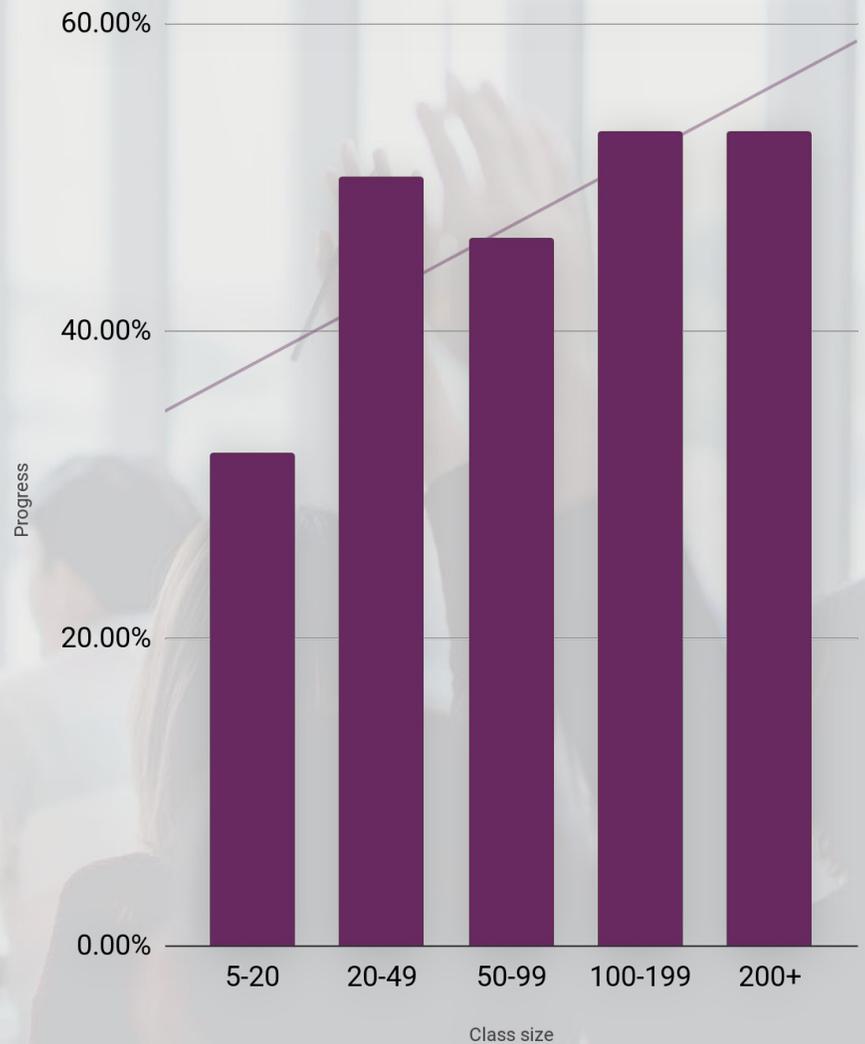
Contrary to popular belief, students don't learn or engage with material more in small classes.

In fact, students in larger classes are as successful at engaging with and effectively learning the material as students in smaller classes.

- Students in 200+ person classes made 53% more progress towards their assigned goals than students in 5-20 person classes.

Cerego's personalized learning experiences scale to groups and classes of any size.

Progress vs. Class size



Replacing test scores with “mastery”

Test scores measure a specific moment in time. **Learning is dynamic, and a more accurate way to assess knowledge is the concept of "mastery."** Building retention is key to learning and mastering knowledge.

When it comes to learning, **human intuition around "how" we learn is bad**, and many of the most well known study habits are actually harmful to learning.

Building up mastery and expertise is surprisingly efficient and quick as long as you're doing it in the optimal way.

2+

minutes

Study time to master a single concept

A concept represents one memory to be learned that maps to a larger body of knowledge (such as a course or subject)

438

concepts

Avg. number of concepts per course

The average number of concepts within a single subject or curriculum on Cerego

15.5

hours

Avg. amount of study time to master a course

The amount of study time it takes to master the average 438 concepts in a subject or course

56

days

Avg. length of time to master a subject

The optimal amount of days the 15.5 hours of studying should be spread across, equating to 16.5 minutes of review per day

Conclusion

These findings can further enhance the learning experience.



1: People are more accurate recalling information in the morning, but learn more effectively in the evening.

2: Shorter, precisely timed study sessions lead to better retention.

3: Mobile learning is more effective than desktop learning.

4: Most of what we read, see or hear is forgotten within 24 hours, but 3-5 minutes of review per day is all that's needed to truly master a subject or skill.

From academia to the corporate world, people are under more pressure than ever to learn and retain information quickly. For students and teachers, positive test scores are paramount to success. For employees and employers, the existential threat of automation and influx of technology into the workplace are changing the way we work.

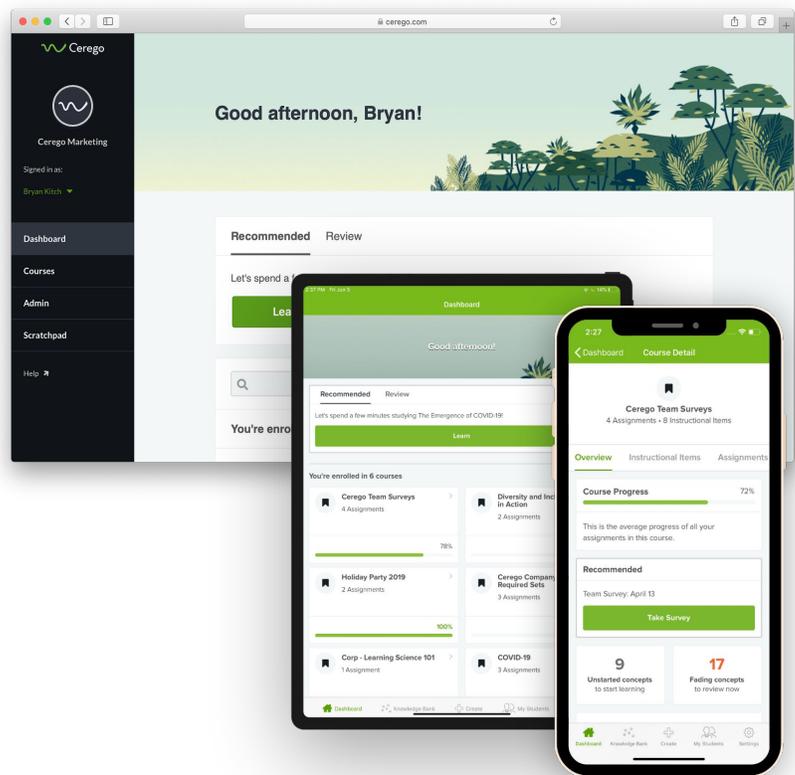
The solution to these challenges we face, both in education and the workplace, is better learning. The problem is, we're not very good at it. The findings presented in this report provide a roadmap for improvement, with the goal of making real learning accessible to everyone.

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About Cerego

Cerego is an adaptive learning platform that uses artificial intelligence and machine learning to scale proven cognitive science and make learning possible for anyone. The proprietary learning engine at the heart of the platform continuously adapts and enhances the learning experience to meet every individual's needs, while predictive analytics deliver actionable data to educators and managers.

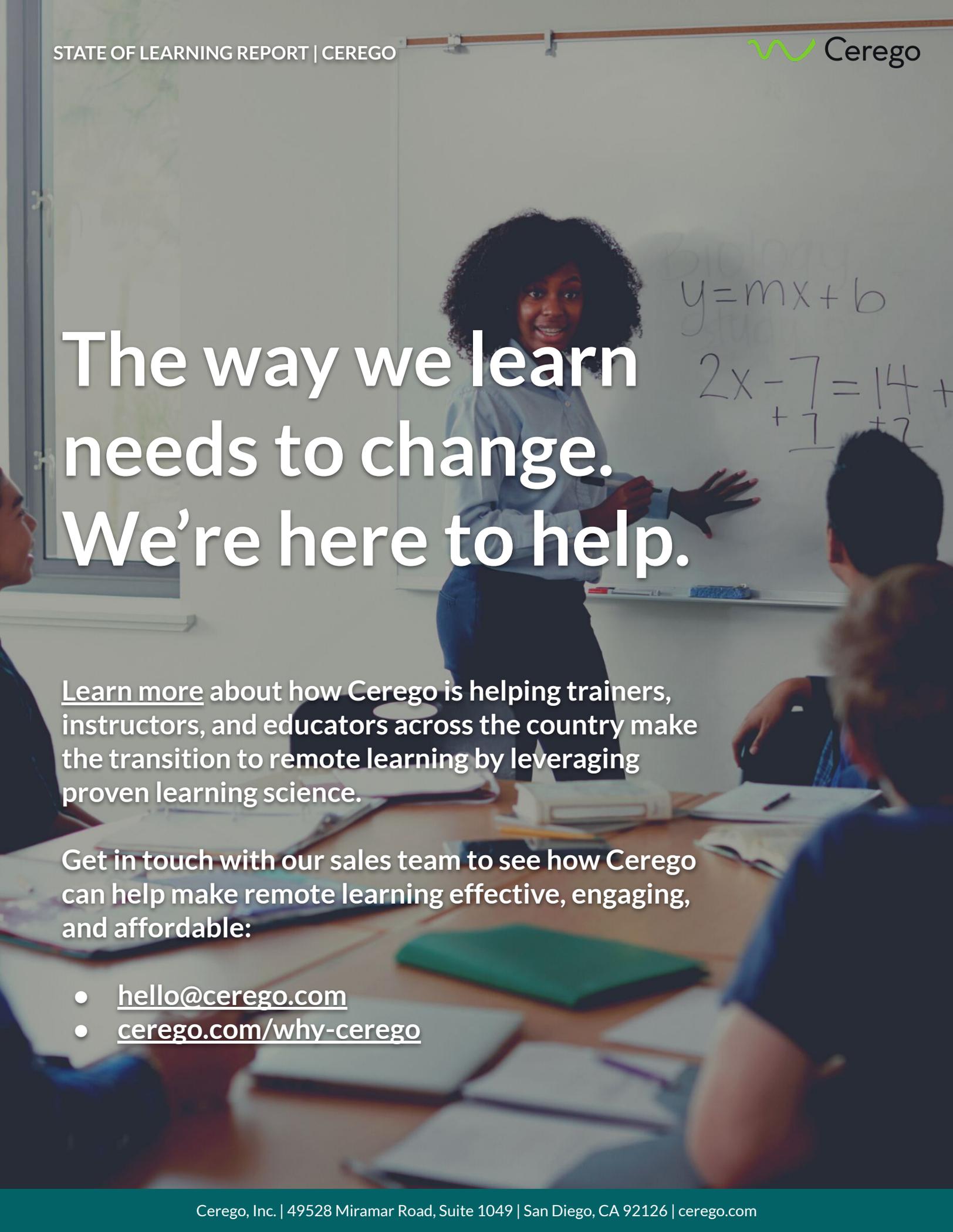
By improving the learning experience, Cerego aims to unlock the promise of education and training, ultimately helping people reach their full potential. For more information about Cerego visit: www.cerego.com.



Methodology

Data overview

Total Cerego learner interaction dataset: 1.25 billion+
Total number of Cerego users: 1.5 million+ individual learners
Time period for study: Varies by analysis



The way we learn needs to change. We're here to help.

Learn more about how Cerego is helping trainers, instructors, and educators across the country make the transition to remote learning by leveraging proven learning science.

Get in touch with our sales team to see how Cerego can help make remote learning effective, engaging, and affordable:

- hello@cerego.com
- cerego.com/why-cerego