

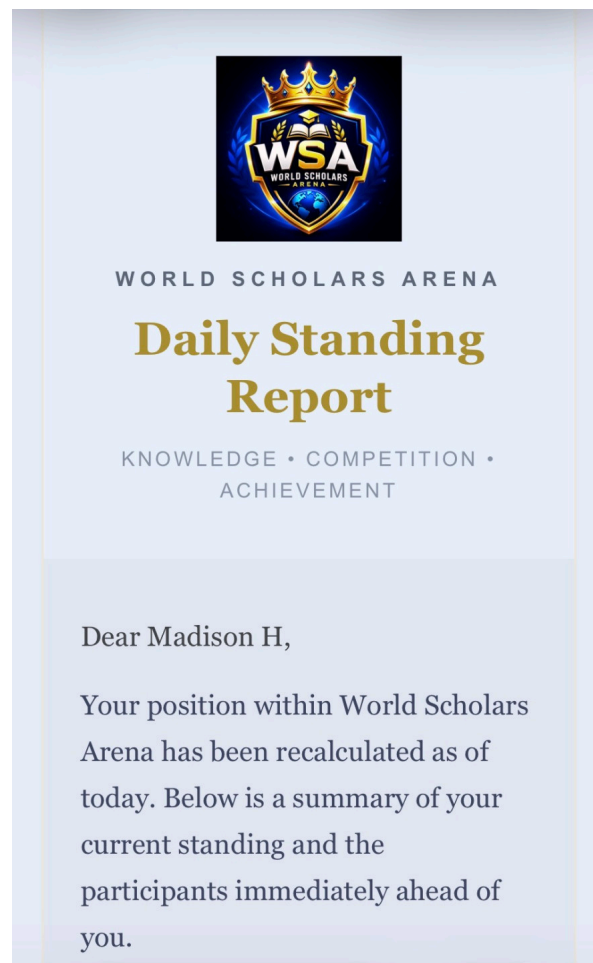


## EDTECH

# Practice Under Pressure

*A learning-science case for daily, competitive education technology, and what World Scholars Arena adds to the evidence*

**Atem Astor Tangap** | Doctoral Student; Founder, Alexia Network LLC | October 15, 2026 | 18 min read



*The standings view of World Scholars Arena, where each day's practice is scored and ranked. Ranking is the motivational layer; the argument of this article is that the learning happens in the daily practice beneath it.*

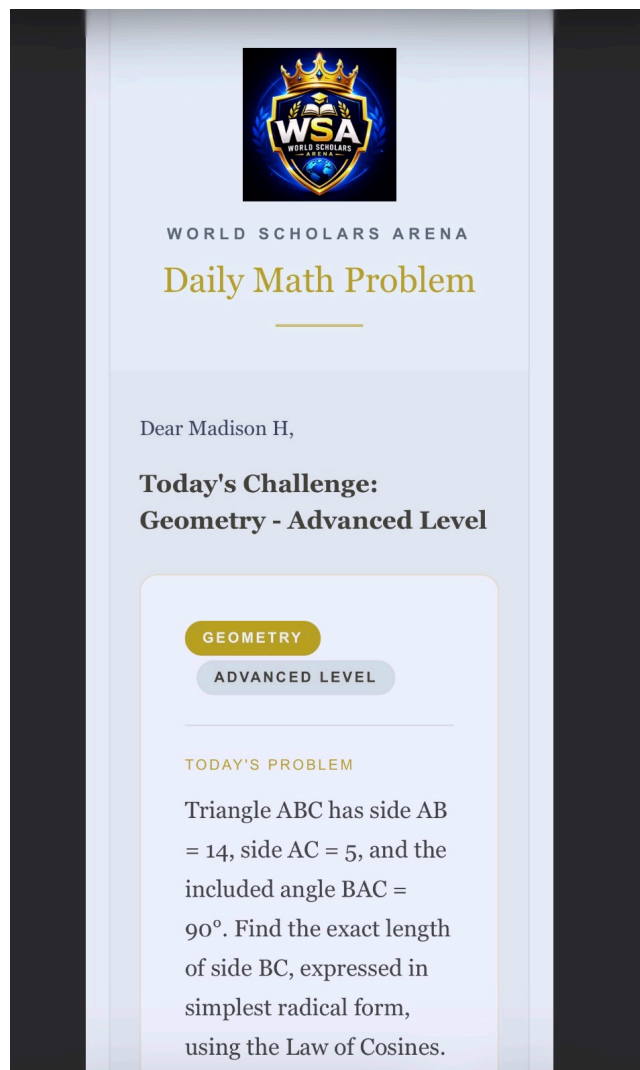


**Figure 1.** The Daily Math Problem, delivered each day at 12:00 PM America/Phoenix. The program page describes each problem as derived by closed-form mathematics and verified with the MathNet.Numerics library before release.

Education technology has never lacked ambition. It has lacked proof. For four decades, each new medium, from the personal computer to the tablet to the large language model, has arrived with the claim that it will finally close the gap between what a teacher can give one student and what a system can give millions. The record is more modest, and more interesting. Some designs work, some do not, and the difference is rarely the technology itself. It depends on whether the design embodies a mechanism the learning sciences have already shown matters.

This article makes a bounded argument. First, it states what the strongest evidence supports: practice that requires retrieval, practice distributed across time, responsive tutoring, and sustained motivation rather



than purchased motivation. Second, it examines gamification and competition, whose effects are real but small and conditional. Third, it describes World Scholars Arena (WSA), a free daily-practice and competition platform built by Alexia Network LLC, as a design that sits where these mechanisms overlap. Fourth, and just as importantly, it states what WSA has not yet shown. A publication that claims more than its evidence permits does the field no service, and the evidence on educational technology in particular punishes overclaiming.

**Disclosure.** The author is the founder of Alexia Network LLC, which publishes this article and operates WSA. Statements about WSA are drawn from the platform's own public pages, cited below, and are descriptions of design, not evaluations of outcomes.

## 1. The evidence problem in EdTech

The most useful recent summary of the field is not a vendor white paper. It is the UNESCO Global Education Monitoring Report 2023, subtitled "Technology in education: a tool on whose terms?" (UNESCO, 2023). Its findings are sobering and worth stating plainly, because any serious product in this space should be able to answer them.

On evidence, the report notes that few companies test their products: in the United Kingdom, only 7% of education technology companies had run randomized controlled trials, while 12% had used third-party certification and 18% had engaged in academic studies. Buyers rarely demand more. In a survey of teachers and administrators in 17 US states, only 11% requested peer-reviewed evidence before adopting a technology. Products also change faster than they can be studied, on average every 36 months. Where reviews exist, they find small-to-medium positive effects compared with traditional instruction, with evaluations often failing to isolate the technology's contribution.

On implementation, the report cites an analysis in which 85% of roughly 7,000 pedagogical tools, costing USD 13 billion, were either a poor fit or implemented incorrectly, and an average of 67% of education software licenses in the United States went unused. On privacy, one analysis found that 89% of 163 education technology products recommended during the pandemic could, or did, monitor children outside school hours, and only 16% of countries explicitly guarantee data privacy in education by law. On equity, at least half a billion students (31% worldwide) could not be reached by remote learning during school closures.

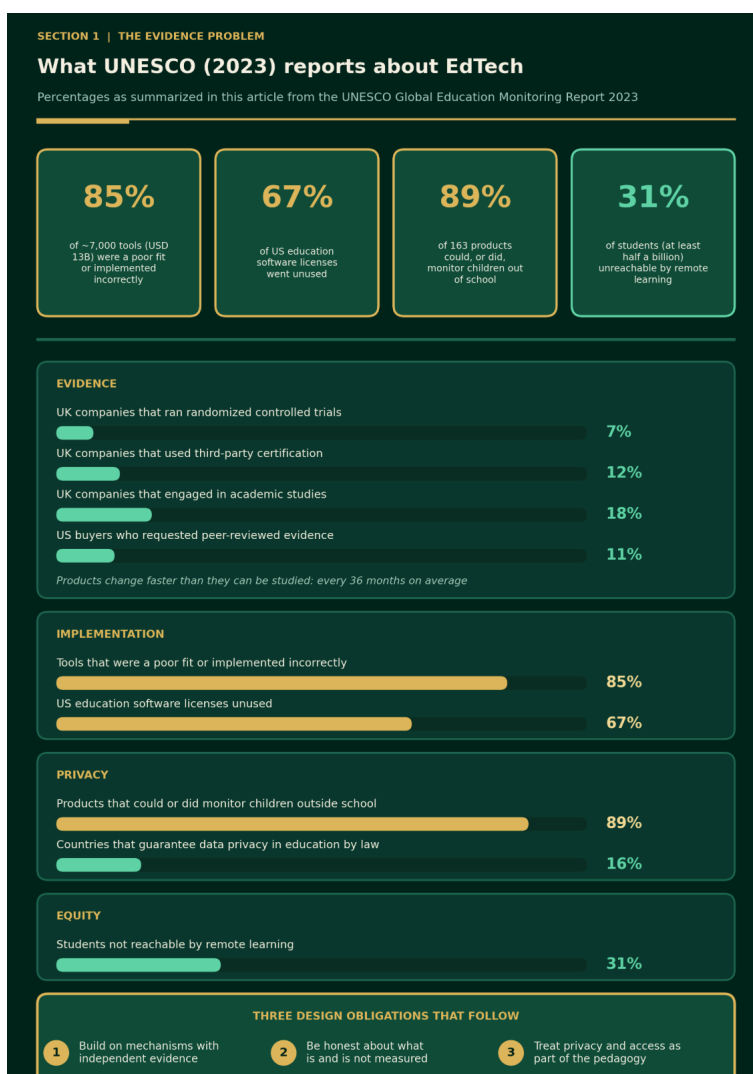


**Figure 2.** What UNESCO (2023) reports about education technology: evidence, implementation, privacy and equity. Every figure is a percentage cited in the text above.

*A tool is only as good as the mechanism it carries, the evidence behind that mechanism, and the terms on which it reaches the learner.*

Three design obligations follow. A platform should be built on mechanisms with independent evidence. It should be honest about what it has and has not measured. It should treat privacy and access as part of the pedagogy, not an appendix. The rest of this article applies those obligations.

## 2. Four mechanisms that survive scrutiny



## 2.1 Retrieval practice

In a widely cited pair of experiments, Roediger and Karpicke (2006) had students study prose passages and then either take a recall test or restudy the material. After five minutes, restudying produced better results. After two days and after one week, prior testing produced substantially greater retention, even though students who had restudied felt more confident that they would remember. The finding has since been replicated broadly, and it carries a design implication that is easy to state and hard to honor: the act of retrieving an answer is itself a learning event, not merely a measurement of one.

Dunlosky and colleagues (2013) reviewed ten common study techniques and rated practice testing and distributed practice as highly useful, while rating familiar habits such as rereading and highlighting as low. A product that asks learners to produce answers, rather than watch explanations, therefore aligns with the stronger side of that ledger.

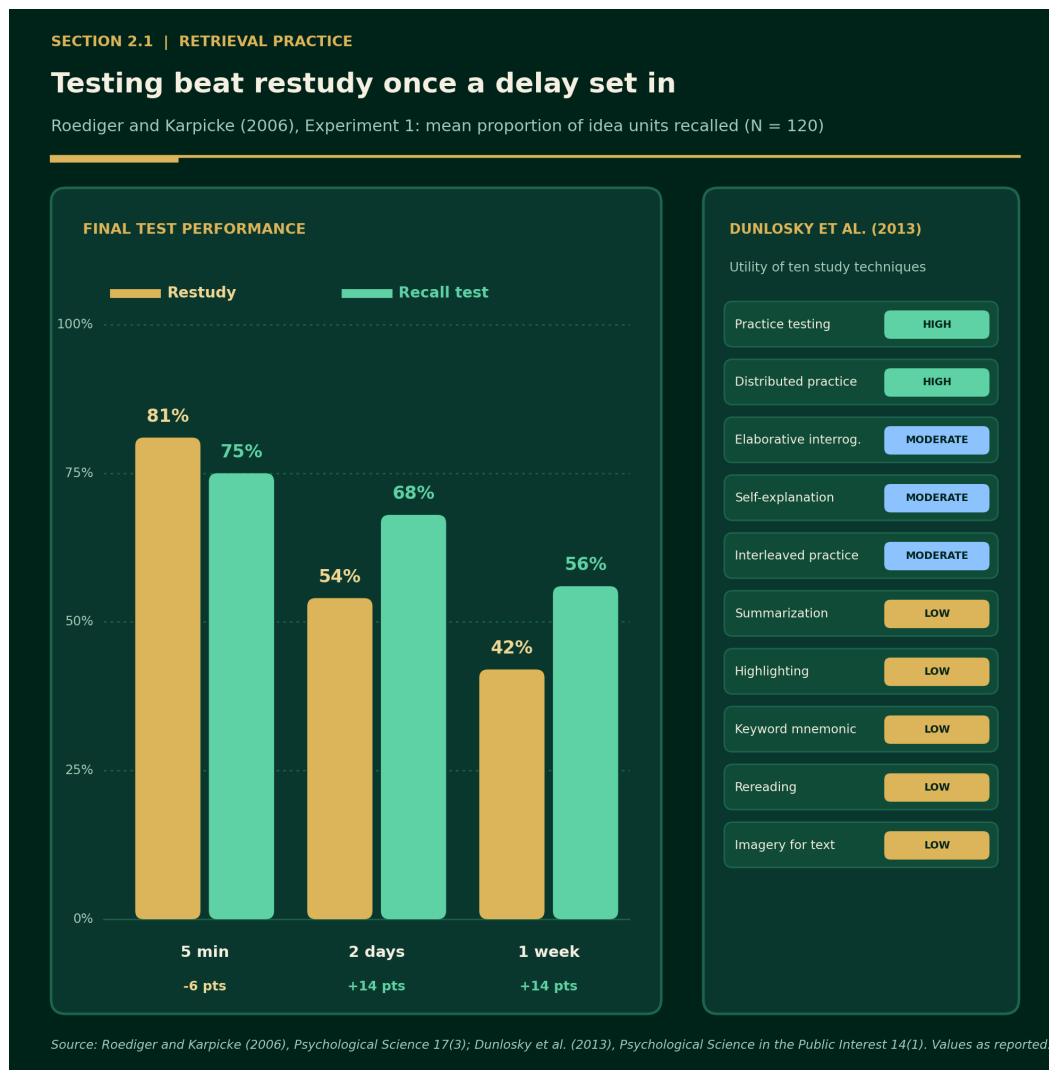


**Figure 3.** Retrieval practice versus restudy. Mean proportion of idea units recalled at 5 minutes, 2 days and 1 week in Roediger and Karpicke (2006), Experiment 1, beside the Dunlosky et al. (2013) utility ratings of ten study techniques.

## 2.2 Distributed practice



ALEXIA NETWORK  
DEVELOPED BY ALEXIA NETWORK  
LLC

WORLD SCHOLARS ARENA - DAILY  
MATH PROBLEM - 2026-09-30

## Today's Challenge, Fully Worked and Independently Verified

GEOMETRY ADVANCED LEVEL

Triangle ABC has side  $AB = 13$ , side  $AC = 8$ , and the included angle  $BAC = 60^\circ$ . Find the exact length of side  $BC$ , expressed in simplest radical form, using the Law of Cosines.

worldscholarsarena.com

**Figure 4.** A fixed daily rhythm. Returning every day is the precondition for any spacing schedule to operate, although a daily cadence is not by itself optimal spacing for any single item.

Cepeda and colleagues (2006) reviewed the distributed-practice literature on verbal recall and found that spreading study across time reliably improves retention compared with massing it, and that the best spacing depends on how long the learner needs to retain the material. A daily cadence does not by itself implement optimal spacing for any single fact. Instead, it creates the habit of returning, which is the precondition for any spacing schedule to work. The distinction matters, and it is revisited in the limitations below.



## SECTION 2.2 | DISTRIBUTED PRACTICE

# The best study gap grows with the retention interval

Cepeda, Pashler, Vul, Wixted and Rohrer (2006), a quantitative synthesis of verbal-recall research

184

articles

317

experiments

839

assessments of distributed practice

### THE FINDING

Interstudy interval (ISI)  
the gap between study sessions

operate jointly



Retention interval  
how long the learner must retain

**The ISI producing maximal retention increased as the retention interval increased.**

Spacing improves retention compared with massing, and the best spacing depends on how long the learner needs to retain the material.

Counts and finding as stated in the abstract of Cepeda et al. (2006), *Psychological Bulletin* 132(3), 354-380.

**Figure 5.** The Cepeda et al. (2006) synthesis of distributed practice: 184 articles, 317 experiments and 839 assessments, and its central finding that the best gap between study sessions grows with the retention interval.

## 2.3 Responsive tutoring

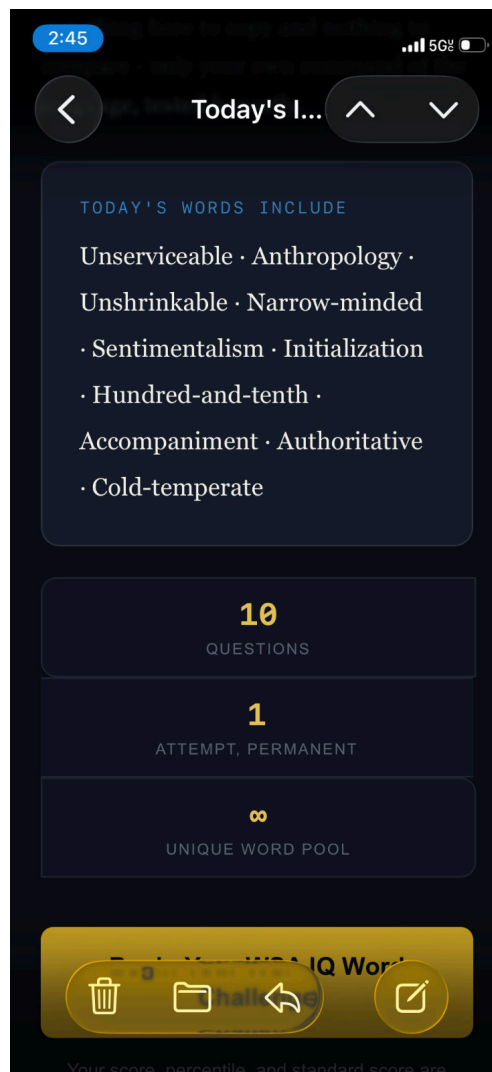


**Figure 6.** Personalization in practice. The IQ Word Challenge, delivered daily at 2:00 PM America/Phoenix, is described as personalized per scholar and scored against the historical distribution of attempts, features that echo the calibrated difficulty and feedback of effective tutoring.

Bloom (1984) reported that students taught one-to-one with mastery learning performed about two standard deviations better than students in conventional classes, and framed the result as a problem: the search for group-instruction methods as effective as one-to-one tutoring. Later work has been more conservative. Nickow, Oreopoulos, and Quan (2020), pooling experimental studies of tutoring from pre-kindergarten through grade 12, reported a pooled effect of about 0.37 standard deviations, still large by education research standards. On the technology side, VanLehn (2011) found that intelligent tutoring systems approached the effectiveness of human tutoring, and Kulik and Fletcher (2016), in a meta-analysis of 50 controlled evaluations, found a median effect of 0.66 standard deviations, which moves a typical



student from the 50th to roughly the 75th percentile. They also found that results depended on whether the outcome test was locally developed or standardized, a reminder that alignment between instruction and assessment inflates apparent gains.

The point for design is not that every product must be a tutor. Personalization, immediate feedback, and calibrated difficulty are among the few features with a consistent record, and effect sizes should always be read with the test-and-control condition in view.

## **2.4 Motivation that lasts**

Self-determination theory proposes that sustained, high-quality motivation depends on three needs: competence, autonomy, and relatedness (Ryan and Deci, 2000). Environments that support these needs tend to produce persistence and well-being; environments that thwart them tend to produce compliance at best. This framing helps evaluate any game-like system because it asks a question that points and badges do not: does the learner feel more capable, more self-directed, and more connected after taking part?

## SECTION 2.4 | MOTIVATION THAT LASTS

### Three needs decide whether motivation persists

Ryan and Deci (2000). A test for any game-like system: does the learner feel more...

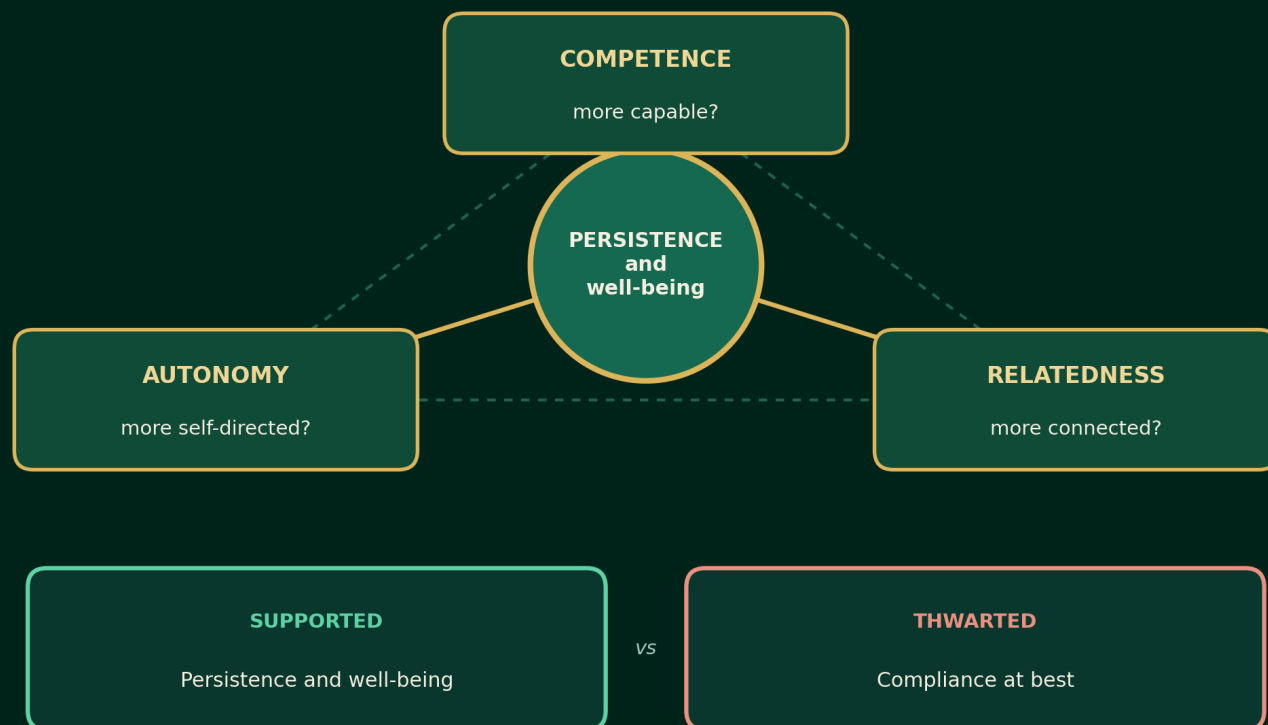


**Figure 7.** The three needs of self-determination theory as a test for any game-like system: does the learner feel more capable, more self-directed and more connected?

## 3. Gamification and competition: small effects, real conditions

“Gamification” is conventionally defined as using game design elements in non-game contexts (Deterding et al., 2011). Early reviews found promising but mixed results and noted that outcomes depended strongly on context and users (Hamari, Koivisto and Sarsa, 2014). The most useful quantitative synthesis to date is the meta-analysis by Sailer and Homner (2020), which found significant but small positive effects of gamification on cognitive outcomes ( $g = .49$ ,  $k = 19$ ,  $N = 1,686$ ), motivational outcomes ( $g = .36$ ,  $k = 16$ ,  $N = 2,246$ ) and behavioral outcomes ( $g = .25$ ,  $k = 9$ ,  $N = 951$ ).

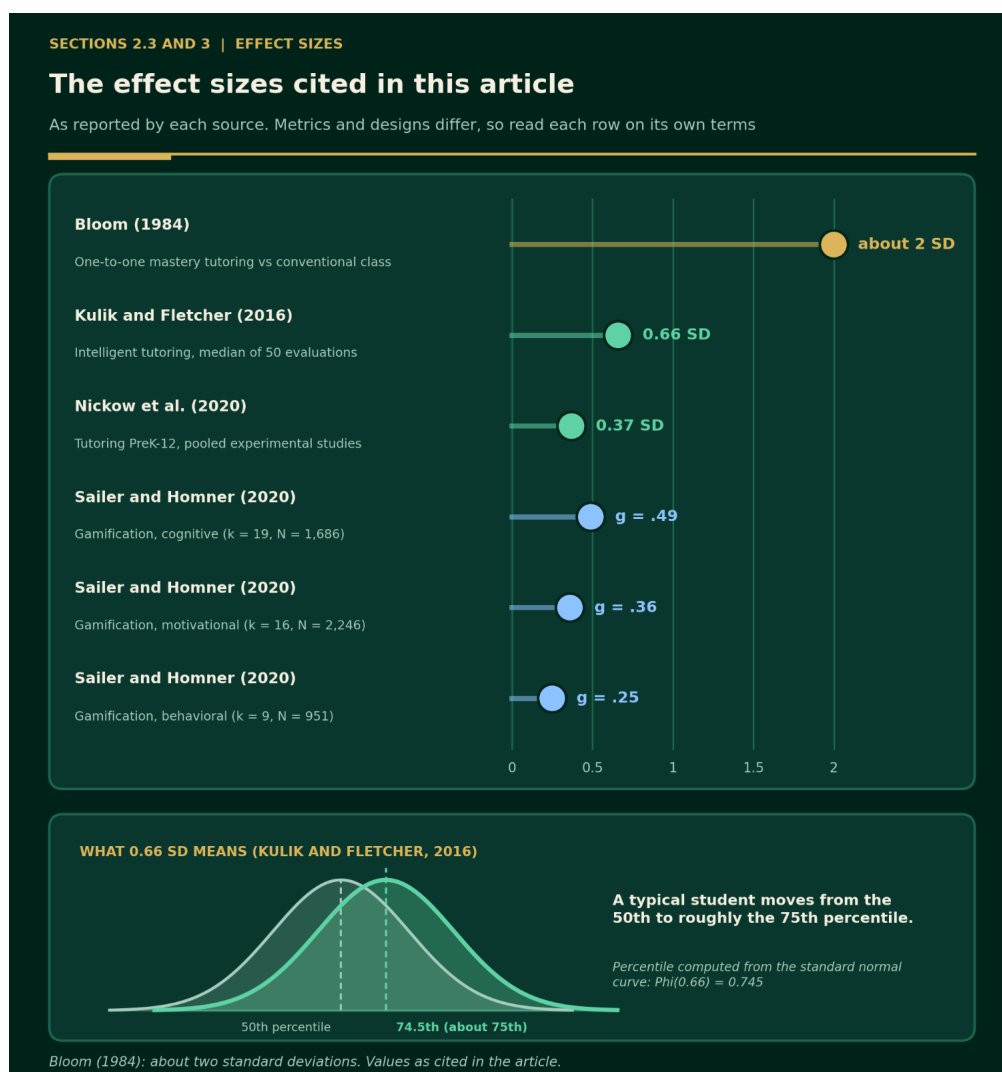


**Figure 8.** The effect sizes cited in this article on one axis. Tutoring effects are reported in standard deviations and gamification effects as Hedges  $g$ , so each row should be read on its own terms. The inset shows what 0.66 SD means as a move from the 50th to roughly the 75th percentile.

Two readings of those numbers are possible, and an honest practitioner should hold both. The optimistic reading is that game elements, added to sound instruction, produce measurable gains in knowledge, drive, and behavior. The cautious reading is that these effects are small, that they come from a modest number of studies, and that they depend on how the elements are implemented. Neither reading licenses the claim that adding a leaderboard makes people learn.

The caution has a theoretical basis. In a meta-analysis of experiments on rewards and intrinsic motivation, Deci, Koestner and Ryan (1999) found that tangible rewards that are expected and contingent tended to



undermine intrinsic motivation. A competitive platform with prizes therefore carries a design risk, not only a design opportunity. The responsible response is to make the learning itself the thing worth returning for, to keep any prize modest relative to the intrinsic payoff, and to measure what happens.

## 4. World Scholars Arena as a design instance

WSA describes itself as a global competitive intelligence platform, built “to measure academic excellence, sharpen reasoning, and reward disciplined daily practice” (World Scholars Arena, home page). It is free, runs on iPhone, iPad, and Android, and aims to democratize access to elite intellectual competition. The product is organized around four daily programs. The following description relies on what those program pages say, not on outcomes data.

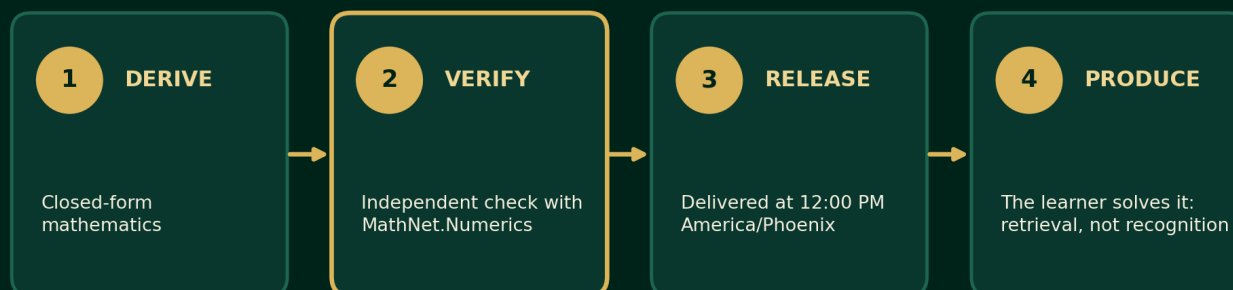
The Daily Math Problem is described as a doctoral-caliber challenge. Its most distinctive design feature is verification. The program page states that each problem is derived by closed-form mathematics and independently checked with MathNet.Numerics, an established open-source numerical library (World Scholars Arena, home page). In an era when generated content is easy to produce and hard to trust, a pipeline in which correctness is established by computation and cross-checked, rather than asserted, is a design choice with real consequences for learner trust. It also maps directly to the retrieval and application mechanism in section 2.1: the learner must produce a solution, not recognize one.



#### SECTION 4 | DAILY MATH PROBLEM

### Correctness is established by computation, not asserted

In an era when generated content is easy to produce and hard to trust, the pipeline cross-checks every problem



*Open-source numerical library used for the independent check. Source: the program page, as cited in the article.*

**Figure 9.** The verification pipeline described on the Daily Math Problem page: derive, verify independently, release, then the learner produces a solution.

The IQ Word Challenge is a vocabulary test delivered daily at 2:00 PM America/Phoenix. The page describes it as personalized for each scholar and scored against the historical distribution of attempts (World Scholars Arena, home page). Two features deserve note. Personalization aligns with the tutoring literature's emphasis on calibrated difficulty (section 2.3). Scoring against a historical distribution gives the learner a norm-referenced signal of where they stand, which can support the competence need in self-determination theory when it is informative and can undermine it when it is only ranking. Which of these occurs is an empirical question WSA should study.

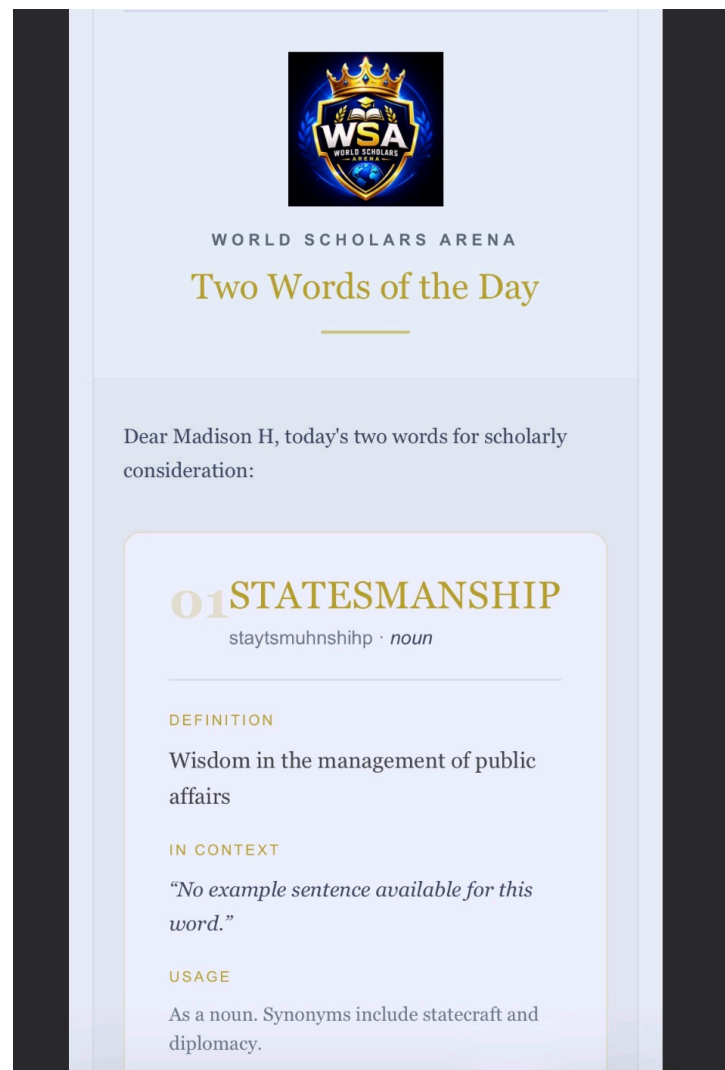


**Figure 10.** Two Words of the Day. A daily pair of vocabulary words with phonetic spelling, definitions, and synonym and antonym relationships, so that each word is met in a network of meaning rather than in isolation.

Two Words of the Day presents a pair of vocabulary words each day, with phonetic spelling, definitions, and synonym and antonym relationships (World Scholars Arena, home page). Presenting words in relation to their neighbors in meaning, rather than as isolated items, is a sound instructional instinct. By itself, it is exposure, not retrieval, and its value rises when paired with the IQ Word Challenge, which asks the learner to use what was seen.

Monthly Champions is the competitive layer. The platform describes a 24/7 global competition with USD 175 awarded each cycle: USD 100 for first place, USD 50 for second and USD 25 for third, with winners notified directly by email (World Scholars Arena, home page). The prize pool is small by design, which, as



Deci, Koestner, and Ryan (1999) argue, is a defensible choice: large enough to signal recognition and small enough that it is unlikely to be the reason anyone solves a problem.



**Figure 11.** The four daily programs, their schedules as stated on the platform, and the learning mechanism each one carries. The USD 175 monthly prize pool is shown in proportion.

## 5. What the design gets right, and what it has not yet shown

Taken together, the four programs make a coherent set of bets, each traceable to the literature.

- **Production over recognition.** Daily problems and challenges demand answers, the central requirement of retrieval practice (Roediger and Karpicke, 2006; Dunlosky et al., 2013).



- **A habit of return.** A fixed daily cadence creates the conditions for distributed practice to work (Cepeda et al., 2006).
- **Personalization and norm-referenced feedback.** Personalized challenges and distribution-based scoring echo the features that distinguish effective tutoring systems (Kulik and Fletcher, 2016; VanLehn, 2011).
- **Verified content.** Computational verification of problems protects learners from errors, a quiet but consequential form of quality control.
- **Modest, recognition-scale rewards.** A small prize pool limits the risk of overjustification (Deci et al., 1999).

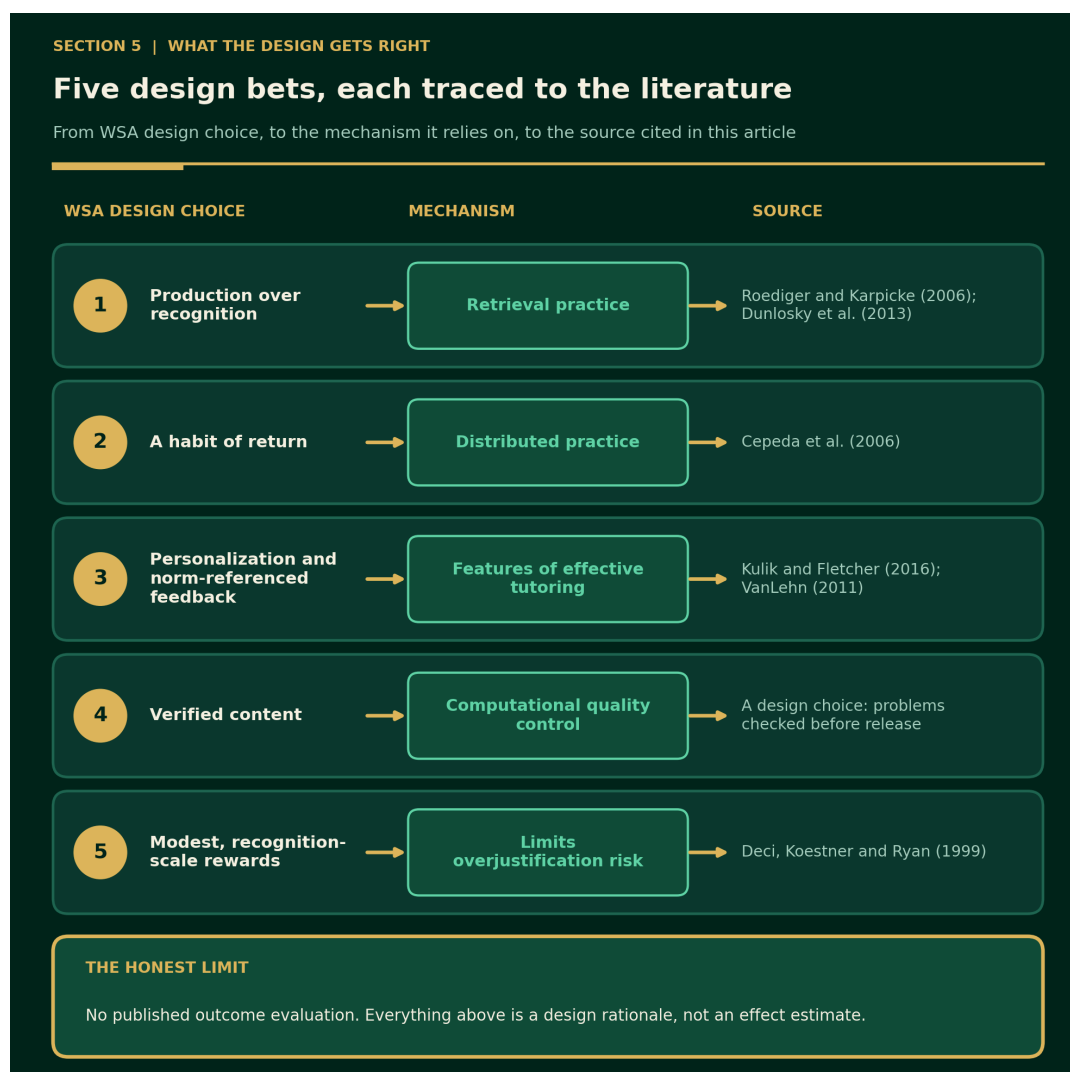


**Figure 12.** Each of the five design bets traced from the WSA design choice, to the mechanism it relies on, to the source cited in this article. All of it is design rationale, not outcome evidence.

The limitations are equally concrete, and stating them is part of the scholarly obligation.

- 1. No published outcome evaluation.** WSA has not yet published a study showing that regular participation improves measured learning. Everything above is a design rationale, not an effect estimate. The correct next step is a pre-registered evaluation with a defined comparison condition, a validated outcome measure independent of the platform's own scoring, and attention to the alignment problem that Kulik and Fletcher (2016) identify.
- 2. Cadence is not spacing.** A daily program supports returning, but optimal spacing is item-specific and depends on retention interval (Cepeda et al., 2006). Whether WSA should resurface earlier items on



an expanding schedule is a promising design question.

3. **Selection effects.** People who choose a daily competitive platform are not a random sample of learners. Any raw comparison of participants with non-participants will overstate benefits.
4. **Competition is not for everyone.** Rank-based comparison can motivate some learners and discourage others. Self-determination theory predicts it will help when it supports competence and hurt when it thwarts it, so the design should be tested across learner groups, not averaged.
5. **Access.** The platform runs on phones and requires a valid email. That serves many learners and excludes others. UNESCO's equity findings, including the 31% of students unreachable by remote learning during school closures, remind us that a free product is not the same as an accessible one (UNESCO, 2023).

## 6. Privacy and trust as pedagogy

UNESCO's privacy findings, summarized above, set a baseline that any education product aimed at learners should meet, stated in plain language. WSA's public pages state that personal data is never sold, that users can permanently delete their accounts and data from within the app or through a web portal, and that a valid email is required because it is the only way winners are reached, with accounts using invalid emails subject to deletion (World Scholars Arena, home page). These are statements of policy, and policy is a floor. A mature program would add independent security review and a published data-retention schedule; both are natural next steps for any platform in this field.

## SECTION 6 | PRIVACY AND TRUST AS PEDAGOGY

### Policy is a floor, and the floor has a next step

The UNESCO baseline, what WSA's public pages state, and the natural next steps

#### THE BASELINE (UNESCO)

**89%**

of 163 products could, or did,  
monitor children out of school

**16%**

of countries explicitly guarantee  
data privacy in education by law

#### WHAT WSA STATES

**1** Personal data is never sold

**2** Users can permanently delete  
accounts and data, in the app or  
through a web portal

**3** A valid email is required: it is the  
only way winners are reached, and  
invalid emails are subject to  
deletion

#### NATURAL NEXT STEPS

NEXT

**Independent security  
review**

NEXT

**Published data-  
retention schedule**

**Policy is a floor: statements of policy set the minimum, and a mature program adds to them.**

**Figure 13.** What the UNESCO privacy findings set as the baseline, what the WSA public pages state, and the next steps this article suggests. The statements are policy, and policy is a floor.

## 7. How Alexia Network is fostering the field

Alexia Network LLC describes itself as a privately held technology company dedicated to education, accessibility, and human advancement (World Scholars Arena, home page). Its contribution to the field, if it earns one, will not come from claims. It will come from four commitments that this publication intends to keep.

- **Free access to the practice itself.** The daily programs are free to play, which removes price as a barrier for the learners the platform reaches.
- **Verified, rigorous content.** We check problems computationally before release, setting a standard for trust in an era of cheap generated content.
- **Transparent design.** Every mechanism described here includes its source, its limits, and the evidence



it rests on, so researchers and educators can judge it and, if warranted, test it.

- **A public record.** The Alexia Network Publication archives every article permanently, in the browser and as a downloadable PDF, so that its claims can be checked against what it said at the time (archive).

**SECTION 7 | FOSTERING THE FIELD**

## Four commitments this publication intends to keep

Alexia Network LLC: dedicated to education, accessibility and human advancement

| 1                                                                      | 2                                                                          | 3                                                                             | 4                                                                                |
|------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>Free access to the practice itself</b>                              | <b>Verified, rigorous content</b>                                          | <b>Transparent design</b>                                                     | <b>A public record</b>                                                           |
| The daily programs are free to play, which removes price as a barrier. | Problems are checked computationally before release, a standard for trust. | Every mechanism includes its source, its limits and the evidence it rests on. | Every article is archived permanently, in the browser and as a downloadable PDF. |
| LEARNERS                                                               | TRUST                                                                      | RESEARCHERS AND EDUCATORS                                                     | READERS                                                                          |

**Figure 14.** The four commitments Alexia Network intends this publication to keep, and who each one serves.

## 8. Conclusion and a research agenda

The strongest case for daily competitive education technology is not that games are fun. It is that a well-built daily practice loop can deliver retrieval, distribution, and personalization at scale, at no cost to the learner, and that a modest competitive layer can help people keep returning. The strongest case against it is that gamification effects are small, that reward structures can backfire, and that platforms rarely publish evidence. The responsible position holds both.

Four studies would move the claims in this article from plausible to demonstrated: a pre-registered comparison of regular WSA participants with a matched comparison group on an independent outcome measure; an experiment varying the visibility of rankings to test the competence and relatedness predictions of self-determination theory; a spacing experiment that resurfaces earlier items on different



schedules; and an equity analysis of who joins, who persists, and who leaves. Researchers interested in any of them can write to [support@worldscholarsarena.com](mailto:support@worldscholarsarena.com).

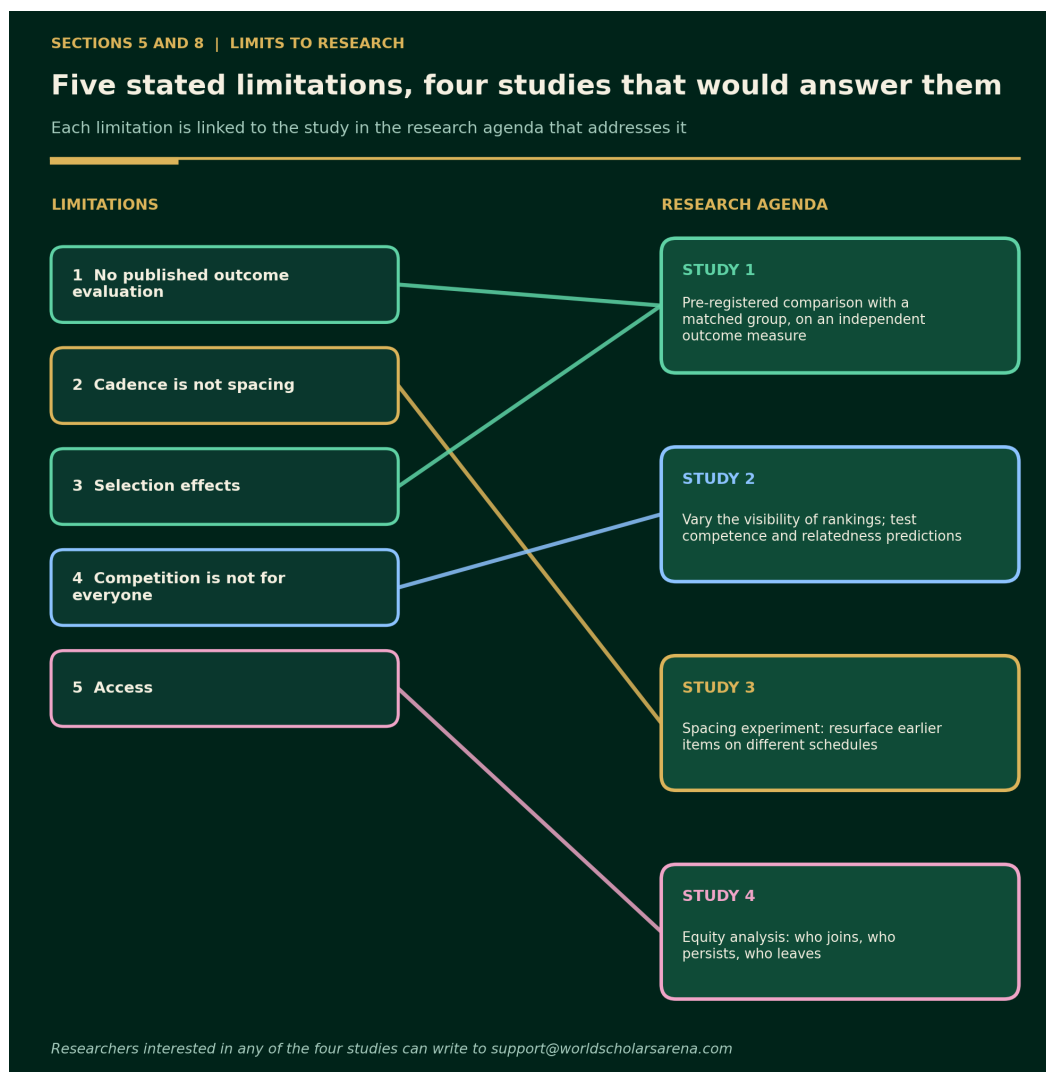


Figure 15. Each stated limitation mapped to the study in the research agenda that would address it.

## Play now, or register

The fastest way to understand a practice platform is to practice on it.

- **Play now:** start with today's challenges at [worldscholarsarena.com/home](https://worldscholarsarena.com/home). Playing is how you sign up.



- **Download and register:** free on the [App Store](#) and [Google Play](#), or see [all download options](#). Register with a valid email so that monthly winners can be reached.
- **Read the programs:** [Daily Math Problem](#), [IQ Word Challenge](#) and [Monthly Champions](#).
- **Privacy and terms:** [Privacy Policy](#) and [Terms of Service](#).

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