WORK-LEARNING RESEARCH

E-Learning's Unique—
And Seemingly Unknown—Capability

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This document outlines a provocative set of ideas that generally haven't been considered in thinking about e-learning.

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Sensible people don't pound nails with paintbrushes, turn screws with hammers, or paint walls with screwdrivers. Hammers have long handles and heavy sturdy heads, which make them uniquely qualified to pound nails. They make sense for pounding. What does e-learning make sense for? Does e-learning have capabilities that make it unique? And if so, are these qualities useful in producing human learning?

> *"What does e-learning make sense for?"*

Research psychologists have proven over and over again that if the same learning method is replicated on different media—for example in comparing video versus text—the learning outcomes will be the same (Clark, 1983, 1994). But the fact that different media enable different learning methods keeps the question open. What can e-learning do that classroom workshops, CD-ROM's, videos, text, and other learning media cannot do—or do easily? Although this is probably the most important question the field of e-learning can ask itself, it appears that very few people are thinking about how e-learning's unique capabilities might be leveraged to produce learning and performance improvements.

E-Learning's Unique Capability

Among all the learning media, e-learning is the only one that has the potential to have meaningful and renewable contact with learners over time. Classroom training suffers from logistical and cost constraints that push it toward one-shot events. CD-ROM's, videos, and books are typically used once and forgotten. Only through e-learning is it easy to give learners pre-work, coursework, post-work, and reminders. Other methods can be molded to add these learning events, but they do it at much greater cost and difficulty.

Can This Capability Facilitate Learning?

It's not enough for a tool to have a unique capability. That capability has to produce something of value. Do people really need a pocket fisherman, spray-paint for bald spots, or chia pets? In the learning-and-performance field the question of value translates into one thing—does e-learning improve on-the-job performance?

Learning research provides an affirmative answer. E-learning's ability to have meaningful and renewable contact with learners can produce learning gains of 112% or more. Let me explain.

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The Learning-and-Performance Research

The *spacing effect* is one of the most replicated phenomena studied by research psychologists. It occurs when learning material is repeated at spaced intervals. The almost universal finding is that spaced learning improves retention up to 40% or so. Although there is some controversy surrounding the cause of its benefits, it is likely that spacing improves retention by energizing learners to pay attention on subsequent repetitions and by prompting learners to process subsequent repetitions in different contexts—a method proven to promote long-term retrieval and performance. One interesting caveat is that spacing doesn't aid retention in situations where the learner uses the information immediately (within an hour or so after the learning event). Its benefits are more long-term, making it useful for training and development. Despite its enormous potential, most instructional developers have never heard of the spacing effect. This lack of familiarity with the concept may explain why the e-learning juggernaut has not moved to utilize spacing's capabilities.

A related phenomenon is *delayed feedback*. Despite previous research reviews that suggested that immediate feedback is better, more recent research suggests that delayed feedback is better than immediate feedback by about 10 to 25%. Two caveats are in play here. Just like the spacing effect, delayed feedback is not useful when the learners will apply their learning immediately after the learning ends. In addition, because it's harmful to have learners practice incorrectly, feedback must come before additional practice opportunities.

Relearning can be instantiated with *repetitions*. Where most learning media provide only a primary learning event, e-learning can provide additional relearning events. In fact, spacing repetitions of key concepts over time may be the only way to get learners to process those repetitions. Research has shown that learners are overly optimistic about their ability to remember what they're learning. This causes them to turn away from repetitions during the primary learning events because they don't think they need the extra reinforcement. However, when repetitions are spaced over time, learners are likely see how they've forgotten what they had learned. This makes them much more open to augmenting material. The first few repetitions generally improve learning outcomes by up to 110%, while additional repetitions improve results by up to 40% or so.

Reducing the retention interval provides another unique opportunity for e-learning. The longer the time between the end of learning and the time when the learned information has to be retrieved from memory, the more the learner will forget that information. If e-learning shortens this retention interval by delivering relearning or remindings, it can reduce the amount forgotten. Although the percentage improvement from this will vary depending on the type of learning material, the expertise of the learners, and the steepness of the forgetting curve, a reasonable guess might be a 50% improvement in learning.

E-learning is unique in its ability to easily utilize the four learning effects just described (spacing, delayed feedback, relearning, and reducing the retention interval). Totaling the percentage-improvement estimates (based on reasoned extrapolations from the research), e-learning can be expected to improve learning results by 112% or so. This number was conservatively estimated by adding the individual maximum estimates (40, 25, 110, 50) to get 225, and dividing that number in half to be conservative. Given e-learning's unique capabilities, we can expect a well-designed e-learning program to outperform other types of learning programs by over 100%, a two-fold increase in learning.

Of course, e-learning can also use other research-based prescriptions not unique to it. For example it can provide retrieval practice (30 to 100%), feedback (10 to 50%), learning objectives (5 to 45%), and aligned contexts (10 to 55%). Of course, because e-learning is a new technology, there may be a tendency to add irrelevant graphics, video, hyperlinks, unstructured chat, etc., which may actually hurt learning (-25 to -50%).

The Utilization of E-Learning's Unique Capabilities

My reading of the field suggests that, with a few notable exceptions we have not begun to utilize the ability of e-learning to connect to learners over time in a meaningful and renewable way. There are many types of e-learning: short self-paced courses, college-style courses that utilize asynchronous elements, short synchronous online sessions, job aids, threaded discussions, list servers, practice tools, etc. Some of these have more potential than others in using e-learning's unique capability.

The Dominant Paradigm

Despite this variety, the dominant e-learning paradigm remains the CBT model, which produces short self-paced courses. To the best of my knowledge, none of the authoring tools designed to produce e-learning courses encourage the utilization of spacing or delayed feedback. Because this paradigm has no history of connecting to learners over time, there is very little use of e-learning's unique capability.

Simulations

One exception to this is the utilization of simulations, which are inherently designed to use both spacing and delayed feedback. So says Howard Eisenberg, Instructional Design Manager at the Strategic Management Group. "First learners are presented with learning material. Then they get the simulation, or vice versa. There's already some spacing going on there. In the simulation, learners get immediate feedback as part of the fiction of the simulation, but then they get feedback from the system after the simulation is done. In our e-learning designs, people then get even more spacing by being prompted to reflect on what they've learned. When we use the simulations in the classroom, learners have a team debrief and then a whole-class debrief, so they're getting an awful lot of spaced repetitions on the key learning points." John Cleave, a partner at Experience Builders agrees. "Our goal with our simulations is to get the users to practice on some specific situations right away. Let them see real-world consequences. But then it's critical to give people some additional general feedback later to get them to understand the underlying concepts behind the simulation scenario."

College Courses Online

Just like their classroom counterparts, online college courses have the potential to space repetitions over time, but don't always utilize this capability to its fullest. Spacing is not just about putting time between learning events. It involves returning to learning points over time. Many online college courses cover a topic and then never return to it, diminishing any spacing effects. This is less true of courses for experienced professionals where the course material builds toward some sort of real-world project. Within each topic area, spacing and delayed feedback are well utilized. Learners are given reading assignments and the concepts are repeated in lectures. Learners then study for tests, take tests, and have to wait a week or so before getting feedback.

Stretching the Learning Into the Workplace

Harvard Business School Publishing (HBSP) has a vast repository of business cases, articles, and additional resources it offers to its online learners in easy-to-download PDF files. By carefully selecting relevant materials to augment e-learning, the learning experience is stretched over time beyond the actual online event. But the use of spacing doesn't end there at HBSP. Jonathon Levy, director of online learning, describes how they use two other features to connect with learners over time. "We use a feature we call *@Work* that enables each manager taking a course to apply what they are learning to their actual workplace over a one- to two-week period while using the program, often with the assistance of a mentor. Another feature, called *Next Steps,* records an individual's work-related objectives and after a specified interval emails the objectives back to the learner or to others, such as a mentor."

For Novice Learners

For learners who are complete novices, spacing may be the only way to go. Michael Korcuska, Managing Director of Learning Strategy at DigitalThink, describes how they created a very successful new-hire training program for Circuit City. "We try to structure these curriculums with a breadth-first as opposed to depth-first approach. New hires don't have enough background when they start. We introduce them to a broad range of concepts, and then we return to these concepts and drill down into the topic areas, going deeper and deeper each time we return to it. We also review each principle and have the learners think about applying it in different contexts."

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Quick and Easy Ways to Use E-Learning to Space Learning Over Time

The ideas in the following table represent just a few of the many possible ideas that can be utilized to keep learners connected to learning over time. This list is not meant to be exhaustive, but is intended to give you a flavor for the kind of implementations that are possible. The range of what is feasible will depend on the topic, the learners, the support given to the learning intervention from organizational players, and the technology available.

Before Primary Learning Events

1. Use simulation-like prequestions with feedback one or two weeks before the primary learning events begin.

2. Prepare learners for primary learning events with compelling articles delivered as Adobe Acrobat PDF files.

3. Provide learners with online self-assessments or 360-degree feedback that is directly relevant to the topics to be taught.

4. Send brief emails that contain engaging and relevant content related to learning points that will be covered later.

After the Primary Learning Events

5. Schedule periodic synchronous "brown-bag" lunches with expert speakers, managers, or peers to follow-up on topics in the course. Similarly, encourage fellow learners to talk about their after-class implementation efforts, while encouraging critique and feedback.

6. Schedule periodic simulation-like postquestions to limit forgetting, provide practice, and reinforce key learning points.

7. Occasionally provide downloadable PDF files on articles for learners who like to read more on the topics they have learned about.

8. Provide follow-up email reminders or short blurbs that revisit topics or main points from the course.

9. Three or more months after the end of the primary learning events, provide learners with the same self-assessments or 360-degree feedback questionnaires they received before the course.

10. Provide online follow-up remediation, coaching, or mentoring for those learners who want it.

As Part of Primary Learning Events

11. Use prequestions or learning objectives that are specific enough so that later learning becomes almost a repetition of what is viewed in these.

12. Track content by learning point, and repeat key concepts using different learning methods within the e-learning. For example, provide a prequestion, then a brief presentation related to the same content, then a case example that targets the same learning point, then a simulation exercise that asks learners to make a decision on the same learning point. But do all these things by interspersing each of these with activities that cover different learning points.

13. If the primary learning events will last over a week or month or more, use cumulative testing and other performance practice opportunities that ask learners to use what they've learned earlier.

14. Prompt learners to use what they're learning on the job. Assign a group of learners to an action-learning project designed to create real organization outcomes. Arrange with each learner's manager to have the learner champion a change effort to implement the learning. Ask learners to create an action plan, and send them copies of their goals at regular intervals.

15. Instead of creating one long program, create shorter programs that return to key points in later sessions.

16. Delay feedback on questions and decision-making exercises. Delays of over one or two days are the most effective, but may not be logistically desirable if learners won't tolerate such delays. To overcome such resistance, provide feedback after every five questions instead of immediately after every question.

17. Give learners the opportunity to ask questions of instructors, experts, or fellow learners at periodic intervals throughout the online experience. Schedule separate question-and-answer sessions to space learning.

The Future of E-Learning's Unique Capability

In my journalistic research for this article, I found very few entities working consciously to utilize e-learning's ability to connect to learners over time. If they were planning for it, they weren't talking about it. It appears that most people simply haven't thought much about it. And the trends in the field don't give any indication that there are secret skunkworks of spacing advocates building the next generation of e-learning. In fact, the most publicized trends in the field suggest the reverse.

Learning Objects

The learning-object concept seems to push the field backward toward isolated non-spaced bits of information. Learning objects could be designed to produce spaced e-learning, but their basic framework will make this difficult.

Learning Management Systems

Learning Management Systems apply the same constrains as learning objects. They push us toward a model of learning as a series of isolated topics, glued together through a system that manages incidents, not spaced flows of information and reinforcement.

As the e-learning industry evolves, these types of cost-cutting initiatives will lose their currency as more and more customers demand that e-learning improves learning, performance, and business results.

The Final Challenge

Jerome Bruner, one of shining stars of the cognitive-science revolution, advocated the adoption of a "spiral curriculum" where learners would periodically be prompted to circle back to topics they had previously encountered. The causal factor behind such a design is spaced repetitions. Will the e-learning field take up the challenge? Will we be quick enough to figure out what e-learning makes sense for? If you believe that e-learning will ultimately have to provide learning-and-performance value—not just cost savings—this question is tantamount to e-learning's survival. Will we spiral up, or spiral down?

> *"Will the e-learning field take up the challenge? Will we be quick enough to figure out what e-learning makes sense for?"*

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