When using technology to train human behavior...

Old Tricks Are the Best Tricks

Repurposing programmed instruction in the mobile, digital age

Robert Feeney
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Knowledge As A Service

Ringorang® is an app-based SaaS platform that delivers targeted changes to human behavior for large enterprises, learning institutions, and for public marketing and awareness campaigns. This research paper, published in the Performance Improvement Journal focuses especially on the results of three Federal research trials that used Ringorang to test the behavior impacts on energy customers.
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About Robert Feeney
Robert is the co-founder and co-inventor of Ringorang®, a gamified enterprise software-as-a-service platform designed to change human behavior. Robert's first career was in the entertainment industry. He realized that the same keys that enable movies, TV, theater, and music to capture the world's attention can be used to draw attention to the most important things to learn. Robert has led Ringorang engagements for Fortune 500 companies, Federal research studies, and some of the most renowned non-profit organizations, where public awareness on critical issues is key to their mission. Most recently Robert led the development of Ringorang's DIY capability so enterprises can use the service to deliver all of their learning and communication materials as chunked micro-learnings, along a learning journey that results in measurable shifts in behavior. Robert is a speaker in the U.S. and internationally on gamification, eLearning, and the art and science of engagement.
Introduction

The National Society for Programmed Instruction. Bet you haven’t heard that name in quite a while. In the 1960s that was the name of ISPI (International Society of Performance Improvement) and programmed instruction was the hot, new technology. Even though it moved out of favor, savvy instructional designers have not forgotten its benefits, and continue secretly applying its principles when the method fits the situation.

This paper describes an interesting mash-up between programmed instruction and cloud-based, mobile technology currently being used for learning retention and habit formation, both in enterprise settings and out in the public. The technology is called Ringorang (ring-o-rang) and it delivers practical, incentive-based education and behavioral impacts. It is an app for mobile and PC devices that produces tangible performance results by interweaving multiple components of behaviorism (and its derivatives) in a deceptively simple digital user-experience: the app asks you a question and incentivizes you to answer. In some regards, it is a modern take on the teaching machine, with a few new tricks thrown in.

Behaviorism Today: a la Ringorang®

Since the early 20th century, behaviorism has influenced so many threads of theory and application, from consumer marketing, language learning, organizational development, and even ISPI. Many of those threads are now recollected in Ringorang. Styled as an engagement and education app, its name, Ringorang, suggests a braiding of multiple concepts: the boomerang
effect of sending out quick bursts of information and returning with instant feedback, combined with the identification of each learner group as a ring of people that the boomerang encircles. Plus, it has a fun, jingly sound to it.

Fun is a key word here. The Ringorang app provides a lightly gamified format for learning and behavior change programs. Gamification is the art and science of applying game mechanics to activities that have nothing to do with games. One of the central pillars of gameplay is rewards, which can be extrinsic (such as prizes won or earned) or intrinsic (a sense of accomplishment). Rewards are also a central pillar of the art and science of behaviorists, among other human performance practitioners.

**The Ringorang App Experience**

Here is how Ringorang works. An organization determines some kind of content that they want an audience to learn and retain, such as IT security protocols to methods that conserve energy (Figure 1). The members of the audience (users) are invited to download the Ringorang app and enter an invite code to join a series of branded Challenges on a given topic. Across a span of time, anywhere from a few hours to many months in length, the audience receives alerts from the app at various times of day, each an invitation to answer a single question on a ticking clock, at the same time as everyone else (Figure 2). Each question is a sequence of information that includes a clue, a multiple-choice question, a follow-up insight, and an optional click to review deeper levels of information on the topic of that question (Figure 3). Users gain or lose points on a leaderboard based on accuracy and speed of answering (Figure 4). The organization may include badges that
the app issues for certain achievements, as well as prizes for achievement and simply for engaging with the app, either or both, depending on what is considered motivating to the targeted audience.

Each interactive question typically takes less than a minute of the user's time, provides immediate feedback to the user as well as real-time data snapshots to the provider via dashboard charts (Figure 5). And then the experience is done, until the next alert comes, at some point later that day, or the next day, depending on the frequency prescribed by the organization.

The Ringorang approach leverages ideas associated with programmed instruction (Markle, 1969) and blends them with the principles of instructional games (Gee, 2003), and with the capabilities found in mobile devices. Across multiple weeks or months, the result is measurable learning retention and behavior modification, as well as data that illustrates user-engagement patterns.

Figure 3: "Learn More" Library is a website that expands on the subject of the Ringorang questions.

Figure 4: Leaderboard where users view points gained or lost in relation to other users.
Ringorang and Energy Education

In 2009, the U.S. Department of Energy provided co-funding through the American Recovery and Reinvestment Act (ARRA) and more recently via the SunShot Initiative (SEEDS) to three randomized controlled trials designed to test innovative electricity rates and customer educational programs. Three of the organizations selected to conduct these trials were Nevada's largest electricity provider, NV Energy (NVE), Michigan's largest electricity provider, DTE Energy (DTE), and the LBJ School of Public Affairs at the University of Texas, Austin (sponsored in part by energy provider AEP Texas). In these trials, Ringorang was used to increase engagement and educate residential customers in Nevada and Michigan, and to educate customers about solar energy in Texas.
For NVE and DTE, the core problem that need to be solved was lack of customer engagement on energy-efficient behaviors influenced by innovative time-based electricity rates. In addition to energy efficiency and conservation, NVE and DTE Energy needed customers to engage more often in energy-shifting behaviors triggered by changes in electricity prices based upon demand, a practice known as demand response.

To set the context here, Accenture (2013) reported that the average amount of time spent by a customer interacting with their energy provider was a mere 9 minutes per year. The implementation of new Federal requirements for utilities to meet efficiency goals and renewable energy targets forced the industry to look for new ways to increase their engagement with customers. So the question that spread across the industry was: how do you influence energy-saving behaviors with customers who are hardly engaged?

**How the studies were designed**

For the DTE Energy (2014) and NV Energy (2015) studies, the goal was to overcome typical customer apathy with a novel approach to delivering education. The aim was to do it in a light but engaging way that would result in 1) increased engagement over the norm, 2) measurable education, 3) sustainable impacts on behavior, and 4) feedback that it was useful and enjoyable. That last item is a doozy for utilities. The typical relationship between utility company and customer is strained. And the notion of utility-delivered information being enjoyable was anything but normal.

Both studies were randomized controlled trials with third party evaluation, measurement, and verification. Both studies were designed with randomly selected customers receiving treatments that differed from each other and from control groups. Treatment groups received educational information, technology (such as programmable thermostats and in-home digital displays) and a time-based rate (i.e., a rate that adjusted depending on time of day and season), delivered in various permutations so that results could be isolated, compared and attributed.

In the NV Energy (2015) study, Ringorang was the central delivery mode, and the technology’s founding company, Vergence Entertainment, was also tasked to develop educational materials in other formats to complement Ringorang gameplay, such as emails and print mailers. DTE Energy (2014) used the same program developed by Vergence and NVE for their study, but
customized some of the curriculum pieces to fit the cold-peak region of greater Detroit, versus the hot-peak region of southern Nevada.

DTE Energy (2015) and NV Energy (2014) diverged on how they provided prizing and incentives. NV Energy (2014) offered Amazon.com gift cards at various increments (e.g., $5, $10 or $15) to enrollees as an incentive to download and join, and then offered a $1,000 cash sweepstakes to ensure the treatment cells were fully enrolled. On the other hand, DTE brought in the Ringorang program 8 months after their study had begun, with the aim to improve engagement with their participants who were not showing much engagement in their previous educational materials. No enrollment incentives were provided to download the Ringorang app in Detroit, so enrollment was lower at DTE then at NVE, but grew gradually over time. In both studies, Ringorang delivered three types of prizes: 1) gift cards to top ranking players on the leaderboard for each weekly Challenge (e.g., achievement-based awards), 2) gift cards issued by Ringorang at random at small increments such as $5 or $10, and 3) entries into sweepstakes drawings were earned by users and issued by the Ringorang system after every question played; and these sweepstakes drawings were of higher value, ranging from dinner or concert tickets, to a vacation package worth thousands of dollars.

If the university could prove that the format for delivering education was as meaningful as the education itself, it could amount to a game-changer in how surveys, public awareness and even institutional education are conducted in the future.

There were thirteen different topics delivered, ranging from simple tasks that a user could do around the house to reduce their energy use daily, to investments they could make in retrofits or upgrading to home-control technology. The primary value proposition to the user was to save money on their bill. Each topic represented a one-week Challenge, where Ringorang delivered three live questions a day, typically several hours apart from each other, across three days of the week, with another couple of days trailing for users to catch up on any questions they left unplayed earlier in the week. Then an email was sent to recap last week’s topic and segue into the coming
week's topic. After three consecutive weeks and three topics were covered, users would play a recap Challenge that included repeated questions selected from the previous topics already played, as a way of measuring improvement of speed and accuracy in answering questions after days or weeks had passed.

As an example, one educational topic related to shifting use of certain appliances until off-peak hours, to take best advantage of the time-based rate. Sometimes this shifting was requested by the utility as part of a demand-response event, where the utility would notify customers that tomorrow is a peak-energy day, so please wait until after 7pm to do laundry. When these peak events were called, users were prepared, due to education delivered by Ringorang. As an example, Ringorang would provide study aids in advance, and then deliver game questions to follow, such as: “Which of these daylight hours falls within the daily peak period?” Another question showed an excerpted image of the bill where kilowatt hours (kWH) are calculated, and asked, “If this calculation appeared on your bill, how much would you be charged?” This then led the user to learn a little more about how to read their monthly bill properly. Educating customers on how best to reduce peak load provides a financial benefit to both the customer and the utility, and contributes measurable reductions to environmental impacts of energy generation. If the utility could be successful in engaging typically indifferent customers to pay attention to this kind of information, and change their usage habits as a result, it would be an important research finding for all concerned, including the U.S. Department of Energy.

UT Austin’s study (2016) had a different aim and a different curriculum. Sponsored in two phases, the first by energy provider AEP Texas and the second by DFW Solar Tour along with prize donor Ikea (and both phases by grant funds from the U.S. Department of Energy), the university's
study was aimed at testing the impacts of customer education about the benefits of solar technology. Specifically, it was to test whether energy customers would show more willingness to contact a solar technology vendor after engaging with the information via Ringorang’s gamified interval repetition. In the first-phase study there was a control group with no Ringorang interaction, and in the second phase there were two control groups, where one group received the same information delivered all at once and the other control group received the same information broken up into two instances. Conversely, Ringorang delivered the same information across many instances via daily questions spread across two weeks. Ringorang issued random gift cards of small increments to incentivize persistence in the game, and the software issued entries into a $500 drawing donated by Ikea for every question answered. The same prizing budget was used to pay participants of control-group surveys using Amazon Mechanical Turk. If the university could illustrate that the format for delivering energy education was meaningful in a randomized controlled trial, it could amount to a game-changer in how surveys, public awareness, and even institutional education is conducted in the future.

Groundbreaking Results

In the SmartCurrents trial (DTE Energy, 2014), Ringorang recorded an average of nine minutes per month of interaction between customers and the energy provider’s information when delivered through Ringorang. This level of engagement was mirrored by that of the Nevada Dynamic Pricing Trial (NV Energy, 2015) which ran an identical cadence of content delivery to that of the DTE Energy (2014) trial. Compared to the data from the Accenture (2013) report, this represents a 1,200% increase in engagement over the norm. The UT Austin study (Beck, Lakkaraju, & Rai, 2016) showed users engaging for 18 minutes over two weeks of Ringorang engagement, an even deeper commitment of consumer attention than the NVE and DTE studies, with this exception: during the development of the NV Energy (2015) trial, at a much-accelerated cadence, NV Energy ran a customer acceptance test where four out of five randomly selected households in Nevada engaged with Ringorang for 6

Ringorang follows this pattern of rewarding users at random times, which often results in the user wanting to try repeatedly for that pay-off, not unlike taking more and more pulls at a one-arm bandit slot machine.
minutes *per day* (Electric Light & Power, 2013), indicating that there may be even more engagement possible with energy customers, *orders of magnitude* more, than was tested within the design of the NV Energy (2015) and DTE Energy (2014) studies.

What makes this enormous increase in interactivity more important is the fact that Ringorang attracted customer engagement that was *additional* to time spent by customers reviewing their energy bills. Ringorang evinced an entirely new spectrum of attention paid by energy customers which is not accessible to energy providers through the traditional billing relationship. This suggests that there is considerably more willingness among customers to interact with their utilities and address their own energy-usage behaviors than was previously assumed by an industry that has historically relied on the bill as the key tool for customer engagement.

Another remarkable fact is that Ringorang was not developed to appeal to millennials or gamers per se. The Ringorang engagement pattern simply offers the opportunity for the user react to a presented question on a ticking clock and select an answer, which requires no gaming skill at all. Customer interviews regularly include testimonials from users who have no habit of playing digital games but find value in the information delivered through the Ringorang format. This includes users in their senior years who were not raised in the current norms of digital interactivity or digital games. The NV Energy (2015) study received responses from interviewees in their senior years such as “[the game] pounds it into your head – fixes it in the back of your mind and changes your behavior” and “It was challenging. It brought a lot of things to light, most of them I was doing wrong” and “I think we should continue with the game or we'll get lax and go back to our bad behavior”. Proving that the appeal to seniors was not isolated to the NVE study, Ringorang has been used repeatedly by the largest association for seniors in the U.S., AARP, to engage their members with important tips around family caregiving and job seeking (Figure 6).
Old Tricks Are The Best Tricks

Figure 6: Image of webpage where AARP invited users to download the app and play a game about sharpening job-seeking skills
Both NV Energy (2015) and DTE Energy (2014) studies showed users achieving over 90% competency across 13 topics related to saving energy, engaging with an average of 11 different educational pieces per month. In the studies, which lasted 6 months and 8 months respectively, results showed that treatment groups which provided Ringorang education and no other home-control or monitoring technologies (such as programmable thermostats or in-home display units) recorded significant shifts in peak energy use, reducing usage during demand-response events by averages of 8% to 12% more than control groups, with even greater reductions achieved from specific customer segments. For example, households in Michigan that had no central air conditioning but had access to Ringorang education showed 22% greater reduction of peak energy use over control. Generally, wherever there was less of a presence of home-control technologies, the participants had to rely on education to shift their behaviors. However, the results were not so consistent across the two studies for households that had more home-control technologies. Some of these more equipped households reduced energy and some increased energy use at peak times. What was consistent was the need for customer education. As a side note, it was an interesting finding from the DTE Energy (2014) study, that households with technologies like thermostats, in-home displays, or smart appliances engaged significantly more often with the Ringorang app than did those which had no in-home technology. Having the in-home technologies seemed to increase their engagement with the education, even though the savings they achieved was not solely attributed to the education. This finding does point to the benefits of combining useful tools with Ringorang education as a means for increasing a customer’s willingness to learn. DTE Energy (2014) came to this conclusion that a combination of technology (information and resources) and education was an optimal approach, consistent with the principles of human performance technology (Chevalier, 2003). NV Energy (2015) recorded further measurements on how Ringorang

Imagine you were part of an ongoing, enjoyable, mass-engagement quiz show, on a topic of importance to you, where it asked for just a minute of your time every once in a while. It would certainly make the information more interesting to consider.
impacted habit retention by showing that users who engaged with Ringorang sustained their changed energy-use behaviors for 18 months after the Ringorang program ended.

In the third trial in Texas (Beck et al., 2016; Rai & Beck, 2016), where the average time spent by users was even greater than in the NVE and DTE studies, the focus was different. It involved a public education about solar technology with the aim to drive interest and a willingness among customers to reach out to a solar technology provider. In addition to users spending over 18 minutes of time with Ringorang over a two-week program, surveys showed the willingness (in this case, the perceived behavior control (Bamberg, Ajzen, & Schmidt, 2003)) to look further into solar technology for Ringorang participants was double the effect size of the control groups.

In the follow-up surveys for all three of these trials, one reaction repeatedly surfaced: users were appreciative and wanted more.

The Drivers: Repetition and Reward

There are many factors that go into the effectiveness of the Ringorang technology in engaging and educating users on any topic. Some of these factors include the simplicity and familiarity of its question-and-answer format, its push delivery that initially compels reaction rather than proaction, the excitement of social simultaneity (such as in flash mobs and music concerts), and the impact of time delimitation (such as in TV gameshows) which stimulates a psychological state known as eustress, or positive stress. However, for purposes of this article, we will focus on the two driving factors of repetition and reward, both of which have been central to behaviorist-oriented solutions.

Reward

Reward draws focus. It stimulates the willingness of the subject, in varying degrees, to pay attention to an activity. Skinner's experiments (Ferster & Skinner, 1957) showed that the key to sustaining attention and driving repeat engagement with an activity sufficiently to adopt a new behavior or habit is not to reward the subject every time. Leave a bit of mystery and hope that drives the subject to try again and again, which results in a reward sometimes or in some ways but not always in all ways. This is known in Skinnerian speak as a variable interval schedule.
Ringorang facilitates several types of reward schemes to appeal to various psychological profiles among its users. Nick Yee’s Gamer Motivation Model (Yee, 2015) categorizes gameplayer profiles based on their prime motivation for playing (Figure 7). Those six motivations are 1) Action, 2) Social, 3) Mastery, 4) Achievement, 5) Immersion and 6) Creativity.

<table>
<thead>
<tr>
<th>Action</th>
<th>Social</th>
<th>Mastery</th>
<th>Achievement</th>
<th>Immersion</th>
<th>Creativity</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Boom!&quot;</td>
<td>&quot;Let’s Play Together&quot;</td>
<td>“Let Me Think”</td>
<td>“I Want More”</td>
<td>&quot;Once Upon a Time&quot;</td>
<td>&quot;What If?&quot;</td>
</tr>
<tr>
<td>Destruction</td>
<td>Competition</td>
<td>Challenge</td>
<td>Completion</td>
<td>Fantasy</td>
<td>Design</td>
</tr>
<tr>
<td>Excitement</td>
<td>Community</td>
<td>Strategy</td>
<td>Power</td>
<td>Story</td>
<td>Discovery</td>
</tr>
</tbody>
</table>

*Figure 7: Gamer Motivation Model, Nick Yee, Quantic Foundry*

Some users of Ringorang are initially attracted to the idea of winning a prize, which appeals to the Achievement type in the Gamer Motivation Model (Yee, 2015). They don’t have to be good at whatever the task or content is, they just have to play. And for them, Ringorang provides random and often numerous instant win giveaway prizes just for participating. The message to these users is you could win at any time, just keep playing (and keep learning). Other users are highly competitive, which appeals to the Action or Social or Mastery types per the Gamer Motivation Model. For them, the reward is to win or to rank high on the leaderboard. Yet other users want to win something large in value. For them, Ringorang awards entries into a sweepstakes drawing after certain regular milestones are reached, which appeals to the Achievement type again, and specifically to ones who take a long-game approach to achievement versus the pursuit of immediate gratification. For these users, Ringorang can provide entries into a high-value drawing after the user answers all questions in each Challenge, or every time a user answers any question. Then there are some users who simply enjoy the diversion of the gameplay, the decompression moment that the gameplay provides or the excitement of it. This pattern can appeal variously to the Social, Mastery or Achievement types per the Gamer Motivation Model. The Mastery or
Achievement personality typically like to go along at their own pace, monitoring their status along the way but most often comparing results to their own record and not others' records. This type of user enjoys the journeyman's intrinsic reward of work-and-earn; and for this user, the Ringorang system offers badges for achievement milestones reached (Figure 8).

Figure 8: Ringorang issues a badge for earning prescribed achievements

Further research would be useful on which of the motivations in the Yee (2015) model are applicable both to gamers as well as to non-gamers who find value in the Ringorang format.

Ringorang and Skinner

Extrinsic rewards excite a person differently, perhaps more tangibly, than intrinsic rewards. Examples of extrinsic rewards are money or valuable merchandise or privileges, like the food rewards in Skinner’s experiments that involved animals, where the best results came not where actions predictably resulted in an extrinsic reward, but where they resulted in rewards occasionally (Ferster & Skinner, 1957). Ringorang follows this pattern of rewarding users at random times, which often results in the user wanting to try repeatedly for that pay-off, not unlike taking more and more pulls at a one-arm bandit slot machine.

While this repetition is going on, there is auxiliary benefit in the establishment of habit and regimen, leading to greater familiarity, clearer and faster recall, swiftness of decision, and a well-fed desire for more of the same. Repetition creates the equivalent of tracks in the snowy hill of the
Repetition is the key.

Ringorang’s fun, light and rewarding experience is the Trojan horse that brings volumes of repeat interactions into the user’s life.

brain that become easier and more efficient to follow with each pass (Doidge, 2007). And when those tracks are made repeatedly because the activity is fun, like sledding down a snowy hill, the result is habituated learning. John Watson, who established the school of psychology that is behaviorism, emphasized the importance of repetition (Watson, 1930). Repetition is the key factor in strengthening neuroreceptors (Sheehan, 2016) and brain plasticity (Doidge, 2007). But whereas Watson behaviorists tend to stick solely to observable behaviors, Ringorang also addresses the learner’s beliefs and perceptions, specifically in its content development format.

Content Formatted for Interval Repetition

The content development method developed especially for the Ringorang system is called the ASK method, a play on the word ask as in “ask a question”; but more importantly it is an acronym for Attitudes, Skills and Knowledge. The ASK method defines a straightforward content-design hierarchy: (1) a singular program goal, supported by (2) a handful of performance objectives, each of which is supported by (3) multiple learning elements. The third tier of this hierarchy, the learning elements, is where the content designer identifies the predominant attribute of each element: either attitude, skill, or knowledge. And it is from these attitudes, skills or knowledge elements that designers write the Ringorang game questions.

By balancing these ASK attributes in a curriculum design, and topstacking1 the most important learning elements so they are repeated, a content designer can affect observable behaviors, as well as the attitudes and understandings that serve as antecedents to observable

1 “Topstacking” is a term used by our team at Ringorang, referring to a form of cued repetition (Moult, 2011) whereby select learning elements in a curriculum are presented to aid the learner in recalling other learning elements. To illustrate, imagine a stack of papers on a desk. One might be familiar with every page in that stack, generally, but one can only specifically focus on what appears on the top page. By pulling a page out of the middle of the stack and placing it at the top, one’s focus is now pulled to that new top page. Doing that repeatedly with select pages reinforces the content in those pages and strengthens one’s recall of the subject matter contained in those select pages. Strategic topstacking of key pages can stimulate the mind to recall much of the content contained throughout that stack.
behaviors (Bloom, Krathwohl, & Masia, 1956). In this way, the ASK method may veer from psychological behaviorism as attributed to Skinner and represent more closely analytical behaviorism (Graham, 2016). ASK puts special focus on attitudes which the method positions as being synonymous with beliefs. This curriculum design format enables anyone creating their educational content in Ringorang to directly target the learner’s beliefs, including their perceived behavioral control, or PBC (Bamberg et al., 2003), which either supports or stands in the way of the learners’ progress.

**Leveraging Attitudes to Drive Learning**

The UT Austin study focused on PBC as a metric to test the impacts of interval repetition as delivered by Ringorang on energy customers (Beck et al., 2016). PBC is one of three tenets to the theory of planned behavior (Bamberg et al., 2003), which links beliefs and behavior, where the measure of the learners’ PBC is considered the most influential predictor of behavior. (Beck et al., 2016) found that short-form curriculum delivered through Ringorang’s interval repetition format resulted in significantly higher PBC from participants over those who received the same information through other methods. They also supported their hypothesis that the format used in delivering education, not just the education itself, was a measurable factor in affecting the antecedents to behavior change.

Ringorang’s end-user experience is deceptively simple. It uses an almost garden-variety form of reward and consequence by delivering immediate feedback on winning or losing points while also reinforcing right and wrong answers. Sounds like a quiz show, doesn't it? Well it is. So, imagine if you were part of an ongoing, enjoyable, mass-engagement quiz show on a topic of importance to you where it asked for just a minute of your time occasionally. It certainly makes the information more interesting to consider. That’s Ringorang. And that’s behaviorism delivered through the very modern user-experience of a smartphone, tablet, or personal computer where its patented engagement format leverages the brain’s natural responsiveness to interval repetition while simultaneously boosting the learner’s attitude and willingness to engage with the information.

Modern platforms demand a shorter form of content. And the users of these platforms have less and less patience for long-form content. These devices have engendered emails, text messages, short videos and social memes, quick simulations, and information-by-the-bite found
Old Tricks Are The Best Tricks

instantaneously at our googling fingertips. Is it any wonder that our attention spans are shorter, now measured to be 8 seconds on average (Microsoft, 2015)? We expect to find information along our path, in chunks, rather than by mass-education formats. Some of the names given to these emerging formats are *ubiquitous learning* and *micro-learning* (Kovachev, Cao, Klamma, & Jarke, 2011), which provide greater opportunity for repetition across intervals of time. And they require smaller, more focused bites of information. The zeitgeist of just-in-time learning is to have the right information at the right time, which is largely unsupportable by mass education formats.

Where educators fail to get learners to revisit a book or article over and over, they succeed with Ringorang repetition. And repetition is the key. Ringorang’s fun, light, and rewarding experience is the Trojan horse that brings volumes of repeat interactions into the user’s life. It’s the spoonful of sugar that helps the medicine go down. What is going on, neurologically, is the brain’s myelination process. This is the process of strengthening the neural cells due in large part to repetition, which gradually speeds the impulses and coordination of neurons (Badenoch, 2008). It is what facilitates practice-makes-perfect skills. Habits and ingrained skills are not achieved in a long sitting or two. If that were so, a concert pianist, or an Olympic athlete, would simply practice for 24 hours straight before an event and be brilliant. Instead, that repetition of practice must be revisited over weeks, months and years of conditioning to achieve excellence. Neural myelination requires repetition over time to improve the speed of recall and brain processing (Wootton & Horne, 2010).

This is the first thing the learner learns: a habitual response to the educator’s requests for attention and action.
Learning vs. Recall: The Missing Link

In the art and science of Ringorang, there is a difference between learning and recall. For us, learning is equivalent to habit formation. It infers that what was learned was retained. Whereas recall is the ability to readily access what is learned, which makes it a vital link in the chain that leads to sustained learning, but is often ignored by educators, especially in workplace training. In particular, Ringorang delivers what is known as cued recall, where words or ideas are presented periodically that relate to a learning element and aid in its mental retrieval (Moult, 2011). Think of each repetition of a learning topic as a link in that chain, a quick reminder of the topic that strengthens the chain. Without developing recall, the forgetting curve (Ebbinghaus, 1885) steals from the learner whatever they gain along the learning chain as quickly as they gain it, which disables the learner from applying it to practical scenarios that pop up in everyday life. A common example is workplace training which, once completed, proceeds to vanish from the mind to the tune of almost 80% loss of recall after a month has passed (Ebbinghaus, 1885). On the other hand, if recall is developed, it topstacks the topic in the learner’s mind so it is retrievable when needed. Recall can be developed in one's short-term memory and then lost, which is why repetition is critical. Over time, repetition engages the long-term memory and ingrains a habit that continues to evolve, which is known in neuroscience as long-term potentiation (Cooke & Bliss, 2006).

Whereas sending emails at that volume would be overwhelming, Ringorang questions, even though delivered at six to ten times the volume of emails or website visits, are not at all regarded as overwhelming.

Here is how Ringorang establishes and uses recall to lead to retained learning:

First, establish responsiveness

This is the first thing the learner learns: a habitual response to the educator's requests for attention and action. With Ringorang, these requests are the audible alerts that come through the app when new questions are available to play. In our experience, we have found that users quickly
Old Tricks Are The Best Tricks

adopt a Pavlovian response to the chime alert, answering the questions immediately (typically between 15% to 25% of the time) or at their convenience (about 75% to 85% of the time). For most users, this responsiveness is established within a week and sometimes within a day, with a habit following within a month’s time.

**Then, drive repeated engagement on a topic**

Questions come at a typical cadence between 3 to 6 times daily or 10 to 25 times weekly. Whereas sending emails at that volume would be overwhelming, Ringorang questions, even though delivered at six to ten times the volume of emails or website visits (DTE Energy, 2014), are not at all regarded as overwhelming. This is one of the carefully tuned features of the technology. It has consistently led to successful strengthening of recall, which leads to learning retention and measurable behavior change. The ticking clock, the competition, the focus on a singular piece of short-form information, and the incentivization combine to drill the user in efficient decision-making and habitual responsiveness. The result is recall, measured by increases in speed and accuracy over time. With each cued repetition, the users become more familiar with the learning element and quicker to answer, and more likely to answer *correctly*, which is rewarded with status, points, and sustained learning.

**Eventually, strengthening recall leads to habit**

Twenty-one days is a fabled minimum period required to build a habit, based on an observation in Maltz’s (1960) book *Psycho-Cybernetics*. It is true that it takes repetition over time to establish a habit, but 21 days is a rare minimum. The actual time it takes to build a habit ranges from 2 to 8 months (Gardner, Lally, & Wardle, 2012) and that’s only if the related learning elements are sufficiently repeated to lead to such a habit. Learning is accomplished in layers and dimensions. It is not only about retaining knowledge (cognition), but also skills (psychomotor) and attitudes (affective) (Bloom et al., 1956). The chain that links these together and gradually strengthens their binding over the time is what we know as recall. But to get there, the learner must stay engaged over sufficient time and repetition. Walking back and forth through that learning chain, we see that repetition strengthens the neural connections. This is what enables faster recall. Prizing drives the willingness to repeat the learning activity, and the more we repeat, the stronger our recall. The stronger our recall, the more we recognize the intrinsic rewards that recall provides, by making us effective in our practical lives.
It is that putting-to-practical-use part which then results in sustained learning and habits. But without strong recall, the gaps in the learning process grow wider with time. The links break. The forgetting curve takes over, and the educator faces an increasing challenge (and budget) in ramping up the learning process again. This common form of waste is frustrating for both the educator and the learner. In dramatic contrast, Ringorang repetition delivers learning in a refreshed, rewarding, and attractively brief format, which sustains a controlled continuum of learning. And learners actually enjoy it. One of the clear indicators of this appeared in the DTE Energy (2014) study, where most the users who completed five months of energy-industry curriculum returned a month later and opted to start all over again... with the same curriculum. If Ringorang can make energy efficiency information attractive enough to repeat, even after five months of it, what other kinds of important but less-than-scintillating types of information could be made engaging in this way?

No communication or education program can be afforded if reinforcement tools for habit formation are not responsibly set in place.
The New Normal

The success of Ringorang programs is a culmination of so many advancements in science and marketing. It includes:

- advancements in technology platforms
- digital rewards and incentives programs
- eLearning and mLearning
- organizational psychology and change management
- the merits of interactive media formats in general
- social media and gamification
- advancements in behavioral psychology

This combination has put a new and digital form to the tenets of behaviorism and programmed instruction. The practical results of using the Ringorang app are

- The collection of previously elusive metrics around learning retention and, most importantly
- The consistent evidence of attitude and behavior change

In this way, Ringorang heralds a game-changing approach to meeting goals for industry, government, science, the arts, and even religion. Anywhere there is knowledge to be communicated, it can no longer be considered normal to accept losses attributed to the forgetting curve. A new normal cries out to be known. And it needs attention in its new incarnation. First, it needs evangelizing while the body of evidence expands. Then it needs maturing into a widely accepted fact: that no communication or education program can be afforded if reinforcement tools for habit formation are not responsibly set in place. We couldn't afford this kind of waste before, either, but many of yesterday's remedies needed today's technology to fulfill their promise, which, even in the novel form of Ringorang, is proof that the best tricks are still the old tricks.
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