Using a Game-of-Chance to Motivate Employee Learning: Evidence from the Field

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ABSTRACT

Our study examines the effectiveness of a novel approach intended to motivate employee behavior desired by the company, i.e., the use of a virtual slot machine that employees can play to possibly win gift card rewards of up to $500. We use proprietary data from a company that implemented an online learning platform where employees could voluntarily self-administer training on a daily basis. Employees who complete the daily training modules and answer quiz questions correctly earn points that they can then use to bid on gift cards through an online auction site linked to the learning platform. The company subsequently activated an option of allowing employees to also use their accumulated points to play a virtual slot machine to possibly win the same gift cards available through the online auction site. Based on psychology theory related to gambling behavior, we predict that for employees who choose to use the slot machine, the enjoyment derived simply from playing will motivate increased completion of daily training modules and improved quiz performance to acquire the currency (points) required to play. Using a difference-in-difference approach based on matched samples of employees who never played the slot machine ('control' group) or played it at least once ('treatment' group), we find support for both of our predictions. Our results suggest that the use of games-of-chance such as a slot machine that are enjoyable to play can be a cost-effective means of motivating desired behavior.

KEYWORDS: Game-of-Chance, Slot Machine, Incentives

I. INTRODUCTION

There is a large literature examining the effects of using incentive pay to motivate individuals and teams spanning multiple disciplines including psychology, economics, management and accounting (Bonner and Sprinkle 2002; Garbers and Konradt 2014). In these studies, monetary rewards are typically provided as a direct consequence of achieving the performance outcomes stipulated by the incentive contract (Bucklin and Dickinson 2001). However, there is evidence that companies are developing novel ways of engaging and motivating employees that move beyond the traditional pay-for-performance approach that has been so pervasively employed in the past (Norberg 2017). For example, some companies use gamification techniques to make certain tasks more fun while other companies allow employees to earn performance-based points that they can spend on items such as merchandise, gift cards or to make donations to a charity (Presslee, Vance and Webb 2013; Kumar and Raghavendran 2015; Cardador, Northcraft and Whicker 2017).[1] Despite their popular use in practice, research has just begun to examine the consequences of these novel approaches to motivating employees.

This study focuses on an example of one such novel approach intended to motivate employee behavior desired by the company, i.e., the use of indirect incentives vis-à-vis playing a virtual slot machine that offers employees the potential to win gift card rewards. In our setting, the currency employees need to play the slot machine is points earned by successfully completing online training modules. The objective of using a game-of-chance in this way is to introduce an element of fun in how tangible rewards are potentially accessed, thereby increasing

[1] Gamification is "the use of game design elements in non-game contexts" with the objective of making an activity more engaging to motivate participation (Deterding et al. 2011). Game design elements include "self-representation with avatars; three-dimensional environments; narrative context; feedback; reputations, ranks, and levels; marketplaces and economies; competition under rules that are explicit and enforced; teams; parallel communication systems that can be easily configured; time pressure" (Reeves and Read, 2009).

the likelihood that employees will engage in the behavior desired by the company, which is participation in online training (Cardador et al. 2017). However, the risk of such an approach is that employee motivation to engage in the desired behavior could be reduced vis-à-vis weakened instrumentality since there is no guarantee for any individual that earning points from participating on the learning platform will lead to tangible reward attainment (Riedel, Nebeker and Cooper 1988).[2] Thus, the primary motivational mechanism likely to influence employees' willingness to earn the points needed to use the slot machine is the enjoyment of playing it rather than any tangible rewards that might be earned from doing so.

We examine our research questions using proprietary data from a company that implemented an online learning platform to allow its employees to voluntarily self-administer training on a daily basis for up to five minutes per day. To motivate employees to regularly complete the daily training modules, points were provided for each quiz question on the learning content that is correctly answered, up to a maximum of five questions per day. Employees could use their earned points to bid against co-workers on an online auction site, integrated with the learning platform, for gift cards provided by the company to various retailers (e.g., Starbucks) in various denominations ($5 - $500). After using the learning platform with the auction feature for three years, the company activated the built-in virtual slot machine feature to further motivate employees to complete the daily training modules. Employees could choose to use their earned points to play the virtual slot machine up to 20 times per day. The prizes available on the slot machine were identical to those available on the online auction site, which remained available

[2] It is plausible to assume that in addition to, or instead of seeking to introduce a 'fun factor' in the incentive schemes, companies might implement indirect reward access approaches such as a virtual slot machine to reduce the cost of providing incentives since the payout likelihood can easily be controlled by the program.

after the slot machine was activated. We have access to several months of employee-level data before and after activation of the slot machine.

There has been a considerable amount of research examining the antecedents and consequences of gambling behavior and there is a stream focused specifically on slot machines (originally known as fruit machines) (Billeux et al. 2012). A slot machine is among the simplest forms of a game-of-chance with play typically involving users inserting coins or tokens, pressing a 'spin' button and waiting for the wheels (two or more) to stop. Winning occurs when the same image on all wheels stops on the payline, which is the horizontal indicator on the slot machine screen that represents the stopping point for all wheels (Griffiths 1991, 1993; Chase and Clark 2010). The desire to repeatedly play slot machines exhibited by some individuals is attributable to several factors, three of which are directly relevant to our research setting.[3] First, like other forms of gambling, playing a slot machine creates arousal and excitement even if the outcome is a loss (Coventry and Constable 1999). Moreover, this excitement just from playing can be experienced often since each spin only requires a few seconds (Griffiths 1991). Second, like all games-of-chance, slot machines can give rise to the gambler's fallacy where individuals erroneously infer the random outcome of a future play based on random outcomes of past plays (Tversky and Kahneman 1971; Walker 1992). For slot machine players the gambler's fallacy can lead to persistence in playing after a series of losses (Coates and Blaszczynski 2014). Finally, each individual play of a slot machine is relatively inexpensive, which can reduce the perceived cost of 'winning' and motivate repeated play (Parke, Griffiths and Parke 2007).

[3]Factors such as the ability to control when the slot machine's wheels stop spinning or being able to choose the 'win' image can also influence play persistence but are not available in our setting so we do not discuss them further (Griffiths 1993; Clark et al. 2012).

We predict that for individuals who choose to play the slot machine, the factors described above motivating repeated play will increase their participation and performance on the daily training modules. The 'currency' required to play the slot machine are points earned from correctly answering questions on the daily training modules; the more questions answered correctly, the more employees can play the slot machine.[4] Because completing the daily training modules is voluntary, there is scope for the availability of the slot machine to influence behavior. Accordingly, we predict that for individuals who choose to play the slot machine, they will increase the number of daily training modules completed relative to the period before the slot machine was available. Moreover, since points are only provided for correctly answering quiz questions, we expect employees will exert more effort to perform well on the daily training module quizzes. As such, we predict that for individuals who choose to play the slot machine, performance on the daily training module quizzes will improve relative to the period before the slot machine was available. For employees who choose not to use the slot machine, there is no reason to expect any systematic change either in the extent to which they complete daily training modules or how well they do on the daily training module quizzes.

We test our hypotheses by partitioning our data into two groups of employees, those who played the slot machine during the three month-period immediately after its introduction ('treatment' group) and those who never played ('control' group). Given that employees who played the slot machine self-selected into the treatment group, they may be inherently different from employees in the control group who chose not to play. Accordingly we use a proximity score approach to create treatment and control groups that are similar on several measures related

[4] It is possible that employees who play the slot machine will reduce their activity on the online auction site without increasing training or improving quiz performance; to the extent this occurs, it biases against our predictions. However, in the results section, we examine activity on the online auction site before and after activation of the slot machine for the control group who did not play the slot machine and the treatment group who did.

to their intrinsic motivation to use the learning platform and its various features prior to the introduction of the slot machine, tenure at the company, length of time on the learning platform, and gender. Our matching approach results in a total sample of 1,470 employees, 735 in each of the treatment and control groups; results support both hypotheses. Compared to the control group, employees in the treatment group showed significantly larger increases both in how many daily training modules they completed and their daily training module quiz performance subsequent to introduction of the slot machine. Additional analysis shows that introduction of the slot machine also resulted in employees in the treatment group being more likely to use other features of the learning platform intended to stimulate engagement in learning.

Our results offer two main contributions. First, to our knowledge, we are the first to demonstrate that providing individuals a 'fun' option for potentially accessing tangible rewards can induce greater effort on tasks that are beneficial to the organization. In our setting, points awarded for performing well on daily training modules were an intermediary reward available to all employees, that could then be used to bid for gift card rewards on an online auction site or to play a slot machine to possibly win gift cards. Our results suggest that the enjoyment derived just from playing the slot machine, win or lose, was sufficient to motivate some employees to engage more in the learning activities that yielded the currency (i.e., points) required to play. It seems highly likely that the appeal of simply playing the slot machine was the key motivating factor in our setting given the low percentage of spins (less than 0.2%) that actually resulted in 'wins.' These findings should be of interest to designers of management control systems as they suggest a potentially cost effective means of inducing employees to engage in desired behaviors. Second, the large literature examining gambling behavior has understandably focused on factors influencing the extent to which individuals will engage in potentially dysfunctional gambling

activities or how such behavior might be mitigated. Our results contribute to this literature by showing that carefully controlled use of a slot machine in an organizational setting can have positive consequences by motivating employees, who choose to play it, to exert greater effort to engage in learning activities intended to improve their job performance.

The remainder of the paper is organized as follows. The next section describes our research setting and develops our hypotheses. We then explain our research method followed by the results presentation. We conclude by discussing the study's contributions and the limitations.

II. RESEARCH SETTING AND HYPOTHESES DEVELOPMENT

Research Setting

Our research site is a company with multiple retail and service locations across the United States (hereafter the "Company").[5] The Company uses a gamified learning platform called Axonify™ to deliver employee training virtually on networked computers.[6] The platform includes gamification features such as achievement badges for performance, points earned for achieving objectives, using points to win prizes, team-based leaderboards that display team and individual performance, a newsfeed about platform-related events such as when a team member earns an achievement badge or wins a prize, and games. To limit the amount of time employees spend on the learning platform, the system only permits them to access one five-minute daily training module each day. The training module delivers learning content to the employee via videos, slideshows, images, and text. After delivering the learning content, the platform quizzes the employee and awards 10 points for each correctly answered question with no points awarded

[5] To maintain anonymity of the Company, we do not disclose details about the nature of the Company's business.
[6] The learning platform has been used by numerous large international companies such as Toyota, Telus, Walmart, and Toys R Us (https://axonify.com/).

for incorrect answers. Each daily training module has a maximum of five questions and thus, a maximum of 50 points can be earned per day by each employee.

To motivate employees to use the learning platform to achieve the learning objectives established by the Company, employees can use their accumulated points in two ways. First, they can bid points on rewards via an online auction site that is a default feature of the learning platform (See Appendix 1, Panel A). The auction for each reward item has a minimum bid (points) and a fixed duration (e.g., two weeks) with the highest bidder at the closing date winning the reward. The rewards are all gift cards to different retailers (e.g., Starbucks, Shoppers Drug Mart, HomeSense) valued at $5, $20, $50, $100, $250, and $500.[7] Research shows auctions can induce "competitive arousal" (Ku, Malhotra and Murninghan 2005, p. 90), which in our setting would result in employees spending more points to 'win' the auction. This in turn would motivate them to replenish their points through regular completion of training modules. Second, after using the learning platform for three years, the company activated a built-in virtual slot machine game option (see Appendix 1, Panel B). Similar to a real slot machine, employees can 'spin to win' a prize; each spin costs 10 points with a maximum of 20 spins per day. The prizes available on the slot machine are identical to those on the auction site and employees are aware of this.[8] Employees can only access the auction or the slot machine after completing their daily training module.

Hypotheses

[7]The use of gift card rewards to motivate employees is not uncommon. A 2015 survey conducted by the Incentive Federation Inc. indicates that 84% of companies that provide non-cash rewards for their employees use gift cards, among other forms of rewards (e.g., merchandise, travel, symbolic awards) (Incentive Federation Inc. 2016).
[8]The slot machine is programmed to deliver a set number of rewards within a particular time period. So, for example if 10 rewards are available for a 10-day period, there will be one win per day delivered by the slot machine. As such, the proportion of spins that will result in a "win" on any given day can vary since it depends on how many spins occur. As such, winning is not a random outcome in our setting but employees are unaware of this.

Slot machines are a well-known form of gambling (Billeaux et al. 2012; Griffiths 1993; Reid 1986) with their appeal derived in part from the simplicity of play; if the same image on each of two or more wheels stops on the payline, the player wins. Our interest is in the extent to which the use of a virtual slot machine as a 'fun' indirect means of potentially providing tangible rewards (i.e., gift cards) that are also available through other means (i.e., an online auction) can induce employee behavior that is consistent with company objectives. In our research setting this behavior would manifest in more frequent participation in online training and better performance on the related quiz questions to provide the points required to play the slot machine. That said, it is well-established in the psychology literature that individual differences affect the extent of enjoyment derived from gambling more generally and from specific forms of gambling such as slot machines, roulette wheels, card games, etc. (Raylu and Oei 2004). Accordingly, any benefits to the organization arising from the use of a slot machine to provide employee access to rewards will necessarily be limited to those who self-select into playing.[9]

Research has identified several general factors that can motivate individuals to persist in playing slot machines, three of which are likely to exist in our setting. First, simply playing a slot machine can generate autonomic arousal (e.g., increased heart rate) even for individuals who do not win, although research shows the effects are stronger for winners than losers (Anderson and Brown 1984; Conventry and Constable 1999; Coventry and Hudson 2001). There is evidence that the source of this arousal is the release of dopamine in anticipation of the possibility of receiving a reward (Linnet 2014). This arousal from simply playing coupled with the fact that the time between playing and receiving a payout (if lucky) is typically only a few seconds for slot

[9] In our sample of 7,289 employees who had completed at least one daily training module during the six-month period which we are examining, 42% (3,061) of them played the slot machine at least once. This indicates that a significant proportion of employees chose to play the slot machine when it was available.

machines, can result in a strong reinforcement of behavior leading to continued play (Griffiths 1993; Choliz 2010). Importantly, autonomic arousal has been shown to be positively correlated with individuals' subjective rating of their excitement when they are playing the slot machine (Coventry and Hudson 2001).[10]

Second, the gambler's fallacy can motivate continued play in the face of repeated losses because individuals will incorrectly infer the outcome of a future random event based on outcomes of random events in the past (Tversky and Kahneman 1971; Oppenheimer and Monin 2009). In other words, individuals who fall victim to the gambler's fallacy believe in "negative autocorrelation of a non-autocorrelated random sequence" (Croson and Sundali 2005, p. 195). When playing a slot machine, this would result in a biased expectation of success in subsequent 'plays' after a string of losses on previous plays (Billeaux et al. 2012). Consistent with this, Coates and Blaszczynski (2014) find that gamblers who are more accurate at estimating payout frequencies are also more persistent in playing slot machines with a lower versus higher payout frequency, controlling for the amount won. Finally, each play of a slot machine typically has a low-cost relative to the amount that might be won making it easier to justify continued play despite losses, because of the low opportunity cost for each attempt (Parke et al. 2007).[11]

A typical approach in studies examining factors that influence slot machine play persistence is to have individuals first play during a 'winning' phase consisting of a pre-determined number of spins (e.g., 50) where one or more variables are manipulated (e.g., payout percentage, ability to select 'win' image, etc.), and where 'wins' with actual payouts (e.g., $10)

[10]Griffiths (1991) reports that some individuals report excitement just from watching others play slot machines.
[11]This feature of slot machines can create a low perceived cost of winning since a single spin could result in a win thereby enhancing the appeal of playing. Consistent with this, employees in our setting may perceive a low cost of winning by playing the slot machine since each spin only requires 10 points (i.e., one correctly answered quiz question) with a possible payoff of up to $500.

are possible (Kassinove and Schare 2001). The 'winning' phase is followed by an 'extinction' phase during which individuals can continue to play as long as they wish, but by design and unbeknownst to players, all outcomes are controlled to be losses (Cote et al. 2003). Players are typically endowed with a fixed amount of currency to play the slot machine at the beginning of the study and they are paid whatever amount is remaining after the winning and extinction phases. Play persistence is operationalized as the number of spins individuals make during the extinction phase.

Our setting is distinct in that to the extent the three characteristics of slot machines described above motivate employees to continue to play, they can only do so if they replenish their available points through completion of daily training modules and correctly answering quiz questions on the learning platform. That is, there is a 'cost' (points) to continued play which has to be funded through engaging in training activity. Thus, we expect that employees who choose to play the slot machine will be more likely to increase the number of daily training modules completed relative to the period when the slot machine was not in use. Moreover, completing daily training modules is only beneficial in facilitating continued slot machine play if quiz questions are answered correctly. Therefore, in addition to increasing number of daily training modules completed, we expect employees will exert more effort to learn the material and answer more questions correctly and as a consequence improve their quiz performance on the daily learning modules.[12] That is, increased number of daily training modules completed is even more valuable to employees if coupled with improved performance on the quizzes. Conversely, for employees who choose not to play the slot machine subsequent to its introduction, there is no reason to expect a systematic change in behavior regarding the number of daily training modules

[12]This assumes that the learning outcomes are sensitive to effort to learn the material being tested, which is valid in many settings (Cennamo 1993; Salomon 1984).

completed or their success in the quizzes on the daily training modules. Accordingly, our two hypotheses are as follows:

Hypothesis 1: Employees who choose to play the slot machine will increase the number of daily training modules completed after its introduction more so than those who choose not to play.

Hypothesis 2: Employees who choose to play the slot machine will improve their quiz performance on the daily training modules after its introduction more so than those who choose not to play.

There are several sources of tension for our predictions. First, although daily voluntary participation in the online learning platform only takes about five minutes it does require employees to find time during their work day to do so. This may involve taking time away from their normal job responsibilities or sacrificing some 'leisure' time (e.g., coffee-break time). Regardless, completing the daily training modules comes at a cost in our setting. Second, there will typically be a delay of a day or more between when an employee completes slot machine play on any given day and when she can replenish her points to facilitate continued play, vis-à-vis the learning platform. This delay works against our predictions to the extent the motivational effects of slot machines leading to our predictions may weaken somewhat during this interval. Third, as described further in the next section, to make participation on the learning platform appealing to employees, the Company used several gamification techniques such as report cards and leaderboards, which research shows on their own can motivated desired behavior (Cardador et al. 2017). As such, the predicted effects of introducing the slot machine on daily training activity will be incremental to those arising from the gamification features already in place. Finally, in our setting the slot machine is not programmed to produce 'near-misses.' A near-miss is a spin outcome where all of the images on the payline match except for a single wheel where the 'win' image is just above or below the payline (Reid 1986). With 24 different images

available on the three-wheel virtual slot machine used by the Company, the probability of a randomly occurring near-miss is only 0.17%. This is important given research showing that 'near-misses' on slot machines have a significant positive effect on the persistence of play (Kassinove and Schare 2001).[13] The small probability of experiencing a near-miss in our study works against the behavior predicted by in H1 and H2.

III. METHOD

Data Description

All participants in the study are employees of a large company with multiple locations across the United States. We have data for 6,005 employees (937 females, 4,191 males, 877 undisclosed) from 780 different locations who completed daily training modules both before and after the slot machine was introduced. As discussed below, we use a difference-in-difference approach to analyze our data, which requires employees to have daily training data both before and after the slot machine was introduced. The learning platform was in use with the default online auction site for three years before the slot machine option was activated in an attempt to increase employee engagement in the learning platform. The online auction site continued to be available after the slot machine option was activated. To allow for possible 'novelty' effects during the period immediately after the slot machine feature was introduced, we base our analysis on three months of post-activation learning platform activity relative to the three months immediately before activation of the slot machine.[14]

[13]Near-misses result in brain activity similar to a win (Chase and Clark 2010), can be falsely interpreted as skill acquisition (Billeaux et al. 2012), and can increase the expectancy of winning on subsequent trials (Clark et al. 2012).

[14]Because employees can play the slot machine daily, we believe that any novelty effects associated with introduction of this feature are unlikely to persist beyond the first month it is available. We test for the possibility of novelty effects as part of the additional analysis reported in the results section.

The primary variable used to test Hypothesis 1 is employee participation in the daily training modules. An employee is also able to complete extra training modules after s/he has completed the designated daily training modules. There is only one daily training module available per day, but there can be a varying number of extra training modules available per day depending on the number of learning topics that day. Extra training modules cover similar materials to those in the daily training modules and are intended to reinforce the learning content in the daily training modules. Although there are questions in the extra training modules, no points are awarded for correctly answering these questions. Periodically, the Company introduces daily training modules (with the opportunity to earn points) that repeat or reinforce learning content covered in prior daily training modules completed by an employee. Hence, although an employee does not earn any points from completing current extra training modules and correctly answering questions for those modules, s/he may be able to improve quiz performance and earn more points on future daily training modules that cover the same learning content as in the extra training modules. As such, we also analyze the number of extra training modules completed. We calculate the number of daily training modules (*Daily Training*), the number of extra training modules (*Extra Training*), and the number of total training (daily plus extra) modules (*Total Training*) an employee completes in a month. We note that prior to the introduction of the slot machine, all 6,005 employees completed at least one *Daily Training* module but almost 69% (4,118) of employees did not complete any *Extra Training* modules.[15]

To test Hypothesis 2 we calculate the percentage of questions answered correctly in the daily training modules (*Daily %*). We also calculate the percentage of extra training questions

[15]This is not surprising given that correctly answering questions on extra training modules does not earn points for employees.

correctly answered (*Extra %*) and the percentage of total questions (daily plus extra) correctly answered (*Total %*).

We collected other measures of user activity on the learning platform. After completing the daily training module, an employee is able to access his/her report card, a leaderboard, and the rewards page. The report card (see Appendix 1, Panel C) displays the number of learning topics completed by the employee, the average percentage of correct answers on the quizzes to date, and the trend of cumulative number of correct answers in the last 30 days. The leaderboard (see Appendix 1, Panel D) provides rankings based on the total points earned for answering questions correctly in the past 30 days for the top 10 employees on the team to which the employee is assigned, along with the total points earned by each. If the individual is not ranked in the top 10 then the leaderboard still shows the top 10 employees, the employee's ranking (e.g., 15^{th}) and the points earned by the individuals ranked immediately above (e.g., 14^{th}) and below (e.g., 16^{th}). The leaderboard also shows the top 10 teams in the company and the average points earned by team members. If the employee's team is not in the top 10 the same reporting approach is used as described for individual performance rankings. The rewards page is used by employees to access the auction site (see Appendix 1, Panel A) or the slot machine (see Appendix 1, Panel B) and shows the available gift card rewards, which are identical under each of the two options for accessing them. We calculate the number of times in a month an employee accesses each of these pages (*Report Card Access, Leaderboard Access, Rewards Access*) as a proxy for interest in their performance and their team's performance on the learning platform and in the rewards provided.

For all the measures described above, we calculate: (1) a pre-test measure, which is the mean of the monthly figure for the three-months prior to activation of the slot machine

(November 2015 to January 2016); (2) a post-test measure, which is the mean of the monthly figure for the three-months after the slot machine was activated (February 2016 to April 2016); and (3) the change from the pre-test period to the post-test period (i.e., Post-test – Pre-test measure). The Company had been using the learning platform with the auction feature since February 2013 and activated the slot machine option in February 2016.

Analysis Approach

We use a difference-in-differences approach to test our hypotheses where the difference between the post-test measure and the pre-test measure is contrasted between a treatment group and a control group (Cook and Campbell 1979; Lechner 2010). The treatment group in our setting includes only employees who have played the slot machine game at least once in the three months after it was introduced in February 2016 (n = 3,061). The number of times an employee in the treatment group played the slot machine during the three-months period after it was activated ranges from 1 to 1,110.[16] The control group includes only employees who never played the slot machine in the three months after it was introduced (n = 2,944). The difference between the post-test measure and the pre-test measure is the dependent variable, and whether the observation is from the treatment group or the control group is the independent variable. The difference-in-differences approach reduces biases due to pre-existing differences between the treatment group and the control group prior to the slot machine introduction (e.g., intrinsic motivation for learning). It also reduces biases due to changes over time that occur regardless of the treatment (e.g., management encouragement to all employees to participate on the learning

[16]Including in the treatment group employees who played the slot machine infrequently biases against our predictions since these employees are more similar to those in the control group who never played. In a robustness check, we redo our analyses with new matched samples of control employees who never played the slot machine and treatment employees who played the slot machine at least three times over the course of three months. All results are similar to those using the full sample.

platform) (Cook and Campbell 1979; Lechner 2010). We further control for the retail location of the employee as a random effect in the regression.

As noted above, the difference-in-differences approach reduces biases due to differences between the treatment and control group that may have existed prior to introduction of the slot machine such as the intrinsic motivation to engage in *Daily Training* (Cook and Campbell 1979; Lechner 2010). However, as a precaution we use two approaches to assess whether the treatment and control groups differ prior to the introduction of the slot machine. First, we compare all of the key measures described above between the two groups pre slot-machine introduction to see if they differ significantly. We find all measures are significantly higher for the treatment group than the control group (not tabulated): *Daily Training* (9.70 vs. 4.73, $t = 29.46$, two-tailed $p < 0.001$), *Extra Training* (2.17 vs. 0.71, $t = 4.77$, two-tailed $p < 0.001$), *Total Training* (11.88 vs. 5.44, $t = 17.60$, two-tailed $p < 0.001$), *Daily%* (0.78 vs. 0.71, $t = 13.96$. two-tailed $p < 0.001$), *Extra%* (0.86 vs. 0.82, $t = 4.26$, two-tailed $p < 0.001$), *Total%* (0.79 vs. 0.72, $t = 14.01$, two-tailed $p < 0.001$), *Report Card Access* (1.03 vs. 0.32, $t = 9.64$, two-tailed $p < 0.001$), *Leaderboard Access* (3.61 vs. 1.32, $t = 16.19$, two-tailed $p < 0.001$), and *Rewards Access* (7.78 vs. 2.41, $t = 27.14$ two-tailed $p < 0.001$).

Second, we conduct an analysis to assess whether there is a selection maturation difference between the treatment group and the control group immediately prior to the introduction of the slot machine. A selection maturation difference would be evidenced by different rates of changes over time in the treatment group versus the control group (i.e., increases or decreases in completing the daily training modules) that is unrelated to the treatment itself (Cook and Campbell 1969). We employ random effects regression using *Daily Training* and *Extra Training* as the dependent variables, with *Month*, *Treatment, and Month*Treatment* as

the independent variables for the three months immediately prior to the introduction of the slot machine, controlling for the location as a random effect and the individual employee as a repeated measure variable nested in the location. For *Daily Training*, we find that there is no significant main effect of *Month* (t = -0.28, two-tailed p = 0.779), a main positive effect of *Treatment* (t = 17.15, two-tailed p < 0.001), and notably a positive interaction effect of *Month*Treatment* (t = 2.78, two-tailed p = 0.005). Separate regressions for the treatment group and the control group indicate that for *Daily Training*, there is a positive effect of *Month* for the treatment group (t = 3.52, two-tailed p < 0.001) but no significant effect of *Month* for the control group (t =-0.32, two-tailed p = 0.745). For *Extra Training*, we find no significant main effect of *Month* (t = 0.15, two-tailed p = 0.877), a main positive effect of *Treatment* (t = 1.98, two-tailed p = 0.048), and no significant interaction effect of *Month*Treatment* (t = 0.80, two-tailed p = 0.425). Separate regressions for the treatment group and the control group indicate that for *Extra Training*, there is no significant effect of *Month* for the treatment group (t = 0.98, two-tailed p = 0.328) or the control group (t = 0.44, two-tailed p = 0.657).

These results show that *Daily Training* increases in the treatment group but not for the control group over the three months preceding the introduction of the slot machine, which indicates the need to control for potential selection maturation differences between the treatment and control groups. As such, we calculated the percentage change in *Daily Training* from Month 1 to Month 2 and from Month 2 to Month 3, and then average those two percentage changes to obtain *Daily Training Average Change%* prior to the introduction of the slot machine. As described below, we use *Daily Training Average Change%* as one of the matching variables to create matched samples from the treatment and control groups that are similar in average month-to-month rate of changes in *Daily Training* prior to the introduction of the slot machine.

In summary, our analyses suggest that prior to the introduction of the slot machine, employees in the treatment group were more engaged on the learning platform, more interested in their individual and relative performance, performed better on the daily and extra training modules, and have a more positive change over time in daily training activity relative to our control group.

Creation of Matched Samples

Given the apparent differences in learning platform engagement between the treatment and the control groups prior to the introduction of the slot machine, using the full sample of employee data could bias results in favor of our predictions. To mitigate this possibility, we create matched samples from the treatment group and the control group in order to attain between-group similarity in learning platform engagement prior to the introduction of the slot machine (Cook and Campbell 1979). We use a proximity score approach, with matching done on *Gender* (exact), *Daily Training* (matched to at least +/- 2 training modules completed), *Extra Training* (matched to at least +/- 1 training modules completed), *Daily Training Average Change%* (matched to at least +/- 0.20), *Days Employed* at the Company (matched to at least +/- 90 days), *Days on Platform* (matched to at least +/- 90 days), *Daily%* (matched to at least +/- 0.20), *Extra%* (matched to at least +/- 0.20), *Report Card Access* (matched to at least +/- 0.1), and *Rewards Page Access* (matched to at least +/- 1).[17] A detailed description of the proximity score approach is provided in Appendix 2.

[17] See Godfrey 2016 for a description of the procedure and the SAS codes. An alternative approach is to use the propensity score approach (Rosenbaum and Rubin 1985) which uses logistic regression to estimate the likelihood of being assigned to a group given a set of matching variables (i.e., propensity score) and observations are matched based on the propensity score. However, the propensity score approach has been criticized for increasing imbalance and, therefore bias (King and Nielsen 2016). Imbalance refers to the mean distance (in terms of the vector of pre-treatment covariates) between each observation in the treatment group and the closest observation in the control group, and should decrease with effective matching.

The proximity score approach yields 735 employees in the treatment group matched to 735 employees in the control group. Pre-slot machine introduction there are no significant differences between the treatment group and the control group respectively for the following: *Daily Training* (2.59 vs. 2.55, t =0.49, two-tailed p = 0.625), *Extra Training* (0.06 vs. 0.06, t = 0.08, two-tailed p = 0.937), *Total Training* (2.64 vs. 2.60, t = 0.50, two-tailed p = 0.616), *Daily Training Average Change%* (-0.28 vs. -0.30, t = 0.52, two-tailed p = 0.604), *Days Employed* (1,489 vs. 1,468, t = 0.29, two-tailed p = 0.771), *Days on Platform* (592 vs. 597, t = -0.18, two-tailed p = 0.858), *Daily%* (0.71 vs. 0.71, t =0.39, two-tailed p = 0.694), *Extra%* (0.86 vs. 0.76, t = 2.10, two-tailed p = 0.282), *Total%* (0.71 vs. 0.71, t = 0.41, 0.681), *Leaderboard Access* (0.44 vs. 0.46, t = -0.09, two-tailed p = 0.932), *Report Card Access* (0.02 vs. 0.02, t = 0.00, two-tailed p = 1.00), and *Rewards Page Access* (1.06 vs. 0.96, t = 0.92, two-tailed p = 0.359). Finally, supporting no significant selection maturation differences across our treatment group and control group during the 3 months before the introduction of the slot machine, our random effects regressions indicate that there are no significant *Month* effects and no significant *Month*Treatment* interaction effects for both *Daily Training* in a month and *Extra Training* in a month (all two-tailed p > 0.212) during the pre-slot machine period. Overall, our matched sample approach results in treatment and control groups that are highly similar on all key learning platform activity measures prior to the slot machine introduction. As such we believe it is more appropriate to use in testing our hypotheses compared to the full, unmatched sample.

A concern with using the difference-in-differences approach is that the monthly user activity measures over the six months (November 2015 to April 2016) may be serially correlated. As a result the standard error for the 'treatment' effect could be understated if we use monthly

data in the OLS regression (Betrand et al. 2004).[18] Following Betrand et al. (2004) we remove the time series dimension by aggregating the data into two periods, pre-slot machine game introduction from November 2015 to January 2016 (i.e., pre-test measure) and the post-slot machine game introduction from February 2016 to April 2016 (i.e., post-test measure).

IV. RESULTS

Hypothesis 1

Our first prediction is that employees who choose to play the slot machine will increase the number of daily training modules completed after its introduction more so than employees who never use the slot machine. Descriptive results for the number of training modules completed for the matched sample (n = 1,470) are shown in Table 1 (Panel A).[19] Consistent with our first prediction, results show that the treatment group significantly increased their *Daily Training* (Post-test – Pre-test = 1.57, t = 11.12, two-tailed $p < 0.001$), *Extra Training* (Post-test – Pre-test = 0.41, t = 4.55, two-tailed $p < 0.001$) and *Total Training* (Post-test – Pre-test = 1.98, t = 10.65, two-tailed $p < 0.001$), after the slot machine was introduced. Conversely, the control group had no significant change in *Daily Training* (Post-test – Pre-test = -0.08, t = 1.07, two-tailed p = 0.286), a marginal increase in *Extra Training* (Post-test – Pre-test = 0.09, t = 1.66, two-tailed p = 0.098), and no significant change in *Total Training* (Post-test – Pre-test = 0.004, t = 0.04, two-tailed p = 0.971) after the slot machine was introduced.

--- Insert Table 1 about here ---

[18] A difference-in-difference estimation can be done either by (1) regressing the difference between the pre-test measure and the post-test measure as the dependent variable, and whether the individual employee belongs to the treatment group or the control group as the independent variable, or by (2) regressing the user activity measure as the dependent variable, with the independent variables being whether the individual employee belongs to the treatment group or the control group, whether the measure belongs to the pre-test period or the post-test period, and the interaction between the two foregoing variables.

[19] Tables 1 and 3 (Panel B) also provide descriptive results for the full sample for comparative purposes but given the differences discussed earlier during the pre-slot machine period between the treatment and control groups all our analyses are based on the matched samples.

To formally test our first hypothesis, we use random effects regression analysis controlling for the location of the employee as a random effect. The results are reported in Table 2. The results for the matched sample indicate that compared to the control group, the treatment group experienced, from the pre-test period to the post-test period, more positive changes in *Daily Training* (Panel A, Model 1, coefficient 1.65, $t = 10.28$, one-tailed $p < 0.001$), *Extra Training* (Panel B, Model 1, coefficient 0.22, $t = 2.50$, one-tailed $p = 0.006$), and *Total Training* (Panel E, Model 1 coefficient 1.93, $t = 9.04$, one-tailed $p < 0.001$). The majority of employees did not complete any extra training modules during either the pre-slot machine period or the post slot machine period, such that the *Extra Training* data is not normally distributed. Therefore, as a robustness check we construct dummy variables (*Extra Training Dummy,* 0 if the employee did not complete any extra training module, 1 otherwise) during the pre-slot machine period and the post-slot machine period. During the pre-slot machine period, the proportion of employees who did not complete any extra training modules is the same in the control group (89.8%) versus the treatment group (89.8%). However, during the post-slot machine period, 71.8% of the treatment group did not complete any extra training modules compared to 90.5% of the control group (chi-square = 83.5, two-tailed $p < 0.001$). Random effects logistic regressions (controlling for location) indicate that the odds of employees completing any extra training module at all is significantly higher in the treatment group versus the control group during the post slot machine period ($F = 76.75$, two-tailed $p < 0.001$) (Table 2, Panels C and D).

Overall these results are consistent with our first hypothesis showing that introducing the slot machine motivated the subset of employees who used it to increase the daily training activity that enabled them to earn the points needed to play. Furthermore, although employees earned no points when they completed extra training modules, introducing the slot machine also motivated

employees who used it to increase their extra training activity. Presumably this behavior occurred because completing extra training modules can help employees earn points in future daily training modules.

--- Insert Table 2 about here ---

Hypothesis 2

Our second prediction is that employees who choose to play the slot machine will improve performance on the daily training module quizzes (*Daily%*) after its introduction more so than employees who choose not to play the slot machine. The descriptive results for *Daily%*, *Extra%*, and *Total%* employing the matched sample (n = 1,470) are reported in Table 3 (Panel A). Consistent with our second prediction, employees in the treatment group significantly improved their *Daily%* (Post-test – Pre-test = 0.10, t = 12.42, two-tailed $p < 0.001$) but so too did employees in the control group (Post-test – Pre-test = 0.07, t = 7.52, two-tailed $p < 0.001$). Results from random effects regression analysis used to evaluate our second prediction, controlling for the location of the employee as a random effect, are reported in Table 4 (Panel A). The results indicate that from the pre-test period to the post-test period, the change in *Daily%* (Model 1 coefficient = 0.03, t = 2.24, one-tailed p = 0.014) is significantly more positive for the treatment group than for the control group. The results for *Total%* reported in Table 4 (Panel C, Model 1) are similar to the results for *Daily%*, with the change in Total% significantly more positive for the treatment versus control group (Model 1 coefficient = 0.03, t = 2.24, one-tailed p = 0.013). No meaningful inferences can be generated for *Extra%* because few employees completed extra training modules in both pre and post slot machine introduction periods and

missing data on the change in *Extra%* further limits our sample size.[20] In summary, our analyses of quiz performances reveal results that are in keeping with our prediction that slot machine users would be motivated to improve performance on the daily training modules in an effort to acquire points needed to facilitate continued play.[21]

--- Insert Table 3 and Table 4 about here ---

Additional Analysis

In the sections that follow, we report results from additional analysis designed to address potential alternative explanations for our results, to examine spillover effects arising from the introduction of the slot machine and to provide further insights regarding the impact of introducing the slot machine on the behavior of those employees who chose to play.

Evaluation of Alternative Explanations

A possible alternative explanation as to why employees who played the slot machine increased the number of daily training modules completed and improved their quiz performance more than those who never played, is the actual cost of winning a prize using the slot machine is lower than the cost of winning a prize using the auction site. Thus, rather than the fun of simply playing the slot machine motivating employee behavior as theorized, those who played it had a higher instrumentality between completing daily training modules (and earning points on the quizzes) and obtaining the gift card rewards. To explore this possibility, we compare the 'cost' (i.e., points used) of winning gift card rewards on the auction site versus using the slot machine

[20]In total, 16 and 38 employees respectively in the control and treatment conditions completed extra training in both the pre and post slot machine introduction periods. However, because of missing data for the number of correctly answered extra training questions we only have a total of four observations for the change in *Extra%*.

[21]As a robustness check we used a reduced set of variables to create our matched sample of treatment and control groups. The reduced set of matching variables includes only: *Gender* (exact match), *Total Training* (matched to at least +/- 2 training modules completed), *Days Employed* by Company (matched to at least +/- 90 days), and *Days on Learning Platform* (matched to at least +/- 90 days). The proximity score approach yields 1,776 employees in the treatment group matched to 1,776 employees in the control group. Results (not tabulated) yield inferences nearly identical to those reported for our more restricted matched sample.

for all employees during the entire six months of our study. Over the entire six-months employees won gift cards totaling $195,730 using 6,796,710 points on the auction site resulting in an average cost of 34.7 points for each $1 of rewards. The average cost of winning $1 on the auction site is about 34.1 points in the three months before the slot machine was introduced and about 42.5 points in the three months after the slot machine was introduced. For the three months after the slot machine was introduced, employees won gift cards totaling $11,285 using 3,605,330 points which equates to an average cost 319.5 points for each $1 won on the slot machine. As such, the cost of winning a prize on the slot machine is almost 7-10 times that of the cost of winning a prize on the auction site. Thus, our results are unlikely to be attributable to the cost of winning a prize being lower on the slot machine than on the auction site.

Another possible alternative explanation for our results is that relative to the control group, prior to introduction of the slot machine employees in the treatment group did not have a sufficient quantity of points above the current bid price for the available prizes to have a non-zero chance of winning an auction.[22] If so, when the slot machine was introduced, employees in the treatment group would have been more likely than those in the control group to perceive that they now had at least a non-zero chance of winning a prize using only 10 points per spin. That is, treatment group employees would have been more likely than control group employees to perceive an increase in the instrumentality between completing daily training modules (and earning points on the quizzes) and obtaining the gift card rewards via the slot machine. If so, treatment group employees would have been more motivated to increase their daily training to

[22]The descriptive statistics reported in Tables 1 and 3 (Panel A) suggest this is unlikely since our approach to creating the matched sample resulted in treatment and control groups that do not differ significantly in the pre-slot machine period with respect to *Daily Training* or *Daily%*. As such, the points accumulated by employees to use in the online auctions in the treatment and control groups during the three-month pre-slot machine period would also have been very similar.

obtain points to play the slot machine. We do not have data on the average balance of points each employee had during the pre-slot machine period to directly test this possible alternative explanation of our findings. However, if it is valid, during the pre-slot machine period, compared to the control group, for employees in the treatment group we would expect to observe: (a) a smaller proportion of employees bidding on the auction site; (b) a smaller average number of bids in a month per employee; (c) a smaller average bid size in a month per employee; and (d) a smaller proportion of winning bids.[23]

In our matched samples, 17.4% of the 735 treatment group employees bid at least once compared to 14.4% of the 735 control group employees during the pre-slot machine period (chi-square=2.46, two-tailed p = 0.117). During the pre-slot machine period, the average number of bids each employee made in a month does not differ significantly between the treatment group and the control group (respectively, 0.10 vs 0.10, t = 0.82, two-tailed p = 0.414), nor does the average bid size per employee in a month (respectively 1,783 points vs 2,191 points, t = -1.26, two-tailed p = 0.216). Furthermore, during the pre-slot machine period, on average 18% of bids placed by an employee in a month won a reward in the treatment group compared to 22.8% in the control group, and this difference is not significant (t = -0.93, two-tailed p = 0.361). Collectively, this evidence is inconsistent with treatment group employees having less points available to win an auction during the pre-treatment period than control group employees.

[23]To calculate the average number of bids in a month for an employee, we total the number of bids by an employee in a month. We then average this figure for the three months pre- slot machine introduction and for the three months post slot machine introduction to obtain the average number of bids in a month pre-slot machine introduction and post-slot machine introduction. Similarly, to calculate the average bid size in a month for an employee, we total the number of points used for all bids in a month and divide it by the total number of bids in a month. We calculate this figure for each month, and then average this figure for the three months pre-slot machine introduction and for the three months post-slot machine introduction to obtain the average bid size in a month pre-slot machine introduction and post slot machine introduction.

We also examine auction site activity in the post slot machine period and compare the change in auction site activity between the pre and post slot machine period for the treatment and control groups. Post-slot machine period, 18.2% of the treatment group compared to 6.5% of the control group bid at least once (chi-square = 46.38, two-tailed $p < 0.001$). During the post-slot machine period, the average number of bids each employee makes in a month is larger for the treatment group than the control group (0.11 versus 0.04, $t = 5.17$, two-tailed $p < 0.001$), but there is no significant difference in the average bid size each employee makes in a month between the treatment group and the control group (975 points versus 1,490 points, $t = -1.36$, two-tailed $p = 0.184$). From the pre-slot machine period to the post-slot machine period, the average bid size per employee did not decrease for the control group (from 2,191 to 1,490, $t = 1.56$, two-tailed $p = 0.121$) but it decreased for the treatment group (from 1,783 to 975, $t = 3.28$, two-tailed $p = 0.001$), perhaps because the treatment group employees are choosing to use some of their points on the slot machine instead of the auction site. From the pre-slot machine period to the post-slot machine period, the treatment group maintained their frequency of their use of the auction site in terms of the number of bids in a month (from 0.10 to 0.11, $t = 0.32$, two-tailed $p = 0.747$) whereas the control group decreased their use (from 0.10 to 0.04, $t = 5.25$, two-tailed $p < 0.001$). These results indicate the control group employees decrease their frequency of the usage of the auction site while maintaining the average bid size whereas the treatment group employees maintain their frequency of the usage of the auction site while decreasing their average bid size.

Overall, there is no evidence suggesting that treatment group employees, relative to the control group employees, were participating less frequently, making bids of smaller sizes, and winning less frequently when they bid both during the pre-slot machine period and the post slot

machine period. As such, there is no indication that the treatment group employees have less points available to win a bid both prior to the slot machine introduction and after the slot machine introduction.

Although not strictly an alternative explanation for our results, it could be that the support for our predictions is heavily influenced by learning platform activity in the period immediately following introduction of the slot machine (i.e., 'novelty effects'). Accordingly, we evaluate whether support for our predictions persists beyond the first month the slot machine was available and thus its availability less 'novel'. To do so we construct new *Daily Training*, *Extra Training*, *Total Training*, and *Daily%* variables for the pre-slot machine introduction period and the post-slot machine introduction period, by dropping the first of the three months in each period. Removing the first month in the post-slot machine introduction period biases against our predictions to the extent that the novelty increases engagement on the learning platform in the first month after the slot machine is introduced. We perform the same regression analyses used to test our two hypotheses, controlling for the location of the employee as a random effect. Results (not tabulated) indicate that there are more positive changes in *Daily Training* (Model 1 coefficient 1.69, $t = 9.08$, one-tailed $p < 0.001$), *Extra Training* (Model 1 coefficient 0.24, $t = 2.00$, one-tailed $p = 0.023$), and *Total Training* (Model 1 coefficient 1.95, $t = 7.65$, one-tailed $p < 0.001$) in the treatment group as compared to the control group, consistent with H1. The change in *Daily%* (Model 1 coefficient 0.03, $t = 1.83$, one-tailed $p = 0.034$) and the change in *Total%* (Model 1 coefficient 0.03, $t = 1.86$, one-tailed $p = 0.031$) are more positive in the treatment group than the control group, supporting H2. These results provide persuasive evidence that 'novelty effects' are not driving our main results.

Learning Platform Access Measures

Next, we explore the extent to which the introduction of the slot machine generated spillover effects whereby employees who use it exhibited increased engagement with other features of the learning platform. Specifically, we examine the change (post-test period versus pre-test period) for *Report Card Access*, *Leaderboard Access*, and *Rewards Page Access* for the treatment and control groups. Greater use of the daily and extra training modules or playing the slot machine does not necessarily result in users accessing their report card, the leaderboard or the rewards page more often; accessing these additional features is a separate choice that is made *after* completing the daily training module. As such, user activity on these pages provides additional information about their level of engagement with the learning platform more generally. Although tangential to the primary focus of our study, evidence of spillover effects would suggest broader benefits of using slot machines to engage employees.

Descriptive results for our additional user activity measures based on the matched sample are reported in Table 5 (Panel A) and indicate that from the pre-test period to the post-test period, in the treatment group there are significant increases in *Report Card Access* (Post-test – Pre-test = 0.27, t = 5.96, two-tailed $p < 0.001$), *Leaderboard Access* (Post-test – Pre-test = 0.70, t = 6.35, two-tailed p = < 0.001) and *Rewards Page Access* (Post-test – Pre-test = 1.77, t = 14.69, two-tailed $p < 0.001$). For the control group, the changes are smaller or negative for each measure: *Report Card Access* (Post-test – Pre-test = 0.03, t = 3.14, two-tailed p = 0.002), *Leaderboard Access* (Post-test – Pre-test = 0.08, t = 1.68, two-tailed p = 0.093) and *Rewards Page Access* (Post-test – Pre-test = -0.24, t = -4.02, two-tailed $p < 0.001$). Results from random effects regression analysis comparing these changes in the treatment group to the control group are presented in Table 6. For each measure the coefficient for Treatment is positive and significant (all two-tailed p-values < 0.01), which is consistent with the slot machine inducing greater

overall engagement with the learning platform for employees who chose to use it in the three months after its introduction.

--- Insert Tables 5 and 6 about here ---

Treatment group behavior

We perform two additional analyses focused on the treatment group from our matched sample (n = 735). First, the theory underlying our two hypotheses leads us to expect that for employees who choose to play the slot machine, there will be a positive association between the number of times they play (*Spins*) and our measures of changes in training modules completed (*Daily Training, Extra Training, Total Training*). There should also be a positive association between *Spins* and changes in performance on the training modules (*Daily%* and *Total%*). In other words, employees who are motivated to play the slot machine more (i.e., greater number of spins) should also be more motivated to increase *Daily Training* and to improve *Daily%* to generate more points to enable more play. To examine whether these relations hold, we use regression analysis with the difference between the post-test measure and the pre-test measure for each variable as the dependent variable, and *Spins* as the independent variable, controlling for the total amount of slot machine winnings during the post-slot machine introduction period (*Winnings*) and the location of the employee as a random effect.[24] Results (not tabulated) indicate that the number of spins is associated with a positive change in *Daily Training* (coefficient = 0.04, t = 8.09, two-tailed $p < 0.001$), a positive change in *Total Training* (coefficient = 0.18, t = 7.33, two-tailed $p < 0.001$), a positive change in *Leaderboard Access*

[24]We control for the amount won from slot machine play so that we can evaluate the incremental effects of just playing the slot machine (*Spins*) on learning platform activity. *Winnings* is only significant in the regression models for *Daily Training* (coefficient = 0.04, t = 2.00, two-tailed p=0.046) and *Total Training* (coefficient = 0.23, t = 2.87, two-tailed p=0.004). We also ran alternative regression models excluding participants who won a gift card reward at least once from playing the slot machine. The resultant inferences are the same as reported for the main analysis except that *Spins* is no longer significantly associated with *Leaderboard Access* (p = 0.17).

(coefficient = 0.01, t = 2.16, two-tailed p = 0.05), and a positive change in *Rewards Page Access* (coefficient = 0.07, t = 16.51, two-tailed p < 0.001). The number of spins is not significantly associated with the change in *Extra Training*, change in *Report Card Access*, change in *Daily%*, or the change in *Total%* (all two-tailed p-values > 0.50). These results suggest that employees who played the slot machine game more often are also more likely to increase their daily training after the slot machine game was introduced as well as increase their access to leaderboard and the rewards page, which is consistent with the primary analyses that contrasted the treatment group with the control group.

Second, to further explore the possible novelty associated with introduction of the slot machine we examine the average number of spins per month for employees in the treatment group for each of the three months immediately following its introduction. Results not tabulated indicate that employees in the treatment group played the slot machine average of 20.8, 16.5, and 22.1 times in Months 4, 5, and 6 respectively. A regression, controlling for location as a random effect and the employee as a repeated measure nested within a location, indicates that the number of spins in a month is not significantly related to month (t = 0.72, two-tailed p = 0.473). This is inconsistent with a novelty effect, where if present we would expect to observe a large number of spins in the first month after the slot machine was introduced (Month 4), followed by a significant decrease in the number of spins in the subsequent months (Month 5 and Month 6).

V. CONCLUSIONS

Based on results from a unique data set we find that employees who used a virtual slot machine subsequent to its introduction, compared to employees who did not use it, were more likely to voluntarily increase their participation in online training modules and performed better on the training module quizzes. The simple causal link in our setting is that increased

participation of training modules and better quiz performance yielded the currency (points) need to fund play on the slot machines. We observe these results despite the fact that the slot machines yielded a very low percentage of winning spins (< 0.2%), were not 'rigged' to induce more play through 'near-misses', and did not offer the 'illusion of control' through techniques such as 'stop buttons' or choice in selecting the 'win' images. As such, the key motivating forces underlying the behavioral consequences of introducing the slot machine appear to be related to the enjoyment employees experienced simply from playing, rather than 'winning' the available rewards, and the gambler's fallacy that arises in games-of-chance (Griffiths 1992; Choliz 2010; Billeux et al. 2012; MacLaren et al. 2012).

Our findings contribute to a burgeoning literature on companies' use of novel approaches to developing management control system elements intended to make the work environment more enjoyable as a means of motivating desired behavior among employees. For example, research in this area has begun to examine the behavioral consequences of gamifying certain features of the task environment (e.g., Cardador et al. 2017). Other studies have focused on the effects of allowing employees to accumulate performance-based points to spend on merchandise or gift card awards made available by their employer or to make donations to a charity of their choice (Presslee et al. 2013; Incentive Federation Inc. 2016). However, to the best of our knowledge, ours is the first study to examine how allowing employees to play a slot machine with points earned under a performance-based incentive scheme can influence their behavior. Importantly, in our setting the learning task in the training modules is gamified using a variety of techniques such as leaderboards and report cards (Kumar and Raghavendran 2015). Thus, to the extent these gamification elements were already motivating employees to complete the training modules, our results suggest strong incremental effects for those who chose to play the slot

machine. A facet of our findings that may be particularly appealing to management control system designers is that the benefits of increased activity on the learning platform came at a relatively small cost given how few spins resulted in gift card wins. In fact, for the employee, the cost of winning a prize on the slot machine in terms of points is almost 7-10 times that of the cost of winning a prize on the auction site which was the default means through which employees could use earned points to access rewards.

Our findings are also relevant to the literature examining gambling behavior and the antecedents and consequences of slot machine use in particular. Research on gambling behavior is highly important given the severity of the dysfunctional consequences that can arise from gambling addictions (Choliz 2010; Linnet 2014). While our results do not speak to the potentially dark side of gambling they do offer the insight that use of games-of-chance such as a slot machine in a highly-controlled manner, with both the extent of slot machine play and time on the learning platform strictly limited, can yield benefits. As such, we believe our study contributes to the broader literature on gambling by showing its role in potentially motivating positive behaviors in carefully controlled settings.

Our study's limitations offer several opportunities for further research. First, we do not have access to data that would permit an evaluation of the relation between employee performance on the training module quizzes and outcomes related to their primary responsibilities (e.g., store sales, quality of work, customer satisfaction, etc.). As such, we are unable to assess whether the positive effects of the slot machine introduction on learning activities that we observe result in better performance at the employee or retail location level. Second, we cannot rule out the possibility that our results are unique to the specific game-of-chance used by the Company, i.e., the slot machine. That said, the particular features of the slot

machine employed in our setting (e.g., low percentage of winning spins, negligible percentage of near-miss spins) make it plausible to conclude that it was some combination of the enjoyment from playing the game, the gambler's fallacy, and the low cost of each 'spin' that induced employees to engage more in the learning platform activities to earn the currency necessary to participate. Accordingly, our theory would seem generalizable to other relatively low-cost games-of-chance (e.g., roulette, dice games, lotteries, etc.) where outcomes are random and thus subject to the gambler's fallacy, but that some individuals simply enjoy playing. Further, if play enjoyment is the primary theoretical mechanism underlying our findings (rather than the gambler's fallacy), introducing games of skill, such as video games that require a currency to play, but offer no tangible reward payouts may offer similar benefits. Future research would be helpful in testing these possibilities. Finally, novel control system features such as the slot machine introduction are likely to eventually lose their appeal and it could be that the motivational effects we document would not persist beyond a few months. However, we examine daily training activity for 90 consecutive days after the slot machine was introduced, which should have provided sufficient time for the motivational effects of the slot machine to dissipate, and yet our additional analysis provides no evidence of any such dissipation. Although management is likely aware of the diminishing effects over time of such innovations, future research could be helpful in identifying how quickly they occur.

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Table 1: Descriptive Results for Training Measures

Panel A: Matched sample based on ten matching criteria in the pre-test period (N = 1,470)[a]

	Treatment Group[b] (N = 735)			Control Group[a] (N = 735)		
	Daily Training[c]	Extra Training[d]	Total Training[e]	Daily Training[c]	Extra Training[d]	Total Training[e]
Pre-test[f] (Nov 2015 to Jan 2016)	2.59 (4.17)	0.06 (0.19)	2.64 (4.19)	2.55 (4.06)	0.06 (0.20)	2.60 (4.07)
Post-test[f] (Feb to Apr 2016)	4.16 (5.03)	0.46 (2.46)	4.62 (5.94)	2.47 (4.23)	0.14 (1.40)	2.61 (4.57)
Post-test – Pre-test[f]	1.57 (3.83)	0.41 (2.43)	1.98 (5.04)	-0.08 (2.09)	0.09 (1.41)	0.004 (2.74)

Panel B: Full sample (N = 6,005)

	Treatment Group (N = 3061)			Control Group (N = 2944)		
	Daily Training	Extra Training	Total Training	Daily Training	Extra Training	Total Training
Pre-test (Nov 2015 to Jan 2016)	9.70 (7.07)	2.17 (16.21)	11.88 (18.31)	4.73 (5.93)	0.71 (3.98)	5.44 (7.50)
Post-test (Feb to Apr 2016)	10.32 (7.15)	1.52 (9.56)	11.83 (12.64)	4.36 (6.06)	0.50 (4.44)	4.85 (7.91)
Post-test – Pre-test	0.61 (4.27)	-0.66 (12.81)	-0.04 (13.86)	-0.38 (3.00)	-0.21 (4.60)	-0.58 (5.88)

[a] We employed a proximity score procedure using ten matching variables: *Gender* (exact), *Daily Training* (matched to at least +/- 2 training modules completed), *Extra Training* (matched to at least +/- 1 training modules completed), *Daily Training Average Change%* (matched to at least +/- 0.20), *Days Employed* at the Company (matched to at least +/- 90 days), *Days on Platform* (matched to at least +/- 90 days), *Daily%* (matched to at least +/- 0.20), *Extra%* (matched to at least +/- 0.20), *Report Card Access* (matched to at least +/- 0.1), and *Rewards Page Access* (matched to at least +/- 1). This sample is used in Model 1 in Tables 2, 4, and 6. *Daily Training Average Change %* is the mean of the percentage change in *Daily Training* from Month 1 to Month 2 and the percentage change in *Daily Training* from Month 2 to Month 3. *Daily%* is the proportion of questions answered correctly in the daily training modules in a month during the pre-test period. *Extra%* is the proportion of questions answered correctly in the extra training modules in a month during the pre-test period. *Report Card Access* and *Rewards Page Access* are the number of times per month an employee accessed the report card page and the rewards page during the pre-test period.

Table 1 continued

[b] The slot machine game was introduced in Feb 2016. Employees can only use points to bid for gift card rewards in an auction from Nov 2015 to Jan 2016, but they can additionally use points to play a slot machine game to win similar gift card rewards from Feb to Apr 2016. The treatment group comprised employees who have played the slot machine game at least once during the period Feb to Apr 2016. The control group comprised employees who have not played the slot machine game at all during the period Feb to Apr 2016.

[c] *Daily Training* is the number of daily training modules completed by an employee in a month. Employees who log on to the Axonify learning platform can access a 5-minute daily training module that presents learning content and quizzes the employee on the content. Only one daily training module is provided per day. Employees are awarded points only for correctly answering questions on the learning content.

[d] *Extra Training* is the number of extra training modules completed by an employee in a month. After an employee completes the designated daily training module for the day, s/he can access extra training modules. Employees are not awarded points for completing extra training modules or answering questions on extra training modules.

[e] *Total Training*: Number of daily training modules in a month + Number of extra training modules in a month.

[f] The pre-test measure is the mean daily/extra/total training in a month over the 3-month period from Nov 2015 to Jan 2016. The post-test measure is the mean daily/extra/total training in a month over the 3-month period from Feb 2016 to Apr 2016. The (Post test – Pre test) measure is the difference between the pre-test measure and the post-post test measure.

Table 2: Random Effects Regressions of Training Measures

Panel A: Dependent Variable: Daily Training Post-test – Pre-test (n = 1,470)

	Coefficient (t, one-tailed p*)[b]
Intercept	-0.08 (-0.72, 0.470)
Treatment[a]	**1.65 (10.28, < 0.001*)**
Random effect	587 locations
AIC	7,490.0
BIC	7,494.4

Panel B: Dependent Variable: Extra Training Post-test – Pre-test (n = 1,470)

	Coefficient (t, one-tailed p*)[b]
Intercept	0.19 (1.85, 0.064)
Treatment[a]	**0.22 (2.50, 0.006*)**
Random effect	587 locations
AIC	5,994.8
BIC	6,003.5

Panel C: Random Effects Logistic Regression for Dependent Variable: Dummy Extra Training Pre-test (n = 1,470)

	Coefficient (F, one-tailed p*)[b]
Treatment[a]	(0.00, 1.00)
Random effect	587 locations
Residual Log Pseudo-Likelihood	7,689.8
Generalized Chi-Square/DF	1.00

Panel D: Random Effects Logistic Regression for Dependent Variable: Dummy Extra Training Post-test (n = 1,470)

	Coefficient (F, one-tailed p*)[b]
Treatment[a]	**76.75 (< 0.001*)**
Random effect	587 locations
Residual Log Pseudo-Likelihood	7,153.5
Generalized Chi-Square/DF	1.00

Table 2 continued

Panel E: Dependent Variable: Total Training Post-test – Pre-test

	Coefficient (t, one-tailed p*)[b]
Intercept	0.04 (0.23, 0.819)
Treatment[a]	**1.93 (9.04, < 0.001*)**
Random effect	587 locations
AIC	8,290.7
BIC	8,299.5

[a] The treatment group (coded as "1") comprised employees who have played the slot machine game at least once during the period Feb to Apr 2016. The control group (coded as "0") comprised employees who have not played the slot machine game at all during the period Feb to Apr 2016.

[b] The analysis is based on matched samples of the treatment and control groups, with ten matching variables: *Gender* (exact), *Daily Training* (matched to at least +/- 2 training modules completed), *Extra Training* (matched to at least +/- 1 training modules completed), *Daily Training Average Change%* (matched to at least +/- 0.20), *Days Employed* at the Company (matched to at least +/- 90 days), *Days on Platform* (matched to at least +/- 90 days), *Daily%* (matched to at least +/- 0.20), *Extra%* (matched to at least +/- 0.20), *Report Card Access* (matched to at least +/- 0.1), and *Rewards Page Access* (matched to at least +/- 1). *Daily Training Average Change %* is the mean of the percentage change in *Daily Training* from Month 1 to Month 2 and the percentage change in *Daily Training* from Month 2 to Month 3. *Daily%* is the proportion of questions answered correctly in the daily training modules in a month during the pre-test period. *Extra%* is the proportion of questions answered correctly in the extra training modules in a month during the pre-test period. *Report Card Access* and *Rewards Page Access* are the number of times per month an employee accessed the report card page and the rewards page during the pre-test period.

Table 3: Descriptive Results for Quiz Performance Measures

Panel A: Matched sample based on ten matching criteria in the pre-test period (N = 1,470)

	Treatment Group[a] (N = 735)			Control Group[a] (N = 735)		
	Daily%[b]	Extra%[c]	Total%[d]	Daily%[b]	Extra%[c]	Total%[d]
Pre-test[e] (Nov 2015 to Jan 2016)	0.71 (0.21) (n = 734)	0.86 (0.15) (n = 22)	0.71 (0.21) (n = 734)	0.71 (0.22)	0.76 (0.17) (n = 21)	0.71 (0.22)
Post-test[e] (Feb to Apr 2016)	0.81 (0.16) (n = 735)	0.85 (0.12) (n = 77)	0.81 (0.16) (n = 0.16)	0.78 (0.21)	0.87 (0.14) (n = 25)	0.78 (0.21)
Post-test – Pre-test[e]	0.10 (0.22) (n = 734)	-0.30 (0.14) (n = 2)	0.10 (0.22) (n = 734)	0.07 (0.26)	0.09 (0.16) (n = 2)	0.07 (0.26)

Panel B: Full sample (N = 6,005)

	Treatment Group[a] (N = 3,061)			Control Group[a] (N = 2,944)		
	Daily%[b]	Extra%[c]	Total%[d]	Daily%[b]	Extra%[c]	Total%[d]
Pre-test[e] (Nov 2015 to Jan 2016)	0.78 (0.17) (n = 3,060)	0.86 (0.14) (n = 551)	0.79 (0.16) (n = 3,060)	0.71 (0.20) (n = 2,943)	0.82 (0.16) (n = 333)	0.72 (0.20) (n = 2,943)
Post-test[e] (Feb to Apr 2016)	0.85 (0.13) (n = 3,061)	0.89 (0.12) (n = 419)	0.86 (0.13) (n = 3,061)	0.79 (0.20) (n = 2,944)	0.86 (0.14) (n = 213)	0.79 (0.20) (n = 2,944)
Post-test – Pre-test[e]	0.07 (0.14) (n = 3,060)	0.03 (0.14) (n = 238)	0.07 (0.14) (n = 3,060)	0.08 (0.23) (n = 2,943)	0.05 (0.15) (n = 116)	0.07 (0.22) (n = 2,943)

[a] See Table 1 for description of the treatment group versus the control group.

[b] Employees who completed a daily training module are asked quiz questions about the learning content in that module. *Daily%:* Number of correct answers to quiz questions in daily training modules/Number of total answers in daily training modules in a month.

[c] Employees who completed an extra training module are asked quiz questions about the learning content in that module. *Extra%*: Number of correct answers to quiz questions in extra training modules/Number of total answers in extra training modules in a month.

[d] *Total%*: Number of correct answers to quiz questions in daily and extra training modules in a month/Number of total answers to quiz questions in daily and extra training modules in a month.

[e] The pre-test measure is the mean number in a month over the 3-month period from Nov 2015 to Jan 2016. The post-test measure is the mean number in a month over the 3-month period from Feb 2016 to Apr 2016. The (Post-test – Pre-test) measure is the difference between the pre-test measure and the post- test measure.

Table 4: Random Effects Regressions of Quiz Performance Measures[a]

Dependent Variable: Daily% Post-test – Pre-test (n = 1,469)

	Coefficient (t, one-tailed p*)
Intercept	0.07 (8.08, < 0.001)
Treatment	**0.03 (2.24, 0.013*)**
Random effect	587 locations
AIC	-50.5
BIC	-41.8

[a]See Tables 2 and 3 for variable definitions.

Table 5: Descriptive Results for Other Learning Platform Related Measures

Panel A: Matched sample based on ten matching criteria in the pre-test period (N = 1,470)

	Treatment Group[a] (N = 735)			Control Group[a] (N = 735)		
	Report Card[b]	Leaderboard[c]	Rewards Page[d]	Report Card[b]	Leaderboard[c]	Rewards Page[d]
Pre-test[e] (Nov 2015 to Jan 2016)	0.02 (0.10)	0.44 (1.86)	1.06 (2.71)	0.02 (0.10)	0.46 (2.24)	0.96 (2.73)
Post-test[e] (Feb to Apr 2016)	0.29 (1.23)	1.14 (3.37)	2.83 (3.72)	0.05 (0.24)	0.54 (2.57)	0.72 (2.43)
Post test – Pre test[e]	0.27 (1.23)	0.70 (2.99)	1.77 (3.26)	0.03 (0.25)	0.08 (1.21)	-0.24 (1.61)

Panel B: Full sample (N = 6,005)

	Treatment Group[a] (N = 3,061)			Control Group[a] (N = 2,944)		
	Report Card[b]	Leaderboard[c]	Rewards Page[d]	Report Card[b]	Leaderboard[c]	Rewards Page[d]
Pre-test[e] (Nov 2015 to Jan 2016)	1.03 (3.45)	3.61 (6.57)	7.78 (9.51)	0.32 (2.04)	1.32 (4.01)	2.41 (5.12)
Post-test[e] (Feb to Apr 2016)	0.97 (3.09)	3.81 (6.98)	8.38 (7.99)	0.26 (1.75)	1.29 (4.12)	1.73 (4.10)
Post test – Pre test[e]	-0.05 (2.21)	0.20 (4.19)	0.60 (7.01)	-0.06 (1.91)	-0.03 (2.35)	-0.68 (3.22)

[a] See Table 1 for description of the treatment group versus the control group.

[b] *Report card*: Number of accesses to the report card page in a month. The report card displays the number of training modules completed by the employee, the average percentage of correct answers on quizzes about the learning content, and the trend of the cumulative number of correct/incorrect answers on quizzes about the learning content for the last 30 days.

[c] *Leaderboard*: Number of accesses to the leaderboard in a month. The leaderboard displays the ranking of the employee in his/her assigned team, and the ranking of the employee's team in the company. The rankings are based on points earned by the employee and by the employee's team in the last 30 days.

[d] *Rewards page*: Number of accesses to the rewards page in a month. The employee views available gift card rewards, and bids in an online auction or plays the online slot machine game to win gift cards on the rewards page.

[e] The pre-test measure is the mean number of accesses in a month to the report card/leaderboard/rewards page over the 3-month period from Nov 2015 to Jan 2016. The post-test measure is the mean number of accesses in a month to the report card/leaderboard/rewards page over the 3-month period from Feb 2016 to Apr 2016. The (Post-test – Pre-test) measure is the difference between the pre-test measure and the post- test measure.

Table 6: Random Effects Regressions of Other Learning Platform Measures[a]

Panel A: Dependent Variable: Report Card Post test – Pre test (n = 1,470)

	Coefficient (t, one-tailed p*)
Intercept	0.08 (1.70, 0.090)
Treatment	**0.19 (5.20, < 0.001*)**
Random effect	587 locations
AIC	3,568.8
BIC	3,577.6

Panel B: Dependent Variable: Leaderboard Post test – Pre test (n = 1,464)

	Coefficient (t, one-tailed p*)
Intercept	0.087 (0.99, 0.321)
Treatment	**0.593 (4.94, < 0.001*)**
Random effect	587 locations
AIC	6,602.8
BIC	6,611.5

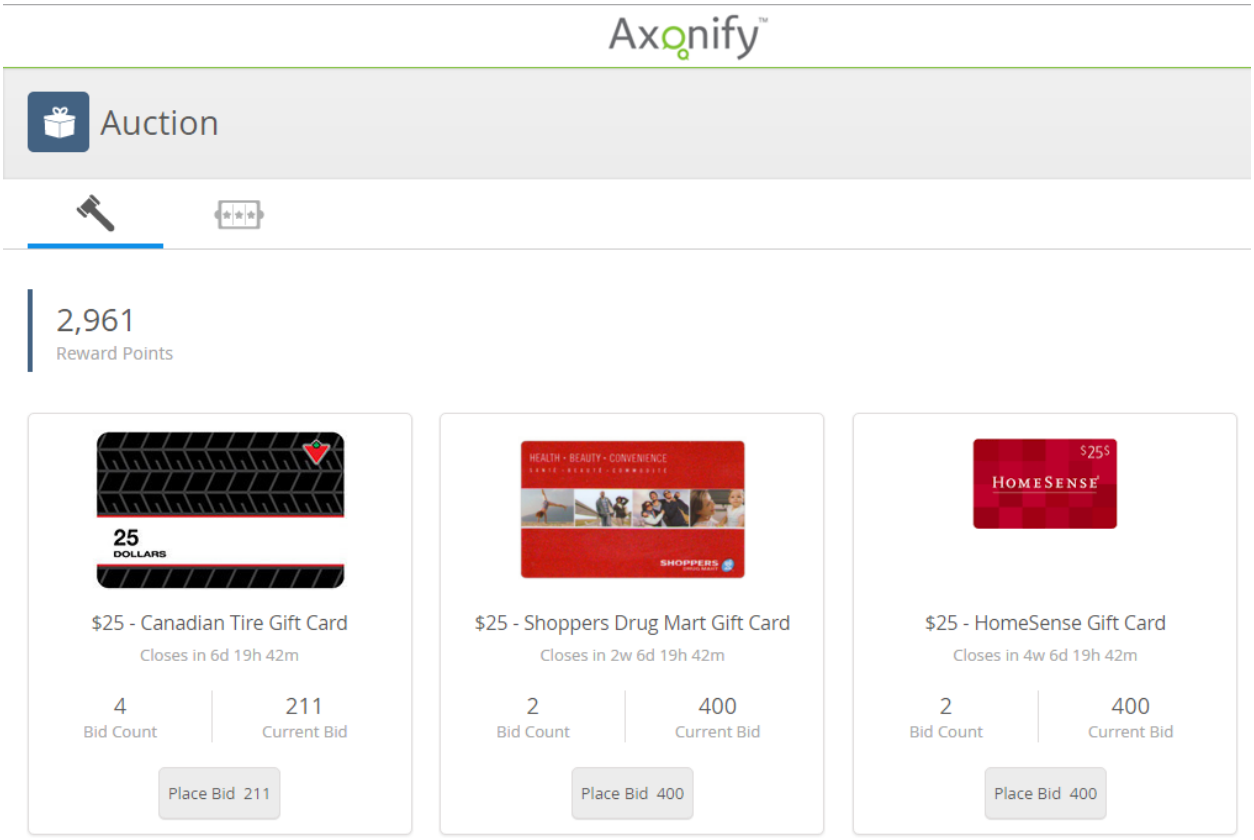
Panel C: Dependent Variable: Rewards Page Post test – Pre test (n = 1,470)

	Coefficient (t, one-tailed p*)
Intercept	-0.24 (-2.48, 0.013)
Treatment	**2.00 (14.87, < 0.001*)**
Random effect	587 locations
AIC	6,957.5
BIC	6,966.2

[a]See Tables 2 and 5 for variable definitions.

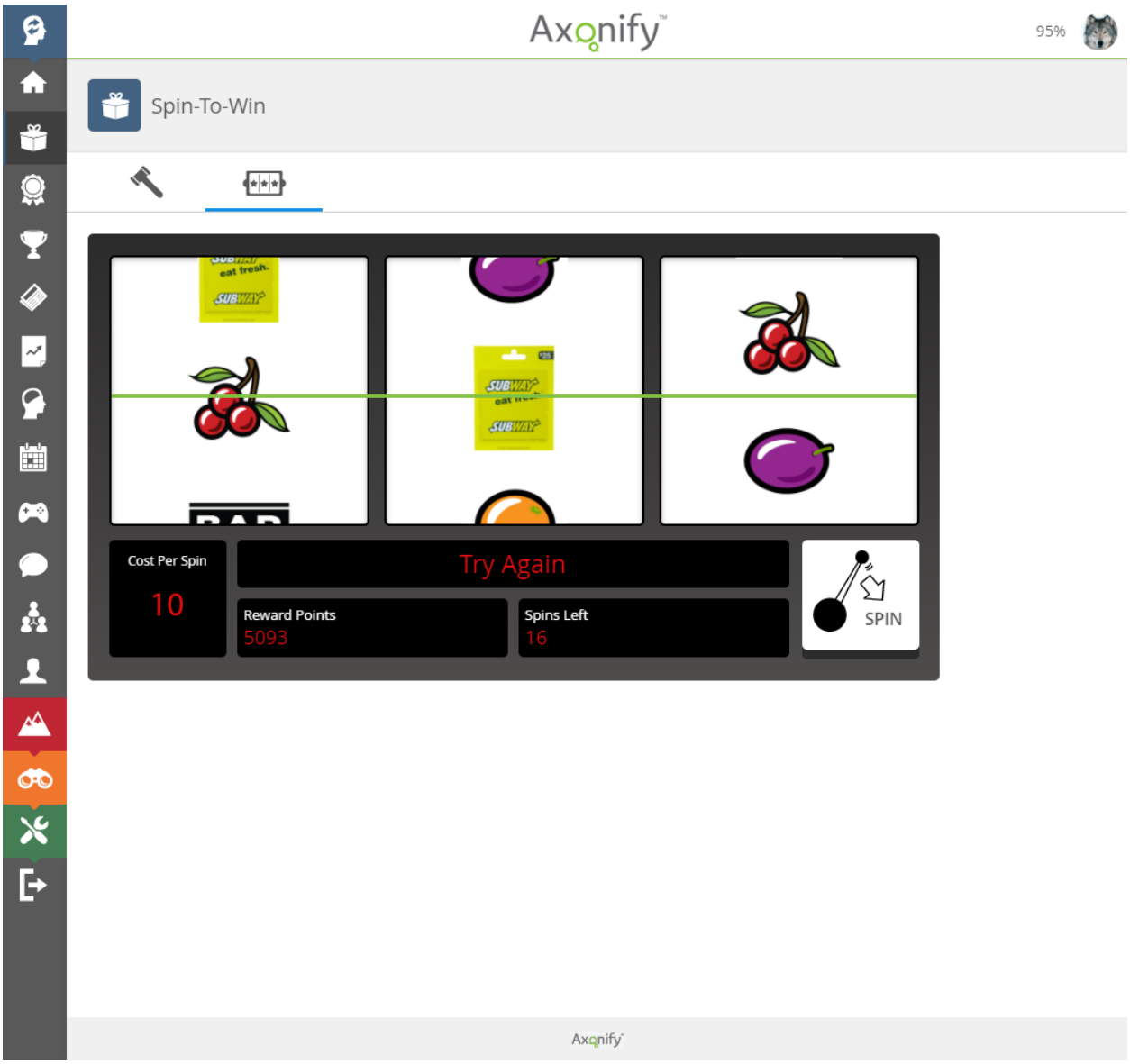
Appendix 1: Learning Platform Screenshots

Panel A: Example of a Rewards Page with Auction Feature



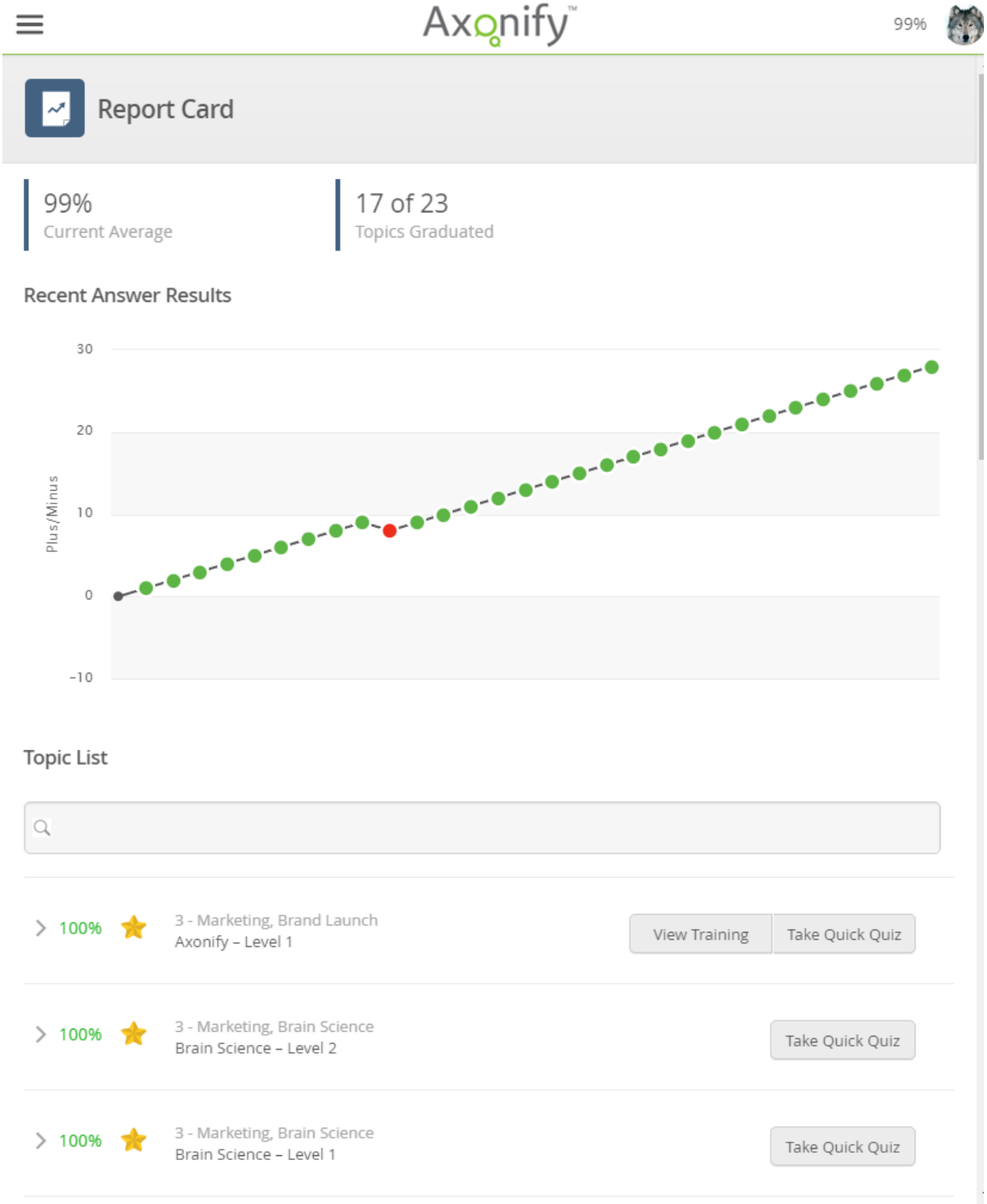
Appendix 1 continued

Panel B: Example of a Rewards Page with Slot Machine Feature



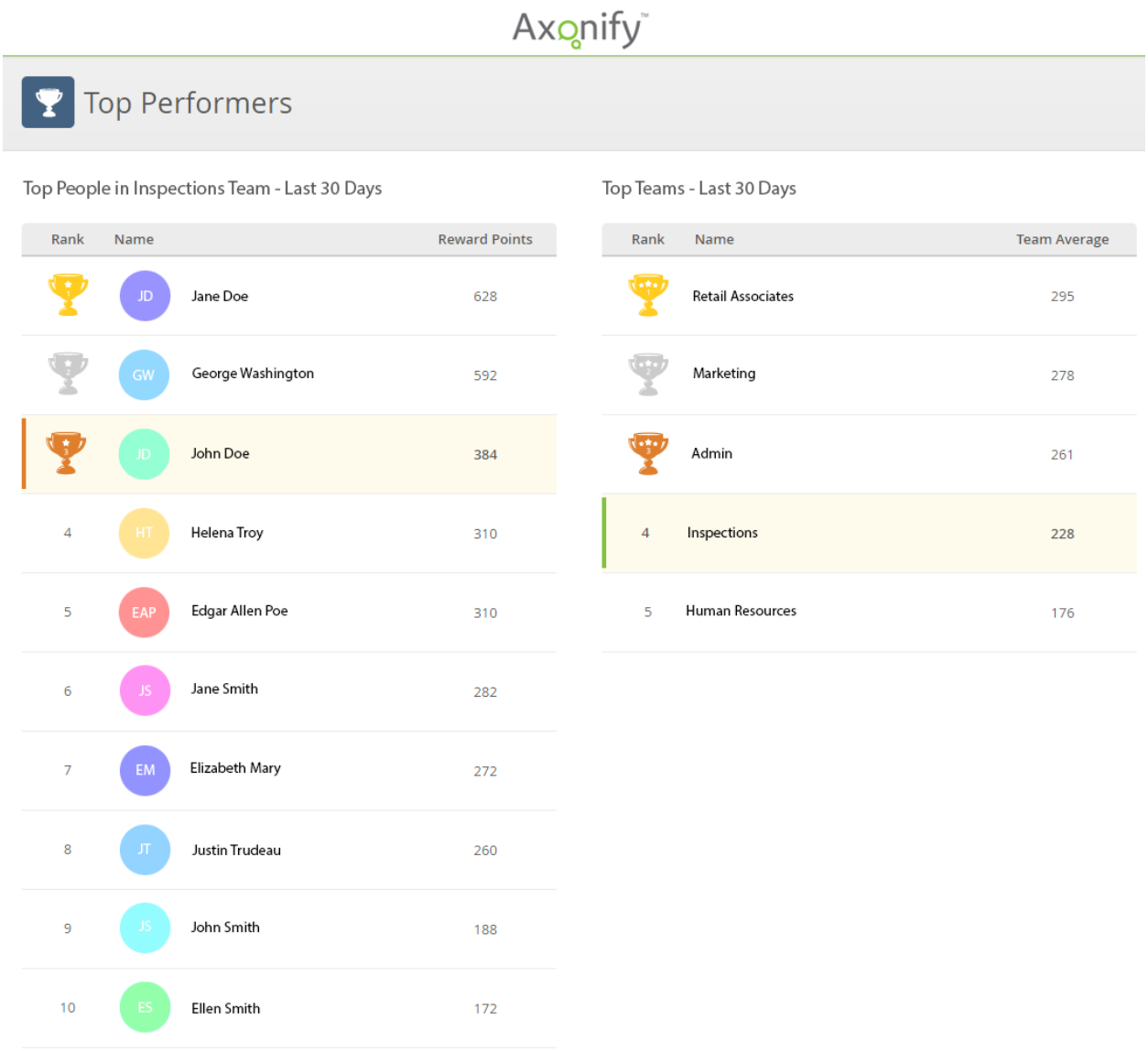
Appendix 1 continued

Panel C: Example of a Report Card Page



Appendix 1 continued

Panel D Example of a Leaderboard Page



Appendix 2: Proximity Score Approach to Create Matched Samples (Godfrey 2016)

In the proximity score approach, the first step involves identifying all possible employee matches from the larger treatment group to each employee in the smaller control group that meet the matching criteria. Thus, an employee from the treatment group may be matched to more than one employee from the control group in this first step, and subsequent steps described later will identify the best unique match in the final samples. If an employee from the control group cannot be matched to any employee from the treatment group in this first step, s/he is dropped. The first step stops once all employees from the control group have been considered. The second step is calculating a proximity score for all identified possible matches between an employee from the control group and an employee from the treatment group. The proximity score for a matched pair is calculated as the mean of the nine absolute differences in the standardized matching variable between the two employees in the matched pair. *Gender*, which is one of the ten matching variables, is excluded because an exact match is used for the *Gender* variable. A smaller proximity score indicates that the two employees in the matched pair are closer in terms of the values of the matching variables. The third step involves calculating the number of possible matches for each employee in the control group and the number of possible matches for each employee in the treatment group. An employee with a smaller number of possible matches is considered 'lonelier' and the matching process described in the fourth and fifth steps attempts to match 'lonelier' employees first. The fourth step involves ordering all possible matches first by the number of matches for an employee from the control group (with employees in the treatment group), then by the proximity score, and last by the number of matches for an employee from the treatment group (with employees in the control group). The fifth step starts with matching the employee from the control group with the lowest number of possible matches (with employees in

the treatment group) with the lowest proximity score to the employee from the treatment group with the lowest number of possible matches (with employees in the control group). Once a match is found, the two employees in the matched pair are moved to the matched sample list and removed from consideration for new matches. Step three is repeated with the recalculation of the number of possible matches for each remaining employee in the control group and the treatment group. Then, step four and step five are repeated. This process continues until all employees in the control group are matched. This matching process maximizes the number of unique matched pairs in the final matched samples while minimizing the differences on the matching variables between the matched pairs.