Do Online Training Work in Retail? Improving Store Execution Through Online Learning

(Authors' names blinded for peer review)

Conversion of retail store traffic into sales depends heavily on store execution. Although it is a critical piece of retail store execution, performance improvement of sales associates through training has received relatively scant research effort. In practice, training can be an expensive way to improve employees knowledge, especially in a retail environment with large number of employees, significant turnover, and relatively low-paid labor. In our study, we focus on a very specific type of training: online learning, which is distinguished by its low cost and easy accessibility. Available to date analysis of Massive Open Online Courses (MOOCs) indicates poor engagement of the participants and questionable outcomes. By disentangling the effects of self-selection and training we study the impact of online training in a retail setting. Our analysis shows that online training has a strong positive impact on employee sales performance. For example, a sales associate who engaged with three short online training modules increased her sales by approximately 5 percent. Those associates who took at least one module sold 46 percent more on average compared to associates who did not engage with the training at all. Surprisingly, however, brand-specific training does not significantly affect sales of the focal brand but instead it improves overall sales ability of all brands.

Key words: retail operations, online learning, business analytics, MOOC, empirical operations management

1. Introduction

Due to increasing sophistication of consumers, growing competition, and numerous new products launched daily, converting demand into sales in today's retail environment is not a trivial task. This conversion depends heavily on the retailer's store execution performance. When retailers fail on their store execution, customers walking into the store leave empty-handed or carrying fewer items than they otherwise might have. Several recent paper including Fisher et al. (2007), Perdikaki et al. (2012), Mani et al. (2015), Kesavan et al. (2014a), Anderson et al. (2006), van Donselaar et al. (2010), Lu et al. (2013), Allon et al. (2011), Kesavan et al. (2014b), collectively point out four key elements that can negatively affect this conversion including (1) the customer needs help and can't find a store associate, (2) the customer finds an associate but the associate is not knowledgeable (3) the product the customer wants to buy isn't in the store because of a stock-out and (4) the checkout line is too long.

While three of these levers have been studied quite extensively, the value of store associates' knowledge has been largely ignored. Indeed, there have been several studies aiming to find the appropriate number of store associates, plan inventory availability and optimize queuing at the checkout registers. But we know relatively little about ways to increase store associate knowledge and we do not know how much value, if any, this knowledge brings in terms of improved sales performance. Our paper addresses these questions by quantifying the benefit of increasing employees' knowledge of brands through online training. Simultaneously, we address another important but yet understudied question: is there any value in using online training modules (similar to MOOCs) which are quick to deploy and relatively cheap, yet early evidence on their benefits is, at best, limited.

A situation where a customer wants to buy a rain jacket for backpacking can help exemplify the underlying mechanism by which employee's knowledge can drive higher sales. The customer entering an outdoor clothing retailer will face products that can vary across several options, for example, weight, breathability, water repellency and whether a brand like GORE-TEX really outperform alternative fabrics with similar claims. A knowledgeable sales associate can explain all of the options clearly, separate facts from fiction, show the customer information on the web, etc. After this interaction the customer can feel more confident in making a choice and therefore decide to buy, rather than continue shopping. Employees' knowledge informs customers, enables customers to have confidence in their purchase decision and therefore buy. This can be particularly relevant when product choices are complex and must combine considerations of fashion, performance and price. For example, the recent TimeTrade.com[1] report on retail choices by consumers suggests

[1] http://www.timetrade.com/files/content_resource/Timetrade_Retail_Reality_Check_Market_Brief.pdf

that "93 percent of customers are likely to buy when helped by a knowledgeable associate" and "85 percent buy more when helped by a knowledgeable associate". The same report claims that "80 percent of retailers noted that sales increase by 25-50 percent when shoppers are assisted by knowledgeable retail associates".

Although a critical piece of retail store execution, knowledge improvement of sales associates has received relatively scant research attention and, to the best of our knowledge, there is no rigorous empirical evidence of the impact of training on sales associates' knowledge and ultimately on sales.

There is consensus among both practitioners and academics that, all else being equal, knowledgeable employees are better for the companies. Nevertheless, retailers spend very limited time training store associates, mostly offering on-the-job training/coaching. The key reason is costs: during training associates do not work, and hiring a trainer is not cheap. Given that retail associates' salaries are low (often at the minimum wage level in the USA) and the impact of training on sales is hard to measure, it is difficult for retailers to justify significant amount of training. Another reason is large turnover, up to 100 percent for many retailers[2]. Given a short expected tenure, it is often hard for retailers to justify training employees. Moreover, it has been documented that a large proportion of store associates are temporary labor, who receive hardly any training at all. On the other hand, brand manufacturer constantly come out with new products that have improved performance, use new materials and provide functionality that was previously unavailable. What is the best way employees can obtain or increase their knowledge about these new products?

Learning and performance has recently been the focus of a many interesting papers in operations management (see for example KC and Staats (2012), Staats and Gino (2012)). In our study we focus on a very specific type of training: online learning.

Online learning has received a lot of attention over recent years as a venue to provide affordable, scalable training in many different areas of knowledge (see Terwiesch and Ulrich (2014) for an interesting discussion of the impact of new technologies in higher education). The proliferation of massive open online course (MOOC) platforms is an indication of the excitement that this new training tool generates. According to The New York Times[3] 2012 was the year of the MOOC, as several providers associated with top universities emerged, including Coursera, Udacity, and edX.

Unfortunately, this excitement and proliferation has come with unclear evidence of the actual benefits MOOCs can provide. Recent studies from the University of Pennsylvania (Perna et al. (2013), Stein and Allione (2014), Christensen et al. (2014)) present doubts and concerns about how effective these online learning tools can be, and skeptics have questioned how effective these

[2] see for instance http://www.cnbc.com/id/102021496

[3] Pappano, Laura. "The Year of the MOOC". The New York Times. 2 November 2012.

tools really are[4]. Among key concerns is user engagement, because completion rates of free online courses are in low single-digits, and learning outcomes, because in some experiments online learners had difficulty earning passing grades.

It is clear that online learning is here to stay, but finding the right audience, the best way to deliver the message, and accurately measuring the impact are still challenges. In this paper, we explore the following question: Is online training a good tool to improve sales associates' knowledge and sales performance?

We partnered with two companies: Dillard's and Experticity. Dillard's is an upscale department store chain in the United States, with more than 250 stores in 29 states. Experticity works with more than 600 brands and more than 65,000 retail locations to help retail associates gain expertise in the products they sell through their web-based retail-training network. By assembling a unique data set which combines sales and training data, we are able to explore our research questions.

Our analysis consists of two main parts. In the first part, we explore whether the online training modules (OTM) have an impact on sales performance for a particular sales associate (SA). The question here is whether a SA, who presumably becomes more knowledgeable about different products through online learning, improves his or her sales performance after the training and by how much. To answer this question, we analyze sales performance at the employee-month level and we estimate how different employees performance varies over time and we measure the impact of the OTM on sales. We implement this analysis using a panel approach, where we control for each SAs personal characteristics and we find that SA's sales increase after engaging with the OTM. We find for example, an SA who engaged with three training modules increased his or her sales performance by approximately 5 percent.

In the second part of the analysis, we want to understand if SAs are different to begin with in terms of their commitment, abilities and engagement. To implement this analysis, we take advantage of the fact that Dillard's did not require SAs to take the OTM. We considered that voluntarily signing up to take an online training module as a sign of the employees level of commitment. We implement an ordinary least squares analysis, where we compare the difference in sales performance between groups of employees who engaged with the OTM and those who did not. Our results show that SAs who engaged with the OTM performed better than those who didn't, and this difference is substantial. SAs who took at least one module sold 46 percent more on average compared to SAs who did not engage with a module. Knowing which SAs are more engaged can be extremely valuable from a management perspective. Given the correlation between OTM taken and sales performance, it is possible to learn a particular SAs level of engagement and sales potential by observing the number of modules that he or she engaged with over time.

[4] Lewin, Tamar. After Setbacks, Online Courses Are Rethought. The New York Times. 10 December 2013.

To the best of our knowledge, this is the first piece of rigorous empirical evidence of the impact of online training on sales associates performance. The economic literature presents a number of interesting studies on the impact of training on personal income and employment (e.g. Ashenfelter and Card (1985); Richardson and van den Berg (2002); Abadie et al. (2002)). In this paper, we present evidence of the positive impact of online training on sales performance in a real business setting. We show that online training can be a powerful tool to address one of the main challenges of retail store execution: increasing sales associates' knowledge. Our results show that online training can be used not only to improve employees' performance but also to identify employees with higher sales potential and sales performance.

2. Empirical Setting

We partnered with two companies that together provided a unique data set to address our research questions. Dillard's an upscale department store chain in the United States, with more than 250 stores in 29 states. Experticity a Salt Lake City-based company that is hired by top brands to create online interactive training modules (OTM's) about their products. These OTM's are then made available to retail sales associates (SA's) who want to increase their knowledge of the products they are selling.

Experticity has developed thousands of OTM's for more than 400 different brands. These modules are structured in a way that a sales representative can learn about a particular brand or product by going through a series of sequential online modules. At the end of each individual module, the employee is offered the possibility to take a test that is presented as an *Edu-Game*[5]. If the test or a series of tests are passed, the employee can access a number of discounts associated with that particular brand. Figure 1 shows a selection of screens from training modules for GoPro video camera.

2.1. Data Description

Our analysis concerns the use of Experticity by Dillard's sales associates (SA) during July 2011 to June 2013. During this period, Dillard's SA were offered the option of taking OTMs. There was no punishment for not taking the training, and no reward except that the associates are paid on commission, and the training could increase their commissions earnings.

From Dillard's we received the time in and out of work each day for each SA, the total dollar sales and number of units sold aggregated by SA and calendar month[6], and the in-stock percentage

[5] Games that are designed to help people to learn about certain subjects, expand concepts, reinforce development, understand an historical event or culture, or assist them in learning a skill as they play.

[6] It is important to note that Dillard's sales system links each transaction to an individual sales associate. Dillard's tracks this information carefully because sales associates obtain a significant portion their compensation from commissions based on their monthly sales.

by store-week. From Experticity we received, for each module taken by an SA, the identification of the SA who took the module, the month when the module was taken, the total time the SA spent on the module, and whether or not the SA passed the test at the end of the module.

Table 1 presents a summary of statistics for the key variables considered in our analysis. We have a total of 54,046 SAs working at 285 different stores in our sample, where 51.8 percent of those SAs took at least one OTM during our period of analysis.

3. Online Training and Sales Performance

Experticity, the brands who hired them and the retailers whose SAs took the training, all hoped that the training would improve SA sales productivity, they did not know this for certain, and they certainly lacked any evidence that the training significantly improved performance. The knew the cost of training but not the benefits. Hence, their motivation for participating in this study.

At the simplest level the data shows that the SAs who took at least one training module sold on average almost 80 percent more per hour than the SAs who took no training. Clearly, this statistic does not imply training adds to sales productivity, since the SAs who engaged in training might differ in many ways from those who didn't. At a minimum, their willingness to engage in training suggests a higher level of motivation.

In addition, to measure the impact of training, we need a reference that controls for how the SAs who trained differ from those who didn't train. The reference we will use is the SA's themselves, since our data set includes sales performance of the SAs who trained before they did any training. We first estimate how different known factors, such as store in-stocks and number of hours worked, affect SA's sales performance. Once we establish this baseline, we move to analyze the impact of OTM's on SA's sales productivity, controlling for SA's inherent ability, as well as other causal factors as in-stock levels and SA work schedules.

3.1. Estimating Sales Performance

In what follows, we present the model with the variables that help us capture different factors that can affect the SAs' sales performance.

We first present a base model that includes covariates, other than training, known to affect SA's total monthly sales. These covariates are grouped into three categories. The first category includes the logarithm of total hours worked by SA i at a store j during month t ($hsWORKED_{ijt}$). Our unit of observation is at the monthly level because this is the most granular level of aggregation for which we received SA sales data from the retailer.

We also include the percentage of hours worked during weekly time slots that, according to the retailer, present different sales dynamics: Monday to Thursday before 2:00 p.m. ($hsMTB_{ijt}$), Monday to Thursday after 2:00 p.m. ($hsMTA_{ijt}$), Friday to Sunday before 2:00 p.m. ($hsFSB_{ijt}$)

and Friday to Sunday after 2:00 p.m. ($hsFSA_{ijt}$). These variables are represented in Equation 1 as $WORK\,HOURS_{ijt}$.

The second category of variables, includes, for SA–store–month, ijt, the logarithm of the average number of SAs who shared the floor in each of the four time blocks defined above for that store and month ($stMTB_{jt}$, $stMTA_{jt}$, $stFSB_{jt}$ and $stFSA_{jt}$) and the average in-stock at store j during month t. To obtain this in-stock metric, we average the in-stock level at the end of each week for all the products sold at the store, then we average the weeks in a month to obtain a monthly in-stock for each store ($InStock_{jt}$). These variable are summarized in Equation 1 as $STORE\,Var_{jt}$.

Finally, the last category includes variables that correspond to a particular SA but are not captured by the SA fixed effect since they change over time. The first variables is the logarithm of the cumulative number of months worked by an SA from the day he or she was hired through month t ($Tenure_{it}$). Note that we are considering the total number of months actually worked and not the number of month since the SA started working. The second variable indicates wether a particular month t is the last month that SA i will be working at the retailer. These variables are summarized in Equation 1 as $EMPLOYEE_{it}$.

In addition, our specification includes fixed effects F_{ij} that capture any time-invariant factors related to the SA and store, as well as time controls W_t (one dummy for each month) that capture any effects on the overall sales at a given point in time; ϵ_{ijt} is the error term.

We define the dependent variable in the regression as the logarithm of dollar sales of employee i at store j in month t ($SALES_{ijt}$) because there is substantial heterogeneity in the sales performance of the SAs. The linear regression model can be summarized as follows:

$$SALES_{ijt} = \alpha \cdot\ WORK\,HOURS_{ijt} + \beta \cdot\ STORE\,VAR_{jt} + \gamma \cdot\ EMPLOYEE_{it} + \\ + F_{ij} + W_t + \epsilon_{ijt} \qquad (1)$$

The results obtained from this model are presented in the first column of Table 2. As seen in the table, all the covariates included in the analysis are statistically significant and have the expected sign. For example, higher in-stock percentages are correlated with higher sales, and an increase in the number of hours worked by the SA is correlated with a sales increase.

3.2. Impact of Training on Sales

After establishing a model that captures the different factors that can affect the sales performance of a SA in a particular month we are ready to state our first hypothesis.

HYPOTHESIS 1. *Sales performance is positively correlated with Passing an OTM.*

To evaluate Hypothesis 1 we will enhance the model introduced in Section 3.1. SAs volunteer to take the OTM, and hence are not randomly assigned to training. Thus it's important to disentangle the impact of the training from the innate ability of the trainee. To do this, we include a fixed effect for each SA to control for his or her innate ability. This approach in essence compares an SAs sales performance before and after taking an OTM.

The regression model we evaluate can be summarized as follows:

$$SALES_{ijt} = \alpha \cdot WORK\ HOURS_{ijt} + \beta \cdot STORE\ VAR_{jt} + \gamma \cdot EMPLOYEE_{it} + \\ + \delta_1 \cdot PASSED_{it} + F_{ij} + W_t + \epsilon_{ijt} \qquad (2)$$

This model adds to the three groups of covariates described in Section 3.1 the variable of interest $PASSED_{it}$, equals to the total number of modules passed by a particular SA i during month t.

The results obtained from this model are presented in column 2 of Table 2, where the coefficient of interest is δ_1 (0.018). SAs who passed an online training module increased their monthly sales by 1.8 percent. This result supports Hypothesis 1.

3.3. Alternative Training Measures

The number of modules passed is one measure of an SAs training. In this section, we consider two alternative measures: the number of modules attempted and the time spend with the modules.

The number of modules attempted equals to the total number of modules that an SA interacted with during a particular month, regardless of whether a particular module was passed. It could be that for some of the modules an SA views during a month, he or she did not go through the whole content, did not attempt to take the test, or failed the test. We expect that there is still a positive effect of attempting modules on sales performance, but this effect should be smaller than when we look only at the passed modules. This leads to our second Hypothesis:

Hypothesis 2. *Sales performance is positively correlated with attempting an OTM, but this correlation is smaller than that of Passing an OTM.*

To implement this analysis, we replace Passed in Equation 2 with modules attempted ($ATTEMPT_{it}$). The results for this alternative measure are presented in the second column of Table 3. The coefficient on $ATTEMPT$ is significant and indicates that with each additional module attempted, an SAs sales increase by 1.5 percent. Thus Hypothesis 2 is validated.

Next, we study the impact of the time an SA spends working on training modules during a month. Our third hypothesis, consistent with our pervious result, is that there is a positive correlation between the time spent with the OTM's and an SA's sales performance.

HYPOTHESIS 3. *The time that an SA dedicates to the OTM's is positively correlated with his or hers sales performance.*

To implement this analysis, we replace Passed in Equation 2 with the logarithm of the total number of minutes spent with the training modules by SA i during month t ($MinModule_{it}$). The results of this analysis are presented in the last column of Table 3 and show a positive and significant effect on sales of the number of minutes spent with the training modules. The interpretation of this coefficient is that, for the average SA who engaged in training, doubling the number of minutes spent on training increases his or her monthly sales by 2.1 percent.

The fact that all three metrics show a similar impact is not surprising given that 85 percent of all modules attempted are passed and the metrics are highly correlated. The correlation between $PASSED$ and $ATTEMPT$ is 0.96 and between $PASSED$ and $MinModule$ is 0.73.

3.4. Brand-Level Analysis

So far in this section, we have presented evidence that OTM can be an effective way to improve the sales performance of those SAs who decide to take the training modules. We found that SA's total sales increase when SA's training increases. Now we want to further understand if this sales improvement can be linked to the specific content of the module or whether sales are impacted an aggregate level. In other words, is there an exclusive impact of a particular brand module on that brand's sales? This bring is to hour next hypothesis.

HYPOTHESIS 4. *Passing an OTM is positively correlated with sales performance of the brand that the OTM is about and this brand level effect is larger than the aggregate effect on sales.*

To study this hypothesis, we increase the level of granularity of our analysis. Our data incudes the employees' monthly total dollars sold by brand as well as the OTM taken by brand for each employee and month. We replicate our analysis at the brand level following a similar approach to the one presented in Section 3.1 estimating the following model:

$$SALES_{ijbt} = \alpha \cdot WORK\,HOURS_{ijt} + \beta \cdot STORE\,VAR_{jbt} + \gamma \cdot EMPLOYEE_{it} + \\ + \rho_1 \cdot PASSED_{ibt} + B_{ijb} + W_t + \epsilon_{ijbt} \qquad (3)$$

The specification includes fixed effects that capture any time-invariant factors related to each SA, store, and brand combination (B_{ijb}) and the dependent variable in the regression is the logarithm of the dollar sales of SA i at store j of brand b on month t ($SALES_{ijbt}$). Similar to our previous analysis, we include time controls W_t and the same covariates as before. Note that for this analysis we include the average in-stock at store j for brand b during month t.

We consider the same three metrics for SAs' engagement with the modules of brand b: modules passed, modules attempted, and time spent with the modules. The results of these analyses are presented in Table 4.

The results are consistent with what we observed at the aggregate sales level. Training on a particular brand has a positive and significant effect on an SA's sales of that brand. The magnitude of the results at the brand level are similar to the one obtained at the aggregate level suggesting that the sales lift obtained from the training is not larger for the OTM's brand. Hence, Hypotesis 4 is not supported.

This result can be surprising at first glace since in a more traditional learning setting the "student" is supposed to get significantly better at the subject being taught compared to others tangential benefits derived from the specific lecture. However, our setting is not "traditional" in that sense. The OTMs are based on a particular brand and can include content about a product or set of products. When SAs train, they learn more, but not exclusively, about the OTM's brand and the products that the OTM is about. At the same time the SAs acquire new information on the category as a whole, learn about similarities and differences between products of multiple brands in the category and, more broadly, gain confidence on what to recommend to a customer. The fact that the effect was not significantly larger at the brand level did not came as a big surprise to the Experticity team since, knowing the content of the OTM and the feedback they receive from SA, they have hypothesized this as a possibility.

4. A Closer Look at the OTM Impact on Sales

In this section, we explore two factors that can affect our results: 1) the extent to which the impact of training is nonlinear and 2) whether an SAs tenure affects the impact of training.

4.1. Marginal Benefit of OTM on Sales

It is reasonable to expect that the marginal benefit of each additional module is not uniform. We can think of two competing hypothesis. The first hypothesis supports the idea that there is a decreasing benefit from each additional OTM taken by an SA. The SA gets tired, loses focus and interest with each additional OTM or the content of the additional module is less novel and for this reason the benefit the SA obtains from each subsequent OTM is smaller than the one obtained from the previous one. This argument leads to Hypothesis 5.

Hypothesis 5. *The impact of each additional OTM has a marginally decreasing impact on an SA's sales performance.*

An alternative argument is that a certain "critical mass" of modules is needed to have an impact. For example, SAs can help customers chose between several alternative brands if they are trained on all of the brands. This leads to Hypothesis 5.

HYPOTHESIS 6. *The impact of each additional OTM has a marginally increasing impact on an SA's sales performance.*

To explore this issue we evaluate two different models. We first add a quadratic term ($PASSED_{it}^2$) to model 2.

$$SALES_{ijt} = \alpha \cdot WORK\,HOURS_{ijt} + \beta \cdot STORE\,VAR_{jt} + \gamma \cdot EMPLOYEE_{it} + \\ + \rho_1 \cdot PASSED_{it} + \rho_2 \cdot PASSED_{it}^2 + F_{ij} + W_t + \epsilon_{ijbt} \quad (4)$$

The results of this analysis is presented in the second column of Table 5 where it can be seen that there is a negative and statistically significant effect on the quadratic term. This result supports Hypothesis 4.

The specification presented on equation 4 forces a quadratic functional form on our results. To explore the nonlinearity of training without imposing a functional form, we add to model 2 a series of dummy variables that indicates wether SA i at store j on month t took one module ($PASSED[1]$), two modules ($PASSED[2]$), and so on, up to eight modules or more ($PASSED[8+]$), to obtain model 5:

$$SALES_{ijt} = \alpha \cdot WORK\,HOURS_{ijt} + \beta \cdot STORE\,VAR_{jt} + \gamma \cdot EMPLOYEE_{it} + \\ + \rho_1 \cdot PASSED[1]_{it} + \rho_2 \cdot PASSED[2]_{it} + ... + \rho_8 \cdot PASSED[8+]_{it} + F_{ij} + W_t + \epsilon_{ijbt} \quad (5)$$

The results of this analysis is presented in the third column of Table 5. It is interesting to observe the coefficients on the dummy variables show a marginally decreasing benefit, supporting Hypothesis 4.

Another interesting observation is that when we include nonlinearity in our model, the average impact of taking a small number of modules increases dramatically. This analsyis shows that taking three OTMs has an impact of 10.2 percent on sales performance. This is 4.8 percent more than the result obtained for three OTMs from our first model (shown in the first column of Table 5). This is logical, since the 4.8 percent increase is an average over early modules having a relatively large impact, and later modules having a declining impact. Figure 2 compares graphically the results of the two non-linear analysis where the marginally decreasing benefits of the OTM becomes evident.

4.2. Tenure's Impact on Training

Next we explore how the benefit of training is affected by the tenure of an SA. We can think of two competing hypotheses. Greater tenure could result in a higher training benefit because more experienced SAs know how to take advantage of the new knowledge. Alternatively, SAs with low tenure have a lower base of knowledge and therefore the information in the OTMs is highly valuable to them. These two perspectives lead to the following two completing hypotheses.

HYPOTHESIS 7. *The impact of each additional OTM is positively correlated with the tenure of the SA.*

HYPOTHESIS 8. *The impact of each additional OTM is negatively correlated with the tenure of the SA.*

To investigate these hypotheses, we first add to model 2 a variable that interacts $PASSED$ and $TENURE$.

$$SALES_{ijt} = \alpha \cdot WORK\,HOURS_{ijt} + \beta \cdot STORE\,VAR_{jt} + \gamma \cdot EMPLOYEE_{it} + \\ + \rho_1 \cdot PASSED_{it} + \rho_2 \cdot PASSED_{it} * TENURE_{it} + F_{ij} + W_t + \epsilon_{ijbt} \quad (6)$$

The result of this analysis is presented in the second column of Table 6 where it can be seen that there is a negative and statistically significant effect for the interaction term. This result supports Hypothesis 7 since it shows a negative impact of the interaction between OTM passed and tenure. This means that as the tenure of the SA increases, the benefit from training decreases. Figure 3 graphically depicts this interaction and indicates that after 18 months, the impact of tenure on training converges to a uniform level.

To further validate this observation we estimate the following model:

$$SALES_{ijt} = \alpha \cdot WORK\,HOURS_{ijt} + \beta \cdot STORE\,VAR_{jt} + \gamma \cdot EMPLOYEE_{it} + \\ + \rho_1 \cdot PASSED_{it} + \rho_2 \cdot PAS_{it}\,TEN_{[1-6]it} + \rho_3 \cdot PAS_{it}\,TEN_{[7-12]it} + \\ \rho_4 \cdot PAS_{it}\,TEN_{[13-18]it} + \rho_5 \cdot PAS_{it}\,TEN_{[More]it} + F_{ij} + W_t + \epsilon_{ijbt} \quad (7)$$

where the new variables of interest are the interactions between the number of modules passed and a dummy variable that indicates whether the SA has a tenure between 1 and 6 month, 7 and 12 month, 13 and 18 month or more. This specification allows us to validate the observation we made from Figure 3. The results in column 3 of Table 6 show that that there is a statistically significant impact of the interaction of the modules passed and SA tenure between 1 and 6 month and between 7 and 12 month. However, after that the analysis show that the benefit from training stabilizes at a baseline level of 1.2 percent per module. Hence, the retailer obtains less return when a SA takes too many OTM.

5. Are SAs that train different from those that don't?

In this section, we want to compare the sales performance of those SAs who never took a module with those who took at least one module with a refined approach. With this comparison, we will learn if the two groups differ in terms of sales performance after controlling for all the relevant

factors, and, should there be a difference, how relevant it is. It is reasonable to assume that those SAs who engage with the training are more motivated and perform better than those SAs who don't engage with the modules. Is there a performance difference between the two groups? and if there is a difference, how big is it?

To perform this analysis, we take an approach similar to the one presented in Section 3. However, this time we will not include the SA fixed effect since what we want to observe is the difference across groups of employees.

In the previous sections we have presented evidence of a significant and economically meaningful impact of training modules on SAs' that choose to train. Our analysis at the employee-level shows that an employee's sales performance improves with each additional training module. We now turn to the question of self-selection. It is very possible that those SAs who engage with the OTM are different from those who do not. Table 7 shows some summary statistics for the main descriptive variables for the group of SA that train versus the SA that do not train[7]. From this simple comparison it is possible to observe that those SA that train have a higher hourly sales rate, tend to work more hours per week and have more tenure. There are many different reasons why one group of SAs might decide not to engage with the modules. It is possible they don't care or they feel they already know all there is to know about certain products; they might think the modules are not useful, are hard to understand or they have short-term focus.

5.1. Training and High Performance

When an SA decides to engage with the training modules there is a self-selection process. The self-selection is even more pronounced in our setup since the employees were presented with the opportunity to take the training modules, although there was neither enforcement for them to do so nor any explicit reward for those who decided to engage with the training. In this portion of the analysis, self-selection is not an econometric problem. In fact, this process of self selection is exactly what we are trying to understand.

As before, the dependent variable in the regression is the logarithm of dollar sales of employee i at store j in month t ($SALES_{ijt}$). In addition, we include all the relevant covariates in the regression: (i) factors related to the hours worked by an employee during a month (denoted $WORK\ HOURS_{ijt}$); (ii) variables related to the specific store where the SA worked ($STOREVar_{jt}$); and (iii) other factors that are specific to each SA ($EMPLOYEE_{it}$).

For this analysis, our variable of interest is given by $TOOKMODULE_i$; this dummy variable indicates whether a particular SA i ever engaged with the OTM. The regression model can be summarized as follows:

[7] For confidentiality reasons the dollars per hour figures were scaled.

$$SALES_{ijt} = \alpha \cdot WORK\,HOURS_{ijt} + \beta \cdot STORE\,VAR_{jt} + \gamma \cdot EMPLOYEE_{it} + \\ + \delta_1 \cdot TOOKMODULE_i + S_j + W_t + \epsilon_{ijt} \quad (8)$$

Our specification includes fixed effects S_j that capture any time-invariant factors related to store j, as well as time controls W_t; ϵ_{ijt} is the error term. The first column of Table 8 shows the results of this analysis, where we can observe that those SAs who engage with the training modules perform better than those who don't. The difference between the two groups is not only statistically significant but also economically meaningful since those SAs who engage with the modules sell on average 46 percent more than those who never engage. Our variable of interest for this analysis ($TOOKMODULE_i$) is not capturing the level of engagement of the SA since it is 0 if the SA never took a module and 1 if he or she took one or more. To complement this analysis, we also explore if the total number of modules ever taken by an SA is indicative of his or her sales potential.

For this analysis, we use a model similar to the one described in Equation 8, but instead of including a dummy variable to indicate whether the SA ever took a module, we include the count of total modules ever taken by the SA as the variable of interest ($MAXMODULE_i$). This means that for an SA who took a total of 5 modules during the period of analysis, the variable $MAXMODULE_i$ will have a value of 5. The results of this analysis are presented in the second column of Table 8. We observe that the performance gap between groups of takers and non-takers increases by approximately 6.1 percent for every additional module taken by that SA group.

5.2. Pre-Training Performance

The analysis presented in Section 5.1 doesn't allow us to separate the effect of the OTM and the innate ability of the employee. This analysis shows that the group of SAs who take the OTM perform significantly better than those who don't. We now know that taking an OTM is positively correlated with SA sales at both an aggregate and at a brand level (see Sections 3). It is still unclear if, or to what extent, the difference between the SAs who take modules and the SAs who do not is driven by what they learned in the module and how much is driven by a difference in the innate ability of those SAs who self-select into the training. The analysis presented here captures simultaneously the performance driven by the intrinsic ability of those SAs who took modules and the benefit that the SAs obtain once they take modules.

To estimate the difference in ability between the two groups (trainers and non-trainers), we replicate the analysis we did in Section 5.1 for a subsample of the observations. In this new analysis, we exclude all the observations, for the SAs that took a module, starting from the month the SA

took his or her first module. By excluding this observation, we remove the impact that the training modules have on the performance of SAs who will eventually take modules.

The results of this new analysis are presented in the last column of Table 8, where we observe that those SAs who eventually engaged with the modules sold on average 20 percent more than those SAs who never took a module. It is important to emphasize that in this analysis, no SAs in either group had taken a training module and for this reason the difference captured reflects the difference in ability between the two groups prior to engaging with the OTM.

6. Store Execution Implications

The results presented have relevant implications for retailers and SAs who want to improve their sales performance. We show evidence that training—in particular online training—can have a positive impact on SAs' sales performance. In this section, we discuss different implications from the results we present, both from the SA and the retailer perspective.

6.1. When Is Training Advantageous for a Sales Associate?

Figure 4 shows the total number of modules taken by employees who engaged with the modules. We can see that less than 30 percent of those employees took more than three modules during the period of analysis. The fact that for most SAs, the level of engagement is not persistent over time indicates that many of the SAs are not perceiving the benefit that training can bring to their monthly income. We investigate here when it is worth an SA's time to engage in unpaid training in order to increase their sales and the commissions paid on those sales.

Consider an SA who works 140 hours a month (the median number of hours worked in our sample). Would she be financially better off if, instead of selling for 140 hours, she sells for 139 hours and spends one hour in training, which, considering the average time per module, implies a total of three OTM? From our most conservative analysis, we estimate that taking three modules is correlated with an approximately 6 percent increase in her monthly sales. Its easy to see that if she is paid completely on commission, she is clearly better off, since the 6 percent gain in sales from training means that in 139 hours she sells the same as she would have in $139(1.06) = 143.43$.

More generally, whether training pays for an SA depends on her commission percentages, hourly wage rate and monthly sales level. Figure 5 shows training indifference curves for various commission percentages, assuming an SA would only justify an hour of training if the incremental income she obtains is above her hourly wage. On the horizontal axis, we consider different hourly wages, and on the vertical axis, we consider different levels of monthly dollar sales that count towards the SAs commission. For a given commission and hourly wage, the SA will be better off engaging in one hour of training if her monthly sales are above the indifference curve. This analysis shows that in a wide range of situations the benefit from training for an hour in a month are positive

for the SA. For example, a SA with an hourly compensation of 18 dollars and a 6 percent sales commission would see a positive return on taking three OTM if her average monthly sales before are above 5,000 dollars.

The analysis presented is conservative since 1) we only consider incremental commission in the current month, even though the benefits of training persist into the future and 2) as we shown in section 4 the benefit from the modules is not linear. This means that the benefit for a relatively small number of modules can be larger than the one we considered. In addition, we have also shown that while the benefit exists for SAs with high and low tenure, the benefit for SA recently hired is significantly larger.

It seems that the financial benefit of training has not been fully appreciated by most SAs. More than 48 percent of the SAs never engaged in the training, and a portion of those who do engage do not show high levels of persistency. This phenomenon can be driven by the fact that it is nontrivial for an SA to link her training effort with her sales performance during a month. The natural fluctuation of an SA's sales can mask the impact of training. It is important to keep in mind that in our analysis, we are able to control for a number of factors that change from month to month (e.g., number of hours worked, in-stock levels, tenure, etc.) that also affect sales performance. This monthly variation can make it very hard for an SA to disentangle the different effects to see the benefits of the training.

In addition to the benefits that the SA can receive from the training, there are those benefits that can have an impact on the retailer. We will explore these opportunities in the following subsections.

6.2. Smart Scheduling

In our analysis, we have presented evidence that there is a positive correlation between the number of online training modules taken and the sales performance of the sales associates. The sales increase we estimated assumes that all the different factors affecting the SAs' sales performance remain constant. However, with the information provided by our analysis, managers can adjust their decisions regarding how to schedule different employees. A retailer that has information about SAs level of involvement with the OTM can benefit from an impact on sales that can go beyond the benefit captured in the regression analysis.

From the summary statistics presented on Table 7 we can see, at an aggregate level, that trainers have an average sales rate 55 percent larger than the non- trainers—this difference in sales performance was validated by our analysis in Section 5. However, while trainers work only 16 percent more hours than non-trainers every month it seems to be the case that the retailer is not able to identify those high performance SA and assign more hours to them. Even more, the retailer could prioritize those SAs and assign them to the most attractive work schedules during the week; if we

compare the percentage of hours worked on the different times of the week between the two groups (Table 7) we do not observe a significant variation across groups.

To address this issue let's consider, as an example, the situation of an SA who took three OTM. Our results indicate that passing three OTMs is correlated with approximately 6 percent increase in the SAs monthly sales. This 6 percent increase could be obtained with respect to a sales baseline for that SA given by a number of factors, including the number of hours worked during the month, the days of the week that the SA worked, and her specific shifts. If a retailer reassigns the SA to a new, more attractive, schedule, the benefit from the OTM will still be 6 percent from the SA perspective, but the impact for the retailer could be larger. Table 9 presents calculations that exemplify this point.

If we take Monday through Thursday morning as the base for sales volume at the retailer, using the coefficient from Table 2, we estimate the sales volume in the other three time blocks for the week. This is captured in the first column of Table 9. Now we consider an SA who took three modules and currently works during the mornings—57 percent of the time during Monday through Thursdays morning and 43 percent of the time Friday through Sunday. Column 4 shows the standard sales she will generate before taking the modules, and Column 6 shows her sales after the impact of the OTM. This shows a 6 percent sales increase due to the OTM. Now, if the SA is rescheduled to the more attractive afternoon shifts, her new base sales will change. This new base is shown on column 5 of Table 9 and the new sales impacted by the OTM can be seen in the last column of the table. From the SA's perspective the OTM had a 6 percent impact on her sales (a higher dollar value than before). However, from the retailer's point of view by rescheduling the SA, the net benefit is 8.6 percent[8]more than the original sales for that SA, before she took the OTM and was rescheduled.

This analysis suggests that in addition to the direct benefit from the OTM, the retailer can leverage that benefit by adjusting the schedule for those SAs who engaged with the training.

6.3. Hiring and Retention

In Section 6.1, we argue and present evidence that suggests it is hard for SAs to identify the benefit they can obtain from the OTM. In a similar way, the retailer can have a hard time identifying SAs who are more engaged and have higher potential. On a regular basis, it is not easy for a retailer to separate the SAs' individual performance from a number of different factors, such as the proportion of hours worked during certain shifts, the number of SAs who are working simultaneously, the

[8] The standard unit sales increment with the regular schedule was 6.36, and with the suggested schedule the increment is now 9.16, that corresponds to a 43.6 percent increase. Hence, from the retailer's perspective, by adjusting the SA's schedule, the base increase of 6 percent is now 8.6 percent (6*(1+0.43)=8.6).

in-stock level at the store, etc. Our results can be very helpful to tease out all the different factors and learn who are the high-performance SAs.

The results we present in Table 8 show evidence supporting the argument that those employees who engaged with the OTM perform better than those who don't. And the difference between the two groups is not only statistically significant but economically large. These results indicate that a retailer could learn who are the most attractive SAs by looking at the engagement of the SAs with the OTM.

In our setting, the retailer tracks a vast amount of information that is linked directly to the SAs' sales. However, our results indicate that retailers, without tracking information at such granular level a retailer could simply look at OTM engagement to identify stars SA. Once a retailer identifies those SAs who perform better thorough their engagement with the OTM, it can start to make decisions that take into account this information.

These decisions can include making additional efforts to retain certain SAs, ensuring those SAs are assigned the best hours of the day or giving them the opportunity to work more hours, motivating SAs who have engaged with the OTM to engage more, and inviting those SAs who have not engaged to explore the opportunity.

As we mentioned before, one common challenge faced by retailers is a large employee rotation. The fact that the OTMs have a larger impact on the new SA can be leveraged by the retailer. If the new SAs' obtain a better income earlier on in their tenure process, by taking regularly OTM, it is more likely that they will stay at the company and on the flip side the retailer will improve its retention rates.

The engagement level with the OTM can become a powerful managerial tool to improve sales though better management of sales associates. Collecting and analyzing this information is not only simple but easily scalable, and these two features can be extremely valuable for retailers that have a large sales force.

7. Conclusion

We have presented evidence of a significant and economically meaningful effect of online training on sales associate performance and its implications for retail managers. To the best of our knowledge this is the first rigorous empirical evidence of the impact of online training on sales associates' knowledge and ultimately on sales.

In the first part of the paper, we show that more knowledge, acquired through online learning, improves sales performance for a sales associates. In particular, we show that, in our most conservative estimation, a sales associate who engaged with three training modules increased his or her sales performance by approximately 5 percent. This result was further refined by showing

how the number of OTMs has a non linear effect on SA's sales and how the benefit derived from the training is larger for SAs with short tenure. In addition, we further present evidence that the benefit from the OTMs are not constrained to the brand or product showcased in the module. In fact, we observed that the impact of the OTM are statistically the same at the aggregate and at the brand level.

In the second part of the analysis, we show evidence that SAs are different to begin with. This difference can be driven by different levels of commitment, abilities or engagement. Our results show that SAs who took at least one module sold 46 percent more on average compared to SAs who did not engage with a module. Knowing which SAs are more engaged can be extremely valuable from a management perspective. Given the correlation between OTM taken and sales performance, it is possible to learn a particular SAs level of engagement and sales potential by observing the number of modules that he or she engaged with over time.

Our analysis supports the consensus among both practitioners and academics that knowledgeable employees are better for the companies but at the same time quantifies this effect and presents a number of managerial implications derived from our analysis. By focusing on a very specific type of training, online learning, we present an opportunity for retailers to deal with the challenges they face when trying to improve employees knowledge mainly cost and scalability. We show that online training can be a powerful tool to address one of the main challenges of retail store execution: increasing sales associates' knowledge. Our results show that online training can be used not only to improve employees' performance but also to identify employees with higher sales potential and sales performance.

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Appendix. Tables and Figures

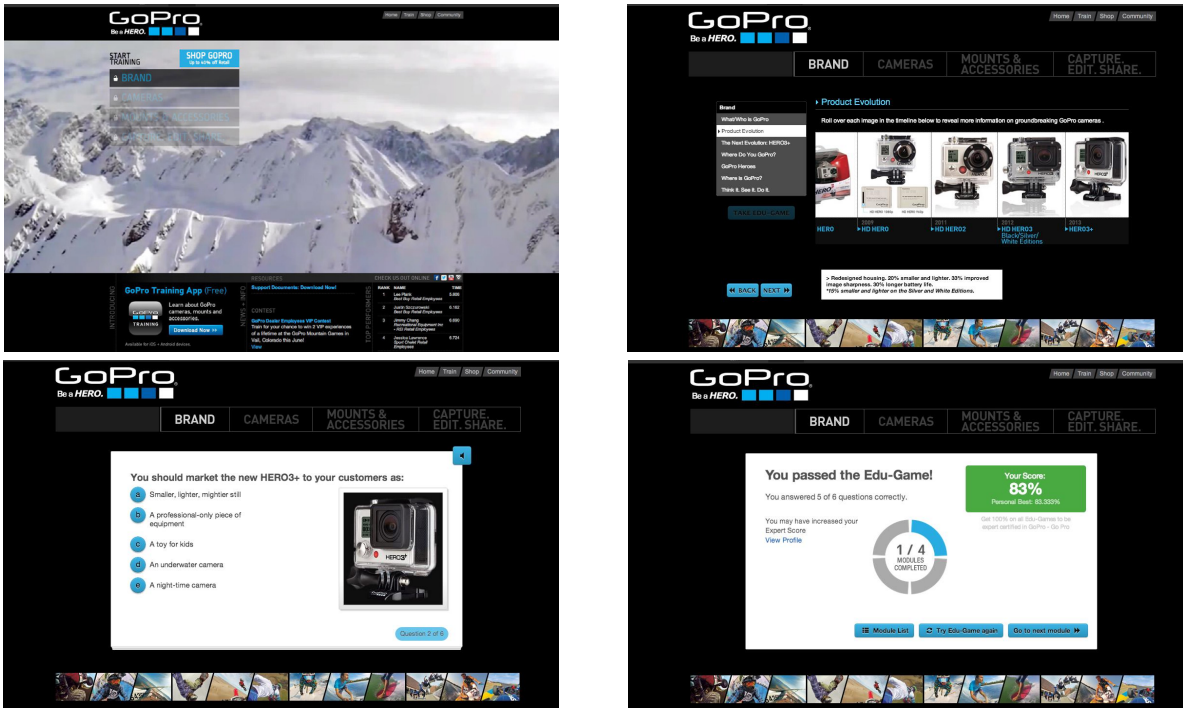

Figure 1 **Screens Shoots Selection from Sample Training Module**

Table 1 **Summary Statistics for Main Variables**

Variable	Units	Mean	St.Dev	Median
InStock	%	0.71	0.06	0.72
hsWorked	hours	131.36	38.29	137.80
hsMTA	%	0.35	0.07	0.35
hsFSM	%	0.16	0.04	0.16
hsFSA	%	0.28	0.08	0.27
stMTM	# empl.	57.57	26.19	51.71
stMTA	# empl.	65.22	29.21	58.53
stFSM	# empl.	63.39	28.26	57.57
stFSA	# empl.	66.86	29.56	60.80
Tenure	month	31.59	58.02	8.00
Last Month	dummy	0.20	0.23	0.14
Passed	count.	1.21	2.18	1.00
Attempted	count.	1.42	2.63	1.00
MinModule	minutes	37.84	96.21	8.08

Total number of Observations = 54,046

Table 2 Impact of Passed Modules on Sales

	(1)	(2)
InStock	0.529***	0.535***
	(0.107)	(0.107)
hsWorked	1.027***	1.025***
	(0.010)	(0.010)
hs_{MTA}	0.303***	0.303***
	(0.051)	(0.051)
hs_{FSM}	0.146*	0.147*
	(0.061)	(0.061)
hs_{FSA}	0.825***	0.825***
	(0.047)	(0.047)
st_{MTM}	0.016	0.014
	(0.086)	(0.086)
st_{MTA}	-0.472***	-0.474***
	(0.095)	(0.095)
st_{FSM}	-0.282*	-0.285*
	(0.119)	(0.119)
st_{FSA}	0.269*	0.275*
	(0.118)	(0.118)
Tenure	0.131***	0.129***
	(0.009)	(0.009)
LastMonth	-0.037**	-0.038**
	(0.012)	(0.012)
Passed		0.018***
		(0.002)
Covariates	All	All
Time Controls	Month-Year	Month-Year
Other Controls	Employee-Store	Employee-Store
Observations	413,569	413,569
Groups	54,046	54,046

Robust Standard Errors in Parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 Impact of Passed and Attempted Modules & Time with Modules on Sales

	(1)	(2)	(3)
Passed	0.018***		
	(0.002)		
Attempts		0.015***	
		(0.002)	
MinModule			0.021***
			(0.002)
Covariates	All	All	All
Time Controls	Month-Year	Month-Year	Month-Year
Other Controls	Employee-Store	Employee-Store	Employee-Store
Observations	413,569	413,569	413,569
Groups	54,046	54,046	54,046

Robust Standard Errors in Parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4 Impact of Passed and Attempted Modules & Time with Modules on Brand Sales

	(1)	(2)	(3)
Passed	0.016***		
	(0.003)		
Attempts		0.014***	
		(0.002)	
MinModule			0.014***
			(0.001)
Covariates	All	All	All
Time Controls	Month-Year	Month-Year	Month-Year
Other Controls	Employee-Brand-Store	Employee-Brand-Store	Employee-Brand-Store
Observations	1,892,029	1,892,029	1,892,029
Groups	391,102	391,102	391,102

Robust Standard Errors in Parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5 Non-Linear Impact of Incremental Number of Modules

	(1)	(2)	(3)
Passed	0.018***	0.027***	
	(0.002)	(0.003)	
Passed sq.		-0.001***	
		(0.000)	
Passed_1			0.056***
			(0.007)
Passed_2			0.068***
			(0.010)
Passed_3			0.102***
			(0.014)
Passed_4			0.112***
			(0.021)
Passed_5			0.096***
			(0.027)
Passed_6			0.133***
			(0.032)
Passed_7			0.156***
			(0.040)
$\text{Passed}_{8\,or\,more}$			0.152***
			(0.029)
Covariates	All	All	All
Time Controls	Month-Year	Month-Year	Month-Year
Other Controls	Employee-Store	Employee-Store	Employee-Store
Observations	413,569	413,569	413,569
Groups	54,046	54,046	54,046

Robust Standard Errors in Parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

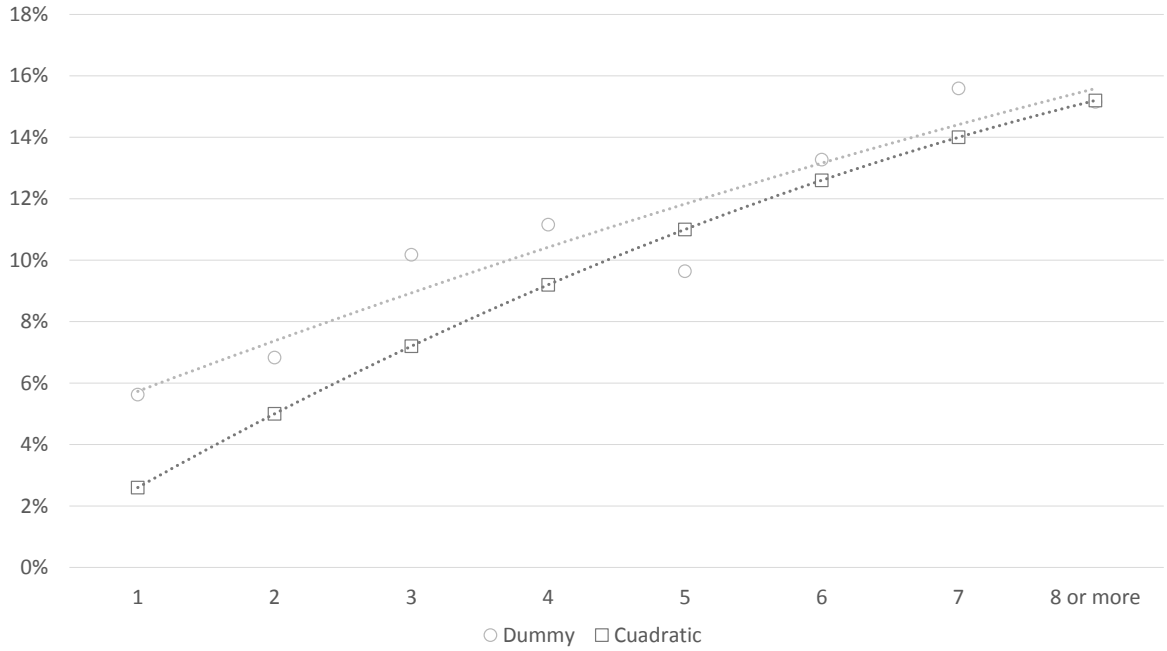

Figure 2 Non-Linear Impact of Incremental Number of Modules

Table 6 Tenure Mitigation of Module Impact

	(1)	(2)	(3)
Passed	0.018***	0.039***	0.012***
	(0.002)	(0.004)	(0.002)
Passed*Tenure		-0.006***	
		(0.001)	
Passed*[1-6]Tenure			0.023***
			(0.004)
Passed*[7-12]Tenure			0.013**
			(0.005)
Passed*[12-18]Tenure			-0.001
			(0.006)
Covariates	All	All	All
Time Controls	Month-Year	Month-Year	Month-Year
Other Controls	Employee-Store	Employee-Store	Employee-Store
Observations	413,569	413,569	413,569
Groups	54,046	54,046	54,046

Robust Standard Errors in Parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

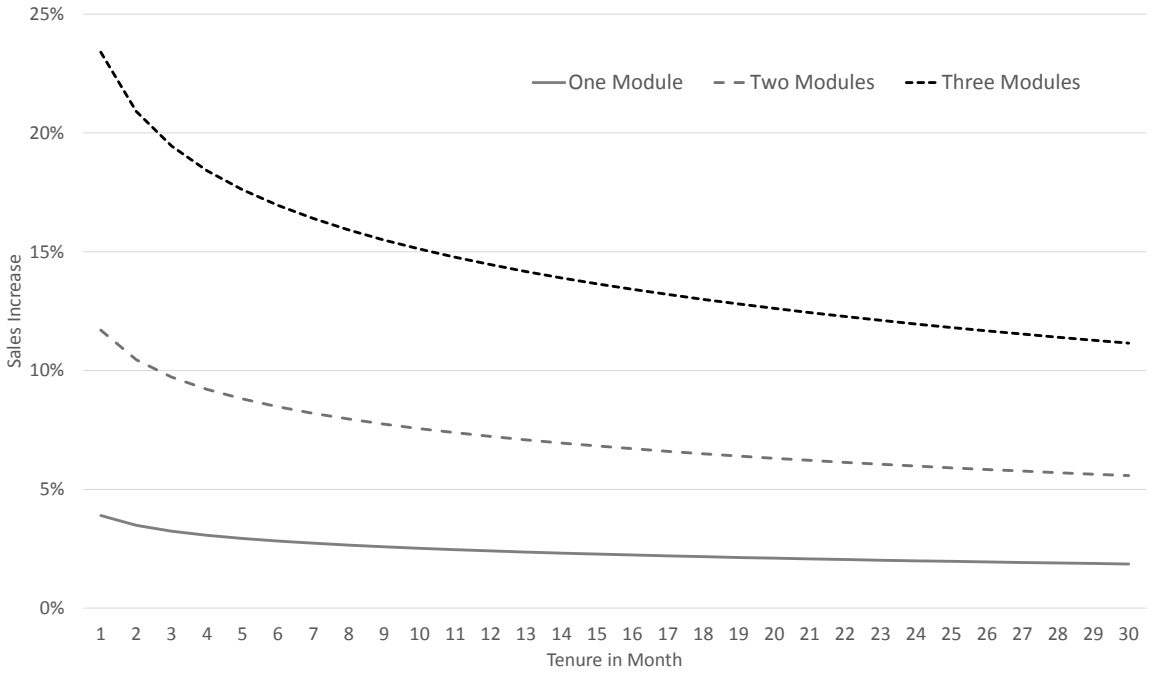

Figure 3 Module Impact Mitigated by Employee Tenure

Table 7 Comparison between Trainers vs Non-Trainers

Variable	Units	Trainers	Non-Trainers
hsWorked	hours	156.0	134.0
		(34.6)	(42.3)
dollars per hs	$/hours	63.4	40.7
		(183.0)	(215.8)
hsMTM	%	34.7	27.9
		(14.9)	(15.6)
hsMTA	%	53.4	47.0
		(15.5)	(17.7)
hsFSM	%	26.0	21.8
		(8.0)	(8.6)
hsFSA	%	41.9	37.3
		(11.7)	(13.5)
Tenure	month	63.2	29.0
		(75.7)	(51.9)

Standard Errors in Parentheses

We obtained these summary statistics by averaging the variables at the monthly level and then we obtain the overall averages.

Table 8 Taking Training Modules as a Performance Signal

	(1)	(2)	(3)
$TOOKMODULE$	0.459^{***}		
	(0.028)		
$MAXMODULE$		0.061^{***}	
		(0.004)	
$TOOKMODULE$			0.206^{***}
			(0.025)
Covariates	All	All	All
Time Controls	Month-Year	Month-Year	Month-Year
Other Controls	Store	Store	Store
Observations	413,569	413,569	277,815

Robust Standard Errors in Parentheses
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

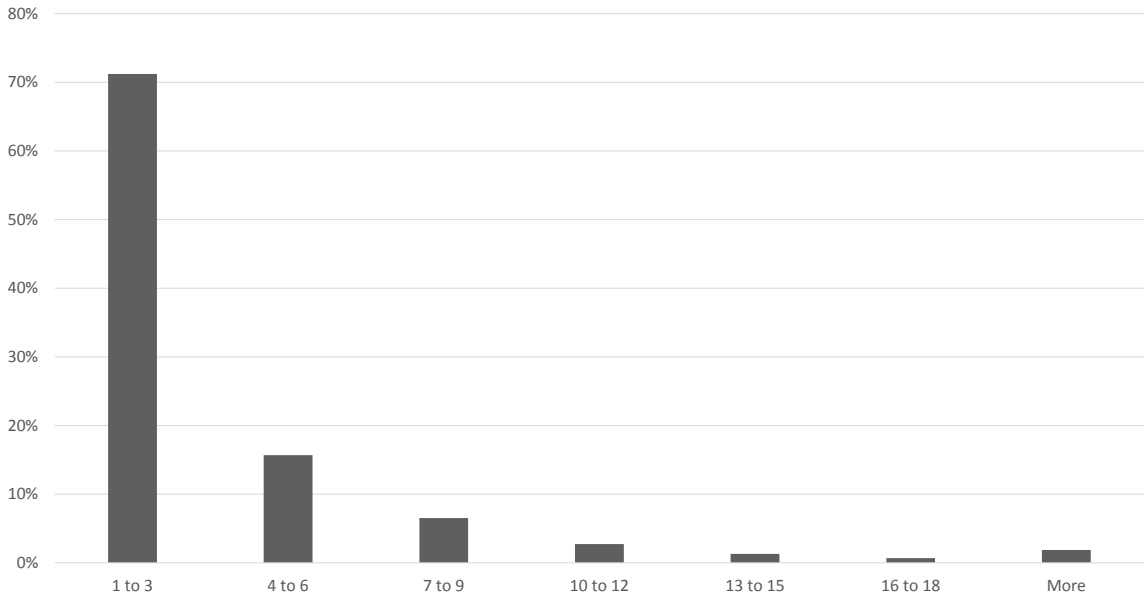

Figure 4 Number of Modules Pass by Employee

Table 9 Smart Scheduling Example

	Store	Employee Schedule		Employee Sales Base		OTM Impact	
	Base Sales	Standard	Suggested	Standard	Suggested	Standard	Suggested
M-Th Morning	100.0	57%	0%	57.1	0.0	60.6	0.0
M-Th Afternoon	130.3	0%	57%	0.0	74.5	0.0	78.9
F-Sun Morning	114.7	43%	0%	49.2	0.0	52.1	0.0
F-Sun Afternoon	182.5	0%	43%	0.0	78.2	0.0	82.9
TOTAL	527.5	100%		106.3	152.7	112.7	161.8

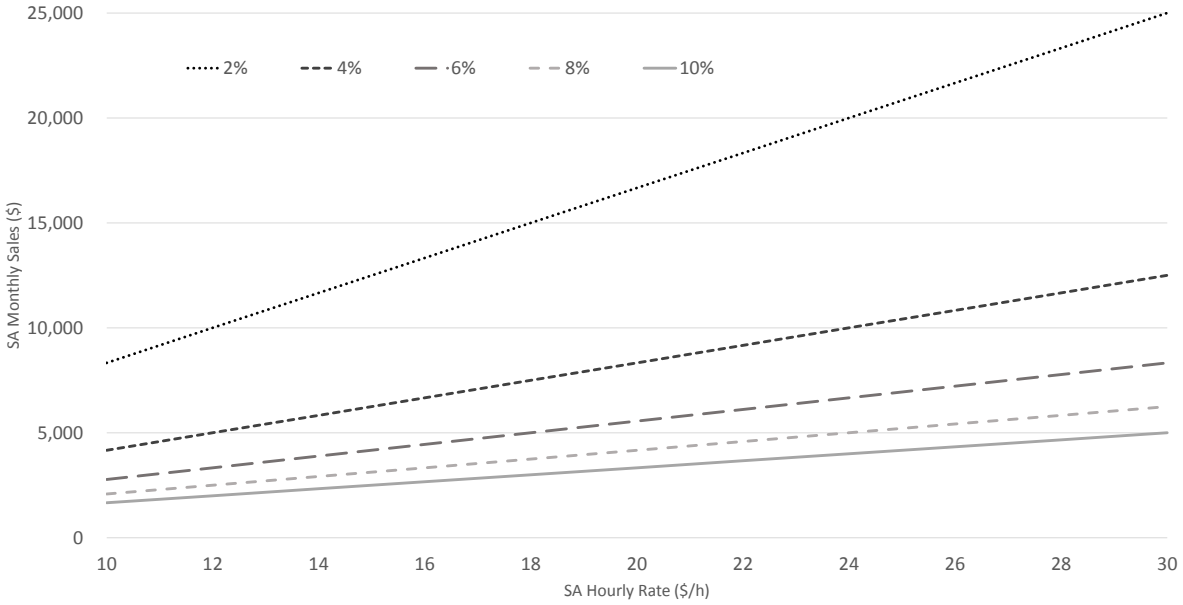

Figure 5 Hourly Rate and Monthly Sales that Justify Training