A Cyclical Model of Motivational Constructs in Web-Based Courses

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The current study investigates antecedents and outcomes of motivation to learn across nine Web-based courses. The results supported a cyclical model of motivational processes across courses in a training curriculum. Trainees’ course expectations had a positive effect on motivation to learn, motivation to learn had a positive effect on trainee reactions, and trainee reactions predicted expectations for subsequent courses in the curriculum. In addition, motivation to learn decreased across the nine courses such that the average level of motivation was 0.30 points lower (on a 5-point scale) for the ninth than the first course. Agreeableness predicted changes in

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motivation to learn such that motivation decreased at a steeper rate for highly agreeable trainees across courses. The results suggest that there is a dynamic interplay among motivational constructs over time, and motivation should be examined from a systems perspective to understand carryover effects across training courses.

Motivation to learn is a central construct in training theory and research. Motivation to learn reflects a trainee’s desire to learn the content of the training program (Noe, 1986). Theory suggests, and research has confirmed, that individual differences and situational factors predict motivation to learn, and motivation to learn predicts knowledge acquisition, trainee reactions, and training transfer (e.g., Abedi & O’Neil, 2005; Cannon-Bowers, Salas, Tannenbaum, & Mathieu, 1995; Clark, 2005; Colquitt, LePine, & Noe, 2000; Sitzmann, Brown, Casper, Ely, & Zimmerman, 2008). Thus, prior research offers a relatively clear picture of the importance of motivation to learn for training effectiveness—with motivation serving as a key mediator between individual and situational characteristics and training outcomes.

Despite the progress made in this area of research, several questions remain. First, does motivation to learn remain stable across courses or does it increase or decrease across multiple training courses? This will provide insight as to whether motivational processes are independent across courses or whether there are carryover effects across courses in a curriculum.

Second, what are the antecedents and outcomes of motivation to learn at the within-person level of analysis? Though previous research has examined antecedents and outcomes of motivation to learn within the confines of a single course (e.g., Mathieu, Tannenbaum, & Salas, 1992; Noe & Schmitt, 1986), military training is often delivered as a sequence of courses, either within a curriculum or within a career path. Longitudinal research is needed to understand whether antecedents and outcomes of motivation to learn covary across courses within a training curriculum. Specifically, do course expectations predict intraindividual changes in motivation to learn? Does motivation to learn predict intraindividual changes in trainee reactions and learning?

Third, do trainees’ personalities influence the stability of motivation to learn across courses? Though past research has shown that personality characteristics predict motivation within a single course (e.g., Rowold, 2007), research has yet to examine the effects of personality traits on motivation to learn across courses. The current study will explore the effect of the Big Five personality traits (i.e., conscientiousness, neuroticism, agreeableness, extraversion, and openness to experience) on intraindividual changes in motivation to learn.

The goal of this study is to address these questions by examining changes in motivation to learn across nine Web-based courses in a military training curriculum. A cyclical model of motivation is proposed in which trainees’ course expectations predict motivation to learn and motivation to learn predicts trainee reac-
tions and learning. The unique contribution of the current model is its focus on relationships among multiple motivational constructs to test the dynamic interplay among motivational constructs across training courses (e.g., trainee reactions are proposed as an antecedent of expectations for future training courses). In the following section, we discuss the relationships between course expectations, motivation to learn, trainee reactions, and learning. Finally, we present a theoretical rationale for why trainees’ personalities may influence the stability of motivation to learn across courses.

A CYCLICAL MODEL OF MOTIVATIONAL CONSTRUCTS IN TRAINING ENVIRONMENTS

Though the majority of research on motivation to learn has been conducted within the confines of a single training course, military courses frequently do not occur in isolation. The U.S. Department of Defense represents a substantial training and education enterprise. Beyond instruction for the 1.4 million active duty personnel, training and educational services are continually provided to 870,000 ready reservists, more than 750,000 civilian personnel, and 110,000 military dependents in K–12 schooling (Wisher, 2006). Billions of dollars are invested each year to train and educate servicemembers—with thousands of courses for hundreds of specialized occupational areas. The immediate goal of individual military training is to qualify personnel to perform competently as members of operational military units. Servicemembers progress from recruit training to formal specialized skill training at technical schools, which provide initial job qualification skills (e.g., occupational skills for combat engineers). Progression through the career field requires additional training courses at higher skill levels. Additionally, there is annual mandatory training through short courses related to topics such as information assurance, prevention of sexual harassment, and force protection. In these situations, motivation to learn should be conceptualized from a systems perspective—examining relationships both within a training course and across courses—recognizing possible carryover effects from one course to the next. This is consistent with Baldwin and Magjuka’s (1997) perspective that every training experience can be categorized as a training episode. From a trainee’s perspective, all parts of the episode—beginning when the trainee first learns about training until the trainee returns to the work situation—are evaluated based on previous training experiences. The following section outlines the foundation of a cyclical model of motivation to learn in which trainees’ course expectations predict motivation to learn, motivation to learn predicts trainee reactions and learning, and trainee reactions predict subsequent course expectations.
Effect of Course Expectations on Motivation to Learn

Course expectations are individuals’ beliefs about the quality and job relevance of an upcoming training experience and are formed based on prior experience and information received about the course. Previous research suggests that course expectations influence motivation to learn at the between-subjects level of analysis and we propose a similar effect should occur at the within-subjects level of analysis. Facteau, Dobbins, Russell, Ladd, and Kudisch (1995) studied 967 supervisors and managers and found course expectations correlated .61 with motivation to learn ($\beta = 0.32$ while controlling for other predictors of motivation). Similarly, Switzer, Nagy, and Mullins (2005) found that course expectations correlated .27 with motivation to learn among 93 managers participating in leadership training. These results suggest that trainees’ expectations about an upcoming training program have a strong influence on their motivation to learn. Thus, we believe that trainees will be more motivated to learn when they have favorable expectations than when they have less favorable expectations. This is the basis of our first hypothesis:

$H1$: Across training courses, course expectations will have a positive effect on motivation to learn.

Effect of Motivation to Learn on Trainee Reactions and Learning

Affect research (e.g., Weiss & Cropanzano, 1996) suggests pretraining motivation should have a positive effect on trainee reactions. Motivation to learn influences enthusiasm for learning (Noe & Schmitt, 1986), such that trainees should exhibit greater interest in learning and should enjoy learning more when they are motivated—leading to more favorable trainee reactions (Ainley, Hidi, & Berndorff, 2002; Weiss & Cropanzano). Previous research has consistently suggested that motivation to learn is an antecedent of trainee reactions at the between-persons level of analysis (e.g., Sitzmann et al., 2008; Tracey, Hinkin, Tannenbaum, & Mathieu, 2001). Sitzmann et al. conducted a meta-analysis and demonstrated in a multivariate analysis that pretraining motivation had a positive effect on trainee reactions ($\beta = 0.48$), while controlling for trainees’ mastery goal orientation and anxiety levels. We hypothesize that motivation to learn will also predict reactions at the within-person level of analysis.

$H2$: Across training courses, motivation to learn will have a positive effect on trainee reactions.

Researchers have also consistently demonstrated motivation to learn has a positive effect on learning outcomes (e.g., Mathieu et al., 1992; Randel, Main, Sey-
mour, & Morris, 1992; Zazanis, Zaccaro, & Kilcullen, 2001). Colquitt et al. (2000) reported that motivation to learn has a strong effect on transfer ($p = .58$) and a moderate effect on declarative knowledge ($p = .27$) and skill acquisition ($p = .16$). This suggests that motivation to learn is an important precursor to learning at the between-persons level, and we expect a similar effect at the within-person level of analysis.

$H3$: Across training courses, motivation to learn will have a positive effect on learning.

Effect of Trainee Reactions on Subsequent Course Expectations

As noted earlier, military training courses do not occur in isolation. In the military, a breadth of training content is available, and trainees repeatedly participate in training to update their work-related knowledge and skills. For example, the U.S. Army encourages all servicemembers to develop a lifelong learning approach and continuously participate in training throughout their careers. It is intuitive that positive or negative experiences in one training course will influence expectations about subsequent courses, especially when the conditions of training (e.g., delivery media, instructor, training location) are similar across courses. For example, trainees who have positive reactions to an instructor are likely to believe that subsequent courses with the same instructor will be pleasant; trainees who found that one Web-based course was difficult to navigate are likely to have negative expectations about subsequent Web-based courses. This is consistent with the attitudes literature, which suggests that experiences influence subsequent attitudes (e.g., individuals who have had negative experiences with computers also have negative attitudes toward computers; Gardner, Dukes, & Discenza, 1993). Thus, trainee reactions to a course are likely to predict expectations for subsequent courses.

$H4$: Across training courses, trainee reactions will have a positive effect on expectations for subsequent courses

Individual Differences and Motivational Processes

Previous research has not examined the extent to which individual differences predict the stability of motivation to learn across courses within a training curriculum. However, theoretical evidence suggests that Big Five personality traits may influence whether motivation to learn is stable or variable across courses. For example, conscientious trainees are persevering and disciplined (Costa & McCrae, 1992) and should have high valence perceptions due to their tendency to commit to assigned goals (Barrick, Mount, & Strauss, 1993). Agreeable trainees are altruistic,
sympathetic, and eager to help others (Costa & McCrae) and should be more sympathetic to minor training inconveniences and less likely to let minor setbacks influence their motivation to learn (Sitzmann et al., 2008). This suggests that trainees high in conscientiousness and agreeableness should have more stable levels of motivation to learn across courses than trainees low in conscientiousness and agreeableness. However, due to the scarcity of research examining motivational processes across courses, we are not posing specific hypotheses. Instead, we explore the effects of the Big Five personality traits on changes in motivation to learn across courses.

METHOD

Occupational Training Program

Trainees participated in an occupational training program designed to prepare them for civilian positions in the military. After successfully completing the training program, trainees were assigned to positions at military installations worldwide. In cohorts of 25 to 30, trainees completed 30 courses, 10 of which were taught online. The courses covered a variety of topics including workplace safety protocols, handling hazardous material, and military regulations. The online courses included in this research were completed in the first 6 months of the program and lasted an average of 5–6 days. Trainees sat at individual workstations and completed courses at their own pace in a computer lab with an instructor and other members of their cohort present.

Nine of the 10 online courses were evaluated as part of the current study.1 The courses all had a similar format—online text and figures were supplemented with readings. Each course included multiple modules, and trainees were allowed to review the modules in any order and as often as desired. At the conclusion of each module, trainees could answer a series of multiple-choice practice questions and receive feedback on their performance. At the end of each course, an instructor led a review session before the trainees completed the posttest. The instructors varied across courses as well as across cohorts.

Participants

Participants were 103 trainees in four cohorts participating in a year-long occupational training program. Seventy-six percent were male, 65% were Caucasian, and the average age of trainees was 35.11 years (SD = 8.89). Participants all had previ-

1One course was dropped because some instructors failed to distribute study measures, leading to a low response rate.
ous work experience and reported working an average of 44 hours per week before starting the training program.

**Measures**

Trainees completed demographics and personality measures at the beginning of the training program. They also completed measures of course expectations and motivation to learn at the beginning of each course and trainee reactions and learning at the end of each course.

**Personality.** The Big Five personality dimensions were measured using Saucier’s (1994) Mini-Markers scale, consisting of 40 adjectives (e.g., cooperative, organized; eight for each of the Big Five dimensions). Trainees indicated on a 5-point scale how accurately or inaccurately each adjective described them. The coefficient alpha reliabilities were .77 for conscientiousness, .82 for neuroticism, .81 for agreeableness, .81 for extraversion, and .73 for openness to experience.

**Course expectations.** A 14-item measure of course expectations was used to assess trainees’ beliefs about whether the course would be enjoyable and useful and whether they would have difficulty using the course technology. Sample items include, “I anticipate this course will be enjoyable,” and “I anticipate the technology interface will be effective for conveying the course material.” The reliabilities for this measure ranged from .84 to .92 across the nine courses.

**Motivation to learn.** Motivation to learn was assessed with a 5-item measure adapted from Noe and Schmitt (1986). Sample items include, “I will try to learn as much as I can from this training course,” and “I am motivated to learn the skills emphasized in the training program.” The reliabilities for this measure ranged from .73 to .90 across the nine courses.

**Trainee reactions.** Affective, utility, delivery, and technology reactions were assessed with 22 items. Sample items include, “This course was fun to complete,” and “I found the information in the training personally useful.” Brown (2005) established that there is a high correlation among dimensions of reactions and advocated for an overall satisfaction measure. Thus, we averaged across the reactions dimensions, and the reliabilities for this measure ranged from .72 to .96 across the nine courses.

**Learning.** Learning was assessed with 20 to 25 multiple-choice, fill-in-the-blank, and short-answer questions designed to assess declarative knowledge related to course learning objectives. Tests were created by subject matter experts and were piloted and revised by additional subject matter experts. Scores were re-
corded as the percentage of test questions answered correctly. To pass each course, trainees were required to earn at least an 80% on the corresponding exam and they were allowed to retake the test until they reached this level of proficiency. The scores used in the current study were from trainees’ first attempts.

Data Analysis

Hierarchical linear modeling (HLM) with full maximum likelihood estimates was used to analyze the within-person results. We ran a series of models to analyze changes in the dependent variables (i.e., motivation, reactions, learning, and course expectations) across the nine courses and used the model building procedure specified by Singer and Willett (2003). For each outcome variable, we first ran the unconditional means (null) model to examine the variance in the outcome before accounting for any predictors. The unconditional means model allows for the calculation of an intraclass correlation coefficient (ICC), which partitions the variance into within- and between-person components. The ICC can then be used to examine whether significant within- and between-person variance exists in learning scores and each of the motivational constructs (course expectations, motivation to learn, and trainee reactions) before running additional models. Next, we ran the unconditional growth model by adding the order of the training courses as a covariate in all of the analyses, because time-dependent analyses can be sensitive to order effects (Vancouver & Kendall, 2006). This predictor will be labeled course when we report the results. Course was centered such that the intercept represents scores for course one.

After running the unconditional growth model for each outcome variable, we added the level-1 predictor variable to the model. There is disagreement regarding the effectiveness of hypothesis tests for fixed and random effects in HLM so statisticians generally prefer to use the deviance statistic to decide whether to accept a simpler or more complex model (Singer & Willett, 2003). Thus, we relied on deviance statistics, rather than the statistical significance of parameters, when deciding whether to retain a variable in a model and interpret a parameter. Deviance statistics can be compared for two models estimated with full maximum likelihood based on identical data in which one model (reduced model) is nested within the other (full model). The difference between the deviance statistics for the reduced and full models is chi-square distributed with degrees of freedom equal to the number of constraints imposed by the reduced model. Variables were retained in the model and the parameters were interpreted if the model fit significantly improved.

To test the research question exploring the effects of the Big Five personality traits on motivation to learn across courses, we added grand mean centered personality traits as level-2 predictors to examine whether they moderated the motivation intercept and slope parameters according to the procedure specified by Bliese and Ployhart (2002). This model-testing procedure allowed us to examine whether in-
Individual differences in personality explain variance in changes in motivation across courses.

RESULTS

First, we calculated descriptive statistics and within- and between-person correlations for study measures (see Table 1). At the between-persons level, conscientiousness was significantly correlated with course expectations ($r = .23$), trainee reactions ($r = .35$), and learning ($r = .30$), whereas agreeableness was significantly correlated with course expectations ($r = .19$) and trainee reactions ($r = .24$). Course expectations, motivation to learn, and trainee reactions were all strongly correlated at the within- ($r$ ranged from .25 to .52) and between-person levels ($r$ ranged from .45 to .76), but none of these measures were significantly related to learning. This suggests expectations, motivation, and reactions covary across courses, and the three motivational processes are positively related within training courses.

One of the advantages of using HLM with a longitudinal design is the robustness in calculating parameters with all available data, despite missing data points (Bryk & Raudenbush, 1992; Ployhart, Holtz, & Bliese, 2002). In the current dataset, all participants provided data for the level-2 variables (Big Five personality traits), however, data for level-1 variables were missing. Across the nine courses, each trainee contributed an average of 3.7 course expectations observations, 3.7 motivation to

<table>
<thead>
<tr>
<th>Variable</th>
<th>$M$</th>
<th>$SD$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conscientiousness</td>
<td>3.90</td>
<td>0.54</td>
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<tr>
<td>2. Neuroticism</td>
<td>2.47</td>
<td>0.72</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Agreeableness</td>
<td>3.98</td>
<td>0.66</td>
<td>.40*</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>4. Extraversion</td>
<td>3.29</td>
<td>0.69</td>
<td>.28*</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<td>—</td>
<td>—</td>
</tr>
<tr>
<td>5. Openness to</td>
<td>3.74</td>
<td>0.58</td>
<td>.24*</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<td>—</td>
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<tr>
<td>6. Course expectations</td>
<td>3.89</td>
<td>0.38</td>
<td>.23*</td>
<td>—</td>
<td>.19*</td>
<td>—</td>
<td>—</td>
<td>.15</td>
<td>—</td>
<td>.52*</td>
<td>.44*</td>
</tr>
<tr>
<td>7. Motivation to learn</td>
<td>4.43</td>
<td>0.35</td>
<td>.12</td>
<td>—</td>
<td>.17</td>
<td>—</td>
<td>—</td>
<td>.09</td>
<td>.58*</td>
<td>—</td>
<td>.25*</td>
</tr>
<tr>
<td>8. Trainee reactions</td>
<td>3.89</td>
<td>0.38</td>
<td>.35*</td>
<td>—</td>
<td>.17</td>
<td>.24*</td>
<td>—</td>
<td>.09</td>
<td>.05</td>
<td>.76*</td>
<td>.45*</td>
</tr>
<tr>
<td>9. Learning</td>
<td>95.33</td>
<td>2.82</td>
<td>.30*</td>
<td>—</td>
<td>.06</td>
<td>.14</td>
<td>.05</td>
<td>—</td>
<td>.05</td>
<td>.22</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note. Between-persons correlations are below the diagonal and within-person correlations are above the diagonal. Due to missing data, the sample size for the between-persons correlations ranged from 66 to 103 and the sample size for the within-person correlations ranged from 224 to 384.

* $p < .05$. 

TABLE 1
Descriptive Statistics and Correlations Among Study Variables at the Within- and Between-Person Levels of Analysis
learn observations, 3.5 trainee reactions observations, and 4.8 learning scores. We ran t-tests to assess whether demographics and personality dimensions differed between trainees who completed the measures and nonresponders. Overall, the results indicate that extraversion did not differentiate responders from nonresponders, because the number of significant t values was not greater than would be expected based on the Type I error rate. However, trainees who were older and lower in openness to experience and neuroticism were more likely to complete the measures (the percentage of significant t-tests was 14, 10, and 10%, respectively). The direction of the effect for agreeableness and conscientiousness varied, although 57 and 24%, respectively, of t-tests were significant.

Table 2 presents the results of the HLM analyses for Hypotheses 1 through 4. First, we tested Hypothesis 1, course expectations will have a positive effect on motivation to learn. The intraclass correlation coefficient for motivation to learn was .40, which indicates that 60% of the variance in motivation was at the within-person level and 40% of the variance was between persons ($\sigma_e^2 = 0.131$ and $\sigma_0^2 = 0.086, p < .05$). In addition, there was significant within- and between-person variability. Course ($\chi^2_{\text{dif}} = 18.40, p < .05$) and course expectations ($\chi^2_{\text{dif}} = 159.54, p < .05$) significantly improved the prediction of motivation to learn. In the final model, the course fixed effect was -0.04, indicating that motivation decreased by 0.04 points per course. Thus, motivation to learn was 0.30 points lower for the ninth than the first course. The course expectations fixed effect was 0.54, indicating that for every 1 point increase in course expectations, motivation to learn was 0.54 points higher. Overall, the results support Hypothesis 1 and indicate that course expectations have a positive effect on motivation to learn across training courses. However, on average, motivation to learn decreased as trainees progressed through the training curriculum.

The second set of analyses tested Hypothesis 2, motivation to learn will have a positive effect on trainee reactions across courses. The intraclass correlation coefficient for trainee reactions was .34 ($\sigma_e^2 = 0.151$ and $\sigma_0^2 = 0.079, p < .05$). Thus, 66% of the variance in trainee reactions was at the within-person level and 34% of the variance was between persons. Adding course to the model did not significantly improve model fit ($\chi^2_{\text{dif}} = 2.67, p > .05$), indicating that trainee reactions did not change in a systematic manner across the nine courses. However, adding motivation to learn did improve model fit ($\chi^2_{\text{dif}} = 71.25, p < .05$). The motivation fixed effect was 0.31, indicating that trainee reactions increased 0.31 points for every 1 point increase in motivation to learn. These results support Hypothesis 2 and indicate that course expectations have a positive effect on motivation to learn across training courses.

Next, we tested Hypothesis 3, motivation to learn will have a positive effect on learning across courses in a curriculum. The intraclass correlation coefficient for learning was .16, which indicates that 84% of the variance in learning was at the within-person level and 16% of the variance was between persons ($\sigma_e^2 = 21.707$ and $\sigma_0^2 = 4.245, p < .05$). Both course ($\chi^2_{\text{dif}} = 25.04, p < .05$) and motivation to
<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Parameter</th>
<th>Motivation to Learn</th>
<th>Trainee Reactions</th>
<th>Learning</th>
<th>Course Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\gamma_0$</td>
<td>Initial status</td>
<td>2.430* (0.182)</td>
<td>Initial status</td>
<td>2.503* (0.276)</td>
<td>Initial status</td>
</tr>
<tr>
<td>$\gamma_1$</td>
<td>Course</td>
<td>-0.037* (0.006)</td>
<td>Motivation to learn</td>
<td>0.312* (0.065)</td>
<td>Course</td>
</tr>
<tr>
<td>$\gamma_2$</td>
<td>Course expectations</td>
<td>0.544* (0.043)</td>
<td>Motivation to learn</td>
<td>-1.055 (0.787)</td>
<td>Reactions to previous course</td>
</tr>
</tbody>
</table>

| Random Effects | $\sigma^2$ | Within-person | 0.081* (0.008) | Within-person | 0.135* (0.014) | Within-person | 18.801* (2.806) | Within-person | 0.102* (0.016) |
|               | $\sigma_0^2$ | Initial status | 1.011* (0.415) | Initial status | 1.652 (0.943) | Initial status | 28.786* (90.688) | Initial status | 1.335 (0.858) |
|               | $\sigma_1^2$ | Course | 0.000 (0.001) | Motivation to learn | 0.110 (0.053) | Course | 0.595 (0.340) | Course | 0.004 (0.003) |
|               | $\sigma_2^2$ | Course expectations | 0.038 (0.021) | Motivation to learn | 0.988* (4.377) | Reactions to previous course | 0.116* (0.063) |

Deviance Statistic
- Motivation to Learn: 253.86
- Trainee Reactions: 368.40
- Learning: 1205.79
- Course Expectations: 203.06

df
- Motivation to Learn: 10
- Trainee Reactions: 6
- Learning: 10
- Course Expectations: 10

*Note.* The top number is the fixed or random effect coefficient. The number in parentheses is the standard error.

*p < .05.
learn ($\chi^2_{\text{dif}} = 1390.98, p < .05$) significantly improved the prediction of learning. The course fixed effect was -0.94, indicating that tests scores decreased by 0.94 percentage points per course for a total of 7.53 percentage points across the nine courses. The motivation to learn fixed effect was -1.06 and in the opposite direction of Hypothesis 3. This indicates that, across the nine courses, for every 1 point increase in motivation to learn, test scores were 1.06 percentage points lower. However, the motivation to learn fixed effect was 0.48 when course was not included in the model. This suggests that motivation has a positive effect on learning, but the effect size is negative when controlling for decreases in test scores across time. This is similar to a suppression effect in regression. Overall, these results fail to support Hypothesis 3.

Hypothesis 4 predicts that trainee reactions will have a positive effect on subsequent course expectations across courses in a curriculum. The intraclass correlation coefficient for course expectations was .41, which indicates that 59% of the variance in course expectations was at the within-person level and 41% of the variance was between persons ($\sigma_e^2 = .134$ and $\sigma_0^2 = .094, p < .05$). Both course ($\chi^2_{\text{dif}} = 11.57, p < .05$) and trainee reactions ($\chi^2_{\text{dif}} = 166.51, p < .05$) significantly improved the prediction of course expectations. The course fixed effect was .03, indicating that course expectations were .23 points lower at the end than the beginning of the training curriculum. In addition, the trainee reactions fixed effect was 0.34, indicating that for every 1 point increase in trainee reactions, course expectations were 0.34 points higher. Thus, the results support Hypothesis 4 and indicate that trainee reactions have a positive effect on subsequent course expectations across training courses.

Effects of Individual Differences on Motivational Processes

Next, we ran a series of exploratory analyses to assess whether trainees' personalities predicted changes in motivation to learn across courses in the curriculum. The results indicate that trainee agreeableness predicted changes in motivation. Adding agreeableness as a level-2 predictor of the intercept ($\gamma_{01} = 0.09$) and course slope ($\gamma_{11} = -0.03$) significantly improved model fit relative to the model with course and expectations as the only predictors ($\chi^2_{\text{dif}} = 6.87, p < .05$). Trainees high in agreeableness were more motivated to learn at course one than trainees low in agreeableness (see Figure 1). However, motivation to learn decreased at a quicker rate across courses for trainees high in agreeableness such that by course nine, trainees low in agreeableness were more motivated to learn than trainees high in agreeableness.

DISCUSSION

The purpose of the current study was to investigate antecedents and outcomes of motivation to learn across courses in a military training curriculum. We examined
the stability of trainees’ motivation to learn and the relationship among multiple motivational constructs across nine online courses. Overall, the results suggest that there is a dynamic interplay among motivational constructs across training courses. The model begins with course expectations, which have a positive effect on motivation to learn. When trainees have positive expectations, they are more motivated to learn the material. This is consistent with expectancy theory, which suggests that trainees consider the utility of training when deciding how much effort to expend to learn the material (Vroom, 1964) and highlights the value of expectations in understanding motivational processes. Course expectations color motivational processes, suggesting that it is critical to maintain a favorable course reputation to ensure that trainees are willing to exert the effort necessary to learn from training (Facteau et al., 1995; Switzer et al., 2005).

In turn, motivation to learn predicts trainee reactions, and trainee reactions predict expectations for subsequent courses in the curriculum. Trainees who are motivated to learn the course material leave the course with more favorable perceptions of the course. Favorable perceptions translate into positive expectations regarding subsequent courses. This highlights the value of considering the training context when evaluating training courses and approaching motivation to learn from a systems perspective (Baldwin & Magjuka, 1997). Training courses do not occur in isolation, and negative experiences in one course can have a detrimental effect on subsequent motivation to learn. Thus, it is critical that organizations invest time and resources in all training courses because a negative experience can spillover and have a negative effect on motivational processes in subsequent courses.

![Graph of the effect of trainee agreeableness on motivation to learn over time.](image)
Perhaps more surprising was the fact that both motivation to learn and learning decreased across courses in the training curriculum investigated in this study. One explanation for this effect may be the design of the training courses. The courses in this study had similar designs, and their format was akin to many Web-based training courses. The courses were primarily text based, with trainees reading several screens of text, answering multiple-choice questions based on the text, and moving on to another section once they correctly responded to the questions. Encouraging active engagement with the material and incorporating a wide variety of instructional methods may have resulted in trainees remaining motivated across courses in the curriculum. To be actively involved, trainees must engage in higher-order thinking tasks such as analysis, synthesis, and evaluation (Bonwell & Eison, 1991). Previous research indicates that active approaches to learning have a positive effect on motivation, learning, and utility reactions (Hake, 1998; Prince, 2004; Wingfield & Black, 2005). Additionally, research suggests that to maximize learning from online instruction, courses should incorporate a variety of instructional methods so that trainees who are having difficulty learning the course content can review with a variety of methods until they have mastered the material (Sitzmann, Kraiger, Stewart, & Wisher, 2006). Future research should examine the effect of instructional methods on changes in motivation and learning across courses.

Another possible explanation for the reduction in motivation and learning may be the 80% cutoff for passing set by the organization. After the first few exams, trainees may have reduced their subsequent effort to merely accomplish this goal. Prior research supports the idea that motivational processes can be negatively related to performance when high self-efficacy translates into reduced effort (Van-couver & Kendall, 2006). Providing incentives for surpassing minimum performance standards may have helped maintain motivation and altered the observed relationship between motivation and learning.

Agreeableness may be an important individual difference to consider regarding whether motivation to learn is likely to change across courses. Trainees high in agreeableness started the training curriculum with higher levels of motivation than trainees low in agreeableness. However, motivation dropped at a steeper rate across courses for highly agreeable trainees, and these trainees were less motivated by the end of the training program than trainees low in agreeableness. This highlights the value of agreeableness in explaining motivational processes and suggests that agreeableness is an important disposition to consider in training research.

Recommendations for Practitioners

These results have important implications for military training courses. First, they suggest that a training course’s reputation predicts how motivated a trainee will be to learn the training material. Regardless of the quality of instruction, trainees may
not be as motivated if they believe that the training program will not be enjoyable or relevant to their jobs. Thus, it is critical that organizations actively collect trainee reactions in an effort to monitor their courses’ reputations. By soliciting feedback from trainees, the military can better understand which training material trainees found useful and difficulties they encountered in the course—enabling them to alter courses as necessary to maintain a favorable reputation.

Second, because motivational processes are cyclical, having more motivated trainees will result in more favorable reactions to training. Favorable reactions will then lead to positive expectations about future training courses. In times of peace, military personnel spend the majority of their time in training (Salas, Milham, & Bowers, 2003), and training quality can have a large impact on the reputation of an organization (Clardy, 2005). Through its effect on the military’s reputation, having high-quality training programs can reduce the cost of recruiting and retaining servicemembers (Clardy). One example of how the military has benefited from positive publicity regarding their training programs is a Discovery channel documentary on Navy SEALs training (Clardy). The SEALs have a rigorous training program to indoctrinate the standards that define the ethos of the SEALs. The positive reputation of SEALs training may be one reason the Navy SEALs are coveted positions in the military.

Third, organizations should encourage trainees to perform at a high level at all times. In the current study, having an 80% minimum standard for test performance and not rewarding trainees who far exceeded this standard may have encouraged trainees to reduce their level of effort as they progressed through the courses. This would explain why motivation to learn and learning decreased over time, and rewarding high performers may have negated this effect.

Study Limitations and Directions for Future Research

There are several limitations to the current study. First, there are missing data because some trainees did not complete all of the study measures and the organization did not provide test scores for all trainees in every course. Missing data is one of the main challenges of a longitudinal field study, but the current results are invaluable because they capture real-world training of working adults. Also, there was some evidence that trainees who provided data were older, less open to experience, and less neurotic than nonresponders. In addition, trainees in the current study, on average, were older (average age was 35 years) than traditional military trainees. Additional research is needed to examine how missing data and the age of trainees may have influenced the current results.

Second, range restriction in test scores may have attenuated observed correlations. The mean for learning across exams was 95.33 with a standard deviation of 2.82. In addition, including changes across courses as a predictor in the model resulted in motivation to learn having a negative effect on learning—akin to a sup-
pression effect in regression. Further research is needed to understand the effect of motivation to learn on learning at the within-person level of analysis.

Another limitation of the study is the exploratory use of individual differences to predict changes in motivation to learn. Given that Myers-Briggs type indicators are generally collected on military officers, future research should investigate how these personality dimensions can be used to inform instruction as to how to keep officers motivated throughout a training curriculum. Additionally, research is needed to examine the extent to which other individual differences predict intra-individual changes in motivation. One possibility is trait positive affect, which represents an individual’s tendency to be enthusiastic, active, and energetic across time and situations (Watson & Clark, 1984). Trainees who are high in trait positive affect may consistently feel energetic and enthusiastic about learning and report high levels of motivation to learn, regardless of the training situation.

CONCLUSION

The current results support a dynamic interplay between course expectations, motivation to learn, and trainee reactions across courses in a training curriculum. The cyclical model begins with course expectations, which have a positive effect on motivation to learn. Across courses in a curriculum, motivation to learn then has a positive effect on trainee reactions, and trainee reactions have a positive effect on course expectations. These results highlight the value of maintaining a positive training reputation and developing courses that trainees find useful and enjoyable. Positive course experiences increase the likelihood that trainees will be motivated and have favorable reactions to subsequent courses in the curriculum.

REFERENCES


