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Action-State Orientation as An Impediment to Engineering Student Success

Paul E Spector

Chris S Ferekides (Professor) (University of South Florida)

Chris S. Ferekides received the Ph.D. degree in electrical engineering from the University of South Florida. He has been a faculty member in the Electrical Engineering Department since 1992. He is currently service as the department chair, and is the principal investigator of a NSF Funded RED Project that addresses the professional formation of electrical engineering students. His research is in the areas of electronic materials with a focus on photovoltaics.

Gokhan Mumcu (Professor)

Ismail Uysal (Assistant Professor) (University of South Florida)

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Paul E. Spector, Christos Ferekides, Chung Seop Jeong, Gokhan Mumcu, Ismail Uysal

University of South Florida

Tampa, FL 33620

Corresponding Author: Paul E. Spector, pspector@usf.edu, 813-974-0357

This is a research paper that describes a study concerned with impediments to engineering student success. Engineering student success is driven by a number of factors, not least of which is their strategies for completing their academic work. Those strategies include the avoidance of distractions, class attendance, and the scheduling of study sessions (Diefendorff et al., 1998). Some students are able to set academic goals, devise strategies to achieve those goals, and implement the strategies. Others might set the same goals and have the same strategies but struggle to translate goals into effective actions that produce success. One psychological factor that determines how well students can translate goals into effective actions is the personality variable of action-state orientation.

Action-state orientation is a personality variable that reflects how well people can translate goals into effective behavioral strategies to achieve them (Kuhl, 1992). An action-oriented person is able to enact planned activities that result in goal attainment, such as studying in advance for an exam. State-orientation represents a break-down in cognitive regulation that allows goal progress. This can occur in three ways: Hesitation is procrastination and having trouble starting something like writing a paper. Preoccupation is difficulty in getting back to work after a distraction, such as receiving a text from a friend. Volatility is stopping an activity due to boredom or lost interest.

The purpose of this research was to determine if the action-state orientation of engineering students would relate to their studying behavior. We hypothesized that action-oriented students would engage more often in productive study behavior such as attending class, avoiding distractions, and studying in advance of exams. This is because such students can avoid procrastination, can easily get back to work after a distraction (or take steps to avoid distractions), and maintain interest and focus on their work. We studied the action-state orientation and study habits of electrical engineering students to see if they were linked.

Background

Action-state orientation is often studied as an individual personality trait that varies among people along a continuum. At one extreme are people who tend to be action-oriented, meaning they have little difficulty maintaining effort toward goal attainment. At the other extreme are state-oriented people for whom there is a breakdown in self-regulation that prevents them from achieving their goals. Heckhausen (1991) notes that such individuals can struggle to control unwanted emotions that interfere with maintaining effort toward a goal. Even though action-state orientation is a relatively fixed personality trait that varies among individuals, it can be induced by situations, such as failure on an important task (Heckhausen, 1991). This suggests

that for a student, failing an exam or receiving a poor grade on an assignment can result in a shift to state-orientation, especially for students who already have that tendency.

There are three action-state dimensions that reflect how individuals remain focused on goals or how they get diverted.

- Hesitation (state) versus initiative (action) is the extent to which a person is able to engage in planned, goal-directed behavior. An action-oriented person has little trouble beginning and maintaining effort on a task. A state-oriented individual, on the other hand, will struggle to get to work and might procrastinate on tasks needed to achieve goals.
- Preoccupation (state) versus disengagement (action) has to do with how a person handles distractions. The action-oriented person is not easily distracted; when a distraction occurs (receives a phone call) he or she easily returns to the goal-oriented task. The state-oriented individual, on the other hand, has a hard time thinking about the distraction and therefore struggles to return to work. Interruptions that induce negative emotions such as anxiety or annoyance can be particularly hard to overcome.
- Volatility (state) versus persistency (action) has to do with continuing to work on a task when there is no distraction. The action-oriented student can set a mini-goal for the day, such as reading a chapter for class, and maintain effort until it is reached. The state-oriented student struggles to maintain effort and can become bored and distracted before completing the day's goal.

Action-state orientation has been shown to predict several goal-oriented behaviors and outcomes of behaviors, as might be expected. State-oriented people have a more difficult time in making decisions and can take more time to make a choice (Heckhausen & Heckhausen, 2018). It has been shown to predict behavior in work settings, such as number of sales for salespeople (Jaramillo et al., 2007), supervisor ratings of job performance (in one of two samples, Diefendorff et al., 2006), and in job search behavior (Song et al., 2006). In educational settings it has been linked to academic performance of college students (Diefendorff, 2004; Jaramillo & Spector, 2004) and level of educational attainment (Diefendorff et al., 2006). Relatedly procrastination, which is related to hesitation, has been linked to academic performance and study behavior. For example, Kim and Nembhard (2019) tracked the study activity of engineering students on 5 online assignments. They were able to track when and how long students worked on assignments, finding that those who procrastinated performed more poorly. Similarly, Troll et al. (2020) studied smartphone use as a specific means of procrastination, finding that amount of time spent on the phone was negatively related to grade point average. Wessel et al. (2021) showed that the trait of procrastination (akin to action-state dimension of hesitation) was related to academic performance and time spent studying.

Based on prior literature, we expected to find that action-state orientation in engineering students would predict their study behaviors. Action-oriented students would be expected to do better than state-oriented students in remaining focused on their studies by engaging, for example, in less procrastination, avoiding distractions, and structuring their school activities.

Method

Participants and Procedure

We collected surveys from 292 engineering students from three electrical engineering classes during fall 2021 semester. Three-fourths of the students were majoring in either electrical (47%), mechanical (19%) or civil (10%) engineering. Ninety-six percent of the students were upper class; 76% were male. Ethnicity breakdown was 44% White, 25% Latin, 7.7% Black, 12.9% Asian, 3.5% multiracial, and 7% other. Students were invited in class by their instructors to participate in the study. A link was sent to them via e-mail to a survey hosted on the Qualtrics website that they could complete on their own time. They were offered extra-credit for completing the survey, but participation was voluntary. The instructors had students indicate outside of the survey if they participated so they knew who participated but could not link survey responses to individuals. Eighty-four percent of enrolled students completed the survey. An additional 10 students were dropped from the analysis because they failed to answer all questions.

Measures

Included were measures of action-state orientation and study behaviors. The action-state orientation scale (Diefendorff et al., 2000) consisted of 21 forced-choice items, eight of which reflected hesitation, eight of which reflected preoccupation, and five of which reflected volatility. Each item had a stem statement with two choice options, one of which indicated action-orientation and the other state-orientation. Respondents indicated which choice best described them. An example item for hesitation is "When I know I must finish something soon" with choices "I have to push myself to get started" (state choice) versus "I find it easy to get it done and over with" (action choice). An example item for preoccupation is "I have to talk to someone about something important and, repeatedly, can't find him/her at home" with choices "I can't stop thinking about it, even while I'm doing something else" (state option) versus "I easily forget about it until I see the person" (action option). For volatility an example item is "When I am busy working on an interesting project" with options "I need to take frequent breaks and work on other projects" (state option) versus "I can keep working on the same project for a long time" (action option). High scores indicate action-orientation.

Study behaviors were assessed with 22 items from three sources. We included the 7-item Management of Environmental Conditions subscale of the Self-Regulation Strategy Inventory (Voils et al., 2019) that assessed the conditions under which the student studies, such as choosing a quiet place and making sure no one disturbs them. Twelve items were adapted from (Renes et al., 2020) to assess study strategies such as attending class regularly, taking notes in class, and studying daily. We added 3 items written for the study that concerned procrastination behaviors, such as working on projects the day before or pulling all-nighters to get work done. Items were written in both directions with 16 indicating good study strategies and 6 indicating poor study strategies that were reverse-scored before computing total scores. For each item there were seven agreement response choices ranging from *Strongly disagree* to *Strongly agree*. Items are scored in the direction so high scores indicate good study habits.

Results

Descriptive statistics for the study variables can be seen in Table 1. For study behaviors there is a total score for all items plus individual scores for environment management, study strategies, and procrastination. Action-state orientation has separate scores for each of the three dimensions. The table includes means, standard deviations, minimum and maximum scores for each measure. Also included are coefficient alphas as a measure of internal consistency reliability. As can be seen in all but two cases the alpha exceeded the generally accepted minimum for research of .70 (Nunnally & Bernstein, 1994). Procrastination had an alpha of .42, suggesting that students who indicate doing one of these behaviors do not necessarily do the others. For example, students who stay up all night to do schoolwork are not necessarily procrastinators who also wait until the night before to do assignments. The low coefficient alpha for volatility was not unexpected given it is close to the .51 reported by Diefendorff et al. (2000).

Table 2 shows correlations among all variables in the study. Results showed that all three dimensions of action-state orientation had statistically significant correlations with the total score of all positive study behaviors; action-oriented students engaged in more productive academic activities. Hesitation ($r = .42$) was most strongly related followed by Preoccupation ($r = .16$) and Volatility ($r = .13$). Correlations of action-state orientation with the more specific dimensions of study behavior showed a somewhat different pattern. Hesitation continues to be the strongest correlate among the action-state subscales with correlations in the .30s for all three behavior subscales. Preoccupation correlates a consistent .12 with all three behavior subscales, although it missed statistical significance with procrastination (this correlation was slightly lower than the others and was rounded to .12). Volatility correlated significantly only with procrastination.

Examining individual items of the study behavior scale indicated that action orientation was most linked to finishing studying before engaging in leisure activities, working on assignments in advance, planning when and what to study each day, and paying attention in class. Less important was avoiding distractions entirely, such as studying in a quiet place or avoiding interruptions.

Discussion

These results show a clear link between action-state orientation and study behaviors. They suggest that among the three action-state orientation dimensions, the biggest impediment to productive studying is hesitation, that is, not being able to settle down to work on academic tasks. Thus, students who are high on hesitation avoid doing their academic work and procrastinate. Although preoccupation was also related to the study behaviors, the correlations were quite modest showing only a slight tendency for students high on preoccupation to have poor study habits. Volatility only related to procrastination behaviors. Students high on volatility tended to put off work until the last minute, but they were no different from students low on volatility when it came to environment management or general study strategies.

A limitation to this study is that it relied entirely on student self-reports of their action-state orientation and their behavior. It is possible that their reports were affected by biases that might have inflated or deflated the correlations we observed (Spector et al., 2019). Further, we did not link these behaviors to academic outcomes, so the study sheds no light on whether action-state orientation has implications for academic success of these engineering students. It is possible that action-state orientation leads to behaviors that lead to academic outcomes, but

future research will be needed to demonstrate that connection. As noted earlier, action-state orientation has been linked to grade point average in prior studies, but not in engineering. For example, Jaramillo and Spector (2004) studied marketing students.

The results of this study are encouraging in showing that action-state orientation is related to the study habits of engineering students. Future research will be needed to tie these findings to academic outcomes. More importantly, intervention research is needed to see if state-oriented students can be taught effective strategies to behave in a more action-oriented way that overcomes their natural tendencies. If successful, such interventions might enable state-oriented engineering students to be more successful in school and beyond.

References

Diefendorff, J. M. (2004). Examination of the Roles of Action-State Orientation and Goal Orientation in the Goal-Setting and Performance Process. *Human Performance*, *17*(4), 375-395. https://doi.org/10.1207/s15327043hup1704_2

Diefendorff, J. M., Hall, R. J., Lord, R. G., & Strean, M. L. (2000). Action–state orientation: Construct validity of a revised measure and its relationship to work-related variables. *Journal of Applied Psychology*, *85*(2), 250-263. https://doi.org/10.1037/0021-9010.85.2.250

Diefendorff, J. M., Lord, R. G., Hepburn, E. T., Quickle, J. S., Hall, R. J., & Sanders, R. E. (1998). Perceived self-regulation and individual differences in selective attention. *Journal of Experimental Psychology: Applied*, *4*(3), 228-247. https://doi.org/10.1037/1076-898X.4.3.228

Diefendorff, J. M., Richard, E. M., & Gosserand, R. H. (2006). Examination of situational and attitudinal moderators of the hesitation and performance relation. *Personnel Psychology*, *59*(2), 365-393. https://doi.org/10.1111/j.1744-6570.2006.00040.x

Heckhausen, H. (1991). *Motivation and action*. Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-75961-1

Heckhausen, J., & Heckhausen, H. (2018). *Motivation and action* (3rd 2018. ed.). Springer International Publishing. https://doi.org/10.1007/978-3-319-65094-4

Jaramillo, F., Locander, W. B., Spector, P. E., & Harris, E. G. (2007). Getting the Job Done: The Moderating Role of Initiative on the Relationship between Intrinsic Motivation and Adaptive Selling. *Journal of Personal Selling & Sales Management*, *27*(1), 59-74. https://doi.org/http://dx.doi.org/10.2753/PSS0885-3134270104

Jaramillo, F., & Spector, P. E. (2004). The effect of action orientation on the academic performance of undergraduate marketing majors. *Journal of marketing Education*, *26*, 150-260. https://doi.org/10.1177/0273475304268780

Kim, J.-E., & Nembhard, D. A. (2019). The impact of procrastination on engineering students' academic performance. *The International journal of engineering education*, *35*(4), 1008-1017.

Kuhl, J. (1992). A theory of self-regulation: Action versus state orientation, self-discrimination, and some applications. *Applied Psychology: An International Review*, *41*(2), 97-129. https://doi.org/10.1111/j.1464-0597.1992.tb00688.x

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory*. McGraw Hill.

Renes, E., Prieto, B., Lopez, M., Fresno, J. M., Gonzalez-Raurich, M., Tornadijo, M. E., Prieto, M., & Alvarez-Ordonez, A. (2020). Identification of study habits and skills associated with the academic performance of Bachelor's degree Food Science and Technology students at the University of Leon (Spain) [Article; Early Access]. *Journal of Food Science Education*, 13. https://doi.org/10.1111/1541-4329.12207

Song, Z., Wanberg, C., Niu, X., & Xie, Y. (2006). Action–state orientation and the theory of planned behavior: A study of job search in China. *Journal of Vocational Behavior*, *68*(3), 490-503. https://doi.org/10.1016/j.jvb.2005.11.001

Spector, P. E., Rosen, C. C., Richardson, H. A., Williams, L. J., & Johnson, R. E. (2019). A new perspective on method variance: A measure-centric approach. *Journal of Management*, *45*(3), 855-880. https://doi.org/10.1177/0149206316687295

Troll, E. S., Friese, M., & Loschelder, D. D. (2020). How students' self-control and smartphone-use explain their academic performance. *Computers in Human Behavior*. https://doi.org/10.1016/j.chb.2020.106624

Voils, S. A., Childs-Kean, L. M., & Thomas, A. (2019). Relationship between pharmacy students' use of self-regulated learning strategies and course outcomes [Article]. *American Journal of Pharmaceutical Education*, *83*(10), 2216-2222, Article 7566. https://doi.org/10.5688/ajpe7566

Wessel, J., Bradley, G. L., & Hood, M. (2021). A low-intensity, high-frequency intervention to reduce procrastination. *Applied Psychology: An International Review*, *70*(4), 1669-1690. https://doi.org/10.1111/apps.12293

Table 1

Descriptive Statistics

Variable	Mean	SD	Minimum	Maximum	Coefficient α
Study habits	105.9	16.3	53	151	.82
Environment management	32.7	7.3	15	49	.76
Study strategies	59.3	9.7	23	82	.74
Procrastination	13.8	3.7	3	21	.42
Hesitation	12.6	2.3	8	16	.73
Preoccupation	12.5	2.3	8	16	.74
Volatility	8.7	1.3	5	10	.58

Note: n = 285-288 due to missing data.

Table 2

Correlations Among Study Variables

Variable	1	2	3	4	5	6
1. Study habits						
2. Environment management	.80*					
3. Study strategies	.88*	.49*				
4. Procrastination	.50*	.25*	.26*			
5. Hesitation	.42*	.31*	.34*	.35*		
6. Preoccupation	.16*	.12*	.12*	.12	.34*	
7.Volatility	.13*	.01	.11	.25*	.27*	.05

*p < .05; n = 284-287 due to missing data.