

Research Statement

Here I briefly describe the conceptual framework we have developed (and continue to develop), and then the more recent areas of applications in which we have been examining the implications of the model (noting work that is ongoing and new directions).

Conceptual framework. Students' ability to maintain motivation while learning (including learning science and math) is critical to mastering material beyond the elementary level, and persisting in the field. It requires not only keeping one's "eye on the prize", but on experiencing interest during the process. However, formal educational curricula typically dictate the types and sequences of materials that must be learned regardless of how interesting a particular student may find that material. Thus, to persist, students must be able to maintain their motivation even when they do not find the experience interesting. Students are typically encouraged to engage in strategies that (re)emphasize the importance of persistence and likelihood of success, but this may not be enough to counter the pull of more interesting choices. However, students can also engage in strategies that make the experience more interesting, *and* they are more likely to do so when motivated to persist. Thus, students do not just regulate their experience in order to feel better; they do so in order to maintain motivation to reach their goals. We have developed the Self-Regulation of Motivation model (Sansone & Smith, 2000; Sansone & Thoman, 2005) to capture this conceptual framework, which outlines how the experience of interest is embedded within the overall process of regulating motivation and behavior. The model synthesizes research detailing how goal-striving affects the experience of interest, along with research on whether and how individuals regulate the interest experience. The model also illustrates how the relationship between regulating interest and performance might result in trade-offs, particularly in the short term (e.g., time spent on something that makes learning more interesting might come at a cost to time spent on completing required tasks). The degree to which short-term trade-offs are acknowledged and accepted may, in turn, determine whether students persist in the long-term. By exploring how the experience of interest and its regulation works within the overall process of self-regulation, the model suggests ways that educators and the educational context could unintentionally hinder interest regulation, as well as places where they could foster successful regulation (Sansone, Thoman & Fraughton, 2015).

Since that time, we were invited to review the model and the research that has been directed by that model in an edited volume on the *Science of Interest* (Thoman, Sansone & Geerling, 2017). More recently, we were invited to contribute a chapter to the *Cambridge Handbook on Motivation and Learning* (Sansone, Geerling, Thoman, & Smith, 2019), and were invited to be part of a special interactive workshop at the American Educational Research Association meeting that brought the authors together to present and discuss the synergies from the varied theoretical and empirical contributions.

A recurring theme in our work is to try to use this conceptualization of the motivation process to understand and predict differences as a function of group memberships or identities (e.g., girls or women in STEM). A recent paper explores the application of this model for understanding group differences (e.g., students from underrepresented versus majority backgrounds) in motivational challenges and processes (Thoman, et al., 2019). I used some of this background as part of the NSF ADVANCE proposal that was submitted in Sept., 2017 (co PI; Diane Pataki, PI).

Research applications

Online learning. When learning takes place “online” via the Internet, students are primarily responsible for regulating their own patterns of engagement with learning activities (Allen & Seaman, 2007; Artino & Stephens, 2009). As a result, relative to traditional classrooms, online learning can allow the construction of individualized learning contexts. However, online learning also can be associated with greater challenges to self-regulation (e.g., by not providing structure for effective time management or by providing easy access to temptations), allowing for trade-offs to more easily appear. For example, Sansone, Smith, Thoman, and MacNamara (2012) found that undergraduates in an online section of an upper-division psychology course were more likely than students in the on-campus section to report trying to make studying for an exam more enjoyable by exploring material on the class Web page. The more students in the online section reported using this strategy, however, the greater their interest but the poorer their exam performance.

Although suggestive, the results of Sansone et al.’s (2012) study were correlational in nature, and thus could not address the causal paths suggested by the theoretical framework. The purpose of our NSF-funded program of research was to examine the implications of the SRM model in the context of online learning. We thus developed a hybrid paradigm that provided many of the controls that are part of an experimental paradigm, but that also allowed students the time and freedom to work through online lessons as they would in a class (e.g., Sansone, Fraughton, Zachary, Butner, & Heiner, 2011).

Using this paradigm, we could test multiple hypotheses generated from the SRM model. For example, Sansone, et al. (2011) showed that when provided with information about the usefulness of learning HTML (e.g., they would be able to enhance personal or organizational webpages; collect information from customers; etc.), students displayed a greater degree of exploration and experimentation with sample codes during the lesson. Greater exploratory engagement during the lesson predicted higher interest at the end of the session, which in turn predicted requests for the access code to the entire online class. Greater engagement during the lesson also tended to predict higher quiz scores. However, the results also reflected the possibility of trade-offs found previously in more controlled experimental settings (Sansone, Wiebe & Morgan, 1999). That is, about 20% of the participants received a zero score on the assignment because they failed to submit the assignment before the session ended, and this failure was predicted by greater exploration and experimentation during the lesson. These findings are described in a draft that will be submitted this semester (Sansone, Fraughton, Sinclair, Butner, & Zachary, in preparation).

In a follow-up study, we collected similar data within the context of two semester-long online computer science courses. In addition to the measures used in the laboratory paradigm, we added assessments of what students were feeling “in the moment” by programming pop-up questionnaires into the class server. These questionnaires appeared either at random intervals while the student was logged into the class (i.e., experience-sampling), or when the student chose to engage with class examples and exercises (i.e., event-sampling; these ‘events’ mapped onto similar engagement measures used in the laboratory paradigm). Using this methodology, we were able to track how students’ interest levels changed over time, both in general and also while students were known to be actively engaged with the course materials of their choosing. In a recent paper we used these data in a dynamic systems approach to examine how feelings of interest and confusion covaried over time (Geerling, et al., 2019), identifying potential gender differences.

Together, findings from research in the context of online learning suggest that students' actions during the learning process over time are critical for whether interest is maintained, and there is evidence that students engage in these actions in circumstances consistent with the SRM model. There is also evidence that these actions may result in performance trade-offs, as assessed by exam grades or submitting an assignment in time. Utilizing an online learning paradigm has thus given us a better sense of the ways in which students can use course materials to regulate their own interest experiences and maintain motivation over time. We anticipate that additional papers will be generated from the overall NSF-funded project.

I most recently lead an effort to identify whether the shift to various implementations of online learning during Fall Semester, 2020, were differentially associated with problems in engagement and motivation. With the support of the College of Social and Behavioral Sciences, we (myself and two graduate students, Yun Tang and Jasmine Norman) implemented repeated surveys across the semester in courses offered in two departments in the college. These courses differed in whether they were developed to be offered asynchronously online, initially scheduled to be in person but shifted to interactive video formats online, or were a "hybrid" version of alternating in person and online formats. (I submitted a small grant proposal to AERA Service Project Initiative program to provide some additional funding, but this was not funded.) We found that the "hybrid" classes showed the most motivational decrements over time, suggesting that more work is needed to understand how to make this combination of methods be effective (just as work was needed to make asynchronous online learning be effective after it initially involved transferring content from correspondence courses to online formats). We presented these findings to administration decision-makers at both the college and university level. We hope to be able to use these data for research purposes in future. I submitted in August of 2021 (with Dustin Thoman as a co-PI) a grant to the Spencer Foundation for funds to follow up this sample, but the grant was unfunded.

Meta-motivational beliefs. In a recent direction we have started to examine how individuals' beliefs about interest regulation may influence their own regulation processes. For example, Thoman, Sansone, Robinson and Helm (2020) proposed that students would only regulate interest if they believed that interest *could* be regulated, and that students would not actively regulate their interest if they believed that the experience of interest was stable (and unchangeable). In one of their studies, college students' theories about the malleability of interest (versus fixed nature of interest) was assessed via an adaption of Dweck, Chiu, and Hong's (1995) measure of implicit theory of intelligence. Student were also asked if they could recall any recent boring assignments from their actual classes, and if so, whether they used any interest-enhancing strategies when completing the assignment(s) (selected from a list). Across a range of academic domains, results revealed that students who believed that interest in an activity could be changed were more likely to report having used interest-enhancing strategies than students who believed that experiences of interest were stable. These findings were also conceptually replicated across two experimental studies. These meta-motivational beliefs are thus an important area of further study, because they will be influenced by parents and educators, and might help to explain why some students appear able to create or renew interest when hitting a motivational roadblock, while others do not. I was asked to be part of an invited symposium on Meta-Motivation and Meta-Reasoning at the International Conference on Motivation meeting that was to be held in Dresden in September of 2020; however, this conference was postponed because of the COVID pandemic.

Attributions for motivational roadblocks. Students beginning college often face motivational struggles with academic tasks that can be pivotal in determining their college experience. This project examines their beliefs about the role of interest as an explanation for

these struggles. Helping students to “discern” interest is often an explicit goal of peer advising (NACE Staff, 2018); however, clarity about students’ attributional processes is needed in order to effectively provide them with the types of support that they may need. We (myself, Dustin Thoman at SDSU, Danielle Geerling (now at St. Norbert’s College), Jasmine Norman and Yun Tang) have begun a program of studies to systematically examine how college students think about interest and value as the cause of motivational challenges associated with performance on academic tasks. We work from the conceptual framework that embeds this process within social influences, including preconceptions about interests for people from particular groups and domains (Thoman et al., 2019). These social influences can affect whether the problem is attributed to interest, as well as the consequences of doing so. For example, interest *can* be developed (Renninger & Hidi, 2016), but students may not see that as an option for people from some groups or in certain domains.

To examine these questions, we developed an online paradigm in which participants are asked to read the profile of an hypothetical student and provide advice. This online peer-advising tool allows us to causally disentangle beliefs related to domain and/or social identity. Participants are provided a profile of an advanced high school student seeking advice about a motivational problem. In all profiles, the student is named “Jordan.” Jordan’s problem is difficulty in getting started on a class assignment. A picture of Jordan is provided, reflecting different gender or ethnic backgrounds (selected from the Chicago Face Data Base (Ma, Correll, & Wittenbrink, 2015) to have equivalent ratings of attractiveness and prototypicality). The domain in which Jordan is having a problem can also be varied (e.g., physics versus history). The assignment content is taken from the Utah Common Core curriculum, but the student’s problem and actions are described similarly in all scenarios. After reading Jordan’s profile, participants are asked to provide advice, rate a set of potential attributions for why Jordan was having the problem, rate a variety of potential strategies that Jordan could do to help with the problem, and indicate whether/how far Jordan should continue in the domain (continue classes in high school, in college and/or major in the field).

To ensure good representation of students, we have been collecting data at two sites simultaneously (the University of Utah and San Diego State University), recruiting students who are at the beginning of their college career. Each study requires 500 participants, and we have completed 3 studies to date. We were starting on a fourth study when the Covid19 pandemic occurred (In addition, I was chair of a symposium that was to be presented at the annual American Educational Research Association meeting in April, 2020, with my graduate student presenting a paper on this research. The conference was cancelled due to the pandemic.)

Given that the sudden (and prolonged) shift to all (or virtually all) online learning lead to a marked increase in reported student problems with motivation, we needed to step back and reconsider data collection. We used Fall 2020 to think through the problems, sought out and added relevant measures, and reworked materials to try to be sensitive to these changes. We began data collection again (though data collection at our second site has been delayed). Two further related problems: 1) the size of the psychology participant pool had greatly decreased as classes (temporarily) decreased or removed the participation requirement. Thus, even though we are collecting data online, the pace of data collection is slower; and 2) we had originally planned that we would need this study to combine with 3 previously completed studies to be competitive for publication (journals in our field have drastically increased expectations for number of participants per study, and number of studies per paper). However, given the current rate of data collection, and the concern that it might be affected by the experiences during the pandemic, we have decided to submit a paper for publication including only the already completed studies.

The initial results from the completed studies suggest that college students were most likely to attribute the motivational problem to a mismatch with interests at a global (rather than situation) level when the hypothetical student was female (relative to male) and having a problem in her physics class. In turn, attributing the problem to interests was associated with lower persistence recommendations. These initial results suggest that in the absence of any information about the hypothetical student's interests or performance, students' judgments are influenced by expectations about females in physics. Results from a subsequent study suggested that this can be overcome if explicit evidence of the female student's prior interest in the field is provided. We have currently developed a draft of a paper reporting the results of these studies with two (now former) graduate students taking co-first author roles (Geerling and Norma), and plan to submit the paper soon.

We also submitted a proposal to the Spencer Foundation in 2020 to use this paradigm to clarify students' theories about interest as a source of motivational problems by varying information about performance, the social identity of the target student, and whether they are describing their own (v. another's) struggles. Although this proposal was unfunded, we plan to continue to pursue these directions.

Beliefs about Interest relative to Performance in Hiring. In a new but related line of research (that resulted from having to rethink Yun Tang's master's thesis in light of the pandemic restrictions), we have begun to look at individuals' beliefs about the importance of interest relative to performance when judging whether a person would be a good candidate for a position. We developed a paradigm that could be used online (with several rounds of piloting) that asked participants with work experience (filtered on MTurk) to evaluate a hypothetical candidate for a full-time position at a company, in light of the evaluation of their internship. These ostensible evaluation forms systematically differed in whether the potential candidate's interest and performance during the internship was evaluated as above or below the average intern. Participants then indicated their likelihood of recommending that the candidate be hired, and also suggested a starting salary. We found across two domains (marketing and sales; software engineer) that participants weighed interest and performance equally when recommending whether to hire the candidate, but weighed performance more than interest when deciding a starting salary. The results of these studies have been submitted for consideration for publication, with Yun as first author. We plan to do follow up studies where we start to examine whether this pattern changes when the job candidate's identity in terms of gender or ethnicity is added to the profile.

New collaborations:

Kirsten Butcher (PI) invited me to be part of a grant proposal submitted to the NSF I-Test program, as one of the co-PIs. In this proposal, we combine questions about interest development with the use of a hands-on exploratory prototype activity involving museum specimens that was previously developed in conjunction with the National History Museum of Utah and funded by NSF (the EPIC Bioscience project). Students collect their own data from digitized specimens to address key questions, analyzing their results and communicating findings. The proposed work is to document and understand how, when, and for whom the EPIC investigations support interest and motivation among middle school students, and how different structural and social components might contribute to or interfere with that process. The proposal was submitted in Aug, 2021, and is currently under review.