Research
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 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 might 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. In 2012, we were invited to a special conference on Interest and K-16 Mathematics and Science Learning (PIs: Renninger & Nieswandt) funded by the American Educational Research Association to present the model and implications for education, and a chapter appears in the edited book based on that conference (Sansone, Thoman & Fraughton, 2015). We have also been asked to review the model and the research that has been directed by that model in two other recent edited volumes (Thoman, Sansone & Geerling, in press; Sansone, Geerling, Thoman, & Smith, submitted).

Recent 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 (grant ended in 2013; I was PI) 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). College student participants came to the computer lab, where they were asked to complete a 90-minute session in which they learned about HyperText Markup Language (HTML) for creating web pages. This session combined several lessons from an actual computer science class offered online, including a final assignment (reproducing a sample web page) to submit before the end of the session. Piloting had suggested that the materials could be completed in about 75 minutes if students worked straight through on the main lesson pages, and so we allowed students 90 minutes to submit their assignments before the lesson session closed. Students were informed that they had 90 minutes to work through the materials at their own pace, including taking breaks, and that piloting suggested that it could be completed in 75 minutes. Click-level behavioral data were collected unobtrusively while students worked through the lessons, tracking the extent to which participants accessed and interacted with optional examples and exercises (measures of engagement), as well as whether they visited other websites (and which ones) during the lesson. At 90 minutes the lesson session closed (whether or not students had submitted the assignment), and a post-session questionnaire assessed their knowledge of what was covered in the lesson and their interest and motivation to learn more in the future. With this paradigm, therefore, we were able to unobtrusively track how students interacted with the lessons over time, when they were responsible for what they did, when, in what order, and so on, much as they would in an actual online class. We were also able to see whether these patterns predicted learning and interest outcomes.

Using this paradigm, we could test multiple hypotheses generated from the SRM model. For example, the SRM model posits that external interventions that increase the value of a learning goal (i.e., increased goal-defined motivation) can enhance interest directly, or indirectly by motivating active engagement with the material in ways that make the experience more interesting. The literature shows that one effective way to increase the value of learning is through interventions that support students in finding the usefulness or utility of the content (e.g., Hulleman & Harackiewicz, 2009). Results from 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. This pattern suggests that students were more likely to create interesting experiences when they value the goal of learning, and that their actions can
potentially hurt short-term performance measures while increasing the odds of longer term learning and reengagement. A second study suggested that this potential trade-off as the result of exploratory engagement could be constrained in contexts where performance evaluation was salient; however, this meant that although students were less likely to fail to submit the assignment in time, they also had lower levels of interest and learning. 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. Initial results (described in Danielle Geerling’s Master’s thesis) suggest that students’ in-the-moment reactions to the course predicted interest and performance outcomes differently when these reactions reflected moments that students were actively engaged with the examples and exercises (event-sampling), as opposed to more general samplings of their experiences within the course (Geerling, 2017).

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.

More recently, we have worked with the Psychology Department to use some of the things we have learned and methods we have developed to help assess the online offerings of classes re-developed as part of the Online Initiative (funds for which we applied for when I was chair). Although to date these data have been used for evaluation of our educational efforts within the department, it is possible that we may be able to use some of the data collected to address research questions. (Elissa Lauber is currently working on an IRB application for using some of the data for research purposes). I should note that we (Jon Butner, Jon Thomas, and I; I served as PI) submitted a proposal to the Spencer Foundation to further the research aspects of the work, but it was not funded. In addition, I served as a “key personnel” as part of a team submitting a grant to NSF to implement and evaluate a new program to integrate computer science in other curriculum on campus; this grant was also not funded.

**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 and Robinson (in preparation) 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.

Attributions for motivational roadblocks. Attributions about why a student might lack interest in completing an academic activity may have implications for how students think about the potential for interest regulation and for underlying ability. For example, a student might attribute lack of interest in completing a science problem to the student’s lack of science ability or to the “fact” that they are just not “a science person”, but attribute lack of interest in completing an English Literature assignment to problems with the material itself. In the former case, the student could feel that nothing can be done, and quit as soon as possible. In the latter case, the student might be more likely to find a way to make the assignment more interesting, leading to greater persistence. We (Danielle Geerling, Dustin Thoman and I) thus developed a new research paradigm in order to investigate whether students’ different underlying theories about when and where (i.e., in what domain) interest in academic activities can be regulated may explain differential selection and persistence in Science, Technology, Engineering and Math (STEM) and non-STEM fields. We also hope to use information obtained from this research to construct ways to encourage interest regulation, particularly among students currently underrepresented in college and, in particular, STEM fields.

In the overall paradigm, participants are told that the general purpose of the research is to ask students who have recently made the successful transition to college what advice they would give to high school students when they hit a roadblock in completing required school assignments. The materials are presented via computer, where participants are randomly assigned to read one vignette about a (hypothetical) student, “Jordan”, and then answer a number of questions relevant to that vignette, as well as a number of questions assessing their own backgrounds and experiences. All vignettes describe the same basic problem (high school student having trouble starting work on a required school assignment), and this information serves as the basic comparison group. Depending on condition, the vignettes also have different kinds of additional information about the targeted high school student. For example, in the first study, in the non-control conditions participants are presented a picture of “Jordan” who is either male or female (two different pictures are used for each, drawn from the Chicago Face Database and rated similarly for levels of attractiveness). In addition, the class in which Jordan is having the problem is either Physics or History (descriptions of the project in each class were based on the published Utah Common Core standards). We have recently completed data collection for this study (collected at both Utah and San Diego State University, over 300 participants in all), and are beginning a second study (where we will vary the ethnicity of “Jordan” via photos from the same database). We are just beginning data analyses (where we will examine effects as a function of the participants’ gender, as well as characteristics of “Jordan”). I am also working with an undergraduate student (Molly Davis) who will be using parts of this research as the basis for her honor’s thesis (she is currently involved as a UROP project). We anticipate that this line of research will provide a number of important follow-up questions, and anticipate that this will be a fruitful area for grant proposals.
**Ambivalent support for students from underrepresented backgrounds.** In a new project with Jackie Chen (and Bert Uchino), we are just starting to collect some pilot data on whether undergraduates who come from underrepresented backgrounds (e.g., first-generation college students or underrepresented ethnic minority backgrounds) are more likely to experience ambivalent support when they seek help for academic problems and challenges (or achieve successes). This direction involves integrating the work Bert and his colleagues have done on the role of ambivalent support in close relationships on stress with work on the potential mismatch between students from underrepresented backgrounds and currently constructed academic contexts, as well as the work suggesting that these students might be seen as 'selling out', having to choose between academic success and their communities, and so on. We are just beginning to discuss this as part of an undergraduate’s potential honor’s thesis work. If the initial work suggests that there are good lines to pursue, we anticipate that this will be another area that might be competitive for grant proposals.

**Final note.**
The past five years covered the period in which I served as Psychology Department Chair; this is my first year back in the faculty role of teaching, service, etc. As a reminder, I was first asked to become chair the summer of 2011 (on an interim basis) in a crisis situation (because of the illness of Fred Rhodewalt). In these circumstances, there was no lead time or opportunity for preparation (basically, the question was ‘can you become Chair tomorrow’). I was midway through my grant from NSF at that point, had several publications coming out or close to completion, and I was able to continue to work these through. I was subsequently asked to take on a full term of chair beginning 2012. I continued to supervise the grant work, but needed to rely more on my graduate students. Unfortunately, my senior graduate student ended up taking a leave because of personal reasons, and my remaining student was a non-native English speaker. Towards the later years in my chair term, then, I was able to make sure that data collection continued, but did not have the time to concentrate on writing up the results, and I had no other personnel who could take up the slack (I did continue to present preliminary results at national and international conferences, however.) I mention all of this because of the time lag between conducting research, submitting papers, and papers ultimately appearing in print. Since the end of my term as chair (mid- to late- 2015 and up to this point), I submitted grants, have an empirical paper published (with a former student as first author, which includes data collected here at Utah) and an ‘in press’ chapter. I have two additional papers close to submission (one as first author, a second with a former student as first author), and an invited chapter that is being submitted to the editors at the end of January. I also presented in symposia at three national conferences. In addition, as described above I developed a new research lab paradigm with one of my newer students, and we are starting to collect data for a second study at two sites. Thus, I am working toward getting my research momentum back after it was interrupted by my service to the department and university. Because of publication lags, though, it will take a few years for this to be reflected in the endpoint of publications that appear in print.

**Goals.** My primary goals are to analyze some of the backlog of data I have collected, continue to develop new areas of research, write-up and submit papers, and develop new grant ideas.