Publications and Presentations Related to the MUSIC® Model of Motivation

Updated April 2018

The purpose of this document is to organize and present many of the publications and presentations that include the MUSIC® Model of Motivation (Jones, 2009, 2018) as a *significant component*. Articles that simply reference the MUSIC model are not included here. For the presentations that are based on some or all of the data in a subsequent publication, the presentation is bulleted beneath the publication to indicate that the research is related. For more information, visit www.theMUSICmodel.com

The citations are generally organized from oldest to most recent within each of the following four sections:

1. Designing Instruction
   - *These works focus specifically on how to intentionally design instruction to affect students' MUSIC model perceptions.*
2. Examining Students' Motivation
   - *These works use the MUSIC model as a framework to examine students' motivation. Teaching implications often result from these examinations and are often discussed in these works.*
3. Fostering Domain Identification
   - *These studies investigate relationships among students' perceptions of the MUSIC model in a course and their identification with (i.e., how much they value) the subject area in the course.*
4. Measuring MUSIC Constructs
   - *These researchers have developed and/or investigated the use of different measures (e.g., surveys, interview questions, observation forms) to assess students' MUSIC perceptions.*

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1. Designing Instruction

These works focus specifically on how to intentionally design instruction to affect students' MUSIC model perceptions.

Primary Sources

Jones, B. D. (2009). Motivating students to engage in learning: The MUSIC Model of Academic Motivation. *International Journal of Teaching and Learning in Higher Education, 21*(2), 272-285.

- Abstract from this article: "The purpose of this article is to present a model of academic motivation that can be used by instructors to design courses that will engage students in learning. The model, based on research and theory, consists of five components that an instructor should consider when designing instruction: (1) empowerment, (2) usefulness, (3) success, (4) interest, and (5) caring. In this article, I describe the components of the model by discussing the key concepts of the components, summarizing the background research and theories that support the importance of the components, and providing questions, suggestions, and examples that instructors should consider when designing instruction. My hope is that novice, as well as experienced, instructors will find this model and the associated suggestions and examples useful as a reference tool to which they can refer when designing instruction." (p. 272)

Jones, B. D. (2018). *Motivating students by design: Practical strategies for professors* (2nd ed.). Charleston, SC: CreateSpace.

Jones, B. D. (2018, April). *Publications and presentations related to the MUSIC® Model of Motivation*. Retrieved from http://www.theMUSICmodel.com

- From the back cover of the book: “The title of the book, *Motivating Students by Design,* was chosen because the author explains how instructors can motivate students intentionally through the design of their courses. The two primary purposes of this book are to present a motivation model that can be used to design instruction and to provide practical motivation strategies and examples that can be used to motivate students to engage in learning. Based on decades of research, Dr. Brett Jones presents a framework to organize teaching strategies that motivate students. All of the strategies presented are followed by several examples, which provide readers with over 100 ideas for how the strategies can be implemented in courses. This book will be useful to graduate students and beginning professors, as well as professors who are more experienced and want to refine their instruction or try new strategies.” (back cover of the book)

Other Sources

Jones, B. D. (2010, October). *Strategies to implement a motivation model and increase student engagement.* Paper presented at the annual meeting of the International Society for Exploring Teaching and Learning, Nashville, TN.

Jones, B. D. (2012, February). How to motivate students in online courses: Using the MUSIC Model of Academic Motivation to connect research to practice. *Proceedings of the 2012 Conference on Higher Education Pedagogy*, Blacksburg, VA.

Jones, B. D. (2014, February). How to make research-based instructional decisions related to student motivation. *Proceedings of the 2014 Conference on Higher Education Pedagogy*, Blacksburg, VA.

Jones, B. D. (2015, February). Designing a flipped classroom to motivate students. *Proceedings of the 2015 Conference on Higher Education Pedagogy*, Blacksburg, VA.

Jones, B. D. (2015, June). *Instructional approaches to enhance motivation for learning*. Cognitive Remediation in Psychiatry Conference, Columbia University, New York, New York.

Chittum, J. R., & Jones, B. D. (2015). Motivating students to engage during reading instruction: Intentionally designing instruction using a model of academic motivation. *Ohio Reading Teacher, 45*(1), 29-40.

Jones, B. D. (2016). Teaching motivation strategies using the MUSIC® Model of Motivation as a conceptual framework. In M. C. Smith, & N. DeFrates-Densch (Eds.), *Challenges and innovations in educational psychology teaching and learning*. Charlotte, NC: Information Age Publishing.

Jones, B. D. (2015, August). *Flipping your course using the MUSIC® Model of Motivation*. Elon University, Elon, NC.

Gardner, A. F., & Jones, B. D. (2016). Examining the Reggio Emilia approach: Keys to understanding why it motivates students. *Electronic Journal of Research in Educational Psychology, 14*(3), 602-625.

- The Abstract of this article: “Because of the success of the Reggio Emilia Approach in early childhood education, it could be useful to researchers and practitioners to identify and explicate components of the approach that make it effective in motivating students. In this paper, we examine the Reggio Emilia Approach through the lens of the MUSIC® Model of Motivation, a model based on key motivation components (i.e., empowerment, usefulness, success, interest, and caring) derived from current research and theory. We explain the connections between the Reggio approach and the MUSIC model using theoretical and practical examples to demonstrate that the success of the Reggio approach is in part due to the manner in which it is consistent with key motivation principles. We believe that educators could assess their own programs to determine whether they could do more to incorporate these motivational components into their educational environment.”

2. Examining Students' Motivation

These works use the MUSIC model as a framework to examine students' motivation. Teaching implications often result from these examinations and are often discussed in these works.

Jones, B. D. (2010). An examination of motivation model components in face-to-face and online instruction. *Electronic Journal of Research in Educational Psychology, 8*(3), 915-944.

Schnittka, C. G., Brandt, C. B., Jones, B. D., & Evans, M. A. (2012). Informal engineering education after school: Employing the studio model for motivation and identification in STEM domains. *Advances in Engineering Education, 3*(2), 1-31.

- Abstract from this article: "Studio STEM adopts a design studio model to provide middle school youth with the opportunity to work with peers and college student facilitators after school in a relaxed, non-threatening, collaborative environment. Two informal learning educators guided overall instruction and pacing, but youth directed their own step-by-step activities by appropriating available resources based on their understanding of presented science and engineering concepts and design problems. We investigated how Studio STEM impacted youth's motivation, beliefs, and identification with engineering, science, and computer science. We documented that the Studio STEM environment supported students' empowerment, highlighted the usefulness of the content, allowed students to feel successful, interested students, and provided the caring needed by students to increase their identification with engineering, science, and computer science. The increases in these beliefs also led to the high *effort* that youth dedicated to Studio STEM, and the claims that youth would *choose* to take a course in these subject areas even if they were not required to do so." (p. 1)

Jones, B. D., Ruff, C., Snyder, J. D., Petrich, B., & Koonce, C. (2012). The effects of mind mapping activities on students' motivation. *International Journal for the Scholarship of Teaching and Learning, 6*(1), 1-21.

- Abstract from the article: "We examined how students‟ motivation differed when they participated in three different types of mind mapping activities: one activity that was completed individually outside of class time, one that was completed individually in class with the instructor available for help, and one that was completed in class with other students and the instructor available for help. Using the MUSIC Model of Academic Motivation (Jones, 2009) as a framework, we implemented a concurrent mixed methods design using identical samples whereby the quantitative component was dominant over the qualitative component. Participants included 40 undergraduate students enrolled in an educational psychology course at a U.S. university. After each of the mind mapping activities, study participants completed questionnaires that included open- and closed-ended items. Although the three activities had similar effects on students‟ motivation-related beliefs, some differences were documented in their preferences of mind mapping activities. Instructional implications are provided." (p. 1)

Jones, B. D. (2012, August). *Factors that impact students' motivation, instructor ratings, and course ratings in an online course*. Research presented at the International Conference on Motivation 2012. Frankfurt, Germany.

Jones, B. D., Epler, C. M., Mokri, P., Bryant, L. H., & Paretti, M. C. (2013). The effects of a collaborative problem-based learning experience on students' motivation in engineering capstone courses. *Interdisciplinary Journal of Problem-based Learning, 7*(2). doi:10.7771/1541-5015.1344

- Abstract from this article: "We identified and examined how the instructional elements of problem-based learning capstone engineering courses affected students' motivation to engage in the courses. We employed a two-phase, sequential, explanatory, mixed methods research design. For the quantitative phase, 47 undergraduate students at a large public university completed a questionnaire that measured the components of the MUSIC Model of

Academic Motivation (Jones, 2009): empowerment, usefulness, success, situational interest, individual interest, academic caring, and personal caring. For the qualitative phase that followed, 10 students answered questions related to the MUSIC components. We identified several instructional elements that led to motivating opportunities that affected students' motivation to engage in the courses. We discuss how these motivating opportunities can foster or hinder students' engagement and provide implications for instruction."

Jones, B. D., Watson, J. M., Rakes, L., & Akalin, S. (2013). Factors that impact students' motivation in an online course: Using the MUSIC Model of Academic Motivation*. Journal of Teaching and Learning with Technology, 1*(1), 42-58.

- Abstract from the article: "The aim of this study was to examine the factors that motivate students in large online courses. Specifically, the purposes were: (a) to document how highly men and women rated motivational beliefs in a large online course; (b) to determine why men and women rated their motivational beliefs the way in which they did; and (c) to provide recommendations for how to intentionally design online courses to motivate students. Using a mixed methods design, we used a questionnaire to assess undergraduate students' perceptions of the components of the MUSIC Model of Academic Motivation (i.e., eMpowerment, Usefulness, Success, Interest, and Caring) in an online course and their suggestions for changing the course. Overall, men and women provided high ratings for their motivational beliefs in the course. The suggestions students provided for changing the course were similar for both sexes and revealed a preference for instructional strategies that were consistent with the tenets of the MUSIC Model of Academic Motivation, including: offering more and/or varied assessments, providing interactive activities, including videos and/or video lectures, and offering face-toface meetings. Other suggestions for improving the online course design are provided." (p. 42)

Hall, S., Jones, B. D., Amelink, C., & Hu, D. (2013). Educational innovation in the design of an online nuclear engineering curriculum. *The Journal of Effective Teaching, 13(*2), 58-72.

Williams, A. W. (2013). *An action research study using the MUSIC Model of Academic Motivation to increase reading motivation in a fourth-grade classroom* (Unpublished doctoral dissertation). Virginia Tech, Blacksburg, VA.

Lee, W. C., Kajfez, R. L., & Matusovich, H. M. (2013). Motivating engineering students: Evaluating an engineering student support center with the MUSIC model of academic motivation*, Journal of Women and Minorities in Science and Engineering, 19*(3), 245-271.

Akalin, S., Schram, A., Chittum, J., Fink, J., & Jones, B. D. (2013, May). *Middle school students' motivation-related perceptions of afterschool science and engineering activities.* Poster presented at the annual meeting of the Society for the Study of Motivation, Washington, D.C.

Evans, M. A., Jones, B. D., & Biedler, J. (2014). Video games, motivation, and learning. In F. C. Blumberg (Ed.), *Learning by playing: Video gaming in education* (pp. 273-289). New York, NY: Oxford University Press.

Lee, W. C., Seimetz, C. N., & Amelink, C. T. (2014). Examining the transition to engineering: A multi-case study of six diverse summer bridge program participants. *Proceedings of the 121st American Society for Engineering Education Annual Conference, Indianapolis, IN*.

Kavousi, S. (2014, February). *The role of motivation in improving student learning in design studio*. Proceedings of the 2014 Conference on Higher Education Pedagogy, Blacksburg, Virginia.

Sahbaz, S., & Jones, B. D. (2014, February). *Testing a model of motivation and students' effort in science class with middle-school students.* Poster presented at the annual meeting of the Eastern Educational Research Association, Jacksonville, FL.

Kavousi, S., & Miller, P. (2014, February). *Student motivation and learning in the design studio: Rethinking the MUSIC model*. Proceedings of the 8th International Conference on Design Principles and Practices, Vancouver, Canada.

Kavousi, S., & Miller, P. (2014, March). *Increasing the academic motivation towards landscape architecture studio course, finding center landscape+values*. CELA 2014 Conference Proceedings University of Maryland, Baltimore, Maryland.

Jones, B. D., Akalin, S., Schram, A., Fink, J., Chittum, J., Schnittka, C., & Evans, M. (2014, April). *Elements of design-based science teaching that affect middle school students' motivation*. Paper to be presented at the annual meeting of the American Educational Research Association, Philadelphia, PA.

Chittum, J. R., Sible, J., & McConnell, K. D. (2014, April). *SCALE(ing)-UP teaching: A case study of student motivation in an undergraduate cancer biology course.* Paper presented at the annual meeting of the American Educational Research Association Annual Meeting, Philadelphia, PA.

Le, H. H., Le, H. D. T., & Pham, B. N. (2014). Applying MUSIC model to explore students' academic motivation in an ESP course. *Sino-US English Teaching, 11*(10), 719-725.

McGinley, J., & Jones, B. D. (2014). A brief instructional intervention to increase students' motivation on the first day of class. *Teaching of Psychology, 41*(2), 158-162. doi: 10.1177/0098628314530350

- Abstract from the article: "What an instructor does on the first day of a course can impact students' motivation in the course. To build upon these prior research findings, we implemented a first-day intervention to influence students' motivation by increasing their perceptions of course interest, course usefulness, and instructor caring. The participants were undergraduate students (n ¼ 111) enrolled in either an introductory or an upper-level psychology class. The instructor implemented an experimental intervention to some sections but not to others. The intervention allowed students to discuss the usefulness of and their interest in the course with one another and to interact with a caring instructor. As hypothesized, students' perceptions of course interest and instructor caring increased significantly; although perceptions of course usefulness did not." (p. 158)

Martin, J. (2014). Motivational factors related to a secondary English teacher's use of new literacies with voice and writing instruction. (Unpublished doctoral dissertation). Virginia Tech, Blacksburg, VA.

Jones, B. D., Chittum, J. R., Akalin, S., Schram, A. B., Fink, J., Schnittka, C.,…Brandt, C. (2015). Elements of design-based science activities that affect students' motivation. *School Science and Mathematics, 115*(8), 404-415. doi:10.1111/ssm.12143

Evans, M. A., Schnittka, C., Jones, B. D., & Brandt, C. B. (2016). Studio STEM: A model to enhance integrative STEM literacy through engineering design. In L. A. Annetta, & J. Minogue (Eds.), *Connecting science and engineering education practices in meaningful ways* (pp. 107-137). Switzerland: Springer. doi:10.1007/978-3-319-16399-4_5

- Abstract from this article: "The primary purpose of this study was to examine the ways in which a 12-week afterschool science and engineering program affected middle school students' motivation to engage in science and engineering activities. We used current motivation research and theory as a conceptual framework to assess 14 students' motivation through questionnaires, structured interviews, and observations. Students reported that during the activities they perceived that they were empowered to make choices in how to complete things, the activities were useful to them, they could succeed in the activities, they enjoyed and were interested in the hands-on activities and some presentations, they felt cared for by the facilitators and received help when they were stuck or confused, and they put

forth effort. Based on our examination of data across our three data sources, we identified motivating opportunities that were provided to students during the activities. These motivating opportunities can serve as examples to help both formal and informal science educators better connect motivation theory to practice so that they can create motivating opportunities for students. Furthermore, this study provides a methodological example of how students' motivation can be examined during the context of authentic science and engineering instruction." (p. 107)

Jones, B. D., Li, M., & Lu, P. (2015, July). *Using the MUSIC® Model of Motivation to redesign instruction in a large course*. Paper presented at the Conference on Teaching Large Classes, Blacksburg, VA.

Cretu, D-M. (2015). A model for promoting academic motivation. *Procedia – Social and Behavioral Sciences, 180*, 751-758.

Smith-Orr, C. S., & Garnett, A. (2016). Motivation and identity in C++: The effects of MUSIC in an engineering classroom. *IEEE*.

Remijan, K. W. (2017). Project-based learning and design-focused projects to motivate secondary mathematics students. *Interdisciplinary Journal of Problem-Based Learning, 11*(1).

Evans, M. A., Duke, R. F., & Jones, B. D. (submitted). *Characterizing youth academic engagement with STEM in an afterschool design studio.* Manuscript submitted for publication.

Tu, H.-W., Jones, B. D. (2017). Redesigning a neuroscience laboratory course for multiple sections: An action research project to engage students. *The Journal of Undergraduate Neuroscience Education, 15*(2), A137-A143.

- The Abstract of this article: "The purpose of our action research project was to improve students' motivation in a multi-section introductory neuroscience laboratory course. In this paper, we present: (a) how we collected data related to students' motivation and engagement, (b) how we analyzed and used the data to make modifications to the courses, (c) the results of the course modifications, and (d) some possible explanations for our results. Our aim is not only to provide the results of our study, but also to explain the process that we used, with the hopes that other instructors can use similar approaches to improve students' motivation in their courses. Our attempts to improve students' motivation-related perceptions were successful in some instances, but not in others. Of particular note was our finding that some of the students' perceptions varied even though the course syllabus was the same across sections. We attributed this variation to the learning environment developed by the teaching assistants (TAs) who taught the different sections. We provide some strategies that faculty instructors can use to redesign courses with high enrollments and help TAs motivate their students." (p. A137)

Evans, M. A., Jones, B. D., & Akalin, S. (2017). Motivating students with game design in out-of-school environments. *Afterschool Matters, 26,* 18-26.

Mora, C. E., Anorbe-Diaz, B., Gonzalez-Marrero, A. M., Martin-Gutierrez, J., & Jones, B. D. (2017). Motivational factors to consider when introducing problem-based learning in engineering education courses. *International Journal of Engineering Education, 33*(3), 1000-1017.

- Abstract from this article: "Problem-Based Learning (PBL) has become more popular in higher education over the past several years. It has proven to be effective in engineering education to increase students' motivation and the acquisition of skills required by the labour market and today's society. However, even when PBL is gradually introduced at an institution alongside traditional teaching, it is not perceived by students as an easy way to learn, especially when ill-structured, real problems are first introduced. Students can feel stressed, often because of their lack of both skills and previous knowledge, and they often prefer to focus their efforts on the final result and on passing their exams rather than the problem-

solving process. To identify the difficulties that students have during PBL and to re-design instruction to increase students' motivation, this study used the MUSIC1Model of Motivation as a conceptual framework. This paper analyses students' motivation when PBL is introduced in a traditional-teaching institution, and discusses the main adjustments needed to increase students' motivation, engagement, and learning." (p. 1000)

Martin, J. M. & Morris, S.L. (2017). Teaching Composition Together: Democracy, Perceptions, and New Literacies. *International Journal For Scholarship Of Technology Enhanced Learning, 1*(2). Retrieved from http://ejournals.library.gatech.edu/ijsotel/index.php/ijsotel/article/view/25

Lee, W. C., Brozina, C., Amelink, C. T., & Jones B. D. (2017). Motivating incoming engineering students with diverse backgrounds: Assessing a summer bridge program's impact on academic motivation. *Journal of Women and Minorities in Science and Engineering, 23*(2), 121-145. doi:10.1615/JWomenMinorScienEng.2017017960

- Abstract from this article: "Student retention is a common concern in engineering education, and first-year retention is a priority in engineering colleges throughout the United States. In an effort to broaden participation, engineering colleges also seek opportunities to engage women and minorities as early as possible. In view of these situations, many colleges offer summer bridge programs that are intended to ease the transition from high school to college for incoming students—often students from groups that are underrepresented, such as women and minorities. Although the adoption of summer bridge programs is widespread in engineering, the literature surrounding the impact of these programs has theoretical limitations. This manuscript describes the use of an evaluation tool based on the MUSIC® Model of Motivation to investigate how concepts from current motivation research and theories can be used to assess a summer bridge program. Two student cohorts (N = 183) of an established summer bridge program that serves a diverse population were assessed. This research highlights how a summer bridge program can affect the motivation-related perceptions of underrepresented students. Because the MUSIC Model of Motivation captures a wide range of motivation constructs it makes it possible to investigate how different subgroups experience a summer bridge program. For example, this study found that male students rated their expectancy for success higher then female students, and represented students rated their expectancy for success higher than underrepresented students. Another key finding was the importance of expectancy for success and having a caring staff on underrepresented students." (p. 121)

Chittum, J. R., Jones, B. D., Akalin, S., & Schram, A. B. (2017). The effects of an afterschool STEM program on students' motivation and engagement. *International Journal of STEM Education, 4*(11), 1-16. doi:10.1186/s40594-017-0065-4

- Abstract from this article: "Background: One significant factor in facilitating students' career intentions and persistence in STEM (science, technology, engineering, and mathematics) fields is targeting their interests and motivation before eighth grade. To reach students at this critical stage, a design-based afterschool STEM program, titled Studio STEM, was implemented to foster motivation and engagement in STEM topics and activities. The purpose of this study is twofold: (a) to investigate how Studio STEM affected students' beliefs about science and whether these beliefs differed from their peers who did not participate in the program, and (b) to examine a case study of one Studio STEM implementation to investigate elements of the curriculum that motivated students to engage in the program. Results: After completing two Studio STEM programs, participants' ratings of their values for science and science competence were higher than those of non-participants. In addition, the Studio STEM participants' motivational beliefs about science and intentions to pursue a college degree were more resilient over time than their peers. We also found that students could be motivated in a voluntary afterschool program (Studio STEM) in which they grappled with STEM concepts and activities, and could verbalize specific program elements that motivated them. Conclusions: Through this study, we found that students could be motivated in Studio STEM and that the experience had a positive impact on their perceptions about science as a field. Importantly, Studio STEM appeared to halt the decline in these students'

motivational beliefs about science that typically occurs during the middle school years, indicating that afterschool programs can be one way to help students maintain their motivation in science. Studying the program features that the students found motivating may help educators to make connections between research and theory, and their classroom instruction to motivate their students." (p. 1)

Chittum, J., & Jones, B. D. (2017). Identifying pre-high school students' science class motivation profiles to increase their science identification and persistence. *Journal of Educational Psychology, 109*(8), 1163-1187. doi:10.1037/edu0000176

- Abstract from the article: "One purpose of this study was to determine whether patterns existed in pre– high school students' motivation-related perceptions of their science classes. Another purpose was to examine the extent to which these patterns were related to their science identification, gender, grade level, class effort, and intentions to persist in science. We collected data from pre– high school students (Grades 5 through 7, 52.5% female, and 90.7% who self-identified as White) from 2 rural public schools in Southwest Virginia. Our analysis included data from 937 questionnaires that measured students' perceptions of empowerment/autonomy, usefulness/utility value, expectancy for success, situational interest, and caring in science class. Using cluster analysis, we identified 5 clusters (i.e., "motivation profiles") of students: (a) low motivation, (b) low usefulness and interest but high success and caring, (c) somewhat high motivation, (d) somewhat high motivation and high success and caring, and (e) high motivation. We tested the cluster stability by cluster analyzing subsamples by year of data collection and by grade level. Significant relationships existed between these motivation profiles and students' science identification, gender, grade level, science class effort, and intentions to persist in science. These findings may support science educators in targeting students with similar motivation profiles rather than adhering to the difficult and often unrealistic task of catering to each student's complex needs, individually." (p. 1163)

Chittum, J. R., McConnell, K. D., & Sible, J. (in preparation). *Undergraduate students' perceptions of motivation in a SCALE-UP Cancer Biology course: A case study.* Manuscript in preparation.

Chittum, J. R., Sible, J., & McConnell, K. D. (in preparation). *The perceived academic motivation of undergraduate students in several science courses: Evaluating one professor's instruction and mentorship using SCALE-UP pedagogy*. Manuscript in preparation.

Bart, A. C., Whitcomb, R., Kafura, D., Shaffer, C. A., & Tilevich, E. (2017, March). *Computing with CORGIS: Diverse, real-world datasets for introductory computing*. Proceedings of the 2017 ACM SIGCSE Technical Symposium on Computer Science Education, pp. 57-62. Seattle, WA. doi:10.1145/3017680.3017708

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3. Fostering Domain Identification

These studies investigate relationships among students' perceptions of the MUSIC model in a course and their identification with (i.e., how much they value) the subject area in the course.

Osborne, J. W., & Jones, B. D. (2011). Identification with academics and motivation to achieve in school: How the structure of the self influences academic outcomes. *Educational Psychology Review, 23*(1), 131-158. doi:10.1007/s10648-011-9151-1

- Abstract from this article: "Authors since William James (1892/1968) have implied that the structure of the selfconcept can influence motivation and outcomes in particular domains. The value or importance an individual places on a domain influences how motivated that individual is to expend effort in that domain, ultimately influencing the positivity or negativity of the outcomes in that domain (the outcomes then likewise influence the valuing of that domain). Taking the example of identification with academics (selectively valuing an academic domain as central to the selfconcept), we review the importance of psychological centrality and present a theoretical model directly linking the structure of the self to motivation

and outcomes, something not explicitly discussed in the literature to date. Finally, strategies are suggested for how to increase a student's identification with academics, which this theoretical framework suggests should lead to improved motivation to achieve in academics and improved outcomes for students." (p. 131)

Ruff, C. (2013). *Examining and supporting domain identification and student interest in first year college students* (Unpublished doctoral dissertation). Virginia Tech, Blacksburg, VA.

Jones, B. D., Osborne, J. W., Paretti, M. C., & Matusovich, H. M., (2014). Relationships among students' perceptions of a first-year engineering design course and their engineering identification, motivational beliefs, course effort, and academic outcomes. *International Journal of Engineering Education, 30*(6A), 1340-1356.

Jones, B. D., Ruff, C., & Osborne, J. W. (2015). Fostering students' identification with mathematics and science. In K. A. Renninger, M. Nieswandt, & S. Hidi (Eds.), *Interest in mathematics and science learning* (pp. 331-352). Washington, DC: American Educational Research Association.

Rakes, L., & Jones, B. D. (2015, February). Assessing VMI engineering majors' motivation perceptions: A program-level investigation. *Proceedings of the 2015 Conference on Higher Education Pedagogy*, Blacksburg, VA.

Jones, B. D., Tendhar, C., & Paretti, M. C. (2016). The effects of students' course perceptions on their domain identification, motivational beliefs, and goals. *Journal of Career Development, 43*(5), 383-397. doi:10.1177/0894845315603821

- Abstract from the article: "The purpose of this study was to examine whether students' perceptions in a first-year university engineering course affected their engineering identification, motivational beliefs, and engineering major and career goals. Based on current motivation models and theories, we hypothesized that students' perceptions of the components of the MUSIC Model of Motivation (the MUSIC model) in one of their first university engineering courses would predict their engineering identification, which would predict their major and career goals. We conducted exploratory factor analyses on an estimation sample of 110 students and used a two-step structural equation modeling approach with a validation sample of 333 first-year engineering undergraduates. The measurement and structural model fit indices demonstrated that the hypothesized model provided a good fit to the data, indicating that students' perceptions of four of the five MUSIC model components were statistically related to students' engineering identification, which then predicted their major and career goals." (p. 383)

Jones, B. D., Tendhar, C., & Rakes, L. (2015, April). *Relationships among students' engineering course-related motivational beliefs, engineering identification, and engineering major and career intentions.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Jones, B. D., Sahbaz, S., Schram, A. B., & Chittum, J. R. (2017). Using psychological constructs from the MUSIC Model of Motivation to predict students' science identification and career goals: Results from the U.S. and Iceland. *International Journal of Science Education, 39*(8), 1089-1108. doi:10.1080/09500693.2017.1319093

- Abstract from this article: "We investigated students' perceptions related to psychological constructs in their science classes and the influence of these perceptions on their science identification and science career goals. Participants included 575 middle school students from two countries (334 students in the U.S. and 241 students in Iceland). Students completed a self-report questionnaire that included items from several measures. We conducted correlational analyses, confirmatory factor analyses, and structural equation modelling to test our hypotheses. Students' class perceptions (i.e. empowerment, usefulness, success, interest, and caring) were significantly correlated with their science identification,

which was correlated positively with their science career goals. Combining students' science class perceptions, science identification, and career goals into one model, we documented that the U.S. and Icelandic samples fit the data reasonably well. However, not all of the hypothesised paths were statistically significant. For example, only students' perceptions of usefulness (for the U.S. and Icelandic students) and success (for the U.S. students only) significantly predicted students' career goals in the full model. Theoretically, our findings are consistent with results from samples of university engineering students, yet different in some ways. Our results provide evidence for the theoretical relationships between students' perceptions of science classes and their career goals." (p. 1089)

Ruff, C., & Jones, B. D. (2016). Becoming a scientist: Using first-year undergraduate science courses to promote identification with science disciplines. *International Journal for the Scholarship of Teaching and Learning, 10*(2). Retrieved from http://digitalcommons.georgiasouthern.edu/ij-sotl/vol10/iss2/12/

Tendhar, C., Singh, K., & Jones, B. D. (2017). Using the domain identification model to study major and career decision-making processes. *European Journal of Engineering Education, 43*(2), 235-246. doi:10.1080/03043797.2017.1329280

- The Abstract from this article: "The purpose of this study was to examine the extent to which (1) a domain identification model could be used to predict students' engineering major and career intentions and (2) the MUSIC Model of Motivation components could be used to predict domain identification. The data for this study were collected from first-year engineering students. We used a structural equation model to test the hypothesised relationship between variables in the partial domain identification model. The findings suggested that engineering identification significantly predicted engineering major intentions and career intentions and had the highest effect on those two variables compared to other motivational constructs. Furthermore, results suggested that success, interest, and caring are plausible contributors to students' engineering identification. Overall, there is strong evidence that the domain identification model can be used as a lens to study career decision-making processes in engineering, and potentially, in other fields as well." (p. 235)

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4. Measuring MUSIC Constructs

These researchers have developed and/or investigated the use of different measures (e.g., questionnaires, interview questions, observation forms) to assess students' MUSIC perceptions.

Jones, B. D., & Wilkins, J. L. M. (2013). Testing the MUSIC Model of Academic Motivation through confirmatory factor analysis. *Educational Psychology: An International Journal of Experimental Educational Psychology, 33*(4), 482-503. doi:10.1080/01443410.2013.785044

- Abstract from this article: "The purpose of this study was to provide empirical evidence to confirm the theoretical factor structure of the MUSIC Model of Academic Motivation that was developed to help instructors understand how current motivation research can be applied to instruction. We hypothesised the MUSIC model as a hierarchical five-factor correlated model and compared its fit to alternative models. Our research question was: Is a hierarchical five-factor correlated model a valid representation of the MUSIC model? The study included 1228 undergraduate students from three different types of university courses. We measured the constructs associated with the main components of the MUSIC model: empowerment, usefulness, success, interest and caring. Results of the confirmatory factor analyses provided strong evidence that the hierarchical five-factor correlated model was a valid representation of the MUSIC model. Thus, the MUSIC model consists of components that are theoretically and empirically correlated, yet distinct." (p. 482)

Fink, J., Chittum, J., Schram, A., Akalin, S., & Jones, B. D. (2013, May). *Measures and methodologies for studying students' motivation in an informal learning environment.* Poster presented at the annual meeting of the Society for the Study of Motivation, Washington, D.C.

Mohamed, H. E., Soliman, M. H., & Jones, B. D. (2013). A cross-cultural validation of the MUSIC Model of Academic Motivation and its associated inventory among Egyptian university students. *Journal of Counseling Quarterly Journal, 36,* 2-14.

Parkes, K., Jones, B. D., & Wilkins, J. (2017). Assessing music students' motivation using the MUSIC Model of Academic Motivation Inventory. *UPDATE: Applications of Research in Music Education, 35*(3), 16-22. doi:10.1177/8755123315620835

- Abstract from this article: "The purpose of this study was to investigate the reliability and validity of using a motivation inventory with music students in upper-elementary, middle, and high school. We used the middle/high school version of the MUSIC Model of Academic Motivation Inventory to survey 93 students in the 5th to 12th grades in one school. Our analysis revealed the inventory produced reliable and valid scores on the five MUSIC scales (MUSIC is an acronym for empowerment, usefulness, success, interest, and caring). Findings provide empirical evidence to support the validity of the five-factor structure of the MUSIC Model of Motivation for music students. Thus, the inventory may be used by music teachers as a reliable means to assess students' motivation-related perceptions. We provide several strategies that music teachers can consider in designing instruction to be consistent with each component of the MUSIC model, as well as possible implications." (p. 16)

Evans, M. A., Jones, B. D., Duke, R., & Schnittka, C. (2015, April). *Motivating and engaging students through Studio STEM.* Research presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Jones, B. D., & Skaggs, G. E. (2016). Measuring students' motivation: Validity evidence for the MUSIC Model of Academic Motivation Inventory. *International Journal for the Scholarship of Teaching and Learning, 10*(1). Retrieved from http://digitalcommons.georgiasouthern.edu/ij-sotl/vol10/iss1/7.

- Abstract from the article: "This study provides validity evidence for the MUSIC Model of Academic Motivation Inventory (MUSIC Inventory; Jones, 2012), which measures college students' beliefs related to the five components of the MUSIC Model of Motivation (MUSIC model; Jones, 2009). The MUSIC model is a conceptual framework for five categories of teaching strategies (i.e., eMpowerment, Usefulness, Success, Interest, and Caring) that were derived from research and theory as ones that are critical to students' motivation (Jones, 2009). Participants included 338 undergraduate students who provided questionnaire responses in reference to 221 different courses at a large public U.S. university. Our analyses included classical item analysis, confirmatory factor analysis, the calculation of Rasch measurement scales, and Pearson's correlation coefficients. Results support the validity of scores produced by the MUSIC Inventory for use with college students. This inventory could be useful to instructors and researchers interested in assessing the effects of instruction on students' motivational beliefs."

Jones, B. D., & Sigmon, M. L. (2016). Validation evidence for the elementary school version of the MUSIC® Model of Academic Motivation Inventory. *Electronic Journal of Research in Educational Psychology, 14*(1), 155-174. Retrieved from http://dx.doi.org/10.14204/ejrep.38.15081

Schram, A. B., & Jones, B. D. (2016). A cross-cultural adaptation and validation of the Icelandic version of the MUSIC Model of Academic Motivation Inventory. *Icelandic Journal of Education, 25*(2), 159-181.

- Abstract from the article: "We describe the cross-cultural adaptation of the middle and high school version of the MUSIC® Model of Academic Motivation Inventory (Jones, 2012) into Icelandic, in order to provide Icelandic educators with a tool to assess motivation and guide the selection of teaching strategies. The inventory measures students´ perceptions of the five components of the MUSIC® Model of Motivation (Jones, 2009, 2015): eMpowerment,

Usefulness, Success, Interest, and Caring. Back-translation of the MUSIC Inventory, followed by expert meetings, was used to gain semantic equivalence. Participants were 458 Icelandic students in fifth to eighth grade. To obtain translation equivalence, we used an exploratory factor analysis that involved principal axis factoring with promax rotation. Subsequently, we implemented a confirmatory factor analysis with a different sample of students to test for model fit. The results replicated the findings obtained with the original version and confirmed the five-factor structure, providing validity evidence for the scores produced by using the Icelandic version." (p. 159)

Pace, A. C., Ham, A.-J.L., Poole, T. M., & Wahaib, K. L. (2016). Validation of the MUSIC® Model of Academic Motivation Inventory for use with student pharmacists. *Currents in Pharmacy Teaching & Learning, 8*, 589-597. doi:http://dx.doi.org/10.1016/j.cptl.2016.06.001

Jones, B. D., Li, M., & Cruz, J. M. (2017). A cross-cultural validation of the MUSIC® Model of Academic Motivation Inventory: Evidence from Chinese- and Spanish-speaking university students. *International Journal of Educational Psychology*, *6*(1), 366-385. doi:10.17583/ijep.2017.2357.

- Abstract from this article: "The purpose of this study was to examine the extent to which Chinese and Spanish translations of the College Student version of the MUSIC® Model of Academic Motivation Inventory (MUSIC Inventory; Jones, 2012) demonstrate acceptable psychometric properties. We surveyed 300 students at a university in China and 201 students at a university in Colombia using versions of the MUSIC Inventory that were translated into Chinese and Spanish, respectively. To assess the psychometric properties of the inventory, we examined: (a) the internal consistency reliabilities for all of the scales, (b) the fit indices and factor loadings produced from confirmatory factor analysis, and (c) correlations between the MUSIC Inventory scales and behavioral and cognitive engagement. The results provide evidence that the Chinese and Spanish translations of the MUSIC Inventory demonstrate acceptable psychometric properties for use with undergraduate students. Therefore, instructors and researchers can use the translated inventories to assess students' perceptions of the five MUSIC® Model of Motivation components." (p. 366)

Manee, F. M., Salehi, E., Baghaei, R. & Alipour, M. (2017). Testing the seven-factor model of academic motivation (MUSIC) in medical sciences students. *Iranian Journal of Medical Education, 17*(8), 69-81.