



Publications and Presentations Related to the MUSIC® Model of Motivation

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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 the most recent to the oldest 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. Examining Relationships Between MUSIC Constructs and Other Constructs
 - *These studies investigate relationships among students' perceptions of the MUSIC model in a course and other constructs such as their engagement, their identification with (i.e., how much they value) the subject area in the course, and course and instructor ratings.*
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.*
5. Conducting Professional Development with the MUSIC Model
 - *These works explain how Dr. Jones and his colleagues have used the MUSIC model to conduct professional development with instructors to teach them about how to implement the MUSIC model in their instruction.*

1. Designing Instruction

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

Primary Sources

Jones, B. D. (2018). *Motivating students by design: Practical strategies for professors* (2nd ed.). Charleston, SC: CreateSpace. <https://vtechworks.lib.vt.edu/handle/10919/102728>

- 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)

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)

Other Sources

Jones, B. D. (2020). Motivating and engaging students using educational technologies. In M. J. Bishop, E. Boling, J. Elen, & V. Svihla. (Eds.), *Handbook of Research in Educational Communications and Technology: Learning Design* (5th ed., pp. 9-35). Cham, Switzerland: Springer. doi:10.1007/978-3-030-36119-8_2

- "The purpose of this chapter is to (a) provide a definition of motivation and the closely related concept of engagement, (b) discuss some of the antecedents and consequences of motivation, (c) list some motivation theories, (d) explain how motivation and engagement have been assessed, (e) discuss how instructors and instructional designers can design instruction to motivate students, (f) consider the motivating effects of current technologies, and (g) discuss some issues in the study of motivation and engagement. This chapter is aimed at a variety of audiences, including educators, administrators, and instructional designers who are interested in applying motivation concepts in instructional settings."

Jones, B. D. (2020). Engaging second language learners using the MUSIC Model of Motivation. *Frontiers in Psychology*, 11(1204), 1-6. doi:10.3389/fpsyg.2020.01204

- Abstract for this article: "The overall aim of this article is to explain how the MUSIC Model of Motivation can be applied to L2 instruction in a manner that is consistent with positive psychology, which emphasizes individuals' strengths and the conditions in which they thrive. The article begins by describing the MUSIC model, which is a research-based framework that

organizes strategies that instructors can use to motivate students to engage in learning. The MUSIC model can be used by L2 instructors to create learning experiences that consider learners' cognition, affect, needs, and desires in order to foster their motivation and engagement in L2 classes. The article also provides teaching strategies related to the MUSIC model and presents an assessment tool (the MUSIC Model of Academic Motivation Inventory) that can be used by L2 instructors to measure students' MUSIC perceptions of their class. The assessment tool provides feedback to instructors that can be used to improve their instruction by incorporating strategies that allow their students to flourish. Examples of how the MUSIC Inventory can be used to assess L2 instruction are provided. Although researchers have examined the use of the MUSIC model in L2 classes, this research is underdeveloped, and many questions related to its use in L2 classes remain. The article concludes by proposing unanswered questions that could lead to more effective uses of the MUSIC model in L2 classes."

Mullins, B., Jones, B. D., & LaCroix, T. J. (2020). Designing for and assessing students' motivation in mathematics classes. *Illinois Mathematics Teacher*, 65(1). Available online January 23, 2020.

- Abstract for this article: "It can be difficult for teachers to develop a coherent plan to motivate students. This article describes a research-based model and associated inventory that teachers can use to assess students' motivation and select engaging strategies. Classroom examples are provided along with practical motivational strategies suggested by mathematics teachers."

Munz, S., & Jones, B. D. (2022). Increasing athletes' engagement and performance using the MUSIC Model of Motivation. *Journal of Contemporary Athletics*, 15(4).

- The Abstract of this article: "Based on research and on our own experience as coaches, we have found that motivation is a key ingredient of successful athletic performance over time. Although maximizing motivation has long been of interest to coaches and practitioners, the vast number of motivational theories, principles, and strategies can be overwhelming and confusing to those unfamiliar with the research. Consequently, there is a need for providing more holistic frameworks to coaches and practitioners that not only summarize the essential findings of motivation research but also make the information more understandable and applicable in practical settings. The purpose of this article is to present the MUSIC Model of Motivation as a framework that can be applied in performance environments by coaches and practitioners to improve athletes' motivation, engagement, and ultimately, performance. The research-based MUSIC model consists of five components: eMpowerment, Usefulness, Success, Interest, and Caring. We explain each MUSIC model component within the context of sports, provide research evidence and examples related to each component, and suggest strategies that coaches can implement related to each component."

Jones, B. D. (2020). Using the MUSIC Model of Motivation to engage students. *The Virginia English Journal*, 69(2), 5-7.

Farkas, K., & McDonald, J. E. (2020). A large-class undergraduate microbiology laboratory activity on microbial diversity and antimicrobial resistance. *Journal of Microbiology and Biology Education*, 21(2), 1-9. <https://doi.org/10.1128/jmbe.v21i2.2043>

Li, M., & Jones, B. D. (2019). Transforming traditional teaching: A professional development program for the college EFL teachers. *Theory and Practice in Language Studies*, 9(12), 1494-1500. doi:10.17507/tpis.0912.05

- The Abstract of this article: "Researchers have demonstrated the value of teacher professional development programs (PDPs) as an effective strategy to improve teaching. The purpose of our study was to design and test an intervention that could be used as part of a PDP with three English as a Foreign Language (EFL) teachers at a Chinese university. The primary aim of our intervention was to help the teachers implement teaching strategies that would motivate students to engage in learning, with the ultimate goal of improving student motivation and achievement. The strategies implemented in the classroom intervention included group presentation activities

and a grading rubric. Through the use of both quantitative and qualitative research methods, we documented that the intervention had a positive effect on students' motivation and achievement, and changed teachers' attitudes and beliefs about how group activities could affect students' motivation and achievement."

LaCroix, T. J., Jones, B. D., & Triggs, K. (2018). Assessing high school students' motivation in the mathematics classroom. *Virginia Mathematics Teacher*, 45(1), 33-40.

Evans, M. A., Jones, B. D., & Akalin, S. (2017). Using video game design to motivate students. *Afterschool Matters*, 26, 18-26.

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."

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.

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."

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

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

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. (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. (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. (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.

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., Fenerci-Soysal, H., & Wilkins, J. L. M. (2022). Measuring the motivational climate in an online course: A case study using an online survey tool to promote data-driven decisions. *Project Leadership & Society*, 3, Article 100046. <https://doi.org/10.1016/j.plas.2022.100046>

- Abstract from this article: "Creating a positive motivational climate in an online course can engage students in their learning. Instructors may be able to better manage their courses and create a positive motivational climate if they implement online survey tools that allow them to assess the motivational climate of their courses. Teachers and researchers have documented that five student perceptions—empowerment, usefulness, success, interest, and caring—are particularly important for creating a positive motivational climate and are associated with students' engagement and evaluations of teaching. In this paper, we describe a case study of an instructor who used an online survey tool to assess the motivational climate in his online asynchronous course over time. He then used the feedback to consider improvements that he could make to his course in the future. In addition, we describe how this process of using the online survey tool could be used by instructors to transform education."

Ismail, M. J., Chiat, L. F., & Anuar, A. F. (2021). 'Music in film' for gifted students: The effect of differentiated learning on students' motivation. *Social Sciences & Humanities*, 29(4), 2709-2728.

- Abstract from this article: "Music is not only an important subject in general education, but it particularly serves gifted students who face various psychological issues not encountered by their 'normal' peers. Nonetheless, it is found that not all schools are implementing proper music lessons due to the focus on STEM subjects. This paper provides an overview of developing music enrichment activities as an approach to meet gifted students' needs. Differentiated instruction was used as the main approach to developing a comprehensive music enrichment activity, namely 'Music in Film', in which gifted students integrated music and computer skills in completing a given task. Furthermore, a research survey was conducted involving 36 gifted students. The MUSIC Inventory was used to measure their motivation and engagement towards the activity to measure the methods. Five domains—empowerment, usefulness, success, interest and caring—were measured on a 6-point Likert scale. Results revealed that all five domains were rated from moderate to high by the gifted students with a minimum 4.5 mean. Although it can be concluded that this enrichment activity is apt and effective for implementation in gifted education, future studies could look at participants with different backgrounds and demographics. It is hoped that this paper will contribute to designing more enrichment activities with a differentiated instruction approach as gifted students possess high potential in various talents that need to be nurtured."

Reash, C., & Larwin, K. H. (2021). Factors of motivation in education: Perspectives of college students and their professors. *Journal of Organizational and Educational Leadership*, 7(1). Article 2. <https://digitalcommons.gardner-webb.edu/joel/vol7/iss1/2>

- Abstract from this article: "This study examines motivational factors based on college students' and faculties' perceptions to determine which factors are most impactful. The researchers utilized Jones' MUSIC® Model of Motivation College Student and Professor inventories. Both are designed to determine the factors that impact student motivation (Jones, 2020). The Caring factor was the highest endorsed factor by both college students and faculty in all data collections. A paired sample t-test revealed that the Usefulness factor was rated statistically different by faculty and students. These data can be used to inform programmatic decisions and course design in the university's education department."

Vaziri, S., Vaziri, B., Novoa, L. J., & Torabi, E. (2021). Academic motivation in introductory business analytics courses. A Bayesian approach. *INFORMS Transactions on Education*. <https://doi.org/10.1287/ited.2021.0247>

- Abstract from this article: “The MUSIC (eMpowerment, Usefulness, Success, Interest, Caring) Model of Academic motivation was developed to help instructors promote student motivation in the classroom. This study examines relationships among student perceptions of motivation and effort compared with their performance in undergraduate business analytics courses. Specifically, the study will attempt to answer the questions of whether students’ scores on the MUSIC model predict or explain effort, academic performance, course rating, and instructor rating. A Bayesian approach to linear regression is used to determine and understand the impact of the MUSIC model components on the aforementioned output measures.”

Young, K. R., Schaffer, H. E., James, J. B., & Gallardo-Williams, M. (2021). Tired of failing students? Improving student learning using detailed and automated individualized feedback in a large introductory science course. *Innovative Higher Education*, 46, 133–151. <https://doi.org/10.1007/s10755-020-09527-5>

- Abstract from this article: “Providing students with timely, targeted, and useful feedback regarding their understanding of course topics is generally accepted as a good educational practice. However, when classes are very large there are challenges that prevent many instructors from accomplishing this goal. This study explores the perceived helpfulness to students and the instructor of implementing a relatively new method of automated scoring and feedback in a large section of an organic chemistry course. Prior research has shown this method to be helpful in other STEM classes. In the current study, students in two different offerings of a stand-alone organic chemistry course completed an anonymous survey in which they were asked to provide feedback about their perceptions of the new methodology. The faculty member who taught the course was also asked to respond to a series of questions regarding the feedback system. Both students and the instructor provided favorable comments about the helpfulness of the methodology and the feedback provided by it. The instructor found it helpful for providing individual feedback to students, which had previously not been possible due to the number of students enrolled in the course. Students reported that the feedback helped them to identify course topic strengths and challenge areas and that they planned to study the material differently going forward. The results indicate that this intervention can help improve student understanding of course topics and necessary actions for improving future performance in the course.”

Anderson, A. S. (2020). One small step in the lecture hall, one big step for student motivation: Short bursts of in-class small group work. *Pedagogy in Health Promotion*. Available online, October 26, 2020. <https://doi.org/10.1177/2373379920963706>

- Abstract from this article: “Great teachers are continually introducing strategies to engage students, especially those who teach large-lecture classes, whose format can limit active learning and student motivation to engage in learning. Implementation of active teaching strategies must be assessed for effectiveness. Using the simple MUSIC model postcourse assessment survey, student motivation to engage in learning was statistically quantified. A simple short intervention of in-class group work led to significant areas of improvement, which included the students’ perception of the class’ Usefulness towards their future career ($p < .01$), their perceived ability for Success in the class ($p < .01$), their Interest in the material ($p < .01$), and their perception of the instructor Caring about their success ($p < .05$). No change was seen in eMpowerment. In addition, students rated the ease of the class ($p < .01$) and the overall satisfaction with the course ($p < .01$) significantly higher than the previous semester, prior to the in-class group work implementation. The implementation of this short simple intervention of in-class group work was highly successful in increasing student motivation in a large-lecture, in-major required exercise and health class and can be easily adapted to other large-lecture classes.”

Jones, B. D., & Carter, D. (2019). Relationships between students' course perceptions, engagement, and learning. *Social Psychology of Education: An International Journal*. Available online, June 3, 2019. doi:10.1007/s11218-019-09500-x

- Abstract from this article: "The purpose of this study was to examine the extent to which college students' perceptions of a course predicted their engagement and, subsequently, their learning in the course. This study is needed because relatively few studies have examined the relationships between several different class perceptions, engagement, and learning (as opposed to achievement). Understanding which class perceptions are significantly related to engagement and learning could help instructors design interventions to increase those perceptions. Participants included 355 students in a psychology course at a large, public university in the southeastern U.S. Students completed an online survey about their course perceptions, behavioral engagement, and cognitive engagement. In class, students completed a pretest and final exam that was used to calculate a learning score. We tested hypothesized path models that included measures of students' class perceptions, engagement, and learning and confirmed that students' class perceptions were not directly related to their learning; but instead, their class perceptions predicted their engagement, which then predicted their learning. Students' perceptions of empowerment (i.e., their ability to have choices and make decisions) and the extent to which the course content was useful to their goals were particularly important in predicting their cognitive engagement. An implication of these findings is that if instructors want to increase students' cognitive and behavioral engagement, they could use strategies that would lead to increases in students' perceptions of empowerment and usefulness."

Chittum, J. R., Jones, B. D., & Carter, D. M. (2019). A person-centered investigation of patterns in college students' perceptions of motivation in a course. *Learning and Individual Differences*, 69, 94-107. doi:10.1016/j.lindif.2018.11.007

Streiner, S. C., & Bodnar, C. A. (2019). Building a local curricular diffusion model based on a gamified homework platform in first year engineering: A case study. *Advances in Engineering Education*, 7(3), 1-28.

- Abstract from this article: "Implementation of educational innovations on a local scale requires consideration of a variety of different factors including stakeholders, curriculum design, classroom context, and culture. Although theories exist for dimensions of scale and diffusion of educational innovations across multiple institutions, they do not focus on the elements necessary to achieve a successful diffusion of a curricular innovation in a local context. This work leverages Actor Network Theory (ANT) and other theories on dimensions of scale to develop a framework for the local diffusion of a digital gamified homework platform called 3D GameLab. As a case study, we offer research findings around the key actors in the local curricula scale-up network and explore the relationships between these actors and how they work together to ensure an effective implementation. This model can be used as a guide for engineering education practitioners when seeking to expand the reach of their local educational innovations."

Davis, K., Salado, A., & McDermott, T. A. (2019, June). *Lessons learned from a first attempt to teach systems engineering as a studio art class*. Annual Conference of the American Society for Engineering Education, Tampa, FL.

Atashrouz, B., Naderi, F., Pasha, R., Eftekhar, Z., & Asgari, P. (2018). The impact of MUSIC model of motivation on academic motivation, educational engagement and mathematic academic performance of Dezful secondary school students. *Educational Innovations*, 66(2), 129-150.

- Abstract from the article: "The purpose of this study was to investigate how the MUSIC model of motivation affects the internal and external educational motivation, educational engagement (motivational strategies, learning strategies), and academic performance of students in mathematics. The research method was experimental with pre-posttests design and control group. The statistical population consisted of all students in the eighth grade of

Dezful city. Using multistage cluster random sampling, 50 students were selected in two classes of 25 students from Dezful city and they were randomly assigned to two experimental and control groups. Pre-tests of academic motivation and educational involvement were distributed to both groups and then the MUSIC model of motivation was implemented in the experimental group and the control group received no training in this regard. In this research, the tools of internal and external academic motivation of Hartar and MSLQ were used. The data were analyzed using descriptive and inferential statistics (Levin test, Kolmogorov-Smirnov test, and single variable covariance analysis (ANCOVA). The results showed that using the MUSIC model of motivation led in increasing the internal educational motivation, decreasing the external educational motivation, increasing the educational engagement and improving the academic performance of students in the experimental group, compared with the control group. Therefore, the use of the MUSIC model of motivation could have a positive impact on the academic motivation, educational engagement, and academic performance.”

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

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

- Abstract from this article: “This article illustrates how mathematics teachers can develop design-focused projects, related to project-based learning, to motivate secondary mathematics students. With first-hand experience as a secondary mathematics teacher, I provide a series of steps related to the engineering design process, which are helpful to teachers in developing design-focused projects, describe various projects that have been developed and implemented within my classroom, and share project artifacts illustrated by pictures, student work, and student comments. Referring to the MUSIC Model of Academic Motivation and reflecting upon personal observations, student outcomes, and student comments, I provide personal insight on how design focused projects can be perceived to enhance student motivation within the mathematics classroom.”

Dockter, D., Uvarov, C., Guzman-Alvarez, A., & Molinaro, M. (2017). Improving preparation and persistence in undergraduate STEM: Why an online summer preparatory chemistry course makes sense. In P. M. Sorensen & D. A. Canelas (Eds.), *Online Approaches to Chemical Education* (pp. 7-33). American Chemical Society: Washington: DC. doi:10.1021/bk-2017-1261.ch002

- Abstract from this article: “General chemistry is a foundational course that serves as a gateway to many STEM degrees. A high level of preparedness and motivation to succeed in STEM coursework correlates with success in general chemistry courses, and general chemistry is vital to persistence of students in STEM. Studies have indicated that an increasing number of students, especially underrepresented minority populations, placed into preparatory chemistry courses do not advance to general chemistry. This lack of advancement is an indicator that a one-size-fits-all preparatory chemistry course does not sufficiently target students’ cognitive and non-cognitive needs. In order to better support, prepare, and motivate students in STEM at UC Davis, an online, adaptive-responsive summer preparatory chemistry course (SP-Chem using ALEKS) was piloted as an alternative to placement exams and the fall, classroom-based preparatory chemistry course (WLD-41C) used for placement into general chemistry. Student performance in general chemistry was comparatively evaluated for four placement paths (SP-Chem, WLD-41C, placement exams, and repeating the course). Additionally, indicators of STEM persistence, namely student motivation and STEM identity, were surveyed and comparatively evaluated. Our findings of the effectiveness of an online, adaptive-responsive preparatory chemistry course, using both cognitive and non-cognitive measures, demonstrate the promise that online learning during the summer holds for improving student performance and persistence in general chemistry and STEM coursework.”

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.

- Abstract from 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). Using video game design to motivate students. *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/ijstotel/index.php/ijstotel/article/view/25>

- Abstract from this article: “This action research investigates co-teaching and democratic learning in a MAED program and Teaching Composition course that integrated new literacies (Lankshear & Knobel, 2011). The course designers utilized a motivational survey and inductive analysis of participants’ written reflections and course artifacts to explore co-teaching and democratic learning within a teaching program that privileged increasing participants’ digital literacy capacity. Moreover, the course designers analyzed participants’ consideration of and enactment of democratic culture and new literacies in their professional practices. The motivational survey, which measured participants’ perceptions of the program, revealed that participants perceived that the course designers cared about their well-being as people and as participants, believed the information taught was useful, and thought that the course designers supported them in being successful. Themes between course designers and participants emerged: (a) democratic ownership of content, space, and knowledge; (b) communication among participants and course designers, common goals, and collaboration;

and (c) transparency in teaching, tools, and feedback. A work-flow model was created in conjunction with the participants, and an advanced version of the model, with new literacies' theoretical components as an overlay, is presented. Limitations included the small, homogenous group of participants, all of whom were high achieving and highly motivated, as well as impracticality of the teaching model; limitations of the methodology are discussed. This research serves as a springboard for future study of the relationship between new literacies and democratic learning environments. Educators may find the motivational survey, which is validated by research, useful in understanding student perceptions of their instruction. The study also provides insight into new literacies and curriculum that privileges democratic learning."

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 than 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., 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.”

Scala, N. M., Tomasi, S., Goncher, A., & Bursic, K. M. (2017). Motivation and analytics: Comparing business and engineering students. *INFORMS Transactions on Education*, 19(1). <https://doi.org/10.1287/ited.2017.0187>

- Abstract from this article: “Data analytics is a foundational topic for engineering as well as business students given its importance in subsequent coursework and curriculum. Many common, interdisciplinary analytical topics exist between the engineering and business fields; undergraduate students may approach learning those topics in various ways depending on program or major. This research examines differences in performance on analytics between engineering and business students that may be explained by differences in motivation and attitude. We use a survey and a lecture on trendlines with a common homework assignment to compare the two groups of students. Instructors of an engineering and a business course that incorporate analytics gave the same lecture on the use of spreadsheets to analyze trendline data, assigned the same individual homework assignment, and administered an end-of-module survey. The survey was built from the established MUSIC® Model of Academic Motivation. Analysis of the student data will address differences in motivation and how the program or major impacts student perception of analytical problem solving and contributes to performance on related assignments. We discuss quantitative and qualitative differences between engineering and business majors, concluding with a discussion of future work and some strategies for educators to use when teaching analytics.”

Smith-Orr, C. S., & Garnett, A. (2016). Motivation and identity in C++: The effects of MUSIC in an engineering classroom. In *Frontiers in Education Conference (FIE), 2016 IEEE* (pp. 1-5). *IEEE*. doi:10.1109/FIE.2016.7757712

- Abstract from this article: “Beyond engaging students in the classroom, keeping them motivated and maintaining their identification with engineering has become a well-known challenge, particularly among underrepresented minority groups. Numerous methods have been utilized within the field including the use of more active pedagogy and course designs to combat this challenge. This study will employ a well-defined model of academic motivation as a guide for course design within an introductory programming class in an attempt to increase engineering identity and sense of belonging among engineering students. The MUSIC model will be incorporated into an already flipped engineering classroom. The aim is to see a quantified change in the motivation, engineering identity, and sense of belonging among students who have participated in the course. Data is represented through structural equation models (SEM) to demonstrate the relationships between the components of motivation and identity and sense of belonging. The outcomes of its investigation will shed new light on the broad impacts that a flipped classroom can have on students within an engineering classroom.”

Li, M., Yu, L., Qin, Y., Lu, P., & Zhang, X. (2016). College student academic motivation and engagement in the college English course. *Theory and Practice in Language Studies*, 6(9), 1767-1773.

- Abstract from this article: “This research examined the relationship between student academic motivation and engagement in the college English course. Based on the current study on communicative language teaching, student academic motivation, and engagement, we hypothesized that student motivation in the English course could predict their engagement. We used the MUSIC model of academic motivation inventory (Jones, 2016b) to explore students’ course perceptions, and we added engagement items to the survey. The participants were 101 first-year college students who were enrolled in this English course. The descriptive statistics data presented the main problems the course in terms of empowerment, success, and interest. The stepwise regression results indicated that the components of empowerment and success in the MUSIC model predicted student engagement. The findings revealed that it is possible for Chinese college EFL teachers to

use the strategies in the MUSIC model to redesign their instruction to motivate and engage their students in the English coursework.”

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., 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

- 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.”

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.

- Abstract from this article: “This study reports the results of a survey exploring the factors that motivate students in a face to face course, considering the components of the MUSIC model of academic motivation. An inventory was administered to the 81 first year undergraduate students near the end of a one semester Pedagogy course. The students’ ratings of the components and aspects of the course that influenced their perception on it will be discussed;

also, the students' suggestions for optimizing the instructional design of the course from the perspective of the MUSIC motivational model will be presented."

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.

- Abstract from the article: "Students' academic motivation in a course is one of the most important factors to evaluate the success of the course. Measuring such a type of motivation has been proven to be complicated and open for debate. In this study, MUSIC Model of academic motivation developed by Jones (2009) was employed to conduct a survey on 214 third-year students of a police university after their Medical English course. Given five major components in the MUSIC Model derived from research and theory that are critical to student engagement in academic settings, including empowerment, usefulness, success, interest, and caring, the study reveals interesting results for considering the effectiveness of an ESP course. Some implications for instructors about how to engage students in a course have been also drawn out. It is believed to be practically helpful for those delivering ESP courses in non-English major universities in Vietnam."

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 this 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 = 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."

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., Epler, C. M., Mokri, P., Bryant, L. H., & Paretto, 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-to-face 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.

- Abstract from the article: "Recruitment and retention are persistent issues for undergraduate engineering programs. In response, many engineering colleges aim to support underrepresented populations through engineering student support centers (ESSCs) such as minority engineering programs and women in engineering programs. Because much of the existing research surrounding ESSCs focuses on student satisfaction and graduation rates, there is a need to better understand how ESSCs are designed and how they contribute to attracting and retaining engineering students. We argue that a successful ESSC creates an environment for positive motivation, leading to increased recruitment and retention. To test this idea, we examined an ESSC (referred to as DiversityX) that has a strong record of increasing student retention in order to understand how it meets the components in the MUSIC Model of Academic Motivation: eMpowerment, Usefulness, Success, Interest, and Caring. For this, we adopted a mixed-methods approach, in which we started with a deductive content analysis of DiversityX documents and followed up with inductive semi-structured interviews of DiversityX staff. We found that all MUSIC model components were represented and that there is general consistency between activities offered and the intentions of the center administrators. We also found that ESSCs may look at prospective and current students' motivations differently. Finally, ESSCs can leverage stakeholders beyond the students themselves to indirectly target student motivation. The results, which are centered on the MUSIC model of academic motivation, offer insight that is useful to other ESSCs beyond DiversityX."

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.

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. (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.

- 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."

3. Examining Relationships Between MUSIC Constructs and Other Constructs

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

Jones, B. D., Miyazaki, Y., Li, M., & Biscotte, S. (2022). Motivational climate predicts student evaluations of teaching: Relationships between students' course perceptions, ease of course, and evaluations of teaching. *AERA Open*, 8(1), 1-17.

<https://journals.sagepub.com/doi/10.1177/23328584211073167>

- The Abstract from this article: "Student evaluations of teaching (SETs) are important at most colleges and universities. One purpose of this study was to determine the extent to which motivational climate was associated with SETs. Another purpose was to determine whether course ease was associated with SETs. Participants included 2,949 undergraduate students from 30 courses at a large public university. Using hierarchical linear modeling, we examined the extent to which students' motivation-related course perceptions (empowerment/autonomy, usefulness, success expectancies, situational interest, and caring) related to SETs at the student and class levels. SETs were highly associated with motivational climate. Furthermore, easier courses were rated lower by students when controlling for motivational climate and the demographical composition of the class. These findings highlight the association between the motivational climate and SETs and suggest that one way to improve SETs may be for instructors to focus on improving the motivational climate rather than making the course easier."

Ismail, M. J., Anuar, A. F., & Loo, F. C. (2022). From physical to virtual: A new learning norm in music education for gifted students. *International Review of Research in Open and Distributed Learning*, 23(2), 44-62.

- The Abstract from this article: "Music education is a subject that is generally thought to have much physical activity involved. However, virtual learning has been mandatory applied to most schools worldwide due to the COVID-19 pandemic. The landscape of music learning has had to be switched to online distance learning (ODL), where students learn music virtually using technological tools. Gifted students are among those affected by the implementation of music ODL throughout 2020. Thus, the purpose of this study is to identify the effectiveness of music ODL on gifted students' motivation. The researchers framed this quantitative study by involving 81 secondary gifted students, aged 13 years, from 13 states in Malaysia. The sample was selected through random sampling, and a preexperimental design was applied to conduct the study. Respondents had been exposed to the music ODL intervention for a month. Data were collected through an adapted questionnaire, namely, the MUSIC Inventory, with a five-point scale. Data were further analysed by descriptive and inferential statistics, integrating two-way MANOVA, using SPSS Statistics version 23. Results reveal that an ODL approach to music classes is significantly effective to enhance gifted students' motivation domains of empowerment, usefulness, success, interest, and caring. Yet, no significant difference was found in gifted students' genders and locations on the four domains. Different approaches in music teaching could be further explored for music ODL to gifted students in future studies."

Li, M., Jones, B. D., Williams, T. O., & Guo, Y. (2022). Chinese students' perceptions of the motivational climate in college English courses: Relationships between course perceptions, engagement, and achievement. *Frontiers in Psychology*, 13, Article 853221. doi:10.3389/fpsyg.2022.853221

- The Abstract from this article: "Effective teachers create a motivational climate that engages students in course activities in ways that lead to increased learning and achievement. Although researchers have identified motivational climate variables that are associated with students' engagement and achievement, less is known about how these variables are related

in different courses and cultures. The purpose of the two studies presented in this paper was to contribute to this research literature by examining these associations within the context of college English courses in two Chinese universities. Specifically, we investigated the relationships between students' perceptions of the motivational climate (i.e., perceptions of empowerment/autonomy, usefulness, success, interest, and caring), cognitive and behavioral engagement, and achievement. This is the first study to examine the connections between all of these variables in one path model in college English courses in China. We administered surveys at two different Chinese universities ($n = 332$ and 259) and used regression and path analysis to examine the relationships among the variables. We demonstrated that (a) students' perceptions of the motivational climate were related to their cognitive engagement, (b) cognitive engagement was related to their behavioral engagement, and (c) behavioral engagement predicted their achievement. These findings are consistent with and extend the growing body of literature on motivational climate and engagement, and they highlight the importance of some motivational climate perceptions over others as significant predictors of cognitive engagement. We conclude that effective English language teachers in China can help students believe that they can be successful, trigger and maintain their interest, and empower students by providing them with choices in activities and assignments."

Rahim, N. A., Abidin, M. Z. A. Z., Shalan, N. A. A. M., Karim, Z. B., Aziz, N. U. A., & Avin, F. A. (2022). COVID-19 lockdown: Physical activity, sedentary behaviour, and academic motivation among undergraduates university students in Malaysia. *Annals of Applied Sport Science*. Online First. Retrieved May 7, 2022. http://aassjournal.com/browse.php?a_id=1085&sid=1&slc_lang=fa

- The Abstract from this article: "Background. In the wake of the COVID-19 global pandemic, the implementation of social restrictions has disrupted daily life routines, including physical activity (PA), sedentary behavior, and academic motivation for undergraduates. The interaction between the changes in PA and academic motivation has not been studied deeply. Objectives. The present study aims to determine the PA level and academic motivation during the restriction movement during the COVID-19 pandemic and to identify the correlation between PA influence and students' academic motivation. Methods. One hundred and five participants (male, $n= 38$ and female, $n=67$) aged between 22-and 26 years old of the Sultan Idris Education University, Malaysia, participated in the study. The PA levels were evaluated using International Physical Activity Questionnaire-Short Form (IPAQ-SF), and the students' motivation was evaluated using the eEmpowerment, Usefulness, Success, Interest, and Caring (MUSIC) Model of Academic Motivation Inventory. Results. The findings showed gender differences between males and females with higher mean values for times per week for vigorous, moderate, and light intensity PA. Both genders displayed the highest rates on Caring (female=5.42, male=5.34), followed by Success (female=5.23, male=5.22) and Usefulness (female=3.96, male=3.92). The lowest motivation was rated on eEmpowerment (female=3.42, male=3.30) and Interest (female=3.85, male 3.84). A significant difference was found between males and females in their rate of both eEmpowerment and Caring subscales. The Pearson test demonstrated a strong correlation between PA (measured by IPAQ-SF) and academic motivation (accessed by MUSIC inventory) among students during the COVID-19 pandemic ($r=0.912$), suggesting that the reduction of total PA had a profound impact on the academic motivation among undergraduates. Conclusion. They maintained that PA as routine is a key strategy for physical and mental health, specifically academic motivation during a forced rest period such as the current COVID-19 lockdown."

Jones, B. D., Krost, K., & Jones, M. W. (2021). Relationships between students' course perceptions, effort, and achievement in an online course. *Computers and Education Open*, 2, Article 100051. <https://doi.org/10.1016/j.caeo.2021.100051>

- The Abstract from this article: "The primary purpose of this study was to examine the extent to which students' course perceptions (i.e., perceptions of empowerment, usefulness, success, interest, and caring) and cost beliefs predict their effort and grades in an online course. We surveyed 1,446 students in an online geography course. Students completed closed- and open-ended items and we used structural equation modeling and qualitative

coding to analyze the data. Students' course perceptions predicted their course effort, which then predicted their final course grade. The quantitative findings demonstrated that students' situational interest and perceptions of instructor caring were statistically significant predictors of their effort and achievement. The qualitative findings indicated that students' perceptions of the usefulness of the course content and their interest affected their effort, as did the amount of time that they had available for course activities. The findings were moderated by students' perceptions of course ease. Students reported decreased effort when they believed that they could succeed and the course was easy, and when they believed it was going to take a lot of time and the course was difficult. This study highlights the importance of designing courses that (a) interest students in the course activities, (b) foster perceptions of caring between the instructor and students, (c) are at an appropriate level of difficulty, and (d) provide a reasonable workload with considerations for students with time constraints. Researchers may use the findings to develop interventions and strategies that instructors can use to encourage students to put forth more effort in online courses."

Wilkins, J. L. M., Jones, B. D., & Rakes, L. (2021). Students' class perceptions and ratings of instruction: Variability across undergraduate mathematics courses. *Frontiers in Psychology*, 12(576282). <https://doi.org/10.3389/fpsyg.2021.576282>

- The Abstract from this article: "The primary purpose of this study was to examine whether students' motivation-related perceptions of mathematics courses were related to their ratings of instruction while controlling for their academic major, type of math class, and expected grade in the class. We investigated these relationships at both the student- and class-level because little is known about whether students' motivation-related perceptions vary across mathematics courses and whether this variance is related to overall class ratings of instruction. The sample included 795 students nested within 43 different mathematics course sections. Students provided their course perceptions of autonomy, utility value, expectancies for success, situational interest, instructor caring, expected grade, and their overall perceptions of the course and instructor. Multilevel modeling techniques were used to investigate potential student- and class-level effects as well as compositional effects. Students' class perceptions varied significantly across mathematics courses. In addition, students' motivation-related course perceptions were positively related to their instructor and course ratings at both the student-level and class-level; however, the strength of these relationships sometimes varied across courses for some of the motivation-related perceptions. These results suggest that the motivational climate (i.e., the psychological environment) can affect students' instructor and course ratings. Moreover, these findings suggest that instructors have some control over their instructor and course ratings through the teaching strategies that they implement. For example, they may be able to increase their ratings by implementing teaching strategies that support students' autonomy, goals, success, interests, and relationships."

Mawson, C., & Bodnar, C. A. (2021, July), *Investigating Potential Gender Differences in First-Year Engineering Students' Academic Motivation and Homework Submission Behavior* Paper presented at 2021 ASEE Virtual Annual Conference Content Access, Virtual Conference. <https://peer.asee.org/37397>

- The Abstract from this article: "Previous studies have shown that there exists a difference in undergraduate students' academic motivation based on gender. Specifically, females have been shown to be more extrinsically motivated than their male peers in a university setting (D'Lima, et. al, 2014). However, little research has been done to examine the effects of gender relevant to academic motivation in gamified systems. The study of gamification systems is important due to the increase in their use within educational activities. This study leverages the Jones MUSIC Model of Academic Motivation and gamification profiles to answer the research question: How does gender influence student behavior and motivation towards an online gamified homework platform? Academic motivation was determined through student responses to the MUSIC Model survey. Behavior was measured through submission behavior including the number of attempts needed to complete a problem and the

frequency of submission. The mastery-based homework portal that was employed in a first-year engineering design course provided data on the number of attempts needed for each student to successfully complete an assignment. In addition, the rate at which students submitted homework assignments within the self-pacing environment was also recorded. This information was utilized to extract gamification profiles to describe the behavior of students over time. The data was analyzed using descriptive statistics to determine if any meaningful differences existed. Overall, it was shown that females have consistently higher overall academic motivation scores than males. It was also shown that males have a wider distribution of gamification profiles, ranging from disheartened behavior to overachieving behavior. Females, on the other hand, were more likely to have a consistent homework submission behavior.”

Topuz, K., Jones, B. D., Sahbaz, S., & Moqbel, M. (2021). A methodology to combine theoretical knowledge with a data-driven probabilistic graphical model. *Journal of Business Analytics*. Advance online publication. <https://doi.org/10.1080/2573234X.2021.1937351>

- The Abstract from this article: “This study presents an analytic inference methodology using probabilistic modeling that provides faster decision-making and a better understanding of complex relations. Two educational psychology models (i.e., the MUSIC Model of Motivation and the domain identification model) were coupled with a data-driven Probabilistic Graphical Model to provide a top-down and bottom-up combination for reasoning. Using survey data from middle school students, Bayesian Network models captured the probabilistic interactions between students’ perceptions of their science class, their identification with science, and their science career goals. Complex/non-linear relationships among these variables revealed that students’ perceptions of their science class (i.e., eMpowerment, Usefulness, Success, Interest, and Caring) were significant predictors of their science-related career goals. These findings provide validity evidence for using the MUSIC and domain identification models and provide educators and school administrators with a web-based simulator to estimate the effect of students’ science class perceptions on their science identification and career goals.”

Taimoory, H., & Knight, D. B., & Hori, K. (2021, July), *Exploring Student Academic Motivation and Perceptions of Teamwork and Communication* Paper presented at 2021 ASEE Virtual Annual Conference Content Access, Virtual Conference. <https://peer.asee.org/37146>

- The Abstract from this article: “STEM outreach programs in the summer provide a good platform for students to continue expanding their interests in STEM fields. A three-week out-of-school program offered by the National Society of Black Engineers (NSBE)--Summer Engineering Experience for Kids (SEEK)—has provided given more than 20,000 students such an experience since 2007. This research is based on data collected from 3rd, 4th, and 5th-grade students participating in SEEK during 2018 and focuses on students’ teamwork skills during the experience. Specifically, the purpose of this study was to investigate the relationship between students’ motivation in the program and the reports of their team processes, teamwork, and communication skills. The SEEK curriculum is designed for students to learn an engineering-based activity, such as building a wind turbine or working with a drone each week and implement their knowledge during a weekly competitive event. For each weekly activity, students work as a team to communicate and collaborate. Students’ teamwork skills and collaboration engagement could improve by implementing Project-Based Learning (PBL) strategies (Jun 2010). Collaboration and intentional communication between students may improve when they work as a team with a joint project goal (Kolmos and de Graaff, n.d.). In such environments, similar to any learning environment, maintaining students’ motivation is theoretically essential for learning to occur. Although a pre- and post-test research design has been used in the overall research project, this paper analysis focuses only on post-test results. Self-report data were collected from 1090 students. Fifteen items with a four-point Likert scale that group into five primary constructs were used to measure academic motivation (see Brett Jones’ MUSIC model). An instrument was designed based on Robinson and Zajicek’s (2005) Youth Life Skills (YLS) to measure group work skills (five items with a three-point Likert scale) and communication skills (four items with a three-

point Likert scale). We used six items with a three-point Likert scale from the Townsend and Carter (2003) Leadership Skills Inventory to measure team processes. Our analysis used Structural Equation Modeling (SEM) to examine the interrelationships between students' academic motivation, communication skills, group work skills, and their team processes. The Confirmatory Factor Analysis (CFA) used for the analysis using SAS statistical software to run the hypothesized path model using the maximum likelihood estimation technique. The residual variance was set to zero, and the latent variable loading was fixed to one. To test the hypothesis, we ran the model and found that this model exhibited an overall moderate fit with the data. RMSEA shows a poor fit while CFI indicates a better fit and SRMR indicates a moderate poor fit. By demonstrating that the analyzed data fit, our hypothesis is moderately confirmed the model. This research provides evidence that using PBL approaches in the summer STEM outreach program helped students' MUSIC perception be motivated in these criteria. Finding suggests that PBL strategies make students more motivated by implementing their STEM knowledge, including better teamwork collaboration with communication and teamwork skills."

Jones, B. D. (2019). Testing the MUSIC Model of Motivation Theory: Relationships between students' perceptions, engagement, and overall ratings. *The Canadian Journal for the Scholarship of Teaching and Learning*, 10(3), 1-15.

- The Abstract from this article: "The purposes of this study were to investigate the extent to which students' course perceptions of the components of the MUSIC Model of Motivation (Jones, 2009, 2018) were related to their engagement in college courses and their instructor and course ratings. Participants included 285 college students who completed questionnaires once or twice during a course. The self-report scales demonstrated high internal reliability. The findings indicate that students' MUSIC perceptions (i.e., perceptions of empowerment, usefulness, success, interest, and caring) were significantly related to their effort in the course, both when the variables were assessed at the same time point and when their effort was assessed at a later time point. These findings provide empirical evidence for relationships proposed in the MUSIC Model of Motivation theory. Students' MUSIC perceptions were also related to their instructor and course ratings, both when the variables were assessed at the same time point and when their instructor and course ratings were assessed at a later time point. These findings are important for instructors because students' MUSIC perceptions can be linked directly to categories of motivational strategies that can be used by instructors as they design instruction."

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 hypothesized 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)

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/>

- Abstract from this article: “In this qualitative study, we examined how two professors (a physicist and biochemist) of first year college students perceived their students’ development of identification in biochemistry or physics and how they actively supported this development. The professors described students who entered college with different levels of domain identification and different expectations for their college science experience depending upon whether they were in a biochemistry or physics major. Although neither professor was familiar with research related to the concept of domain identification, their beliefs about their students’ identification and academic support strategies generally aligned with the Osborne and Jones (2011) model of academic identification.”

Jones, B. D., Tendhar, C., & Paretto, 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., 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.

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.

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., Osborne, J. W., Paretto, 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.

- Abstract from this article: "The MUSIC Model of Academic Motivation and a model of domain identification have been shown to be useful models to explain students' motivation. We used these models to examine the extent to which students' perceptions of a first-year engineering cornerstone course affected their engineering identification and motivational beliefs (i.e., engineering utility, engineering program belonging, and engineering program expectancy), as well as the extent to which students' engineering identification and motivational beliefs affected their course effort, course grades, and engineering major and career goals. We surveyed 365 first-year engineering students enrolled in an introductory design course at a large U.S. public university. A series of structural equation models were estimated, with each model answering a different question and examining a different outcome. The results provide evidence to support the validity of the MUSIC model and model of domain identification with a sample of undergraduate engineering students. This evidence includes the fact that significant relationships existed between variables that the model predicted should be related, such as course perceptions, domain identification, motivational beliefs, effort, and academic outcomes. Because students' perceptions of the MUSIC model components in the engineering course were related to students' engineering identification and motivational beliefs, it might be possible to develop course curricula and methods directed towards the MUSIC components that could foster these important academic outcomes."

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

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)

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.

Gladman, T., Gallagher, S., & Ali, A. (2020), MUSIC® for medical students: Confirming the reliability and validity of a multi-factorial measure of academic motivation for medical education, *Teaching and Learning in Medicine*. doi:10.1080/10401334.2020.1758704

- Abstract from this article: “The MUSIC® Inventory measures the construct of academic motivation across five factors: empowerment, usefulness, success, interest, and caring. The factors are defined in terms of the degree the student perceives that they have control over their environment, that the coursework is useful to their future, that they can succeed in the course, that the course and instructional methods are interesting, and that the teacher cares about their wellbeing and their success respectively. *Background:* A valid measure of medical students' academic motivation would provide medical teachers with a method for evaluating the motivational aspect of their course and provide focus for changes in teaching and learning to improve medical student engagement. While the MUSIC® Inventory structure has been validated in the tertiary setting and with several professional programs, it has not been validated with medical students. The aim of this study was to use both classical test theory and Rasch modeling to assess the reliability and confirm the structure of the five-factor model of the MUSIC® Inventory with medical students. *Approach:* One-hundred-fifty-two medical students completed the 26-item inventory. Descriptive statistics, internal consistency, correlations between factors, confirmatory factor analysis, and Rasch analysis using the rating scale model were performed to determine reliability and validity. *Findings:* The five factors showed good internal consistency (Cronbach's alpha .87 - .92). Correlations between factors were moderate to high ($r = .38 - .89$). Confirmatory factor analysis highlighted inconsistencies in factor loadings of three of the items hypothesized to measure interest. Rasch analysis using the rating scale model showed that all items for each factor had good item fit (0.65 - 1.37). Person separation (2.28 - 2.85) and reliability (.84 -.91) scores indicated that the scales were able to differentiate different levels of respondents. Item separation (2.25 - 6.97) and reliability scores (.83 -.98) indicated that the items of the scales were being differentiated by the respondents. *Conclusions:* Rasch analysis indicates that the five factors of academic motivation measured by the MUSIC® Inventory account for the response patterns in data from medical students. However, while the factors of empowerment, usefulness, success, and caring showed expected reliability and validity using classical analysis, three of the interest items cross-loaded on to the usefulness factor. Possible reasons may include ambiguity of language for the items or medical students' conception of usefulness and interest. Future research will explore medical students' understanding of the language used to measure these factors in further detail.”

Saperstein, A. M., Jones, B. D., Hansen, M. C., & Medalia, A. (2020). The Cognitive Training version of the MUSIC® Model of Motivation Inventory: A follow-up validity study. *Schizophrenia Research*. Available online January 7, 2020. doi:10.1016/j.schres.2019.12.027

- Abstract from this article: “Further validation of the MUSIC® Model of Motivation Inventory (MMI) for use in Cognitive Remediation (CR) for schizophrenia is needed. The MMI was compared to the Intrinsic Motivation Inventory – Schizophrenia Research and Perceived Competency Scale following early treatment exposure in a CR clinical trial. MMI Usefulness, Success, and Interest scales were significantly correlated with corresponding comparison scales. The MMI was not correlated with pre-morbid cognitive ability. Higher expectancy for success and perceived usefulness were significantly associated with greater intensity of session attendance. Results support the convergent, divergent, and predictive validity of the MMI for CR research and clinical use.”

Hansen, M. C., Jones, B. D., Eack, S. M., Glenthøj, L. B., Ikezawa, S., Iwane, T., ...Medalia, A. (2019). Validation of the MUSIC Model of Motivation Inventory for use with cognitive training for schizophrenia spectrum disorders: A multinational study. *Schizophrenia Research*, 206, 142-148. doi:10.1016/j.schres.2018.11.037

- Abstract from this article: "Aim: Low motivation is a core symptom of schizophrenia which significantly impacts successful engagement in and benefit from psychosocial treatments. Therefore, it is important for clinicians to design psychosocial treatments to effectively motivate and engage patients during the treatment. The MUSIC® Model of Academic Motivation Inventory (MMI) is an 18-item instrument with five scales that assess students' motivation during academic tasks. The objective of the current study was to validate the MMI for use with schizophrenia spectrum patients undergoing cognitive training. Methods: Participants included 181 people with schizophrenia spectrum disorders enrolled in cognitive training in four countries. A confirmatory factor analysis (CFA) assessed construct validity. Quality of fit was determined using the Comparative Fit Index (CFI), the Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA). Pearson's correlation coefficients assessed construct validity and Cronbach's alphas assessed reliability. Furthermore, we examined factor loadings for each inventory item and assessed predictive validity by analyzing MMI scales with attendance outcomes. Results: Consistent with the original MMI validation studies used in academic settings, we found CFI values indicated a good fit, as did the SRMR and RMSEA values. The scales were correlated yet distinct. Cronbach's alpha values ranged from good to excellent and factor loadings showed that all items loaded very well onto their intended factors. The MMI had a positive relationship to treatment intensity."

Jones, B. D., Byrnes, M. K., & Jones, M. W. (2019). Validation of the MUSIC Model of Academic Motivation Inventory: Evidence for use with veterinary medicine students. *Frontiers in Veterinary Science*, 6(11), 1-9. doi:10.3389/fvets.2019.00011

- Abstract from this article: "The MUSIC® Model of Motivation is used to help instructors select strategies that can increase students' motivation and engagement in courses. The MUSIC model is comprised of five categories of strategies titled: empowerment, usefulness, success, interest, and caring. The purpose of this study was to examine the extent to which the MUSIC® Model of Academic Motivation Inventory (College Student version, short-form), demonstrates acceptable psychometric properties when used with students enrolled in a College of Veterinary Medicine. The inventory is comprised of five scales that correspond to the five MUSIC model components, and it measures the extent to which students perceive that: they have control in the course (empowerment); the activities in the course are useful to their future (usefulness); they can succeed in the course (success); the teaching activities and coursework are interesting (interest); and the instructor cares about students' learning and well-being (caring). The inventory has been validated for use with many different student populations, including students in different countries and of different ages (e.g., college students, middle and high school students, elementary school students). However, the inventory has not been validated for use with veterinary medicine students. We analyzed the data from 578 questionnaires that were obtained from students in six different courses at a College of Veterinary Medicine. We examined the psychometric properties of the MUSIC inventory by: (a) computing the internal consistency reliabilities for the scales; (b) calculating the fit indices and factor loadings obtained from confirmatory factor analyses; and (c) computing correlation coefficients between the inventory scales and students' self-reported effort in the course. The results provide evidence that the inventory demonstrates acceptable psychometric properties for use with veterinary medicine students. Consequently, the MUSIC Inventory can be used by researchers and instructors to assess students' motivation-related perceptions of courses."

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.”

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.

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>

- Abstract from this article: "In this qualitative study, we examined how two professors (a physicist and biochemist) of first year college students perceived their students' development of identification in biochemistry or physics and how they actively supported this development. The professors described students who entered college with different levels of domain identification and different expectations for their college science experience depending upon whether they were in a biochemistry or physics major. Although neither professor was familiar with research related to the concept of domain identification, their beliefs about their students' identification and academic support strategies generally aligned with the Osborne and Jones (2011) model of academic identification."

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>

- Abstract from the article: "**Objective:** To assess the reliability and construct validity of the MUSIC Model of Academic Motivation Inventory in a student pharmacist population. **Methods:** The MUSIC Inventory was administered via Qualtrics two weeks prior to mid-semester examinations in three required pharmacy courses, representing three distinct cohorts. Cronbach's α reliability estimates were calculated to measure reliability. Exploratory factor analysis was conducted on the overall sample to measure construct validity. **Results:** Students returned 154 usable responses (response rate 75%). Cronbach's α values for the overall sample were close to or above 0.9 for all subscales. Exploratory factor analysis found that the items loaded to five distinct factors. The median completion time across the three cohorts was 119.8 seconds. **Conclusions:** These preliminary findings suggest that the MUSIC Inventory may have sufficient reliability, validity, and ease of administration to be a useful tool for pharmacy faculty desiring to adjust their instructional design to maximize student motivation to learn."

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.

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.

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.

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."

5. Conducting Professional Development with the MUSIC Model

These works explain how Dr. Jones and his colleagues have used the MUSIC model to conduct professional development with instructors to teach them about how to implement the MUSIC model in their instruction.

Jones, B. D., Biscotte, S., & Harrington Becker, T. (2020). Using a motivation model and student data to redesign general education courses: An examination of a faculty development approach. *Journal of General Education*, 69(3-4), 235-250. <https://doi.org/10.5325/jgeneeduc.69.3-4.0235>

- Abstract from this article: “The aim of this paper is to explain a faculty development approach we used with faculty who teach general education courses. The purpose of the professional development was to help faculty intentionally create a class environment that engages students. Key to this process is introducing faculty to a research-based motivation model that they can use to assess and redesign their instruction. This motivation model uses students’ perceptions of a course as a starting point to identify areas in which the course could be improved. In this paper, we describe the six steps of our faculty development approach, we provide a case study of an instructor who participated in the faculty development, and we reflect on the strengths and weaknesses of the approach in hopes that this approach may be useful to others. Preliminary evidence suggests that this approach is beneficial and can help faculty to intentionally consider strategies that engage students. This faculty development approach may be especially useful to faculty who teach general education courses because students in those courses may be less motivated and engaged if they do not perceive the courses to align directly with their major and career goals.”