STaR Poster Session – Chris Thompson
Mentor: Robert Capraro

T3 Grant

Capraro, R. M., Barroso, L. R., & **Thompson, C. G.** (2018). *Bridging Today's 6-12 Classrooms to Tomorrow's Greatest Discoveries – TAMU STEM*. Texas A&M University T3 Grant. Role: Co-Investigator

STEM Teacher Boot Camp is an engineering-design driven on campus experience where teacher teams will observe research-based effective instructional practices in the mornings and participate in afternoon workshops to develop their content and pedagogical skills. In the morning, the teachers will shadow professors (using distributed video) during our week-long middle- and high-school science, technology, engineering, and mathematics (STEM) summer camp. During the afternoon workshops, teachers will visit active research labs, have opportunities to interact with these cutting-edge researchers, reflect on the pedagogies used during the morning, and develop their own STEM Project-based Learning activities for use in their K-12 classrooms. The knowledge and skills teachers acquire during this experience will be reinforced and sustained by an online support system available to teachers in the Fall semester after the Boot Camp.

Catapult Grant

Gilson, C. B., & **Thompson, C. G.** (2017). *The Job Coaching Academy: A Proposed Training Program for Job Coaches in Special Education Transition Programs*. College of Education and Human Development 2018 Catapult Grant. Role: Co-Principal Investigator

Paraprofessionals in high school transition settings often serve as job coaches to facilitate vocational skill development for students with intellectual and developmental disabilities. Effective job coaching can have a positive impact on students' work performance and employment outcomes, yet little training is available for job coaches to learn the skills needed to promote student independence and social integration. Our study's goal is to evaluate the efficacy and social validity of targeted training for 200 job coaches across five diverse districts in southeastern Texas. Job coaches in the academy will receive hands-on training over three months, related to fostering their students' employment-related social skills and independence when practicing vocational skills. We will measure the impact of the training using observational data from procedural fidelity and survey data from social validity. We hypothesize that job coaches who receive the training will exhibit higher procedural fidelity scores and report a more socially focused view of the job coach's role than participants who do not receive the intervention. We will use this project to extend the scope of its scholarly and societal impact with implications for interdisciplinary stakeholders at state and national levels.

Publications

Thompson, C. G., Kim, R.-S., Aloe, A. M., & Becker, B. J. (2017). Extracting the variance inflation factor and other multicollinearity diagnostics from typical regression results. *Basic and Applied Social Psychology*, 39(2), 81-90.

In this article we discuss and show several post hoc methods for assessing multicollinearity. One such multicollinearity diagnostic is the variance inflation factor (VIF). We outline the post hoc VIF method, which computes the VIF from the standardized regression coefficient and semi-partial correlation, both of which can be calculated from commonly reported regression results. Three examples of computing multicollinearity diagnostics using data from published studies are shown. R code is also provided.

Yeaton, W. H., & **Thompson, C. G.** (2017). Transforming the canons of John Stewart Mill from philosophy to replicative empirical research: The Common Cause research design. *Journal of Methods and Measurement in the Social Sciences*, 7(2), 122-143.

When an element or factor is common to a set of circumstances that element may be causal in its relationship to particular dependent variables. This premise was stated by John Stuart Mill more than 170 years ago, and Mill's canon, the Method of Agreement, is used here as a basis to create the "Common Cause" (CC) research design. The CC design is particularly relevant when a set of multiple circumstances can be represented by alternative theories of change or competing explanations. We consider several potential applications of the design and elaborate its structure within the validity framework of Shadish, Cook, and Campbell. We discuss threats to validity controlled by the CC design and illustrate possible analytic strategies using simulated data. We explicitly compare the CC design to four quasi-experimental designs in terms of the validity threats that they eliminate. Design weaknesses are addressed and ways to enhance the design's inferential power discussed. The CC design itself represents a proof of concept suggesting that other research designs can be created from philosophical principles.

Select Publications Under Review

Aloe, A. Norris, B. D., **Thompson, C. G.**, & Weiss, B. (under review). Heteroskedastic mixed-effects meta-regression

Tokac, U., Novak, E., & **Thompson, C. G.** (under review). Effects of game-based learning on student mathematics achievement.

Semma, B., Henri, M. A., Luo, W., & **Thompson, C. G.** (under review). Mixed-effects reliability generalization of the meaning in life questionnaire.

Invited Talk and Presentations

Thompson, C. G. (2017, November). *Meta-analysis concepts and applications.* Samford University, Birmingham, AL (webinar)

Thompson, C. G., & Becker, B. J. (2018, April). *The meta-analysis of bivariate and partial effects using a power prior distribution*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY.

Tokac, U., Novak, E., & **Thompson, C. G.** (2018, April). *Effects of game-based instruction on mathematics achievement*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY.

Semma, B., Henri, M. A., Luo, W., & **Thompson, C. G.** (2018, April). *Bayesian, method of moments, and REML estimation in mixed-effects reliability generalization studies*. Poster presented at the annual meeting of the National Council on Measurement in Education, New York, NY.

Project with Graduate Student

Thompson, C. G., & Semma, B. (in preparation). A data-driven prior distribution for between-studies heterogeneity in meta-analysis.

When using Bayesian methods for meta-analysis, one must specify prior distributions for all parameters, typically the overall mean (μ) and between-studies standard deviation (τ). The choice of prior for τ can be particularly challenging given its existence on a closed positive interval. Instead of using common non-informative priors (e.g., uniform, half-Normal with large variance), we propose a weakly-informative prior distribution which uses the folded non-central t (FNT) distribution and has a frequentist estimate of τ as its non-centrality parameter. Using this distribution, instead of making likely unrealistic assumptions about the distribution of τ (e.g., uniform probability over the parameter space), the FNT approach centers the mass of the prior on τ at the frequentist estimate $\hat{\tau}$.

Let $\boldsymbol{\Gamma} = \{\mu, \tau\}$, $\mathbf{T} = \{T_k\}_{k=1}^{K}$, and $\mathbf{V} = \{v_k\}_{k=1}^{K}$, then the overall model is

$$T_k \mid \theta_k, v_k \sim \pi(\theta_k, v_k)$$
$$\theta_k \mid \mu, \tau \sim \pi(\mu, \tau)$$
$$\mu \sim \pi(\bullet)$$
$$\tau \sim \pi(\bullet)$$

Under our new approach, we specify the above model as

$$T_k \mid \theta_k, v_k \sim \mathrm{N}(\theta_k, v_k)$$
$$\theta_k \mid \mu, \tau \sim \mathrm{N}(\mu, \tau)$$
$$\mu \sim \mathrm{N}(0, \bullet)$$
$$\tau \sim \mathrm{FNT}(\varphi = \hat{\tau}, \psi)$$