Results of a Year-Long Professional Learning Program for Special Educators and Related Service Providers

Kimberly A. Murza
Audiology and Speech-Language Sciences Department
University of Northern Colorado, Greely, U.S

Debbie L. Hahs-Vaughn
Methodology, Measurement, and Analysis Program

University of Central Florida, Orlando, U.S.

P. Charlie Buckley
Department of Special Education, Early Childhood, and Culturally and Linguistically Diverse Education, Metropolitan State University of Denver, Denver, U.S.

Tami Cassel
Exceptional Student Services, Colorado Department of Education Denver, U.S.

Abstract: The purpose of this study was to determine if certain variables predicted whether educators dropped out of a year-long, voluntary, professional learning program and whether participant characteristics predicted their attitudes and behaviors at the end of the program. Special educators volunteered to participate in the year-long program with their educational teams. A total of 206 educators and related service providers enrolled and completed at least one assignment. Of these participants, those who attended the single face-to-face meeting and those who took the program for college credit were statistically significantly more likely to complete the program than their peers. None of the other participant characteristics (e.g., age, years of experience, setting, role, knowledge and skill level, initial attitudes) predicted completion. These findings along with the additional study results suggest there are many unanswered questions in regard to what keeps individual school professionals inspired and motivated to change their practice.

Across the globe, educators engage in professional development with the primary aim to increase their ability to positively impact students (Brown-Easton, 2013). However, not all professional development activities have been shown to be effective in improving student outcomes. For example, the oft-occurring single-day training without follow-up or evaluation does not lead to teacher behavior change or increases in student achievement (Graner, Ault, Mellard, & Gingerich, 2012). Fortunately, standards for professional learning based on empirical evidence do exist. For example, Learning Forward, formerly named the National Staff Development Council (NSDC) has developed standards for high-quality professional learning (see https://learningforward.org/standards-for-professional-learning) that are evidence-based (Bergquist, 2006; Slabine, 2011; Wei, Darling-Hammond, & Adamson, 2010).

Special education teachers, para-educators and related service providers such as speech-language pathologists also have a need to engage in high-quality professional learning to meet the diverse needs of students in their classrooms and therapy rooms. These school professionals are called upon to implement scientifically based practices to support learning for students who struggle, including those with language impairments and autism spectrum disorder (ASD) (e.g., Individuals with Disabilities Education Act [IDEA], 2004). A critical focus for this work, especially for children with autism spectrum disorder (ASD), is increasing social communication and engagement as social communication and social interaction deficits are diagnostic criteria for identifying ASD (American Psychiatric Association, 2013). Currently, there is strong evidence to support the use of naturalistic developmental behavioral interventions (NDBIs) to target social communication and engagement in children with ASD (see Schreibman et al., 2015). These interventions share several characteristics. They all:

1. Occur in natural environments
2. Target naturally-occurring social activities
3. Are more child-directed that traditional Applied Behavior Analysis (ABA) approaches
4. Use strategies to promote spontaneity, initiative, and generalization
5. Focus on developmental targets such as joint attention and imitation
6. Incorporate collaboration with family members

The purpose of this study was to investigate the preliminary efficacy of the Social Communication and Engagement Triad (SCET; authors) professional learning program. The content of the SCET program was designed using the characteristics of NDBIs listed above and the process of delivery of the program incorporated principles of high-quality professional learning. Participants in the year-long SCET Program were special educators, para-educators and related service providers across the state of Colorado.

Background

High-Quality Professional Learning

There is a body of research to support which aspects need to be included for the professional learning program to be considered a “high-quality” adult learning experience. For example, Dunst, Trivette, and Hamby (2010) completed a rigorous systematic review and meta-analysis of the effectiveness of adult learning methods and strategies. Their analysis included 58

randomized controlled trials representing 2,095 treatment participants and 2,213 control participants. They looked specifically at the effect of four adult learning methods and found positive and moderate-large effect sizes for three of the four methods: coaching (*d* = .91; CI = .78 to 1.04), just-in-time training (*d* = .52; CI = .37 to .68), and guided design (*d* = .49; CI = .39 to .58

In addition, Graner and colleagues (2012) suggest there are several guiding principles for developing successful professional learning experiences for educators, "The professional development experience must balance the need for and impact of the intervention while recognizing the knowledge of the participants" (p. 7). In order to achieve this, they suggest attending to three principles: the need for orientation and motivation, the need for human sense making, and the need to balance content and coherence.

These three principles align well with what we know about adult learning. For example, in Dunst and colleagues' (2010) meta-analysis, several factors were determined to positively impact the success of professional learning activities. These included active engagement and experiential learning, instructor support/facilitation and feedback, learner reflection and critical thinking, real world relevance and immediate applicability, and self-assessment of progress. All of these principles of effective professional learning align with Desimone's (2009) conceptual framework for studying the effects of professional development on teachers and students. Desimone's framework includes these five core features of professional development: content focus, active learning, coherence, duration, and collective participation.

Mode of Delivery

Rapid advances in technology have allowed professional learning opportunities to reach educators that may not have been able to access programs due to location or lack of resources (O'Dwyer, Carey, & Kleiman, 2007). However, there remains concern about what might be lost in online delivery of professional learning (Fishman et al., 2013). For example, can online learning provide the same type of support for educators or does the format prevent participants from building trust and collegiality? Many online learning platforms provide collaborative tools (e.g., discussion boards, group video conferencing) but it remains unclear whether these platforms are equally effective in promoting active learning for educators (Garet, Porter, Desimone, Birman, & Yoon, 2001).

More recently, researchers have explored the efficacy of online professional learning in changing educators' knowledge and practice. Several studies have demonstrated that online professional learning programs are efficacious in improving both knowledge and practices of educators (e.g., Masters et al., 2010). Although the research comparing online formats to face-to-face delivery is limited, results from three studies support the notion that educators' learning and practice are positively impacted no matter the delivery mode (Fishman et al., 2013; Shaha, Glassett, & Copas, 2015).

Evaluating Professional Learning

When educators participate in a professional learning program, they are asked to engage in a variety of activities to learn new practices and procedures. A significant issue is the cost benefit

of these activities—that is, whether the educators' personal investment of time and effort and the school system's investment of financial resources yield sufficient results. Although the intent of professional learning in schools is ultimately to improve student outcomes, research suggests that participant satisfaction is largely the only form of evaluation being conducted. For example, Muijs and Lindsay (2008) conducted a survey of 223 professional learning facilitators and 416 teachers from a randomly selected sample of 1,000 schools. More than 75% of professional learning coordinators reported that participant satisfaction was evaluated "usually" or "always," whereas participants' use of the innovation and student outcomes was consistently evaluated ("usually" or "always") less than 40% of the time.

Guskey (2005) has argued there are five critical stages of professional learning that build on one another across the learning process. These stages, based on Kirkpatrick's model (1959), increase in complexity and include the following:

1. Participants' reactions
2. Participants' learning
3. Organizational support and change
4. Participants' use of new knowledge and skills
5. Student learning outcomes

Researchers have shown that professionals who are asked to adopt an innovation when they participate in professional learning programs do so in predictable ways (Guskey, 2005; Hall & Hord, 1987). Hall and Hord (1987) suggest it behooves professional developers to understand and evaluate this change process so that they may facilitate change in school professionals. The Concerns-Based Adoption Model (CBAM) is a system Hall and Hord originally published in 1987 that includes specific tools to evaluate the adoption process. Tools from the CBAM were used in the evaluation of the SCET Program and will be discussed in the methods section of this paper.

The Social Communication and Engagement Triad Design

Although the design, delivery, and evaluation of professional learning is critical to its success, the content has to also be worthy of educators' time and effort. As the incidence of autism spectrum disorder (ASD) continues to rise (Atladottir et al., 2007; Centers for Disease Control and Prevention, 2012, 2014; Nassar et al., 2009) with the CDC estimating a prevalence rate of 1 in 68 individuals diagnosed with an ASD (2014), educators find themselves serving more children with ASD often without adequate pre-service preparation (Myles, Simpson, & deBoer, 2008). To address the growing needs of educators, the National Research Council was charged by the U.S. Department of Education with creating a framework for educating children with ASD based on available research. They recommended that intervention programs address the core deficits in ASD (e.g., social communication and engagement) with goals that focus on initiation of spontaneous communication during functional activities and the generalization of goals across, activities, communication partners and environments (National Research Council, 2001).

Using these recommendations and the previously mentioned principles of naturalistic developmental behavioral interventions (NDBIs) (see Schreibman et al., 2015) as a framework,

the researchers developed the Social Communication and Engagement Triad (SCET). The SCET teaches educators how to complete authentic assessments while considering (a) the students' communication and engagement, (b) the communication partner and the strategies he/she uses that lead to success, and (c) the environmental strategies that support communication and engagement. Professional development activities were designed to teach educational teams how to use their assessment data to support all opportunities for communicative interactions for students at all language levels including students with ASD.

The purpose of this study was twofold. First, the researchers were interested in whether certain variables predicted whether educators dropped out of the SCET Professional Learning Program. The program was unique compared to many professional learning programs because participation was completely voluntary at every stage and the program was much more intense than typical single "sit and get" types of professional learning programs (i.e., 75 hours of work over an academic school year). Interested participants registered to participate and were able to earn university credit or Colorado Department of Education continuing education credits for activities they completed. It was made clear that they had the option to end their participation at any point but were encouraged by the instructors to continue. The second purpose of this research was to determine whether characteristics of participants' including their baseline attitudes and behaviors related to the SCET Professional Learning Program predicted their attitudes and behaviors at the completion of the program. The following research questions were posed:

1. To what extent do baseline Stages of Concern and Levels of Use, as well as participant characteristics, predict program completion?
2. To what extent do baseline Stages of Concern and Levels of Use, as well as participant characteristics, predict post-training Stages of Concern?
3. To what extent do baseline Stages of Concern and Levels of Use, as well as participant characteristics, predict post-training Levels of Use?

Methods

Professional Development Context

The Social Communication and Engagement Triad (SCET) professional learning program was designed to provide a year-long experience to educators, para-educators, and related service providers across the state of Colorado. In May of 2016, an announcement was emailed to educators across the state announcing the program and previewing additional information to be sent out after the summer break. In August 2016 a flyer was emailed to educators across the state explaining the program components and requirements and information about registration.

Participants were also informed they had an opportunity to earn either Colorado Department of Education (CDE) contact hours or university credit for completion of course components. If they completed at least 80% of the Module 1-4 activities, they earned contact hours with CDE or 1 credit hour with the university. If they completed at least 80% of Modules 5-6, they earned contact hours with CDE or 1 credit hour with the university. Interested educators were asked to apply to register for the course. Applicants registering in teams were given priority. SCET Program Content and Requirements are provided in Table 1 below.

Table 1: **Social Communication and Engagement Triad Program Content and Requirements**

Program description

The Social Communication and Engagement Triad Program is designed for school teams supporting individualized education programs for students with communication disorders. Participants will work collaboratively to support communicative engagement for students at all language levels, using all means of communication.

Participant Learning Objectives

1. Identify how communicative engagement is impacted by: theory of mind, joint attention, and emotional regulation.
2. Identify naturally occurring opportunities to support communicative engagement for each part of the school day with different communication partners using a variety of communicative functions.
3. Recognize and use communication partner strategies to promote full engagement.
4. Create communication goals that align with standards, link to assessment information, and promote opportunities for engagement.
5. Collaboratively collect and analyse meaningful data that increase communication and engagement.

Module	Participant Learning Outcomes	Activities/Assignments	Total Time
Module 1: Introduction to the course	1. Define the course purpose. 2. Successfully navigate the online learning platform.	Student Goal and Lesson Plan Scavenger Hunt Introduction	4 hours
Module 2: Big Ideas of Engagement	1. Identify how communicative engagement is impacted by theory of mind, joint attention, and emotional regulation	Module 2 Discussion Board Module 2 Reflection Question Module 2 Knowledge Check	9 hours
Module 3: Communication Partner and Environment	1. Recognize and use communication partner strategies. 2. Modify and adapt communicative environment.	Module 3 Discussion Board Module 3 Reflection Question Module 3 Knowledge Check Assessment of Communication Partner Strategies	12 hours
Module 4: The Child and Communicative Assessment	1. Apply knowledge of communication, language, and engagement to determine under which circumstances a child is communicatively engaged. 2. Evaluate what kinds and levels of support are needed to facilitate communicative engagement across contexts.	Module 4 Discussion Board Module 4 Reflection Question Module 4 Knowledge Check Assessment of Communicative Functions Social Communication Engagement Tool	18 hours
Face-to-Face Workshop: Bringing it all Together	1. Collaboratively create a diagnostic teaching session plan based on assessment data.	Diagnostic teaching assessment plan	8 hours
Module 5: Goals and Progress Monitoring	1. Design progress monitoring goals that align with standards, link to assessment information, and promote opportunities for communicative engagement. 2. Collaboratively collect and analyze meaningful data that informs instruction to increase communicative engagement.	Module 5 Discussion Board Module 5 Reflection Question Module 5 Knowledge Check Diagnostic Teaching Session (Social Communication Goal and Intervention Plan #2	12 hours
Module 6: Collaboration and Coaching	1. Design and carryout a professional learning community plan with your team. 2. Support colleagues in their adoption of the social communication and engagement triad using the Appreciative Inquiry framework.	Module 6 Discussion Board Module 6 Reflection Question Module 6 Knowledge Check Professional Learning Community Plan	12 hours

Data Collection and Procedures

Quantitative data were collected using three instruments. A 28-question demographic survey was designed. This survey was then created in Qualtrics, an electronic survey development, distribution, and management system. An explanation of the research study was provided at the start of the survey according to university IRB approval. SCET participants answered the question, "Do you wish to take part in this research study" before moving on to the remaining survey questions. This served as their informed consent documentation. Only those participants who indicated "yes" were included in the results of this study.

The remaining two assessment measures were the Stages of Concern (SoC) Questionnaire (Hall & Loucks, 1979) and the Levels of Use Branching Interview (Loucks, Newlove, & Hall, 1975) both part of the Concerns Based Adoption Model (CBAM; Hall & Hord, 1987). The SoC Questionnaire allows thoughts, feeling, and perceptions to be measured as educators are engaged in professional learning. This 35-item research validated (Bailey & Palsha, 1992) instrument allows participants to be categorized into one of seven stages of concern according to their responses to the questions. These stages of concern reflect the predictable pattern of adoption seen in individuals who engage in learning a new innovation. Participants typically move from an unconcerned stage (stage 0) to stages focusing on the impact of their implementation (stages 4-6). Research participants were asked to take an online SoC Questionnaire at two time-points; the fall of 2016 before they began any learning modules and, in the spring of 2017, after they completed the program.

The Levels of Use (LoU) Branching Interview was also used as a pre- and post-assessment measure. This component of CBAM examines the actual implementation of participants. Similar to the SoC, individuals who are asked to adopt an innovation follow a predictable pattern of adoption (Loucks et al., 1975). Participants start as non-users (levels 0-II) and move up to advanced users (levels IVB-VI) given high-quality professional learning opportunities. To gather these data, Loucks et al. (1975) developed a framework for interviews to determine adopters' use called the LoU Branching interview.

Participants signed up online to complete interviews with graduate research assistants. After undergoing training, four graduate research assistants completed all pre- and post-assessment interviews based on their availability and the availability of the participants. Each interview was conducted over the phone and recorded. Two additional graduate research assistants completed training until they reached 100% inter-rater reliability with the first author using interviews from a separate study. These research assistants then completed ratings of all of the recordings independently and were blinded to whether the recordings were gathered at pre- or post-test. Initial inter-rater reliability was calculated at 83%. The research assistants then met to discuss disagreements and were able to reach consensus on ratings for 100% of the interviews.

Missing Data

Missing data were imputed using the expectation-maximization (EM) algorithm. The EM algorithm for missing data replacement is an iterative process that produces maximum likelihood estimates were missing values are estimated in an iterative fashion via a regression-based process

with predictors being all other variables in the model (Graham, 2009). Simulation research suggests that the EM algorithm yields standard errors with little to no bias and does so with large proportions of missing data (Puma, Olsen, Bell, & Price, 2009).

Results

Sample

There were 327 individuals who consented to participate. Of those, 121 enrolled but never began the course. These individuals were similar to individuals who completed at least one assignment in regards to the number of children with ASD served (Wald = .620, *df* = 1, *p* = .431), the number of years in the field (Wald = 2.094, *df* = 1, *p* = .148), being a teacher (compared to all other positions) (χ^2 = .190, *df* = 1, *p* = .663), holding a graduate degree (relative to bachelor's degree or less) (χ^2 = .057, *df* = 1, *p* = .812), age (χ^2 = 1.227, *df* = 5, *p* = .942), working in only one school (relative to working in more than 1 school) (χ^2 = 2.617, *df* = 1, *p* = .106), enrolling for college credit (relative to not taking the course for credit) (χ^2 = 1.489, *df* = 1, *p* = .222), being White or Asian (relative to all other races) (χ^2 = 2.192, *df* = 1, *p* = .139), being novice (as compared to intermediate or advanced) in knowledge in social communication engagement (χ^2 = .569, *df* = 1, *p* = .451), and being novice (as compared to intermediate or advanced) in terms of supporting social communication engagement (χ^2 = .029, *df* = 1, *p* = .864). Individuals who enrolled but never began the course were statistically significantly less likely to work with preschool and/or elementary children (compared to working with children of other ages) (χ^2 = 9.240, *df* = 1, *p* = .002).

The remaining analyses are based on individuals who completed at least one assignment (*n* = 206). Of these 206 individuals in the analytic sample, participants completed an average of 71% of modules 1-4 (*SD* = 37.93, range 1%-100%) and 52% of modules 5-8 (*SD* = 43.15, range 0%-100%), and on average, completed 68% (*SD* = 33.59) of the course. There was a relatively strong positive correlation between the percentage of modules completed in the fall (i.e., modules 1-4) and the percentage of modules completed in the spring (i.e., modules 5-8), *r* = .610, *p* < .001. These participants (*n* = 206), in large part, had attended face-to-face (*n* = 174, 85%) and were not enrolled for credit (*n* = 138, 67%). Additionally, the majority of participants were more likely to work in only one school (*n* = 114, 55%), hold a master's degree (*n* = 159, 77%), be female (*n* = 194, 94%), be White or Asian (*n* = 182, 88%), be a teacher (*n* = 171, 83%), and work in a preschool and/or elementary school (*n* = 125, 61%). Most participants were 40-49 years of age (*n* =67, 33%), followed by 30-39 (*n* = 57, 28%), 50-59 (*n* = 37, 18%), or under 30 (*n* = 33, 16%). The average number of years working in the field was 12 (*SD* = 8.7) and ranged from 1 to 41. The average number of children with ASD with whom the participant directly worked was 7 (*SD* = 8.1) and ranged from 0 to 70.

Research Question 1

RQ1 data analytic approach. The first research question asked: To what extent do baseline Stages of Concern (SoC) and Levels of Use (LoU), as well as participant characteristics, predict program completion? Hierarchical generalized linear modelling (HGLM) was used to examine this question. The outcome was binary. It was anticipated that there may be variation in responses based on the district of employment (*n* = 39). Thus, multilevel analyses was

appropriate where respondents (level 1) were nested within district (i.e., level 2). Given the binary nature of the outcome, coupled with the nested nature of the data, HGLM was the data analytic approach taken to examine these questions. HGLM is the multilevel equivalent of logistic regression, a statistical procedure that allows the examination of outcomes with two or more categories. HGLM is therefore a regression-based procedure where the outcome can be predicted by categorical or continuous variables. Because the outcome is binary, the results are interpreted as odds, i.e., the probability of one category of the outcome occurring. Binary variables were uncentered, and continuous variables were group mean centered. Continuous variables included: age, number of years working in the field, number of children with ASD with whom they worked, baseline SoC, and baseline LoU. All other variables were binary. Full maximum likelihood via adaptive Gaussian quadrature was the estimation method for the HGLM.

An unconditional model was estimated first, which allowed the examination of the extent of variation between districts. Model 2 examined the extent that baseline Stages of Concern and Levels of Use, as well as being a novice in knowledge of and skill in social communication and engagement (as compared to intermediate or advanced) predicted program completion. Model 3 examined the extent these variables were related to the outcome, after controlling for personal characteristics.

RQ1 results. Based on the null model (i.e., no predictors included), the intraclass correlation coefficient indicated that a teacher in a typical district has a predicted probability of completion of about 42%. Model 2 was a random intercept fixed slope model which included current level of knowledge in social communication engagement, current level of skill in supporting social communication engagement, pre-SOC, and pre-LOU. Model 3 included the same covariates while controlling for teacher characteristics.

Model 2 (see Table 2) suggests that the log odds of completing the course were similar regardless of a participant's current level of knowledge in social communication engagement (novice versus intermediate or advanced), current level of skill in supporting social communication engagement (novice versus intermediate or advanced), baseline SoC, and baseline LoU.

Based on Model 3 (see Table 2), the log odds of completing the course were statistically significantly greater for participants who were enrolled for credit (relative to not taking the course for credit) (coefficient = 2.15, $p < .001$) and who attended the face-to-face meeting (relative to not attending face-to-face) (coefficient = 4.05, $p < .001$). Comparing two participants who are similar in other ways but differ only by whether they are enrolled for credit, the odds of completion for a participant enrolled for credit are over 8-1/2 times greater than for a participant not enrolled for credit and about 57 times greater for a participant who attends the face-to-face meeting. The log odds of completion were similar for participants regardless of degree (holding graduate versus all other degree types), being White or Asian (as compared to all other races), being a teacher (as compared to all other positions), working with preschool or elementary children (as compared to other grade levels), age, number of years working in the field, number of children with ASD with whom they worked, current level of knowledge in social communication engagement (novice versus intermediate or advanced), current level of skill in

supporting social communication engagement (novice versus intermediate or advanced), baseline SOC, and baseline LOU.

Table 2. ***Fixed Effects (Top) and Variance-Covariance Estimates (Bottom) for Models of the Predictors of Program Completion***

	Model 1	Model 2	Model 3
Fixed Effect Parameters	Coefficient (*SE, p*) *(OR; CI OR)*	Coefficient (*SE, p*) *(OR; CI OR)*	Coefficient (*SE, p*) *(OR; CI OR)*
Program completion (β_0) Intercept (γ_{00})	-.31 (.24, .21) (.73; .45, 1.20)	-.27 (.29, .36)	**-5.76 (1.44, <.001) (.003; .000, .058)**
Model for baseline Stages of Concern slope (β_1) Intercept (γ_{10})		.26 (.21, .22) (1.30; .86, 1.96)	.28 (.26, .29) (1.32; .79, 2.22)
Model for baseline Level of Use slope (β_2) Intercept (γ_{20})		-.30 (.41, .47) (.74; .33, 1.68)	-.61 (.54, .25) (.54; .19, 1.56)
[a]Model for knowledge of social communication engagement is novice slope (β_3) Intercept (γ_{30})		-.07 (.63) (.93; .27, 3.23)	.34 (.69, .62) (1.41; .36, 5.55)
[b]Model for skill in social communication engagement is novice slope (β_4) Intercept (γ_{40})		-.02 (.63, .97) (.98; .28, 3.41)	-.24 (.68, .73) (.79; .21, 3.02)
[c]Model for taking course for credit slope (β_5) Intercept (γ_{50})			**2.11 (.48, <.001) (8.27; 3.18, 21.51)**
[d]Model for graduate degree slope (β_6) Intercept (γ_{60})			-.26 (.55, .63) (.77; .26, 2.28)
[e]Model for White or Asian slope (β_7) Intercept (γ_{70})			1.08 (.63, .09) (2.95; .85, 10.32)
[f]Model for teacher (β_8) Intercept (γ_{80})			-.19 (.63, .77) (.83; .24, 2.88)
[g]Model for preschool or elementary (β_9) Intercept (γ_{90})			.71 (.46, .13) (2.03; .81, 5.09)
Model for age slope (β_{10}) Intercept (γ_{100})			.17 (.25, .49) (1.19; .72, 1.96)
Model for number of years working in field slope (β_{11}) Intercept (γ_{110})			-.03 (.04, .36) (.97; .90, 1.04)
Model for number of children with ASD slope (β_{12}) Intercept (γ_{120})			.02 (.03, .43) (1.02; .97, 1.08)

[h]Model for attend face-to-face slope (β_{13}) Intercept (γ_{130})		**4.18 (1.19, <.001) (65.17; 6.15, 690.28)**
Random Effect Parameters (Variance Components)		
Variance between districts intercepts $(\tau_{00})(u_0)$	.96	1.26

[a]Reference category = intermediate or advanced; [b]Reference category = intermediate or advanced; [c]Reference category = not taking course for credit; [d]Reference category = bachelors degree or less; [e]Reference category = all other races; [f]Reference category = all other positions; [g]Reference category = all other grade levels; [h]Reference category = did not attend face-to-face

Research Question 2 and 3 Results

RQ2 and RQ3 data analytic approach. Hierarchical linear modelling (HLM) was used to examine questions two and three. The outcome in each was continuous. As with question one, it was anticipated that there may be variation in responses based on the district of employment (n = 39). Thus, multilevel analyses was appropriate where respondents (level 1) were nested within district (i.e., level 2). Binary variables were uncentered, and continuous variables were group mean centered. Restricted maximum likelihood was the estimation method. For each question, an unconditional model was estimated first, which allowed the examination of the extent of variation between districts. Model 2 examined the extent that baseline Stages of Concern and Levels of Use, as well as being a novice in knowledge of and skill in social communication engagement (as compared to intermediate or advanced) predicted the outcome. Model 3 examined the extent these variables were related to the outcome, after controlling for personal characteristics.

For both analyses, the data, based on the final model (model 3), were screened to determine the extent to which the assumptions associated with multilevel modelling were met. These assumptions included: 1) linearity; 2) residuals (i.e., random effects) at level 1 are normally distributed and have equal variances; and 3) residuals at level 2 are multivariate normal. Linearity and homogeneity of variance at level 1 was reviewed by plotting the level 1 residuals to fitted values. A random display of points suggested this assumption was met. The hypothesis test for homogeneity of variances at level 1 suggested that equal variances between districts were plausible (p > .500). The assumption of normality of level 1 residuals was met for both analyses based on skew and kurtosis within the range of normal. Multivariate normality was assessed by a scatterplot of Mahalanobis distance (MDIST) and the expected values of the order statistics (CHIPCT). Points generally adhered to a diagonal line, suggesting evidence of multivariate normally distributed data.

RQ2 results. Research question 2 asked: To what extent do baseline Stages of Concern and Levels of Use, as well as participant characteristics, predict post-training Stages of Concern? Based on the null model (i.e., no predictors included), the intraclass correlation coefficient indicated that the proportion of variation in post-training SoC that is between districts is about 11%, warranting multilevel modelling. Model 2 was a random intercept fixed slope model which included current level of knowledge in social communication engagement, current level of

skill in supporting social communication engagement, pre-SoC, and pre-LoU. Model 3 included the same covariates while controlling for teacher characteristics.

Model 2 (see Table 3) suggests that post-training Stages of Concern were similar regardless of a participant's current level of knowledge in social communication and engagement (novice versus intermediate or advanced), current level of skill in supporting social communication and engagement (novice versus intermediate or advanced), and baseline SOC. However, baseline LoU was positive and statistically significantly related to post-training SoC. More specifically, the average effect across districts for baseline LoU is represented as an increase of 1.25 points in post-training SoC.

Based on Model 3 (see Table 2), on average and across districts, being a teacher (relative to all other positions), baseline SoC, and baseline LoU were positive and statistically significantly related to post-training Stages of Concern. The average effect (i.e., slope) across districts for being a teacher (relative to all other positions) is represented as an increase of .75 ($p < .04$). The average effect across districts for baseline SoC is represented as an increase of .12 points in post-training SoC, and baseline LoU is represented as an increase of 1.27 points in post-training SoC. Post-training SoC were similar for participants regardless of degree (holding graduate versus all other degree types), being White or Asian (as compared to all other races), working with preschool or elementary children (as compared to other grade levels), age, number of years working in the field, number of children with ASD with whom they worked, current level of knowledge in social communication engagement (novice versus intermediate or advanced), current level of skill in supporting social communication engagement (novice versus intermediate or advanced), completing at least 70% of modules 1-4 (relative to completing less than 70%), and completing at least 70% of modules 5-8 (relative to completing less than 70%). Statistically significant variation in the district means still exists ($u_0 = .49$, $p < .001$). This suggests that differences between the districts in post-training SoC still exist. The proportion reduction of within-district variation, relative to model 2, was less than 1%. The variation between districts, relative to model 2, has decreased about 17%. In terms of model fit, all model fit indices suggest better model fit when reviewing Model 2 to Model 1. However, the model fit indices suggest Model 3 is not a better fitting model, relative to Model 2, as AIC, BIC, and SBIC have slightly increased in Model 3 and the deviance test is not statistically significant. For purposes of examination of the contextual model, however, interpretations of Model 3 have been made.

Table 3. Fixed Effects (Top) and Variance-Covariance Estimates (Bottom) for Models of the Predictors of Stages of Concern

	Model 1	Model 2	Model 3
Fixed Effect Parameters	Coefficient (*SE*, *p*)	Coefficient (*SE*, *p*)	Coefficient (*SE*, *p*)
Mean post-Stages of Concern (β_0) Intercept (γ_{00})	**1.15 (.08, <.001)**	**1.55 (.22, <.001)**	-.01 (.60, .99)
Model for baseline Stages of Concern slope (β_1) Intercept (γ_{10})		.13 (.15, .40)	**.12 (.31, <.001)**

Model for baseline Level of Use slope (β_2) Intercept (γ_{20})	**1.25 (.30, <.001)**	**1.27 (.31, <.001)**
[a]Model for knowledge of social communication engagement is novice slope (β_3) Intercept (γ_{30})	.28 (.43, .51)	.41 (.44, .36)
[b]Model for skill in social communication engagement is novice slope (β_4) Intercept (γ_{40})	.18 (.43, .68)	.13 (.44, .76)
[c]Model for taking course for credit slope (β_5) Intercept (γ_{50})		.19 (.29, .52)
[d]Model for graduate degree slope (β_6) Intercept (γ_{60})		-.14 (.31, .66)
[e]Model for White or Asian slope (β_7) Intercept (γ_{70})		.67 (.36, .07)
[f]Model for teacher (β_8) Intercept (γ_{80})		**.75 (.36, .04)**
[g]Model for preschool or elementary (β_9) Intercept (γ_{90})		-.24 (.28, .39)
Model for age slope (β_{10}) Intercept (γ_{100})		-.07 (.15, .64)
Model for number of years working in field slope (β_{11}) Intercept (γ_{110})		-.01 (.02, .48)
Model for number of ASD children slope (β_{12}) Intercept (γ_{120})		.02 (.02, .22)
[h]Model for attend face-to-face slope (β_{13}) Intercept (γ_{130})		.64 (.40, .12)
[i]Model for completed 70% or more modules 1-4 slope (β_{14}) Intercept (γ_{140})		-.36 (.31, .25)
[j]Model for completed 70% or more modules 5-8 slope (β_{14}) Intercept (γ_{150})		.41 (.30, .17)

Random Effect Parameters (Variance Components)			
Variance between districts intercepts (τ_{00}) (u_0)	.14 (p = .01)	.62 (p < .001)	.49 (p < .001)
Variance within districts $(\sigma^2)(r_{ij})$	1.08	249	2.44
Model Fit			
-2LL (Deviance Test)	--	795.77, χ^2= 31.59, p < .001	776.20, χ^2= 19.57, p = .05
AIC	833.36	809.77	812.20
BIC	836.90	818.04	833.48
SBIC	828.75	799.02	784.57

[a]Reference category = intermediate or advanced; [b]Reference category = intermediate or advanced; [c]Reference category = not taking course for credit; [d]Reference category = bachelors degree or less; [e]Reference category = all other races; [f]Reference category = all other positions; [g]Reference category = all other grade levels; [h]Reference category = did not attend face-to-face; [i]Reference category = completed less than 70%; [j]Reference category = completed less than 70%

RQ3 results. Research question 3 asked: To what extent do baseline Stages of Concern and Levels of Use, as well as participant characteristics, predict post-training Levels of Use? Based on the null model (i.e., no predictors included), the intraclass correlation coefficient indicated that the proportion of variation in post-training LoU that is between districts is about 23%, warranting multilevel modelling. Model 2 was a random intercept fixed slope model which included current level of knowledge in social communication and engagement, current level of skill in supporting social communication and engagement, pre-SoC, and pre-LoU. Model 3 included the same covariates while controlling for teacher characteristics.

Model 2 (see Table 4) suggests that post-training Levels of Use were similar regardless of a participant's current level of knowledge in social communication and engagement (novice versus intermediate or advanced), current level of skill in supporting social communication and engagement (novice versus intermediate or advanced), baseline SoC, and baseline LoU.

Based on Model 3 (see Table 4), on average and across districts, holding a graduate degree (as compared to less than a graduate degree), being White or Asian (relative to all other races), being a teacher (relative to all other positions), and having more students with ASD were positive and statistically significantly related to post-training Levels of Use. Attending face-to-face (relative to not attending face-to-face) and completing at least 70% of modules 1-4 (relative to completing less than 70%) were negatively related to post-training Levels of Use.

The average effect (i.e., slope) across districts for holding a graduate degree (as compared to less than a graduate degree) is represented as an increase of .53 points (p = .01), being White or Asian (relative to all other races) is an increase of .81 points (p = .001), and being a teacher

(relative to all other positions) is an increase of .65 (p = .01). Additionally, for each additional child with ASD served, there is a .03-point increase in LoU. The average effects across districts for attending the face-to-face meeting (relative to not attending the face-to-face meeting) and completing at least 70% of modules 1-4 is represented as decreases of .55 and .79 points, respectively, in post-training LoU.

Post-training LoU were similar for participants regardless of taking the course for credit (relative to not taking the course for credit), working with preschool or elementary children (as compared to other grade levels), age, number of years working in the field, current level of knowledge in social communication and engagement (novice versus intermediate or advanced), current level of skill in supporting social communication and engagement (novice versus intermediate or advanced), completing at least 70% of modules 5-8 (relative to completing less than 70%), baseline SoC, and baseline LoU.

Statistically significant variation in the district means still exists (u_0 = .32, p < .001). This suggests that differences between the districts in post-training LoU still exist. The proportion reduction of within-district variation, relative to model 2, was about 24%. The variation between districts, relative to model 2, has decreased about 22%. In terms of model fit, all model fit indices suggest better model fit when reviewing Model 2 to Model 1 and when reviewing Model 3 to Model 2, suggesting Model 3 is the best fitting model.

Table 4. **Fixed Effects (Top) and Variance-Covariance Estimates (Bottom) for Models of the Predictors of Levels of Use**

	Model 1	Model 2	Model 3
Fixed Effect Parameters	Coefficient (*SE*, *p*)	Coefficient (*SE*, *p*)	Coefficient (*SE*, *p*)
Mean post-Levels of Use (β_0) Intercept (γ_{00})	**3.35 (.15, <.001)**	**3.38 (.17, <.001)**	**2.69 (.42, <.001)**
Model for baseline Stages of Concern slope (β_1) Intercept (γ_{10})		.08 (.12, .51)	.06 (.11, .59)
Model for baseline Level of Use slope (β_2) Intercept (γ_{20})		.15 (.23, .52)	.25 (.21, .24)
[a]Model for knowledge of social communication engagement is novice slope (β_3) Intercept (γ_{30})		-.29 (.33, .39)	.04 (.30, .90)
[b]Model for skill in social communication engagement is novice slope (β_4) Intercept (γ_{40})		.17 (.33, .61)	-.11 (.30, .72)
[c]Model for taking course for credit slope (β_5) Intercept (γ_{50})			.31 (.20, .13)

[d]Model for graduate degree slope (β_6) Intercept (γ_{60})			**.53 (.21, .01)**
[e]Model for White or Asian slope (β_7) Intercept (γ_{70})			**.81 (.25, .001)**
[f]Model for teacher (β_8) Intercept (γ_{80})			**.65 (.25, .009)**
[g]Model for preschool or elementary (β_9) Intercept (γ_{90})			-.03 (.19, .88)
Model for age slope (β_{10}) Intercept (γ_{100})			-.10 (.10, .31)
Model for number of years working in field slope (β_{11}) Intercept (γ_{110})			.0003 (.01, .98)
Model for number of ASD children slope (β_{12}) Intercept (γ_{120})			**.03 (.01, .03)**
[h]Model for attend face-to-face slope (β_{13}) Intercept (γ_{130})			**-.66 (.28, .02)**
[i]Model for completed 70% or more modules 1-4 slope (β_{14}) Intercept (γ_{140})			**-.80 (.21, <.001)**
[j]Model for completed 70% or more modules 5-8 slope (β_{14}) Intercept (γ_{150})			-.08 (.20, .69)
Random Effect Parameters (Variance Components)			
Variance between districts intercepts (τ_{00}) (u_0)	.44 (p < .001)	.41 (p < .001)	.32 (p < .001)
Variance within districts $(\sigma^2)(r_{ij})$	1.46	1.48	1.12
Model Fit			
-2LL (Deviance Test)	--	690.22, χ^2= 2.83, p > .500	622.39, χ^2= 67.83, p < .001
AIC		704.22	658.39
BIC		712.49	679.67

SBIC	693.48	630.76

[a]Reference category = intermediate or advanced; [b]Reference category = intermediate or advanced; [c]Reference category = not taking course for credit; [d]Reference category = bachelors degree or less; [e]Reference category = all other races; [f]Reference category = all other positions; [g]Reference category = all other grade levels; [h]Reference category = did not attend face-to-face; [i]Reference category = completed less than 70%; [j]Reference category = completed less than 70%

Discussion

The Social Communication and Engagement Triad (SCET) professional learning program was unique when compared to what most professionals receive in that: (a) it was completely voluntary at every stage, (b) participation in school teams was prioritized, (c) a significant time commitment (75 hours) was required, and (d) there was both an online and face-to-face component. Due to the voluntary nature of the program and the time commitment required, attrition was expected but the number of individuals who initially enrolled in the program but never began the course (n=121) was higher than anticipated.

There are several potential explanations for this. First, because team participation was prioritized, there may have been some "peer pressure" to participate by team members who were initially most interested in the program. Once enrolled, team members who were less interested may not have felt it necessary to continue since their team members were not prevented in continuing in the program by their own lack of participation. Another possible explanation for the level of initial attrition may be that participants did not become completely aware of the requirements or content of the SCET program until they received the syllabus via email. Although the program was designed to support students from preschool through high school, it may have been perceived as more appropriate for younger children given the topic. This may explain the fact that those who enrolled but didn't begin the course were significantly less likely to work with preschool and/or elementary children compared to working with children of other ages. Interestingly, no other participant characteristics significantly differed between those individuals who initially enrolled but didn't begin and those individuals who began the course. The remaining participants (n=206) were used in the subsequent analyses to answer the research questions that are discussed below.

Research Question 1

The first research question asked: To what extent do baseline Stages of Concern (SoC) and Levels of Use (LoU), as well as participant characteristics, predict program completion. Findings suggested there were only two characteristics that predicted whether a participant would likely complete the program. The first was whether the participant was enrolled in college credit. The odds of completion for a participant enrolled for credit were over 8-1/2 times greater than for a participant who enrolled for Colorado continuing education units. Similar to many states, Colorado's education system is locally controlled. The reality is that some districts allow educators to move up the pay scale after earning a certain number of college credits. Other districts do not provide this incentive. Although it is unclear whether this may explain these results, it is true that the adopting a new practice is difficult and even the most motivated educator may need incentives to start and persist through the change process.

The other characteristic that proved to be significant was whether a participant attended the face-to-face meeting. As previously mentioned, a single full-day face-to-face meeting was held in locations across the state. Participants who attended this single face-to-face meeting were about 57 times more likely to complete the program than those participants who did not attend the face-to-face meeting. There could be several explanations for this finding. First, individuals who were motivated to attend the face-to-face may have been more motivated to actively participate in the SCET program than those who decided not to participate. It is also possible that attending the face-to-face allowed educators the time they did not otherwise have to work within their school team and/or the opportunity to build trust and collegiality.

Perhaps more interesting was the fact that no other participant characteristic or baseline score on SoC or LoU predicted course completion. This is encouraging for those that work in the professional learning arena because it suggests that there is not a certain "type" of educator that should be targeted for participation. Participants who completed the program were not significantly different from those who did not on any participant characteristic. Results suggest that degree of participation was not related to experience level, role, education level, attitude or initial level of use.

Research Question 2

Research question 2 asked: To what extent do baseline Stages of Concern and Levels of Use, as well as participant characteristics, predict post-training Stages of Concern? Model 3 suggests that baseline SoC and baseline LoU were positive and statistically significantly related to post-training SoC. Participants with higher initial SoC and LoU scores also had higher post-training SoC and LoU scores. Considering the fact that adopters typically move up the SoC levels of concern from unrelated and self-types of concern to task and ultimately impact levels of concern supports these findings. For instance, a participant who was initially unconcerned about their involvement with the SCET program may have been less motivated to participate and thus their attitude may be harder to change than individuals who were interested in learning more about how adopting the SCET program would directly impact their work or the logistics of adoption. Similarly, participants who identified at higher levels of use could focus their efforts on skill building rather than only on information gathering and preparation for use. Because the SCET program moved quickly from foundational knowledge to activities that promoted using the principles of the SCET program in practice, it may have been easier for individuals at higher initial levels of use to try than those participants who were still focused on gathering information about the program which could explain the more positive attitudes of those participants who came in with some knowledge and skill.

Additionally, participants who were teachers had a higher post-training SoC than those participants who held other roles (e.g., speech-language pathologists, para-educators, speech-language pathology assistants, and administrators). Since those participating teachers were special educators, these results could be explained by the simple fact that they are with children with social communication and engagement deficits all school day whereas related service providers work with these children among many other children with other disabilities. This does not explain the results when considering para-educators, however. Instead, it could be that para-

educators had a greater learning curve when it came to the content than educators and may not have grasped the importance of the content as the special educators did.

Research Question 3

Similar to question 2, research question 3 focused on whether participant characteristics and baseline SoC and LoU scores predicted post-training LoU. Using the best fit model, Model 3, to discuss the findings suggests that there were several characteristics that adequately predicted post-training LoU. Interestingly, a higher degree of education was positively and significantly related to post-training LoU along with being a teacher, being White or Asian, and having more students with ASD. A possible explanation for these findings might be that those individuals with higher levels of education and more experience working with students with ASD were able to better grasp some of the foundational concepts of the SCET program and more easily change their practice behaviors. Similarly, those with higher levels of education including teachers, may have been introduced to concepts of SCET (e.g., joint attention, emotional regulation, communicative functions) in their previous education. Perhaps because it was already in their wheelhouse, they simply needed a refresher course to actually implement previous learning in their classrooms whereas participants who did not have the background had a much steeper learning curve.

However, attending the face-to-face training and completing at least 70% of the modules 1-4 were negatively related to post-training LoU. Although participants who were interviewed at baseline LoU were asked to confirm that they watched the innovation configuration map video, their understanding of the program based on only that video was not assessed. It is possible that some participants initially thought they were using the SCET program but after learning more about it through the modules and face-to-face meeting, realized they were not actually using it but were doing something else which is similar to previous research findings (e.g., author, 2015). In other words, participants who completed at least 70% of the modules were more knowledgeable of SCET and, therefore, LoU and thus were more practical in their assessment of LoU at post-test as compared to participants who completed less of the training. And this realization may have been heightened for participants who attended the face-to-face training.

Conclusion

What makes a professional learning experience “high-quality” is not a new idea (e.g., Bergquist 2006; Slabine 2011; Wei et al. 2010). However, single-session professional learning experiences are what most educators experience (Graner et al., 2012). Although, we as professional learning facilitators, understand what is required, it remains difficult to support educators over the long-term with the goal of changing student outcomes. The results of this investigation support this notion. Specifically, findings suggest that face-to-face connection with colleagues and facilitators is important as well as an incentive for participating system. Perhaps most interesting is the finding that there is not a “type” of educator who is more inclined to commit to a year-long professional learning endeavour. Educators, speech-language pathologists, para-educators, and administrators all successfully completed the SCET program and all dropped out. The fact remains there are many unanswered questions in regard to what keeps individual school professionals inspired and motivated to change their practice. Future research should consider

whether voluntary or required professional learning experiences yield greater outcomes and whether delivery mode also impacts outcomes. Future research should also expand our efforts to determine whether participant characteristics determine whether individual adopters are encouraged through certain supports.

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