STEM+ FOR ALL:
Training and Mentoring Special Education Teachers to Deliver Effective STEM Plus Computer Information Science Instruction to Students with Disabilities

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Alphabetical List of Key Abbreviations

ESCCO	Educational Service Center of Central Ohio (partnering local education agency)
OHIO	Ohio University (partnering institution of higher education)
STEM+	Science, technology, engineering, mathematics plus computer information science
STEM+ FOR ALL	Project title

Absolute Priority and Competitive Priority 1

Absolute Priority: Creating and Implementing an Effective Teacher Residency Program

The primary goal of *STEM+ FOR ALL* is to develop and implement a teacher residency program at Ohio University (OHIO) in partnership with the Local Education Agency (LEA) of the Educational Service Center of Central Ohio (ESCCO), a high-need district they serve (i.e., South-Western City School District [20% of students living in poverty; SAIPE, 2018]), and a consortium of 21 high-need schools within South-Western City School District (e.g., Alton Hall Elementary School, 66% FRPL; Holt Crossing Intermediate School, 73% FRPL; Franklin Heights High School, 76% FRPL). For full information on the ESCCO and their high-need schools, see Appendices A, C, and D. Within OHIO, both the College of Education and College of Arts and Sciences are collaborating to ensure prospective teachers acquire both the content and pedagogical knowledge necessary for the effective training of K-12 students with moderate-to-intensive educational needs (see OHIO's Joint Letter of Support from Deans of these two colleges in Appendix I). The purposes of *STEM+ FOR ALL* are to improve the quality of OHIO's special education teacher preparation program and thereby to improve the academic achievement of the K-12 students the program graduates serve. These purposes align with the purposes of the Teacher Quality Partnership Grants, which according to Section 201 of the Higher Education Act of 1965 are to (1) improve student achievement, (2) improve the quality of the current and future teaching force by improving the preparation of prospective teachers and

enhancing professional development activities, (3) prepare teachers who are highly competent in the academic content areas, and (4) recruit highly qualified individuals, including minorities, into the teaching workforce.

In an effort to improve learning outcomes for K-12 students with moderate-to-intensive educational needs, *STEM+ FOR ALL* aims to leverage the preparation of prospective teachers at OHIO to build the capacity of OHIO and ESCCO in Partnership to train and mentor prospective, new, and current teachers. Specifically, the *STEM+ FOR ALL* Partnership will extend OHIO's online moderate-to-intensive special education master's degree program to include the following three redesign efforts : **(1)** ***Integrating evidence-based and high-leverage practices in special education and science, technology, engineering, and mathematics plus computer information science (STEM+) content into OHIO's Special Education Master's Degree Program.*** *STEM+ FOR ALL* will use a multidimensional approach to integrate evidence-based and high-leverage practices into the core pedagogy of the graduate course work, summer training opportunities, clinical experiences, and ongoing mentoring and induction supports. **(2)** ***Lengthening OHIO's Special Education Master's Degree clinical experiences to include a yearlong teacher residency.*** *STEM+ FOR ALL* will redesign the clinical experiences of OHIO's graduate special education preparation program to encompass a yearlong teaching apprenticeship (i.e., teacher residency) under the mentorship of a special education teacher from ESCCO who is licensed, experienced, and successful in the teaching of K-12 students with moderate-to-intensive educational needs. **(3)** ***Ongoing mentoring and induction supports on topics contextually relevant to ESCCO (e.g., teaching students with severe emotional disturbance).*** Prospective teachers completing their master's degree through *STEM+ FOR ALL* will receive ongoing mentoring from ESCCO mentor teachers in special education and STEM+ content, as well as an

OHIO faculty member in the Special Education program. New teachers (i.e., *STEM+ FOR ALL* graduates) will continue to receive ongoing mentoring from both ESCCO mentor teachers and a faculty member in OHIO's Special Education program for two years post-graduation.

Across the five years of *STEM+ FOR ALL*, we will train and mentor 104 new special education teachers who focus on delivering instruction to K-12 students with moderate-to-intensive educational needs, including those with autism spectrum disorders and severe emotional disturbance. For moderate-intensive classrooms, the average class size is six students, which means the impacts of *STEM+ FOR ALL* could extend to 624 K-12 students per year. Moreover, we will provide ongoing training and mentorship to at least 26 experienced teachers who will serve in the capacity of mentor teachers. Said efforts will immensely enhance the capacity of ESCCO and our partnering schools to meet the educational needs of students with moderate-to-intensive educational needs in the greater Columbus, Ohio vicinity by increasing both the quantity and quality of the special education teaching workforce.

Competitive Preference Priority 1: Improving Student Achievement in STEM+

Both in Ohio and nationally, students with disabilities' academic achievements in STEM+ are lower than their same-age peers without disabilities (Nord et al., 2011). These outcomes can result from a number of causes such as teachers' and/or parents' lower expectations regarding students' abilities, ineffective use (or a lack thereof) of accommodations to promote STEM+ engagement, and more experiences with STEM+ content taught by less-qualified teachers (Alston & Hampton, 2000; National Science Foundation, 2002; Spelling, 2007; U.S. Commission on Civil Rights, 2009). Subsequently, students with disabilities receive unequitable access to high-quality STEM+ instruction compared with their peers without disabilities (Aron & Loprest, 2012). These and other systemic barriers (e.g., persistence through

an undergraduate degree, biases in hiring) lead to an underrepresentation of people with disabilities in STEM+ post-secondary educational programs and also in STEM+ professional careers (Hawley, Cardoso, & McMahon, 2013; Report of the President's Commission on Excellence in Special Education, 2002).

STEM+ FOR ALL takes an innovative approach to improving the STEM+ outcomes of students with disabilities in three ways. First, *STEM+ FOR ALL* integrates computer information science content and pedagogy throughout the curricular and clinical experiences of prospective teachers' master's degree program. Second, prospective and mentor teachers will collaborate in the planning, teaching, and assessing of multiple connected computer information science lessons to K-12 students with and without disabilities during a Computer Information Science Summer Institute for each year of their master's degree (including the resident year) and for their two years of induction after completing their degree program. Third, prospective and new teachers will be provided a mentor teacher in their prospective area of licensure (i.e., K-12 moderate-to-intensive special education) and also a STEM+ mentor who will support their content and pedagogical expertise in computer information science. This mentored experience will ensure that all prospective and new teachers have the knowledge and skills to deliver high-quality STEM+ instruction to the students with disabilities in their classrooms. Through this innovative approach to developing high-quality special education teachers who are well prepared to deliver effective computer information science instruction to students with disabilities, we will improve the STEM+ achievement of students with disabilities in our prospective and new teachers' classrooms. In addition to achievement, our innovative approach to delivering high-quality teacher preparation will promote design thinking and computational thinking skills in K-12 students, both of which can promote problem solving skills and a critical thinking mindset.

Quality of the Project Design

STEM+ FOR ALL's **Rationale**

Students learn best when they are taught by well-prepared teachers who demonstrate the pedagogical and content-related competencies aligned with their teaching positions (Wayne & Youngs, 2003). Shortages in special education teachers and limited professional development resources to support special education teachers' steadfastness in the profession have resulted in teachers with limited capacities instructing students with disabilities. Consequently, students with disabilities have less exposure to high-quality teaching in the content areas, which results in fewer opportunities for students with disabilities to develop proficiency in STEM+ content. The lack of high-quality teaching in STEM+ fields for students with disabilities is a huge disservice to these students, because the STEM+ fields are ones in which students with neurodiversity (e.g., autism spectrum disorders) tend to excel due to needing an extreme level of focus in order to successfully solve some problems (James, 2010; Lorenz, Reznik, & Heinitz, 2017). In order to promote equitable educational experiences in STEM+ content, and to ensure that students with disabilities are career ready for computer information science professions, prospective special education teachers need strong pedagogical and content-specific preparation (Israel, Pearson, Tapia, Wherfel, & Reese, 2015). This preparation must be paired with intensive clinical experiences where the prospective special education teachers can apply their knowledge in the classroom with students with disabilities so that the prospective teachers develop the skills necessary to positively impact the learning of K-12 students with disabilities and effectively prepare individuals with disabilities for computer information science careers. In the following sections, we (1) elaborate on this rationale using data to support our conceptual logic, (2) present *STEM+ FOR ALL's* logic model, and (3) show how the key components of the logic model are

informed by research that suggests when they are implemented with fidelity, they result in positive outcomes for prospective teachers and their K-12 students with disabilities.

Special education teacher shortages, particularly in the education of students with moderate-to-intensive educational needs

Critical shortages in special education have existed for decades across the United States (McLeskey & Billingsley, 2008; Zhang, Wang, Lsinski, & Katsiyannis, 2013). The Bureau of Labor Statistics (2017) reported that roughly 450,000 special education teachers are hired to instruct school-age students with disabilities each year, but approximately 10% of these teachers (i.e., 45,000) are not certified for their positions. This problem reflects an educational inequity for students with disabilities who are currently being educated by teachers who are lesser qualified to meet their educational needs. Due to the limited personnel and resources to meet students' individualized needs, special education teachers have reported they believe their students are not achieving mastery in the content areas compared to their peers without disabilities (Mitchem, Kossar, & Ludlow, 2006). For the past 25 years, Ohio has faced chronic shortages in special education teachers and are in the greatest need of teachers of students with moderate-to-intensive educational needs (U.S. Department of Education, 2017).

As shown in the *Needs Assessment* from our partnering local education agency ESCCO (see Appendix C), both they and the high-need school district and the consortium of high-need schools they serve have chronic turnover in qualified special education teachers each year, with the greatest need related to teachers of students with moderate-to-intensive needs (i.e., moderate-to-intensive special education teachers are the LEA's highest-need area). This results in our partnering agencies needing to re-hire approximately 49% of their special education moderate-to-intensive teaching positions annually. This attrition requires extensive recruitment efforts

annually to hire the best and most qualified teachers. The ongoing and rigorous training of prospective teachers paired with the professional development efforts for new and mentor teachers of students with moderate-to-intensive educational needs that encompass the goals of *STEM+ FOR ALL* will assist our partnering agencies in filling vacancies of their special education teachers, and in supporting their retention of these critical teachers.

Limited Capacity for Teachers to Meet the Individualized Needs of Students with Disabilities

Multiple evidence-based practices exist to effectively teach students with disabilities such as repeated readings (What Works Clearinghouse, 2014), peer-assisted learning strategies (What Works Clearinghouse, 2012), and function-based behavioral interventions (What Works Clearinghouse, 2016). However, scholars have found that many teacher preparation programs do not train their prospective teachers in the use of evidence-based practices (Toch & Rothman, 2008), nor do they provide their prospective teachers with sufficient opportunities to practice using evidence-based practices within clinical experiences while receiving performance-based feedback (Billingsley, 2011). Given (a) the current shortage of fully certified special education teachers, coupled with (b) the research documenting the positive association between teachers' inability to meet students' needs and their stress (Dickie et al., 2014) and attrition from the profession (Berry et al., 2011; Billingsley, 2004), immediate action is necessary. *STEM+ FOR ALL* will take this necessary action by providing effective training to prospective teachers along with two years of ongoing and individualized induction supports in the use of evidence-based practices to support students who demonstrate moderate-to-intensive educational needs.

STEM+ academic achievement gaps between students with and without disabilities

With the persistent unequitable educational experiences between students with and without disabilities, it is not surprising that the academic achievement for students with

disabilities lags behind that of their peers without disabilities in STEM+ outcomes (Wayne & Youngs, 2003). These academic achievement gaps exist for students represented in all of the federal categories of disabilities at both the elementary and secondary levels, and the gaps are the widest for students with moderate-to-intensive educational needs (Kohli, Sullivan, Sadeh, & Zopluoglu, 2015; Wei, Lenz, & Blackorby, 2013). For example, Wei and colleagues (2013) found that elementary students with disabilities had lower math achievement and slower growth on math outcomes compared to their peers without disabilities. *STEM+ FOR ALL* will work to ameliorate these achievement gaps by preparing prospective special education teachers with strong teaching skills by integrating effective pedagogical practices within clinical experiences while ensuring ongoing mentoring from a trained, experienced, and effective special education teacher of learners with moderate-to-intensive educational needs. Moreover, as our graduates transition from prospective teachers into the role of new teachers, we will continue providing them with the necessary, ongoing induction supports from an interdisciplinary team of three mentors that include an OHIO Special Education faculty member, and a licensed, experienced, and successful special education teacher and STEM+ teacher.

Necessity of High-Quality Preparation for Special Education Teachers

In order to provide equitable learning opportunities for students with disabilities (in relation to their peers without disabilities), special education teachers need to be better equipped to effectively teach them. To meet the individualized and intensive needs of their students, this requires stronger preparation at the preservice level with sustained, practical opportunities to use effective practices within their clinical experiences while receiving performance-based feedback.

Scholars have identified multiple evidence-based practices for teaching students with disabilities, including students with moderate-to-intensive needs (Fleury et al., 2014). For

example, Fleury and colleagues (2014) identified that reading aloud and explicit instruction are effective practices for teaching students with moderate-to-intensive needs literacy and mathematics/science, respectively. In addition to such evidence-based practices, scholars in special education and content-area instruction have identified high-leverage practices that are essential teaching strategies for promoting positive outcomes for K-12 students (Ball & Forzani, 2011; Grossman, Hammerness, & McDonald, 2009; Leko, Brownell, Sindelar, & Kiely, 2015; McDonald, Kazemi, & Kavanaugh, 2013; McLesky et al., 2017). For example, Ball and Forzani (2011) identified 10 high-leverage practices for mathematics learning for all students such as teaching and using academic language and responding productively to students' mathematical errors. Evidence-based practices and content-specific high-leverage practices are essential elements of high-quality teacher preparation programs that we will embed within our coursework and require application during clinical experiences while providing performance-based feedback. For example, by providing instruction on the essential components of literacy instruction paired with assignments requiring prospective teachers to implement literacy programs during their teacher residency that focus on the essential reading components, prospective and mentor teachers will gain skills in the implementation of effective literacy programs that incorporate all components of literacy instruction. As is the case in this example, *STEM+ FOR ALL* will prepare its prospective special education teachers with strong pedagogical and content-related skills necessary to effectively teach their students with disabilities STEM+ content, literacy programs, social-emotional skills, and functional skills (e.g., communication, money management).

STEM+ FOR ALL's Goals, Objectives, and Outcomes

The ultimate purpose of *STEM+ FOR ALL* is to improve the academic achievement of K-12 students with moderate-to-intensive educational needs. To achieve this purpose, *STEM+ FOR*

ALL will increase the quality and quantity of new moderate-to-intensive special education teachers by (1) enhancing the quality of curricular coursework and clinical experiences for OHIO's Special Education Master's degree program, and (2) designing effective mechanisms that strengthen communication, collaboration, mentorship, and professional development for prospective, new, and current moderate-to-intensive special education teachers. Both in the logic model (see Table 2 and Appendix G) and in the ensuing text, we outline these two goals, their related objectives, and the expected outcomes in clear, specific, and measureable ways.

OHIO and ESCCO will collaborate on the recruitment and selection of prospective teachers into the program, including working with our respective state and local business partners to identify potential candidates for the program. OHIO and ESCCO has four primary recruitment strategies that we will replicate annually to recruit each of the four cohorts of 26 prospective teachers. Recruitment includes special consideration for (a) parents of students with disabilities in the partnering schools serviced by ESCCO; (b) interdisciplinary attendees of OCALICON (autism and disability state conference); (c) business partners who may have employees seeking to change professions (e.g., nationwide children's hospital; chase bank), and (d) STEM+ professionals in the greater Columbus, Ohio area. See Table 1 for selection criteria.

Table 1. Eligibility and Selection Criteria for *STEM+ FOR ALL* Prospective Teachers

Topic	Selection Criteria for Prospective Teachers
Application	Submit a complete application for OHIO's Special Education Master's degree program in moderate-to-intensive needs
Recent Graduate OR Mid-Career	Have received an overall 3.00 GPA (on a 4.00 point scale) for their undergraduate degree
Content Area Knowledge	Demonstrate strong content knowledge and/or record of professional accomplishment in special education and/or STEM+ fields
Written & Verbal Communication	Demonstrate strong written and verbal communication skills, as measured via a writing sample and interview and evaluated using application rubrics
Professional Dispositions	Demonstrate the professional dispositions necessary to become a teacher as evidenced through letters of recommendation and the interview
Commitment to Teach	Provide written verification they will complete the service obligation to ESCCO for at least three years or repay their living stipend to OHIO

Table 2. *STEM+ FOR ALL's* Logic Model

Objectives	Inputs & Activities	Short-term & Long-term Outcomes
Goal 1:To effectively train 104 new special education teachers to successfully obtain licensure in special education for learners with moderate-to-intensive needs and teach K-12 students with moderate-to-intensive educational needs		
Objective 1.1 To develop a *STEM+ FOR ALL* Executive Team who will take a leadership role in the design and implementation of all *STEM+ FOR ALL* activities	* Utilize the expertise of all partnering agencies to collaboratively design all project teams and activities * Meet bi-weekly to ensure the timely planning and completion of all objectives and activities on budget * Design, implement, and disseminate research to measure the impacts of *STEM+ FOR ALL* on special education teachers and K-12 students with disabilities	* Formation of a partnership that will sustain collaborative efforts after the grant project ends * Creation of the systems, supports, and processes necessary for sustained collaborative efforts * Data-driven decisions about refinements to the systems to improve the partnership * Provision of data-driven recommendations to the field to promote the replication of effective partnership efforts
Objective 1.2 To develop a *STEM+ FOR ALL* Curriculum Team who will enhance the current moderate-to-intensive special education program at OHIO	* Embed evidence-based practices (EBPs) and high-leverage practices (HLPs) throughout the curriculum and assessments * Develop added curriculum related to computer information science * Collect formative and summative data on prospective teachers' knowledge of EBPs, HLPs, and computer information science	* Refined curriculum that OHIO will continue to use with future cohorts * Graduates with increased knowledge related to EBPs, HLPs, and computer information science * Enhanced academic achievement (including STEM+ outcomes) for prospective teachers' K-12 students with disabilities
Objective 1.3 To develop a *STEM+ FOR ALL* Clinical Team who will enhance the current special education clinical experiences at OHIO	* Develop a year-long teacher residency program modeled after OHIO's Teaching Fellows Program * Create a stronger alignment between curriculum and clinical experiences * Collect formative and summative data on prospective teachers' skills in using EBPs and HLPs within their classrooms	* Redesigned teacher residency program for OHIO's special education program * Graduates with increased skills to use EBPs and HLPs with students with disabilities * Graduates with improved teaching effectiveness * Enhanced academic achievement for prospective teachers' K-12 students with disabilities

Goal 2: To create pathways that increase communication, collaboration, and mentorship among prospective and new special education teachers and licensed, experienced, and successful special education teachers and STEM+ teachers

Objective 2.1 To develop a *STEM+ FOR ALL* Mentoring Team who will create the systems, activities, and materials that foster ongoing communication, collaboration, and mentorship	* Use grant funding to purchase the technology required for distance observations and mentoring of prospective teachers by OHIO faculty * Collaboratively (mentor special education teachers, STEM+ teachers, and OHIO faculty) support the development of prospective special education teachers * Develop the mentoring expectations, processes, and procedures that will promote ongoing and effective mentorship for prospective special education teachers	* Acquisition of an initial set of technology to provide effective observations from a distance * Creation of the systems and supports necessary for sustained mentoring after the grant project ends * Graduates who have strong self-efficacy to teach students with disabilities * Graduates who have strong self-efficacy to teach computer information science content * Graduates who have increased teaching skills * Enhanced academic achievement for the prospective teachers' K-12 students
Objective 2.2 To develop a *STEM+ FOR ALL* Induction Team who will design a two-year induction program that effectively supports new teachers	* Develop a 2-year induction program that will effectively support new special education teachers * Create professional learning networks and communities of practice wherein new and mentor special education teachers mature together * Design the systems and structures necessary for sustained mentorship of new special education teachers	* Creation of the systems and supports necessary to implement the induction program after the grant ends * New teachers' increased exposure to ongoing support from mentors and other new teachers * Increased retention of new special education teachers within partnering agencies * Increased career satisfaction of new special education teachers and their mentor teachers
Objective 2.3. To develop a *STEM+ FOR ALL* Professional Development Team who will leverage resources, activities, and supports across *STEM+ FOR ALL* stakeholders to provide ongoing professional development	* Plan and implement an annual Computer Information Science Summer Institute wherein prospective, new, and mentor teachers collaborate to develop and implement lessons that are effective for use with all K-12 students * Utilize OHIO, ESCCO, and other state resources (e.g., OLAC) to provide ongoing professional development for new teachers, mentor teachers, and other teachers from the Partnership * Design the systems and structures necessary for new teachers to receive feedback during and after participation in professional development	* Formation of a collaborative Summer Computer Information Science Institute that continues annually after the grant project ends * New teachers' regular access to high-quality professional development with access to performance-based feedback * Increased access to impactful instruction for K-12 students with disabilities * Enhanced academic achievement for K-12 students with disabilities

Goal 1: To effectively train 104 new special education teachers to successfully obtain licensure in special education for learners with moderate-to-intensive needs and teach K-12 students with moderate-to-intensive educational needs

We have outlined three objectives that are necessary to achieve *STEM+ FOR ALL's* first goal. As we explain below, these objectives are to develop the following three teams to redesign our special education program: (1) an Executive Team, (2) a Curriculum Team, and (3) a Clinical Team. These three teams will work in unison to ensure that we redesign OHIO's special education program in a manner that prepares prospective special education teachers with strong teaching skills and effectively builds their capacity to improve the academic achievement (including STEM+ achievement) of K-12 students with moderate-to-intensive educational needs.

Objective 1.1 To develop a STEM+ FOR ALL Executive Team who will take a leadership role in the design and implementation of all STEM+ FOR ALL activities to increase the quality and quantity of special education teachers for learners with moderate-to-intensive needs.

The Executive Team will consist of at least one individual from each partnering agency who has the authority to make educational decisions on behalf of their agency. For example, Dr. Tom Goodney, Superintendent of the ESCCO, will serve as a member of the Executive Team, as will Dr. Jennifer Ottley, Coordinator of the Special Education Program at Ohio University. These agency leaders will be standing members of the Executive Team across all years of *STEM+ FOR ALL*. The rest of the Executive Team will consist of members who rotate annually, based on the individuals who are serving as chairs for each of the other Teams (i.e., Curriculum, Clinical, Mentoring, Induction, and Professional Development).

The purpose of the Executive Team is to provide the overall leadership for the success of all *STEM+ FOR ALL* activities. Executive Team members will meet bi-monthly to communicate

information related to the individual teams and to utilize the expertise of all partnering agencies to lead the design, implementation, and research activities of *STEM+ FOR ALL*. These ongoing meetings and collaborative efforts will lead to the formation of a sustainable partnership that has all of the systems, supports, and processes developed to effectively implement *STEM+ FOR ALL* activities, refine these activities based on research and evaluation data, and sustain the collaborative efforts after the conclusion of the grant project.

Objective 1.2 To develop a STEM+ FOR ALL Curriculum Team who will enhance the current moderate-to-intensive special education program at OHIO to include content and pedagogy regarding evidence-based practices and high-leverage practices for (a) teaching K-12 students with moderate-to-intensive needs, (b) delivering effective STEM+ and literacy instruction, (c) implementing instruction that promotes the active engagement of students with disabilities who learn differently, and (d) using research and assessment data to improve instruction.

The Curriculum Team will consist primarily of faculty members of OHIO, but will also include representatives from all other agencies. The purpose of the Curriculum Team is to redesign the curriculum of OHIO's moderate-to-intensive special education program to prepare prospective teachers with strong teaching skills. To achieve this purpose, the Curriculum Team will integrate coursework specific to evidence-based practices and high-leverage practices into the curriculum. For example, the Council for Exceptional Children's (CEC) sixth high-leverage practice is for teachers to develop the competencies to use student assessment data to analyze their instructional practices and make the necessary changes to improve outcomes for students with disabilities (McLeskey et al, 2017). These high-leverage practices are based on research evidence (e.g., Mandinach & Gummer, 2013) and the Curriculum Team will collaboratively identify how to effectively teach this content to prospective teachers in a manner that increases

their knowledge and skills. To develop these strong teaching skills we will pair (1) CEC high-leverage practices, which research evidence has shown to be the teaching skills most important to be successful, with (2) evidence-based practices that research has shown to improve the academic achievement for K-12 students with disabilities (e.g., Bain, Lancaster, Zundans, & Parkes, 2009; Ball, Sleep, Boerst, & Bass, 2009; McLeskey, 2015; McLeskey et al., 2017; Riccomini, Morano, & Hughes, 2017; Scheeler, Budin, & Markelz, 2016).

The Curriculum Team will also redesign the curriculum to included added coursework in computer information science content and will identify opportunities to embed the STEM+ content-specific evidence-based practices and high-leverage practices into the special education program's coursework (e.g., Windschitl et al., 2012). This curricular redesign will result in prospective teachers developing increased knowledge relative to computer information science content and the pedagogical approaches to teach the content well to students with disabilities. We expect that these curricular changes will produce enhanced academic achievement for the K-12 students with disabilities who are taught by *STEM+ FOR ALL's* prospective teachers.

In Table 3, we provide the scope and sequence of the *STEM+ FOR ALL* Master's Degree in Special Education in Moderate-to-Intensive Educational Needs. Prospective teachers will complete 4 semesters of coursework (shown across 5 sessions, because the summer semester has 2 sessions) that span 17 months. The timeline for the year-long teacher residency in a moderate-to-intensive educational needs classroom in one of ESCCO's partnering high-need K-12 schools within South-Western City School District is 12 months spanning from June through May.

During the third semester of coursework (see Fall semester in Table 3), the program curriculum has a strong focus on using research and data to modify and improve classroom instruction. Within the Assessment course, the use of data to modify and improve classroom

Table 3. Scope and Sequence for the Redesigned *STEM+ FOR ALL* Master's Program

Course Number	Course Name	Credit Hours
Year 1 Spring Semester **January – May**		**14**
EDSP 5750	Curriculum, Collaboration, Co-Teaching & Consultation	3
EDSP 5700	Nature and Needs of Children and Adults with Exceptionalities	3
EDSP 6800	Practicum in Moderate-to-Intensive Educational Needs	2
EDTE 5260	Content Area Reading	3
EDTE 5300	Problems & Practices in Modern Elementary Mathematics	3
Year 1 Summer Semester – Session I **May – June** *Start of the Year-Long Teacher Residency*		**12**
EDTE 5600	Advanced Studies of Children and Adolescents	3
EDSP 5720	Career Development and Transition Planning	3
EDTE 5210	Foundations of Language & Diversity	3
EDCT 5011	Technology Applications in Education	3
Year 1 Summer Semester – Session II Semester **July – August**		**11**
EDTE 5240	Literature for Children & Adolescents	3
EDSP 5760	Current Issues in Special Education	3
EDTE 5270	Phonics and Structure of Language	3
EDSP 6800	Practicum in Moderate-to-Intensive Educational Needs	2
Year 1 Fall Semester **August – December**		**18**
EDTE 6670	Teacher as Action Researcher	3
EDSP 5730	Assessment of Learners with Special Needs*	3
EDSP 5740	Behavioral Management for Learners with Special Needs*	3
EDSP 6700	Technological Applications in Special Education*	3
EDPL 5620	Professional Internship w/Moderate-to-Intensive Educational Needs	6
Year 2 Spring Semester **January – May** *End of the Year-Long Teacher Residency*		**18**
EDTE 6940	Master's Research Project	3
EDPL 5630	Professional Internship w/Moderate-to-Intensive Educational Needs	6
EDPL 5650	Professional Internship Seminar	3
EDSP 5770	Methods and Materials for Learners w/Moderate-to-Intensive Needs	3
EDCT XXXX	Computer Information Science Elective	3
Total: 17 Months of Coursework Spanning 4 Academic Semesters		**73**

instruction focuses on K-12 students' academic achievement and the Behavior Management course focuses on the use of data to modify and improve classroom instruction to enhance K-12 students' social-emotional and behavioral outcomes. Moreover, during this semester, prospective teachers also complete the Teacher as Action Researcher course where they learn how to find research literature, assess the quality of it, select potentially beneficial evidence-based practices to use with their students, and learn how to plan for their own data collection to evaluate the impacts of said practice on their students. Prospective teachers will then enact this plan during the fourth and final semester of coursework when the prospective teachers implement their plan, collect data on their students' performance, analyze these data, and use them to improve their classroom instruction and make generalizable recommendations for the field of special education. Across both of these semesters, prospective teachers will be engaged in their yearlong teacher residency where they will have multiple opportunities to apply their knowledge on the use of research and data to improve K-12 students' outcomes within their clinical placement.

Table 4 outlines the core competencies that we will use to guide our preparation of prospective special education teachers in OHIO's redesigned program. These competencies align with the CEC's professional preparation standards for teachers of learners with moderate-to-intensive needs, Ohio's standards for the teaching profession, and the CEC's high-leverage practices for the teaching of learners with disabilities. Throughout their teacher preparation program, all prospective teachers will be required to document three instances in which their teaching demonstrates mastery of each of the competencies, as well as documenting the semester in which they achieve each competency. These competencies cover a number of important skills such as teaching students using data to analyze one's teaching, and translating literacy- and computer information science content into an effective instructional program. The knowledge

and skills needed to achieve these competencies are taught in at least one of the courses of the program (listed in Table 3; e.g., teaching students who have limited English proficiency is covered in EDSP 5700 and EDTE 5210) and will be practiced within the clinical experiences. Table 4 will serve as a resource for guiding prospective teachers, OHIO faculty, and mentor teachers in determining which skills should be a focus for each teacher based on the extent to which the skills have been mastered so that all prospective teachers are well-prepared to pass all Ohio state licensure requirements and become an effective K-12 special education teacher.

Table 5 describes the key assessments we will use to assess the prospective teachers' content and pedagogical knowledge, and teaching effectiveness. These assessments provide OHIO faculty with multiple, ongoing, and diverse forms of assessment of prospective teachers' competencies so that we can (1) observe growth and development in prospective teachers' skills over time, (2) provide prospective teachers with support as needed throughout the program, (3) ensure full mastery of special education teaching skills before the end of the teacher preparation program, (4) plan for and provide individualized induction supports to new teachers, and (5) revise the curriculum and clinical experiences as needed for subsequent cohorts of prospective teachers based on the previous cohort's mastery of teaching skills. The Curriculum Team will work to align the competencies from Table 4 with the key assessments from Table 5. For example, one of the competencies is to "collaborate with professionals to promote student success." This competency directly relates to key assessment #6 "Individualized Education Plan," (IEP) because it is the special education teacher's responsibility (in collaboration with administration) to support the general education teacher to (a) provide necessary data for the IEP, (b) participate as a member of the IEP team, and (c) use the accommodations, modifications, and interventions as outlined in the IEP. Consequently, as the prospective teachers practice these

skills in class and implement these skills in their teacher residency program, the prospective

teachers, with their mentor teachers, will provide ongoing support to general education teachers

on their team to effectively teach the students with moderate-to-intensive needs that they serve.

Table 4. *STEM+ FOR ALL's* **Prospective Special Education Teacher Competencies**

	Evidence of Mastery 1	Evidence of Mastery 2	Evidence of Mastery 3	Semester Competency Achieved
Learner Development and Individual Learning Differences				
Develops, implements, and adapts instruction based on students' abilities and content knowledge mastery				
Communicates with and about students using assets-based language				
Demonstrates high expectations for all learners				
Demonstrates knowledge and skills in the teaching of students who are English Language Learners				
Uses culturally relevant practices				
Learning Environments				
Establishes a consistent, organized, and respectful learning environment				
Provides positive and constructive feedback to guide students' learning and behavior				
Uses flexible groupings				
Uses strategies to promote active student engagement				
Uses assistive and instructional technologies				
Curricular Content Knowledge				
Demonstrates knowledge of the foundations of computer information science				
Prepares lessons based on effective computer information science pedagogy and instructional strategies				
Teaches lessons that demonstrate computer information science literacy				
Implements a literacy program that addresses the essential components of reading instruction				
Assessment				
Uses multiple sources of data to develop a comprehensive understanding of a student's strengths and needs				
Interprets and communicates assessment information with stakeholders to collaboratively design and implement educational programs				

Uses student data to analyze instructional practices and make necessary adjustments to improve student outcomes				
Conducts functional behavioral assessments to develop individual student behavior support plans				
Instructional Planning and Strategies				
Identifies and prioritizes long- and short-term learning goals				
Systematically designs instruction toward a specific learning goal				
Uses explicit instruction				
Adapts curriculum tasks and materials for specific learning goals				
Provides scaffolded support				
Provides intensive instruction				
Teaches cognitive and metacognitive strategies to support learning and independence				
Teaches social behaviors				
Teaches students to maintain and generalize learning across time and settings				
Professional Learning and Ethical Practices				
Uses data and methods of inquiry to problem-solve, reflect, and evaluate the outcomes of one's teaching				
Seeks ongoing professional development in the teaching of individuals with disabilities and in curricular content knowledge				
Pursues leadership roles, including advocacy, on behalf of one's students				
Collaboration				
Collaborates with professionals to increase student success				
Organizes and facilitates effective meetings with professionals and families				
Collaborates with families to support student learning and secure needed services				

We will assess specific competencies in computer information science within the key assessments that are marked with an asterisk (*) in Table 5. For example, within the Lesson Plan assignment, among other competencies, we will assess prospective teachers' abilities to integrate technology effectively into their instruction and use technology to collect, manage, and analyze data to improve students' learning. These assessments include the Pre-Professional Internship Review (interview) during the second semester of the program and a Lesson Plan (project-based

Table 5. Description of *STEM+ FOR ALL's* Key Assessments

	Name of Assessment	Type or Form of Assessment	When the Assessment Is Administered	By Whom the Assessment Is Administered
1	**Assessment of early field performance:** Field Observation Evaluation	Assessment of Performance in the early clinical	During the Graduate Practicum course: EDSP 6800 *(Semester 1)*	Collaboratively by the OHIO Clinical Supervisor and Mentor Teacher
2	**Assessment of content knowledge in special education:** Pre-Professional Internship (PI) Review*	Assessment of Performance based on progress in the early clinical and courses	Required prior to the year-long teacher residency PI *(Semester 2)*	Each prospective teacher completes the Pre-PI Review with their OHIO faculty advisor
3	**Assessment of the use of data to improve instruction:** Functional Behavior Assessment & Behavior Intervention Plan	Application Project with rubric-based assessment	During the Behavior Management course: EDSP 5740 *(Semester 3)*	The OHIO instructor of the Behavior course (20% double-scored)
4	**Licensure assessment:** Ohio Assessments for Educators Special Education/043	State-Required Examination; Standardized Test	Must be taken prior to graduation; passage required for licensure in Ohio *(Semester 3)*	Ohio Department of Education
5	**Assessment of candidate's ability to plan and implement appropriate teaching and learning experiences:** Lesson Plan*	Application Project with rubric-based assessment	During the Methods course: EDSP 5770 *(Semester 4)*	The OHIO instructor of the Methods course (20% double-scored to ensure inter-rater reliability)
6	**Assessment of content knowledge in special education:** Individualized Education Plan	Application Project with rubric-based assessment	During the Methods course: EDSP 5770 *(Semester 4)*	The OHIO instructor of the Methods course (20% double-scored)
7	**Assessment of internship:** PI Final Evaluation*	Assessment of Performance in the Field	End of Professional Internship *(Semester 4)*	Collaboratively by the OHIO University Supervisor and Mentor Teacher
8	**Assessment of candidate effect on student learning:** Education Teacher Performance Assessment (edTPA)*	Capstone Assessment of Teaching Effectiveness	During Professional Internship in Teaching *(Semester 4)*	Pearson Education, Inc.'s edTPA reviewers

assessment), Professional Internship Final Review (performance-based assessment), and the edTPA (capstone assessment of teaching effectiveness) during the fourth semester of the program. In addition to these programmatic assessments of prospective teachers' computer information science competencies, the ESCCO will assess new teachers' computer information science competencies and offer teachers who demonstrate proficiency microcredentials.

Objective 1.3 To develop a STEM+ FOR ALL Clinical Team who will enhance the current special education clinical experiences at OHIO by (a) creating rich connections between coursework and fieldwork, and (b) creating a year-long clinical experience modeled after OHIO's highly effective and nationally recognized Teaching Fellows Program.

The Clinical Team will be composed of the individuals who are the most closely connected to overseeing the clinical experiences for their respective agencies. For example, Dr. Areej Ahmed (OHIO) will lead the Clinical Team, as 100% of her teaching responsibilities for the 2019-20 academic year are dedicated to the clinical supervision of prospective special education teachers. The purpose of the Clinical Team is to strengthen OHIO's clinical experiences to support the prospective special education teachers' use of evidence-based practices and high-leverage practices with fidelity. The Clinical Team will play a critical role in the design and implementation of the new year-long teacher residency program that will be modeled after OHIO's highly-effective Teaching Fellows Program (Gut et al., 2003). The Clinical Team will also collaborate with the Curriculum Team to ensure a strong alignment between the coursework and clinical experiences; this alignment is observable through the key assessments that are project-based and performance-based (see Table 5) and will continue to be strengthened and made more clear and intentional through the work of the Clinical Team. This alignment is important, because prospective teachers need ongoing opportunities to practice new

skills in the classroom while receiving performance-based feedback on the quality with which they use the targeted practices. The implementation of these redesigned clinical experiences will improve the prospective teachers' teaching effectiveness, thereby enhancing the academic achievement of their K-12 students with disabilities.

Goal 2: To create pathways that increase communication, collaboration, and mentorship among prospective and new special education teachers and licensed, experienced, and successful special education teachers and STEM+ teachers

Next, we have delineated the three objectives that are necessary to achieve *STEM+ FOR ALL's* second goal. These objectives are to develop the following three teams that will create sustained communication, collaboration, and mentorship among individuals from all partnering agencies: (1) a Mentoring Team, (2) an Induction Team, and (3) a Professional Development Team. These three teams will coordinate their efforts to develop the systems and structures necessary to provide effective and sustained support to prospective and new teachers from mentors with diverse areas of expertise (e.g., severe emotional disturbance, STEM+) who are dedicated to the advancement of novice teachers. These collaborative efforts will leverage the expertise and resources across agencies to develop and implement systems and supports that are sustainable after the conclusion of the grant period. Through Goal 2, OHIO faculty will work with licensed, experienced, and effective teachers from ESCCO and the high-need schools within the South-Western City School District to provide effective instruction that meets the needs of learners with moderate-to-intensive needs, including students who have intensive emotional disturbance, autism spectrum disorder, and those with Limited English Proficiency. These professional development opportunities that OHIO faculty will provide to prospective, new, and current teachers in the *STEM+ FOR ALL* Partnership will focus on strengthening (a) teachers'

STEM+ content knowledge and teaching skills, (b) partnering schools' literacy programs based on Ohio's revised standards and Ohio's literacy plan to improve literacy achievement (Ohio Department of Education [ODE], 2018), and (c) teachers' use of evidence-based practices for improving social-emotional and behavioral outcomes.

Objective 2.1 To develop a STEM+ FOR ALL Mentoring Team who will create the systems, activities, and materials that foster ongoing communication, collaboration, and mentorship among prospective special education teachers and special education and STEM+ mentors.

The Mentoring Team will consist of OHIO faculty and teachers from the ESCCO and the partnering schools who are serving as mentors for prospective teachers. The ESCCO will lead recruit efforts for mentor teachers. For the purpose of *STEM+ FOR ALL*, mentor teachers are teachers who (1) are licensed in teaching students with moderate-to-intensive educational needs (special education mentor) or STEM+ content (STEM+ mentor), (2) have at least three years of full-time teaching experience, and (3) show their effectiveness as a teacher, as evidenced by their (a) knowledge of content, pedagogy, and assessment, (b) differentiation of instruction based on learner needs, (c) ability to collaborate effectively with colleagues, and (d) K-12 students' academic achievement. ESCCO and OHIO will collaborate on the initial and ongoing training of mentor teachers, which we will provide face-to-face and online.

The Mentoring team will develop expectations, processes, and procedures that are feasible to implement within the typical workloads of the mentors' current position and are perceived to be an acceptable means in which to support prospective teachers. Groups of three mentors (i.e., OHIO faculty member, special education mentor teacher, STEM+ mentor teacher) will collaboratively provide mentoring to prospective teachers. Mentoring will occur at least once bi-weekly. Execution of the *STEM+ FOR ALL* mentoring activities will lead to increased

levels of self-efficacy and enhanced skills for prospective special education teachers as measured by teachers' development of special education teacher competencies (see Table 4), performance on key assessments (see Table 5), and a self-efficacy questionnaire (Tschannen-Moran & Hoy, 2001). In turn, these outcomes will improve the academic achievement of K-12 students with disabilities, as evidenced by performance on curriculum-based measures, quarterly benchmarks, and annual evaluations of student knowledge.

Objective 2.2 To develop a STEM+ FOR ALL Induction Team who will design a two-year induction program that effectively supports new special education teachers

Similar to the Mentoring Team, the Induction Team will consist of OHIO faculty and teachers from the ESCCO who have strong expertise in special education and/or STEM+ content. The primary purpose of the Induction Team is to develop a two-year induction program that is grounded in adult learning theory (Clarke & Hollingsworth, 2002), and based on best practices for the ongoing support of new teachers (Goldsmith & Phelps, 2010; Ottley et al., 2015). The Induction team will create and implement the processes and procedures for a sustained professional learning network for new teachers in the form of ongoing communities of practice and sustained mentorship by other new special education teachers, mentor special education teachers, and OHIO faculty from the special education program. Supports provided within the professional learning network will be individualized to the needs of the teachers and will include a variety of topics including, but not limited to, STEM+ content, literacy-focused content, supporting learners with moderate-to-intensive needs (including emotional disturbance), and thriving in the first years of teaching.

A community of practice is a group of individuals who mutually engage in social activities for shared and sustained collective learning (Wenger, 1998). Multiple benefits result

from participation in communities of practice, including feeling supported (Fiszer, 2004; Hou, 2015), solving one another's problems (Tseng & Kuo, 2014), and enhancing knowledge and practice (Chien, 2018; Yoon & Armour, 2017). We expect our communities of practice to provide extra support to new special education teachers, which will increase their retention in the profession. We also expect the sustained mentoring experiences (included in the induction program) to increase the career satisfaction for new special education teachers and their mentors.

Objective 2.3. To develop a STEM+ FOR ALL Professional Development Team who will leverage resources, activities, and supports across STEM+ FOR ALL stakeholders to provide ongoing professional development to prospective, new, and current teachers

The Professional Development Team will consist of at least two individuals from each Partnership. This team will identify how to utilize all of the resources that the state of Ohio and the partnering agencies provide to deliver effective and ongoing professional development to prospective, new, and experienced special education teachers and general education teachers who provide instruction and support to students with moderate-to-intensive educational needs. Such professional development activities will focus on the state of Ohio's initiatives in evidence-based literacy instruction (ODE, 2018), collaborative models of inclusive practice (Andrei, Day, & Ottley, 2018), and evidence-based STEM+ instruction. New teachers with specific areas of expertise will be relieved from their teaching duties to provide the time to lead the delivery of these professional development services to other teachers.

In addition, each year, the Professional Development Team will plan and deliver a Computer Information Science Summer Institute wherein prospective, new, and mentor teachers receive additional training on STEM+ content and content pedagogy. Interdisciplinary teams of teachers will collaboratively develop shared computer information science focused lessons

during the first week of The Institute. These teacher teams will then co-teach their lessons with

K-12 students from the local community during the second week of the Computer Information

Science Summer Institute, using student data to inform their instruction for the subsequent days

of the week. These interdisciplinary teaming experiences will promote the growth and

development of all teachers involved (e.g., STEM+ teachers will have exposure to effective

teaching of students with moderate-to-intensive needs; prospective teachers will develop

competencies in the co-plan, co-teach, and co-assess collaboration structure). We will facilitate

the storing and sharing of these lessons in a central repository to further support the development

of STEM+ content knowledge and sustaining the community of practice for new teachers.

***STEM+ FOR ALL* will build capacity and yield results that will extend beyond the grant**

Given the variability of quality in the current special education workforce with respect to

both content knowledge and skills to provide instruction to students with disabilities, it is critical

to identify ways to enhance the capacity of special education teachers to effectively instruct their

students. *STEM+ FOR ALL* uses a combination of theoretically- and empirically-based strategies

in an innovative way to build the capacity of both OHIO and ESCCO to meet the needs of our

high-need schools and the K-12 students with disabilities they serve. *STEM+ FOR ALL* uses

Goodlad's (1994) model of simultaneous renewal, wherein collaboration is viewed as a teaming

process that is mutually beneficial for all stakeholders. Scholars have found that simultaneous

renewal collaborations enhance outcomes for K-12 students (Bay-Williams et al., 2007; Shroyer

et al., 2007). In addition, the American Association of Colleges of Teacher Education (2018) has

indicated that simultaneous renewal is a necessary model of collaboration for partnerships to be

effective and maintained long term. Because of our simultaneous approach to collaboration, our

partnership goals to build OHIO and ESCCO's capacities to train and mentor 104 new special education teachers to provide effective instruction to their K-12 students are achievable.

The purpose of *STEM+ FOR ALL* is to enhance OHIO's current Special Education Master's degree program by redesigning the curriculum and clinical experiences in partnership with our high-need LEA (ESCCO) and their high-need schools. The strategies we are using in our redesign efforts include strengthening our content on evidence-based practices, high-leverage practices, data-based decision making, intensive emotional disturbance, autism spectrum disorders, and STEM+ content (Bain et al., 2009; McLeskey et al, 2017; Owens et al., 2012; Riccomini et al., 2017; Windschitl et al., 2012). These redesign activities will be spearheaded by the Curriculum Team (Objective 1.2) and include the collective expertise of faculty members in special education and computer information science, as well as partner representation from ESCCO and the mentor teachers from their high-need schools. These curricular revisions will be coupled with a strengthening of our clinical experiences to include a year-long residency where prospective teachers receive performance-based feedback from a distance using video conferencing (work led by the Clinical Team [Objective 1.3] and the Mentoring Team [Objective 2.1], respectively; Coogle, Rahn, & Ottley, 2015; Ottley, 2016; Ottley et al., 2019, in press). We will use interdisciplinary teams of prospective teachers, new teachers, mentor teachers to engage in communities of practice, summer training institutes, online learning modules, and ongoing professional development opportunities (activities led by the Induction Team [Objective 2.2] and Professional Development Team [Objective 2.3]; Gut et al., 2014; Schaefer & Ottley, 2018). Co-teaching structures with interdisciplinary teams of STEM+ general education teachers with our special education teachers (prospective, new, and mentor) are critical for improving students' academic achievement. Most importantly, through *STEM+ FOR ALL*, we will leverage the

Teacher Quality Partnership resources, as well as other resources from OHIO and ESCCO to develop all of the systems and structures necessary for the grant activities to continue after the Federal funding period ends. Thus, while the grant funding is available, we will remove the systemic barriers that hinder the effective training and mentoring of new special education teachers so that we achieve our goal of developing 104 new special education teachers.

STEM+ FOR ALL represents an exceptional approach for meeting statutory purposes and requirements

The online delivery of OHIO's Special Education Master's degree program in moderate-to-intensive educational needs and the online induction supports (e.g., professional learning network, community of practice, repository of lesson plans) makes the training and mentoring accessible to prospective and new teachers from diverse backgrounds and locales who may otherwise be unable to complete their teacher preparation program in rural, southeastern Ohio. OHIO's special education faculty have strong expertise in the online delivery of teacher licensure programs and have collaborated with OHIO's Office of Instructional Innovation to deliver the highest quality program. Consistently, OHIO's online master's degree programs in education have been rated in the top 50 programs in the country (currently ranked #34; U.S. News & World Report, 2019). Consequently, taking OHIO's current, high-quality, expertly delivered program and redesigning it into one with more field-intensive components and computer information science curriculum will ultimately improve the experiences and increase the competencies of OHIO's prospective teachers.

OHIO's faculty are experts in the clinical model of teacher education (Henning et al., 2018; Newton, Ottley, Coogle, & Hartman, accepted; Ottley et al., in press; Schaefer & Ottley, 2018), have other teacher residency programs that are nationally recognized (Gut et al., 2003;

Henning, Gut, & Beam, 2015, 2018), and have successfully implemented other large teacher preparation grants to increase the number of fully licensed STEM teachers in Ohio (e.g., Woodrow Wilson Ohio Teaching Fellowship [2012-2014]). For example, 100% of Woodrow Wilson fellows completed their program successfully, obtained licensure, and taught in a high-need school in Ohio after graduation (Woodrow Wilson National Fellowship Foundation, 2017). In addition to this excellent record of the effective implementation of teacher residency programs, we are experts in mentoring and coaching, including the use of technology to provide performance-based feedback from a distance to prospective and new teachers (Coogle et al., 2015; Henning et al., 2018; Ottley et al., 2019, in press). Our expertise paired with these innovative and highly-impactful methods for training and mentoring prospective and new special education teachers situate *STEM+ FOR ALL* well for achieving all of the purposes and requirements of the Teacher Quality Partnership grant program (i.e., developing the teacher residency program with 2 years of post-graduation supports to effectively train prospective and new teachers in partnership with a high-need LEA and consortium of high-need schools).

Finally, focusing on the content of computer information science is immediately relevant to the ESCCO. The ESCCO has recently started working with their secondary students with disabilities to develop computer information science competencies so that their students persist through high school and are career-ready for entry-level computer information science careers after graduation. Consequently, training prospective special education teachers with computer information science competencies who will become new teachers for ESCCO who are highly effective at delivering computer information science curriculum to their students with disabilities directly aligns with ESCCO's current goals for their K-12 students and supports this goal of theirs by teaching this content to K-12 students prior to high school. Thus, *STEM+ FOR ALL*

both aligns with the requirements of the Teacher Quality Partnership grant, holds critical

importance for ESCCO and their K-12 students with disabilities, and demonstrates the

collaborative strength of OHIO and ESCCO teaming together for this partnership work.

***STEM+ FOR ALL* partnership activities are consistent with Ohio educational reform**

activities that promote teacher quality and student academic achievement

The current educational priorities in Ohio are to increase students' academic achievement

and career readiness as well as students' persistence to graduation from high school (ODE,

2019). Historically, students from diverse racial and ethnic backgrounds and students with

disabilities have underperformed their White peers without disabilities. This is why Ohio has

made concerted efforts to support their districts and schools to provide equitable educational

opportunities for all of their students. Some of these efforts have included (a) the development of

an Equity in IDEA advisory group who provides input to the Ohio Department of Education to

improve educational outcomes for students with disabilities and (b) the development of a

transition-to-work endorsement that Ohio special education teachers and career technical

educators can add to their license showing they have the competencies to support adolescents

and adults in their transition from high school to college and career. These efforts show the Ohio

Department of Education's emphasis on meaningful and equitable outcomes for students with

disabilities.

In addition to these educational outcomes for students, Ohio has prioritized teacher

quality by focusing on (a) inclusive preparation programs (b) with field-intensive clinical

experiences (c) that are provided in partnership with one or more LEAs (ODE, 2019). Ohio has

also prioritized teacher quality for practicing teachers through its investment in the Ohio

Leadership Advisory Council (OLAC) and the Ohio Improvement Process (OIP), which provide

multi-tiered systems of support for teachers, schools, and districts to meet the needs of all of their students. Consequently, Ohio has invested in both the pre-service and in-service supports that are necessary for schools to be effective. Collectively, *STEM+ FOR ALL*'s goals, objectives, activities, and outcomes strongly align with Ohio's educational reform activities and priorities.

Adequacy of Resources

The adequacy of support, including facilities, equipment, supplies, and other resources

OHIO is a public research university situated in Southeast Ohio. The Carnegie Foundation has classified OHIO as a doctoral university with high research activity. The U.S. News Report (2019) has ranked OHIO's online education programs as #38 in the nation. OHIO has one of the largest teacher preparation programs in the state of Ohio, serving nearly 1700 students per year, with approximately 100 of these students being those seeking licensure in moderate-to-intensive needs. Consistent with the requirements for the State Report Card, OHIO consistently has and continues to share teacher preparation data with the state of Ohio in a timely manner. OHIO is an NCATE accredited institution with CEC accreditation in the moderate-to-intensive educational needs program that is among the highest-performing teacher preparation programs in the State (Ohio Department of Higher Education, 2019). All of OHIO's moderate-to-intensive special education prospective teachers have passed the Ohio Assessment of Educators, including knowledge in the content areas, for the past three years (i.e., 100%), which is higher than the state's average of 96%.

The Office of Research and Sponsored Programs provides post-award support for faculty to manage external grants. Supports for faculty include accounting (account set-up, partnership agreements) and communications with the funder (submission of reports, requests for budget revisions). In addition, the College of Education has its own post-award staff member who

performs a number of grant-management tasks including: maintaining the grant's budget, placing vender orders, and arranging faculty and GA grant appointments.

The OHIO Center for Intervention Research in Schools (CIRS) currently has four active federal grants. In addition to the two co-directors, CIRS has seven affiliate faculty (including Ottley, Allan, and Gut), one research scientist, and a full-time manager that coordinates logistical tasks associated with grant projects. CIRS has offices in Athens and Columbus; the Columbus office will be critical to facilitate connections to ESCCO's high-need schools in central Ohio. This site has multiple offices and work stations, meeting rooms, assessment rooms and video-conferencing equipment. CIRS faculty also have access to a library of professional development manuals and procedures (e.g., Daily Report Card, an evidence-based practice for supporting K-12 students' behavioral functioning; Owens et al., 2012), as well as a variety of assessment tools. To support the professional development of faculty and students, CIRS holds writing group, steering committee, and research team meetings. These meetings provide time for ongoing mentorship to occur from CIRS' co-directors, as well as other faculty affiliates of CIRS. CIRS has toll-free phone lines and video conferencing, which will be used for bi-weekly meetings among the partnership team. CIRS has a secure and networked server that allows for secure storage and sharing of files across sites, which will be important for the confidential sharing and storing of data among OHIO, ESCCO, and prospective and new teachers.

The intended use of grant funds

About 75% of our requested grant funding is to provide support for the 104 prospective teachers. The primary use of this funding is to supply prospective teachers with a cost-of-living stipend for the year in which they complete their teacher residency. Prior to receiving their stipend, prospective teachers must apply in writing to receive the stipend and provide their written commitment that they will (a) complete their Ohio licensure exams to become a fully-

certified moderate-to-intensive special education teacher, (b) serve as a full-time special education teacher for ESCCO in one of their high-need schools for at least 3 years immediately after completing their teacher residency program, and (c) provide written verification of this employment to OHIO from ESCCO's chief administrative officer; If the conditions of (a), (b), and (c) are not met, then prospective teachers provide their written commitment that they will repay their living stipend (with interest) to OHIO. We will outline 3 specific exemptions to the repayment requirements on the grounds of being called to active duty in the U.S. Armed Forces, an inability to secure employment by ESCCO, and unforeseen health incapacitations. OHIO will use any monies received from repayment to train and prepare more special education teachers.

The next largest expense is for the personnel who will participate in the grant activities. This includes the time and resources needed for the project evaluator to complete the evaluation of the grant's activities. This also includes the salary and benefits of full-time project manager who will oversee the project's implementation, engage in the leadership team and Clinical Team, and who will participate in the mentoring of prospective teachers during clinical experiences. Personnel funding also includes the provision of a stipend for a graduate assistant who will work solely on this grant project supporting the Partnership with implementation of grant activities. Personnel funds will also be used to compensate *STEM+ FOR ALL* faculty to work on grant tasks over the summer (outside of their 9-month contracts) and for Drs. Ottley and Strycker to receive one course release per year to ensure the time is available to implement the grant.

We will also use grant funding to purchase supplies. We will purchase 13 Swivl robot and iPad sets (one set for each mentor teacher's classroom), which are essential technology to promote the effective observation of teachers from a distance through video conferencing. These technologies allow for OHIO faculty to observe and mentor prospective teachers from a distance

while they are teaching in their mentor teacher's classroom. Using video conferencing software on an iPad housed on a Swivl robot is a recommended practice for distance observations to capture a better video of the teachers' instruction (Coogle et al., 2015; Ottley, 2016). The purchase of these technologies are important to ensure that access to these materials does not serve as a barrier to receipt of meaningful performance-based feedback or program completion.

We will also use grant funding to cover the costs associated with the Computer Information Science Summer Institute. This includes the purchase of materials needed to implement the computer information science lessons, the fees of the school district to run two buses to pick up and drop off K-12 students to the Summer Institute, and the supplies needed to provide materials and sustenance to all of the K-12 students who attend the Summer Institute, which will ensure the equitable access to the Summer Institute regardless of economic background and resources. The materials will be reusable so that the Summer Institute can be sustainable after *STEM+ FOR ALL* ends by replicating thematic lessons every five years.

Each year of *STEM+ FOR ALL*, the principal investigator and another member of the Partnership will attend the mandatory grant funder's meeting. Moreover, during years three, four, and five, we have budgeted money for four team members to attend a professional conference to disseminate information related to *STEM+ FOR ALL's* implementation and outcomes.

Finally, we will use grant funding to pay mentor teachers a small stipend for their time and expertise in supporting the prospective and new teachers outside of their contractual hours during the academic year and in the summer.

The integration of funds from other related sources

Both OHIO and ESCCO have planned to be intentional about our efforts to coordinate strategies and activities for prospective, new, and mentor teachers to strengthen the quality of the special education teacher workforce. For example, OHIO has online training programs in both

computer information science (College of Education) and data analysis (College of Arts and Sciences). To strengthen the prospective and new teachers' content knowledge in computer information science, courses within these programs will be completed as core coursework. In this way, courses that are already scheduled to be offered and that are taught by expert computer information science faculty will be available for our teachers for a nominal cost to our program. In this way, OHIO will operate more efficiently with the available resources so that the goals of *STEM+ FOR ALL* can be achieved and sustained after the grant period ends. Likewise, ESCCO has a number of extensive and high-quality professional development opportunities they provide to their special education teachers such as training on evidence-based social-emotional learning strategies and IEP compliance (see *Needs Assessment* in Appendix C). A number of these opportunities are funded through the Individuals with Disabilities Education Act, the Elementary and Secondary Education Act, the National Science Foundation, the Ohio Leadership Advisory Council and the Ohio Improvement Process. By OHIO and ESCCO's coordinated efforts to align the strategies and activities we currently provide to our prospective (OHIO) and practicing (ESCCO) teachers, the Partnership will develop more efficacious and effective teachers who have the knowledge and skills to meet the academic and social-emotional needs of K-12 students with moderate-to-intensive needs. Notably, the integration of resources and activities aligns with the state and local educational reform priorities and activities that focus on high-quality inclusive educators who effectively promote the learning of all students whom they serve.

The relevance and demonstrated commitment of each partner of *STEM+ FOR ALL* to the implementation and success of the project

As demonstrated in the letters of support from OHIO, ESSCO, and South-Western City School District (with their 21 high-need schools), we have full commitment and partnership from

all entities of the partnership (see Appendix I). This commitment includes representation from each partnering agency on each of the six Teams that we are developing to complete *STEM+ FOR ALL* grant work. Each agency's representation will have a role. OHIO faculty will ensure their team covers the scope of the content, the use of evidence-based practices with fidelity, the reliability and validity of measures, and the alignment of *STEM+ FOR ALL* efforts with the state of Ohio's policies and initiatives. ESSCO teachers and staff will ensure the acceptability of the practices, the feasibility of their implementation, and the contextual relevance of the processes created and practices targeted. Mentor special education and STEM+ teachers will (a) indicate the perceived effectiveness of the new practices for their K-12 students and their satisfaction with using the practices, and (b) guide the identification of necessary topics for their career satisfaction and retention, and the long-term benefits of K-12 students with moderate-to-intensive needs. As shown in the figure to the right, our teaming process will ensure that research and policy inform prospective, new, and mentor teachers' practice; that teachers' practical knowledge and experience as well as research evidence inform our local policies, and that any research completed (e.g., prospective teachers' action research projects) are informed by policy and practice. These important connections promote the strongest outcomes for K-12 students, teachers, and the Partnership. In Table 6, we summarize the qualifications and roles of key personnel (CVs are in Appendix H).
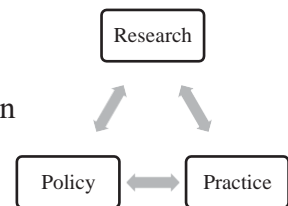
Table 6. *STEM+ FOR ALL Key Personnel*

Dr. Jennifer Ottley is an Associate Professor and the Program Coordinator of Special Education in the Department of Teacher Education at OHIO. Ottley has served as PI for nine grants and has strong grant management and leadership skills. Ottley has taught individuals with moderate-to-intensive needs in both school and home settings and has extensive expertise in using interdisciplinary teams and evidence-based practices to promote positive outcomes for students. Ottley will lead the Executive Team and co-lead the Induction Team.
Dr. Jesse Strycker is an Assistant Professor in Instructional Technology at OHIO. Strycker leads the College of Education's Technology committee, which works to embed computer information science technology throughout all educator preparation programs therein. Strycker

has taught computer education in the public schools and served as a district's technology coordinator. Strycker will co-lead the Curriculum Team and will serve on the Professional Development Team.
Dr. Darcey Allan is an Assistant Professor in Clinical Psychology from the College of Arts and Sciences at OHIO. Allan was a Fellow in an interdisciplinary doctoral training fellowship between Education and Psychology. Allan's expertise is in data analysis and supporting students with behavioral regulation disorders in school-based settings. Allan will serve on the Curriculum Team and co-lead the Professional Development Team.
Dr. Jen Newton is an Assistant Professor in Special Education at OHIO. Newton has served in multiple roles in public schools including a primary teacher, literacy specialist, and early childhood program director. Newton's expertise centers on equity and social justice for students through effective personnel preparation. Newton will co-lead the Curriculum Team.
Dr. Dianne Gut is a Professor in Special Education at OHIO. Gut has taught middle school students with disabilities. Gut's expertise is on mentoring prospective and new teachers. Gut will lead the Mentoring Team and will serve on the Induction Team.
Dr. Areej Ahmed is a Non-Tenure-Track Faculty Member in Special Education at OHIO whose primary responsibilities and expertise focus on clinical supervision of prospective teachers. Ahmed's experience has focused on adolescents and adults with disabilities. Ahmed will lead the Clinical Team.
Dr. Michael Burton is a Professor in Political Science in the College of Arts and Sciences at OHIO. Burton has extensive knowledge in computer sciences and data analysis. Burton will serve in an advisory capacity for *STEM+ FOR ALL*, reviewing products developed by the Curriculum, Induction, and Professional Development Teams and communicating with the *STEM+ FOR ALL* Executive Team on behalf of the College of Arts and Sciences.
Dr. Tom Goodney is the Superintendent of ESCCO. Dr. Goodney's expertise centers on leadership, accountability, and culture to promote the success of an organization. Dr. Goodney will serve on the Executive Team.

The commitment of the resources of the Partnership, including financial support, faculty participation and time commitments, and to the continuation of activities when the grant ends

The collaborative and engaged teaming that we described in the section above, which will occur from the beginning of the project, ensures that our efforts reflect the perspectives and priorities of each stakeholder and that our efforts are sustainable after the life of the grant. At a minimum, our teaming efforts will continue after the grant (a) for two-years of induction in our final cohort of prospective teachers, and (b) until ESCCO fulfills its need of moderate-to-intensive special education teachers. Because ESCCO continues to expand as an LEA to other high-need districts around the greater Columbus, Ohio vicinity, this Partnership could continue

into the unforeseeable future as other districts request that ESCCO provide their services for students with moderate-to-intensive educational needs based on the success of our initial cohorts.

In Appendix I, we have included documentation of our 100% match for the project. This match comes from both OHIO and ESCCO, which demonstrates (a) our partnership, and also (b) our commitment of resources to ensure the success of *STEM+ FOR ALL*. For OHIO faculty, we have included adequate time commitments <u>each year of the grant</u> to ensure the completion of Partnership activities (See Appendix I and Budget Justification). For ESCCO teachers, we have committed release time and stipends to cover the work of *STEM+ FOR ALL* that occurs outside of their contractual obligations for <u>each year of the grant</u>. These efforts ensure that individuals from all agencies have the time and resources to participate in *STEM+ FOR ALL's* activities for each year of the grant and to continue after the grant ends.

Quality of the Management Plan

Adequacy of the management plan to achieve *STEM+ FOR ALL's* objectives on time and within budget, including clearly defined responsibilities, timelines, and milestones

We have designed the *STEM+ FOR ALL* management plan so that the structures and processes necessary to manage and achieve *STEM+ FOR ALL's* objectives on time and within budget are both achievable as well as sustainable after the grant period (see Table 7). Most importantly, the distributed leadership among OHIO, ESCCO, teachers within the partnering schools, and stakeholders from the community ensures that all relevant parties have a voice to communicate the assets of the plan as well as any barriers experienced or anticipated that could jeopardize the targeted outcome achievement if not addressed.

Table 7. *STEM+ FOR ALL* **Project Timeline of Activities, Responsible Parties, and Deliverables**

Timeline	Program Activities	Responsible Parties	Program Deliverables
Goal 1: To effectively train 104 new special education teachers who successfully obtain licensure in special education for learners with moderate-to-intensive needs and teach K-12 students with moderate-to-intensive educational needs *Goal 2:* To create pathways that increase communication, collaboration, and mentorship among prospective special education teachers, expert special education mentor teachers, and expert computer and information science mentors			
Year 1 Aug. – Dec. 2019	1. Develop Executive Team and all other Teams 2. Executive Team meets bi-weekly 3. Curriculum Team, Clinical Team, Mentoring Team, Induction Team, and Professional Development Team meet monthly to complete their respective Team's charge from the Executive Team 4. Recruit first cohort of 26 prospective teachers	1. Executive Team 2. The Executive Team 3. The Executive Team and each respective Team is responsible for their Team's outcomes 4. The Executive Team	1. Team memberships and Team charges created 2. **Executive Team:** Creation of the systems, supports, and processes necessary to facilitate goal completion 3. **Curriculum Team:** Matrix of EBPs, HLPs, and computer information science standards and their corresponding alignment with CEC standards and program coursework 3. **Clinical Team:** Creation of a useable system of policies, procedures, and structures for the initial and year-long teacher residency clinicals 3. **Mentoring Team:** Selection of mentor teachers, acquisition of technology for distance observations, and development of policies and procedures for using technology for mentoring 3. **Induction Team:** Backward map of the systems and supports necessary to implement the induction program to achieve the outcomes of teacher efficacy, retention, and satisfaction 3. **Professional Development Team:** Table identifying the essential competencies of mentors, current training available to strengthen these competencies, and the additional training needing developed to address these competencies 4. Creation of marketing materials and interview protocol; selection of 26 prospective teachers to serve as the first cohort
Year 1 Jan. – April 2019	1. Hold introductory Cohort 1 meeting 2. Executive Team meets bi-weekly 3. Other Teams meet monthly to complete	1. The Executive Team; prospective and mentor teachers 2. The Executive Team	1. Meeting minutes; Table matching prospective special education teachers, mentor special education teachers, and mentor computer and information science teachers; Dissemination of technology materials; Completed registration for first semester coursework 2. **Executive Team:** Revisions to the systems, supports, and processes to facilitate goal completion and improve partnership relationships

	their respective Team's charge	3. The Executive Team and each respective Team is responsible for their Team's outcomes	3. **Curriculum Team:** Embed all EBPs, HLPs, and computer information science content into the first 2 semesters of coursework 3. **Clinical Team:** Pilot the policies, procedures, and structures of the clinical experiences for the introductory semester of field experiences 3. **Mentoring Team:** Pilot the policies, procedures, and structures of the mentoring for the introductory semester of field experiences 3. **Induction Team:** Development of the induction communication systems and data collection measures that will be used during the 2-year induction program, as well as the costs of sustaining the tools 3. **Professional Development Team:** Provision of training to all mentors to develop knowledge; facilitation of monthly communities-of-practice for all mentors to strengthen skills; Planning of the Year 1 Summer Institute and advertising it to the partnership schools
Year 1 May – July 2019	1. Hold the first individual advising meetings with prospective teachers, OHIO faculty, and mentor teachers 2. Executive, Clinical, and Mentoring Teams hold monthly Team meetings 3. Convene the 1st Annual Computer Information Science Summer Institute 4. Convene annual stakeholder meeting	1. OHIO faculty; prospective and mentor teachers 2. The Executive Team, Clinical Team, and Mentoring Team, 3. The Executive Team, Curriculum Team, Induction Team, Professional Development Team, prospective and mentor teachers 4. The Executive Team	1. Prospective teachers' documentation of evidence toward program competencies; creation of individualized goals for each prospective teacher for the teacher residency year 2. **Executive Team:** Creation of annual report and executive summary of the Year 1 activities, deliverables, and progress to completion 2. **Clinical Team:** Revised policies, procedures, and structures of the clinical experiences for the summer field experience opportunities 2. **Mentoring Team:** Revised policies, procedures, and structures of the mentoring for the summer field experience opportunities 3. **Executive Team:** Oversee the final planning and implementation of The Institute; engagement with community and business partners 3. **Curriculum Team:** Compilation of curriculum-based resources and assessments related to The Institute theme for the year 3. **Induction Team:** Development of the policies, procedures, and structures wherein new teachers will engage in The Institute during their two years of induction 3. **Professional Development Team:** Implementation of the 1st Annual Computer Information Science Summer Institute; synthesis of feedback from teachers, K-12 students, and community members 4. Proceedings from the meeting; List of strategic ideas for Year 2

Years 2-5 Aug. - July	1. Hold advising meetings with prospective teachers, OHIO faculty, and mentor teachers (Nov., March, May) 2. Hold introductory meetings with each cohort in Dec. prior to the cohort's start 3. Executive Team meets bi-weekly 4. Other Teams meet monthly to complete their respective Team's charge 5. Convene the Annual Computer Information Science Summer Institute 6. Convene annual stakeholder meeting	1. OHIO faculty; prospective and mentor teachers; Induction Team 2. The Executive Team; prospective, new, and mentor teachers 3. The Executive Team 4. The Executive Team and each respective Team is responsible for their Team's outcomes 5. The Executive Team, Curriculum Team, Induction Team, Professional Development Team, prospective and mentor teachers 6. The Executive Team	1. Prospective teachers' documentation of evidence toward program competencies and individual goals, revision of goals as needed, and documentation of competency and goal mastery prior to graduation; if any area is not proficient prior to graduation, embed that competency and individual goal into the new teacher's induction plan 2. Meeting minutes; Table matching prospective and mentor teachers; Dissemination of technology materials; Completed registration for first semester coursework 3. **Executive Team:** Achievement of milestones, objectives, and goals; Creation of annual reports and executive summaries 4. **Curriculum Team:** Embed all EBPs, HLPs, and computer information science content into the last 2 semesters of coursework (Year 2); revisions of curriculum based on prospective teachers' competency data (Years 3-4) 4. **Clinical Team:** Effectively executed field experiences (including year-long residency) for all cohorts; Revised policies, procedures, and structures for all clinical experiences 4. **Mentoring Team:** Effectively executed mentoring; Revised policies, procedures, and structures of the mentoring process 4. **Induction Team:** Effectively executed induction; Revised policies, procedures, and structures of the induction process 4. **Professional Development Team:** Provision of training to new and mentors to develop knowledge; facilitation of monthly communities-of-practice for new and mentors to strengthen skills 5. Effective planning and implementation of Annual Summer Institute; synthesis of feedback to improve subsequent years 6. Proceedings from the meeting; List of strategic ideas for scaling and sustaining the partnership; Summary of partnership's impacts

Note. OHIO = Ohio University; EBPs = Evidence-Based Practices; HLPs = High-Leverage Practices

During the first month after receiving the Teacher Quality Partnership grant award, Drs. Ottley and Goodney will determine the membership of all of the *STEM+ FOR ALL* Teams and create each of the Team's charges to complete milestones, objectives, and goals. Throughout the duration of the grant period, the Executive Team will meet bi-weekly to review the status of *STEM+ FOR ALL,* review inputs and outputs of the other teams, set timelines, address barriers, create short-term goals to keep the full team on track for success, and review evaluation data about the progress toward achieving milestones and long-term goals.

Because the Executive Team includes the Chair of each of the other teams (i.e., Curriculum, Clinical, Mentoring, Induction, Professional Development), each Chair of a Team will share relevant information (e.g., timelines and milestones) from the Executive Team meetings with their Teams during their respective Team meetings. All Teams will have working meetings monthly throughout the duration of the grant period to complete the activities needed for their Team to complete their charge and achieve identified milestones to keep *STEM+ FOR ALL* on track for achieving the goals and objectives on time and within budget. These activities includes such tasks as developing policies and procedures for the implementation of the special education teacher residency preparation program and creating shared materials for use by the full partnership to save resources and eliminate duplication of efforts (Refer to Table 7 for specific information about each Team's timelines, activities, and deliverables). Although all of these activities and their corresponding deliverables will continue throughout the duration of the grant, the first year of the grant will be the most intensive for the partnership in order to create the systems and supports necessary to effectively implement the teacher residency preparation program throughout the remainder of the funding period. Then, during the subsequent four years, we will implement the policies and procedures developed while providing the needed supports to

ensure *STEM+ FOR ALL's* objectives are completed on time and within budget. Each Team will use data collected regarding the feasibility, acceptability, and effectiveness of the developed processes to revise how the program is implemented for the second, third, and fourth cohorts of prospective teachers. These iterative development and refinement efforts will increase the likelihood that we will achieve our goals and engage in opportunities for scaling and sustaining the partnership efforts after the grant period ends.

Quality of the Project Evaluation

The evaluation design for *STEM+ FOR ALL* includes both a formative component for project improvement and a summative component to assess short- and long-term outcomes and achievements. Identified weaknesses and challenges will inform process improvements and assist the Executive Team to adjust as needed. At the conclusion of each year, the evaluators will assess outcomes against the stated goals and in the context of the institutional norms and averages. Additionally, the evaluators will assess the long-term sustainability of the program.

A pragmatist theoretical framework guides the overall evaluation approach (Creswell, 2014). This philosophical worldview lends itself to the multiphase mixed-method study with combined qualitative and quantitative data providing a holistic means to determine elements of the program that support attainment of goals and assessing, pragmatically, "what works" (Creswell, 2014). As an example, statistical data on the retention of prospective teachers in the program is more clear and meaningful in the context of interview and survey responses. We provide a list of the guiding evaluation questions in Table 8.

Table 8. Evaluation Questions

Evaluation Questions
1. What is the relationship between the support services (e.g., focused training and mentoring) prospective and new teachers receive and their persistence, graduation, and retention?
2. What do prospective and new teachers identify as the most effective and important aspects of the teacher development program?
3. What is the relationship between the development of a partnership between OHIO and ESCCO in meeting the needs of high-need schools within their LEA?
4. Does the partnership effectively coordinate strategies and activities through this program with other teacher preparation and/or other professional development?
5. Are the activities consistent with other State and local education reform activities?
6. Is the partnership able to effectively integrate grant funds with other sources of support to create a sustainable change?
7. How are the Executive, Curriculum, Clinical, Mentoring, Induction, and Professional Development Teams operating and impacting the effectiveness of the Program?
8. What is the relationship of the teacher residency program, curriculum changes, and induction process to the program completion and retention of cohort teachers?
9. What is the impact of STEM+ content being integrated into pedagogy? What is the relationship of these changes to teacher retention?
10. What is the relationship of the Computer Information Science Summer Institute to student computer literacy? What is the relationship to STEM+ student achievement?
11. What is the relationship of the teacher residency program, curriculum changes, technology integration, and induction process to K-12 student achievement and computer literacy? What is the relationship to STEM+ student achievement?

The extent to which the methods of evaluation will provide valid and reliable performance data on relevant outcomes

Dr. Lesli Johnson, Associate Professor, will serve as the lead evaluator. Dr. Pamela Wilson, Research Associate, will serve as Research Coordinator of the evaluation team. The Voinovich School has extensive experience in program evaluation and the development of performance measurement systems to help develop the capacity of organizations. Using both qualitative and quantitative methodologies, the School has conducted evaluations to meet the needs of health care providers, state and local agencies, school districts, and foundations.

The evaluation will include a formative and summative assessment of the program, including an assessment of the Partnership and its effectiveness in engaging individual schools

and their teachers. Further, the evaluation will examine how well the program integrates its activities with other professional development and school reform activities and how the program utilizes grant resources along with other supports to create a sustainable effort. The summative portion of the evaluation will focus on outcomes at the teacher, school and student level.

Importantly, the evaluation is being conducted by an external evaluation team that does not have a stake in the program's development or implementation. This will help ensure that the evaluation is unbiased and that the outcomes of the evaluation are objective. Additionally, multiple measures and methods will be utilized to complete the evaluation. This will afford the opportunity to triangulate data across participants and data collection methods, which will ensure that the evaluation data are credible and reflect the multiple diverse perspectives of each stakeholder group (e.g., ESCCO, South-Western City Schools, prospective and new special education teachers. Evaluators will assess the recruitment methods and training methods for effectiveness, and modify these methods as needed annually.

The extent to which the methods of evaluation are thorough, feasible, and appropriate to the goals, objectives, and outcomes of the proposed project

To evaluate *STEM+ FOR ALL's* performance toward project aims, the evaluators will use six forms of data. We provide performance measures, target goals, and data sources in Table 9.

Evaluation Timeline, Tools, and Instruments

Quantitative measures include institutional data, such as demographics, responses to selected surveys, progression rates, and academic achievement. Qualitative methodologies incorporate observations, individual interviews, surveys, and document review. The evaluation design facilitates interaction between qualitative and quantitative data throughout the program period to allow an examination of multiple components within the STEM+ FOR ALL program.

Statistics provide summary information regarding the data, facilitate detailed descriptions, and

enhance trustworthiness of observed phenomenon (Onwuegbuzie, Johnson, & Collins, 2009);

qualitative descriptions provide added context to triangulate the data, add credibility to the data,

and help explain data variability. See Table 10 for a summary of the Evaluation Plan.

Table 9. Evaluation Performance Measures, Target Goals, and Data Sources

Performance Measures	Goals	Data Sources
Licensure. The percentage of special education program graduates who have attained initial State licensure by passing all necessary licensure assessments within one year of program completion.	100% of program graduates	Ohio Department of Education
STEM+ Microcredentials. The percentage of special education program graduates that attain microcredentials from ESCCO by passing all necessary competency assessments within one year of program completion.	90% of program graduates	ESCCO administrative data
One-Year Persistence. The percentage of program participants who were enrolled in the postsecondary program in the previous grant reporting period, did not graduate, and persisted in the postsecondary program in the current grant reporting period.	90% of program enrollers	OHIO administrative data
One-Year Employment Retention. The percentage of program completers who were employed for the first time as teachers of record in the preceding year by the partner high-need LEA and were retained for the current school year.	95% of program graduates	ESCCO administrative data OHIO survey data
Three-Year Employment Retention. The percentage of program completers who were employed by the partner high-need LEA for three consecutive years after initial employment.	90% of program graduates	ESCCO administrative data OHIO survey data
K-12 Student Learning. The percentage of grantees that report improved aggregate learning outcomes of students taught by prospective and new teachers (i.e., K-12 student academic growth over time).	80% of students in classrooms of graduates	ESCCO administrative data

Data Management

Throughout the evaluation period, evaluators will use a variety of methods to collect

summative data annually. Quantitatively, teacher progress, graduation, certification, placement,

and retention will provide a baseline and a framework for assessing progress. Qualitative data,

with interview and focus group protocols to be developed, will assist in developing a profile of

the prospective teachers, new teachers, mentor teachers, and teacher educators as prospective

teachers enter and complete the program. Other information, such as program support materials,

mentoring practices, and clinical experiences will be reviewed. Qualitative data, such as

interview audio recordings, will be kept on a secure, password protected drive and destroyed

once transcribed. The Voinovich School utilizes a secure, password-protected File Transfer

Protocol (SFTP) to transfer data files securely across sites. SFTP is a standard protocol for

accessing and managing files on remote file systems. Unlike standard File Transfer Protocols,

SFTP encrypts commands and data both, preventing passwords and sensitive information from

being transmitted in the clear over a network. The Voinovich School also uses Filelocker to share

large files (up to 8GB) easily and securely, with strong encryption backed by password

protection and automatic expiration of all files uploaded to our Filelocker accounts. The School

also employs Whole Disk Encryption and NetShare to restrict access to sensitive data to

authorized users with valid authentication keys. OHIO will archive project data for a 10-year

period following the conclusion of the grant. De-identified data will be made available to

researchers, which integrates resources across data collection sources and strengthens OHIO's

special education preparation program.

Table 10. *STEM+ FOR ALL's* **Evaluation Plan**

Absolute Priority: Create & Implement an Effective Teacher Residency Program		
Phase	**Objective**	**Tools and Instruments**
Phase 1: Baseline	Analyze and assess establishment of Executive, Curriculum, Clinical, Mentoring, Induction, and Professional Development (PD) teams. Assess the effectiveness of the partnership to a) engage in grant activities, b) coordinate and integrate grant activities with other professional development and school reform efforts, and c) utilize grant resources along with other supports to enhance sustainability	Review documents and attend committee meetings.

Annual survey of Executive Committee and key partners. Key Stakeholder interviews as needed |

	Assess recruiting processes (candidates and mentors).	Review documents and recruiting process, supports, and communications.
	Profile cohort 1.	Statistical review of candidates' demographics and key characteristics.
Phase 2: Year 1-5	Assess modifications to recruiting processes.	Review documents and recruiting process, supports, and communications.
	Profile incoming cohort(s).	Statistical review of candidates' demographics and key characteristics.
	Assess existing cohort(s) retention, perceptions, and achievements.	Conduct interviews and/or focus groups of cohort members, mentors, and committee members.
	Assess retention: program completion; Year 1 retention; Year 3 retention.	Evaluation program metrics.
	Assess progress to goals defined in the logic model.	Review and assess redesigned curriculum, teacher residency program, and acquisition and implementation of technology.
	Assess results of modifications to curriculum, processes, and PD requirements.	Review modifications and assessment results.
	Assess the effectiveness of the partnership to a) engage in grant activities, b) coordinate/integrate grant activities with other professional development and school reform efforts, and c) utilize grant resources and other supports to enhance sustainability	Document review, annual survey of Executive committee and other key stakeholders
Competitive Priority: Improve K-12 Student Achievement in STEM+ Outcomes		
Phase	**Objective**	**Tools and Instruments**
Phase 1: Baseline	Develop baseline data on special education student achievement and computer literacy.	Statistical review of student characteristics.
Phase 2: Year 1-5	Assess student achievement.	Assess curriculum-based STEM+ metrics at the start of the academic year and during the Summer Institute (data collected from prospective and new teachers); assess achievement through quarterly benchmarks and annual statewide exams (data collected through the LEA).
	Assess effectiveness of the Computer Information Science Summer Institute.	Conduct post-Institute evaluation through student and teacher surveys.