

# Secondary Mathematics and Science Teachers Prepared for Inclusion

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*Teachers often find themselves unprepared for inclusion, the practice of providing instruction and supports to students with learning disabilities and related special needs in general education classrooms. Research indicates many pre-service teachers have limited, if any, coursework to equip them with the necessary skills for inclusive classrooms. This study examined preservice and in-service secondary mathematics and science teachers' perceptions of the influence of special education coursework during a graduate level teacher preparation program. Results indicate that special education coursework is both meaningful and useful within three elements related to the influence of the curriculum: personal transformation, pedagogical evolution, and relevancy.*

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## INTRODUCTION

Students with learning disabilities taught in general education classes in high school are more likely to graduate on time and enroll in college than students educated in more-restrictive settings (Schifter, 2011). Special education practices have been shifting from separate learning environments to more inclusive learning environments over the past few decades. Disability does not mean inability, rather it means a difference in how children learn. In school systems, the disability label is given to children not meeting predetermined academic and social benchmarks. Some students need a more specialized approach to learning because the disability affects the process of learning. Research and practice both support the use of differentiated instruction to meet these special education needs of students. Differentiating instruction in the classroom provides an educational approach to allow successful inclusion of students with disabilities in general education classes (Broderick et al., 2015). Regardless of disability, where students learn makes an important difference.

The National Center of Education Statistics (NCES, 2021) reports that in the United States, 7 million students (14%) receive special education services under 14 disability categories. Of the 7 million, 33% receive special education services for specific learning disabilities (SLD). Other disability categories for children with average or above average intellectual ability in the US include communication disorders (CD; 19%), health impairments (OHI; 15%), autism (ASD; 11%), and behavioral disorders (EBD; 5%). The 2021 NCES document reports that 95% of students ages 6–21 with special education needs (SEN) are enrolled in regular schools and spend 80% or more of the school day in general classes with non-disabled peers. Of those 7

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million students, about 72% graduate with a regular high school diploma, 16% drop out, and 10% receive an alternative certificate.

Disabilities are viewed and defined differently worldwide making it more complicated to compare students with disabilities (SWD) precisely. For instance, Sweden addresses SEN for three categories to include learning, medical, and social (Sansour & Bernhard, 2018). They report 8.1% (79,600) of their students receive special education measures (supportive instruction) with the majority of services occurring in their general curriculum classes. In comparison to Sweden, Germany reports 6.6% of their students have SEN. Included in that 6.6% are about 40% are considered to have learning disabilities (LD; Sansour & Bernhard, 2018). More than half of these students are educated in specialized schools (Sturm, 2019). And Turkey reports 12.29% of their students are identified with disabilities in eight disability groups appropriate for inclusive education combined with special education services. Inclusive education may be full time, part time, or reversed (reversed inclusion takes place in special schools; Sakiz & Woods, 2015).

Based on differences in defining and labelling disabilities, in this paper we refer to students with disabilities (SWD) rather than students with LD; understanding that the focus is on learning, social, and behavioral difficulties similar to the academic and behavioral difficulties and deficit areas commonly identified in students with LD.

In urging inclusion across the world, UNESCO (2001) stated that to meet the special education needs of students with disabilities within inclusive classrooms, educators will need to remove the existing barriers within school systems such as poorly trained teachers, badly designed curricula, and inappropriate medium of instruction. These are all skills taught in teacher preparation programs. Unfortunately, even though inclusion is more common in the US, a majority of secondary teachers, both general and special education, reported that their preservice teacher preparation program (TPP) did not adequately prepare them for teaching SWD in specific content areas (Conderman & Johnston-Rodriguez, 2009). As a result, practicing teachers “frequently have limited knowledge and understanding of the details of evidence-based inclusive teaching practices and their application” (Lancaster & Bain, 2019, p. 53). Developing evidence-based content knowledge is a necessary and critical component for successful inclusive practice (Arthur-Kelly et al., 2013). The very training teachers receive in content, particularly science and mathematics, will be a huge asset for SWD. Therefore, in response to the concerns regarding the lack of adequate preparation to work effectively with this diverse population, some universities are exploring various methods to better prepare teachers (Fullerton et al., 2011a). As Burke and Sutherland (2004) found, “universities must continue to develop preservice programs that provide prospective teachers a meaningful understanding of the elements of instruction in an inclusive environment” (p. 171). Special education advocates argue for meeting the needs of all students and encourage TPPs to restructure programs so all teachers learn to teach all children (Anderson et al., 2015; Florian et al., 2010). As Bunch (2015) points out, learning to differentiate instruction for SWD may effectively guide and support teachers in meeting the needs of all students in diverse classrooms. However, for teachers to implement this type of practice, they need to develop knowledge in content, curriculum, and pedagogy, as well as understand

how their experiences influence their own learning within these areas (Morewood & Condo, 2012). Thus, equipping all preservice teachers with relevant content and pedagogical skills may greatly increase their ability to effectively meet the needs of all their students.

In a study of teacher preparation program (TPP) participants, Tangen and Buetel (2017) found that when graduate preservice teachers were encouraged to consider themselves inclusive teachers, their “pre-determined notions of teaching changed” (p. 69). In similar studies investigating attitudes about SWD, researchers (Shippen et al., 2005; Taylor & Ringlaben, 2012) reported that one college course led to an increase in acceptability of inclusive classrooms. These findings underscore the critical need for carefully thought out and effective courses that focus on preparing educators to teach SWD. Effective teacher preparation may be instrumental in changing the mindset of our future teachers in accepting SWD, their abilities and their needs.

Currently, traditional TPPs require, at most, one special education course for secondary teachers (Allday et al., 2013; Harvey et al., 2010). However, some TPPs are requiring multiple special education courses for preservice secondary teachers (Deluca, 2012; Dykes et al., 2012). Teachers at the secondary level, find they need skills to complement content knowledge including assessing student needs, grouping students, adapting content, adjusting the pace of instruction, teaching collaboratively, and integrating the Individualized Education Program (IEP) goals into the curriculum (Conderman & Johnston-Rodriguez, 2009). Teacher preparation presents the ideal opportunity to learn the skills for inclusive instruction in content courses (Deluca, 2012; Powell, 2015). An integrated program that provides both general and special education pedagogy to preservice teachers is one way to refine existing TPP practices (Fullerton et al., 2011a; Kim, 2011). Providing aspiring teachers with adequate pedagogical tools to teach SWD may influence their attitudes and sense of competence in meeting individual needs of students within general education classrooms.

Research indicates that teacher attitudes toward inclusion and confidence to teach students with varying disabilities differs across the globe, depending on various factors (De Boer et al., 2011; Monico et al., 2018). For example, Brownell & Pajares (1999) found that teachers need positive attitudes toward SWD and inclusion, accompanied by effective instructional strategies and content knowledge. Although some evidence exists that both general education teachers and special education teachers, across grade levels, respond positively toward inclusion (Kahn & Lewis, 2014), this attitude is not consistent among all teachers. For example, Jordan et al. (2010) found that 25% of teacher participants in their study believed disabilities are internal, fixed, pathological conditions of the individuals that instruction would not help. Results indicated that teachers tended to ‘blame the learner’ for underachievement brought on by their learning difficulties, and therefore spent little effort teaching these students. In addition, teachers also preferred segregated class settings for students with learning disabilities. Conversely, 20% of the study participants believed student disabilities were created, in part, by societal barriers, and they saw it as an aspect of their job to create lessons that allowed access through accommodations and reducing barriers to increase learning. As a result, these teachers spent more time and effort providing intensive instruction for all students with learning difficulties. The remaining 55%

of the participants fell somewhere in the middle of these two perspectives. Furthermore, Kim (2011) found that when TPPs combined the general and special education curriculum, preservice teachers demonstrated significantly more positive attitudes toward inclusion than preservice teachers from programs with separate curriculums.

In addition to limited training, educators with deficit beliefs concerning student abilities have the potential to be harmful to student success because deficit beliefs lead to lower expectations (Kahn & Lewis, 2014), which results in lower rates of learning. Children and youth with disabilities are among the most marginalized, excluded people in the world,” (GEM, 2020). One example of the negative influences of low expectations was reported by Shifrer and Callahan (2010) who found that SWD take fewer STEM-related courses to graduate from high school than their non-disabled peers. The threat to student success from low teacher expectations is particularly disconcerting as “the vast majority of special education students (80% - 85%) can meet the same achievement standards as other students when given specially designed instruction, access, supports, and accommodations, as required by IDEA” (Thurlow et al., 2011, p. 5). A critical benefit of inclusion is to ensure the right of SWD to learn from content-area experts, which theoretically should increase their success in content-rich subject areas. However, if negative attitudes regarding SWD are unchanging, these students who make up 14% of the school population, will continue to have limited access to the general education curriculum. Unfortunately, as classes continue to be more inclusive, teachers continue to report lacking the necessary skills to teach SWD in their classrooms (Srivastava et al., 2017).

In response to a lack of this preparedness, this study was designed to examine secondary mathematics and science teachers’ perceptions regarding the practicality of special education coursework during their preservice teacher preparation residency program. In this study, disability instruction was extended beyond LD to include other learning difficulties including behavior, autism, communication, and health impairments. Although labelled differently, many of the learning characteristics are similar to LD, with students struggling academically, socially, and behaviorally in and out of the learning environment.

The purpose of this study was to examine secondary mathematics and science teachers’ perceptions regarding the usefulness of the special education coursework as completed as part of their teacher preparation residency program (TPRP). The following questions guided this study: (a) What are secondary mathematics and science teachers’ perceptions regarding the usefulness of their special education coursework as preservice teachers? (b) What are secondary mathematics and science teachers’ perceptions regarding the usefulness of their special education coursework as in-service teachers?

## METHODS

We used a mixed-methods explanatory approach to collect and analyze data to examine secondary mathematics and science teachers’ perceptions of the usefulness of their special education coursework in a TPRP. This research method is appropriate when “the goal or purpose of the research is to obtain an understanding of both product and process, or outcomes and explanations of the outcomes” (McMillan, 2012, p. 317). Since we were interested in the participants’ perspectives of their

coursework first as pre-service teachers, then as in-service teachers, this design was most appropriate for our research study because it allowed for an explanation of the quantitative data. Collecting quantitative data also helped to inform our focus groups questions to further explore participants' thinking about working with students with disabilities and teaching experiences.

### ***Participants and Context***

The participants were members of four different cohorts who completed a year-long, teacher preparation residency program in mathematics or science with a concentration in special education at one public university in the southwestern United States. The goals of the program included recruiting academically talented and diverse post-baccalaureate candidates committed to teaching mathematics or science in high-need secondary schools; preparing teachers for high-need schools by providing a rigorous and high-quality curriculum; and retaining teachers in high-need schools to positively impact the education of students with and without disabilities in mathematics or science. Of the 45 participants, 36 (80%), 29 (64%) were female and 16 (36%) were male. The participants included 4 (9%) African American, 1 (3%) African, 2 (4%) Asian, 11 (25%) Hispanic, and 27 (60%) White. Fifteen (33%) were seeking certification in mathematics, 25 (55%) in science, and 5 (11%) in both special education *and* mathematics or science. Their prior work experiences included varied positions such as retail associate, construction worker, engineer, software consultant, substitute teacher, college graduates in various fields of mathematics and science, as well as businessowners, a scientist, a technology consultant, a US army veteran, an elementary level paraprofessional, substitute teachers, and day care provider. Of the 45 original preservice cohort members, 39 completed the teaching residency program and became classroom teachers: 11 from cohort one, 8 from cohort two, 12 from cohort three, and 8 from cohort four.

The participants were enrolled as full-time students throughout the residency experience and attended classes at the university on Mondays during the fall and spring semesters. The curriculum included the following four special education courses: (a) Survey of Exceptionality, (b) Educating Students with Mild Disabilities, (c) Assessment and Evaluation of Students with Disabilities, and (d) Positive Behavioral Interventions and Support (PBIS) in Schools. For three of the four cohorts, three of the four selected courses were taught by the same professor to all participants. The first cohort of the residency program had a different professor for each of the courses however, the same curriculum was taught to all cohorts. The PBIS course was taught by the same professor to all four cohorts. See the Appendix for detailed information regarding these courses and the content taught.

The participants were placed in a participating school through selection of content, grade level, and the school context. They reported to their respective school campus the other 4 days of the week and worked with an experienced classroom teacher who received an annual stipend for supporting them as a mentor. The participants worked in the mentor's classroom gaining firsthand knowledge of a teacher's role and responsibilities from the first to the last day of school. While most of the participants were hired at the same campus at the end of the program, some found jobs at another high need school.

### ***Data Sources***

Data for this study were gathered over a six-year period while participants were preservice teachers and again later when they were in-service teachers. The data were triangulated (Marshall & Rossman, 2006) using end-of-course questionnaires, online survey, and both preservice and in-service focus groups. The questions were informed by the extant literature on educating students with special education needs and for preparing teachers for the inclusion of students with disabilities. All participants, both preservice and in-service teachers, that contributed to this study were members of one of the four cohorts in the same TPRP.

### ***Data Sources and Procedures***

Data gathering began with end-of-course questionnaires distributed to the preservice teachers each semester over the four years for each cohort. After each semester concluded, the preservice teachers were contacted via email to complete a survey for each course completed. Participants responded to these two prompts, (a) I found the course content to be meaningful, and (b) taking this course will help me become a more effective teacher; using a 5-point Likert scale, from “Strongly Agree” to “Strongly Disagree”. The questionnaire also included the following open-ended questions: (a) What did you like most about this class and the instructor? (b) In what ways has this course informed your practice in the residency? and (c) In what ways has this course enhanced your growth in the residency? Requiring participants to respond to the same set of questions for each course provided an opportunity to compare their responses and to offer insight into their perspectives about learning and teaching students with disabilities.

The second data source consisted of focus groups conducted with each cohort of preservice teachers at the university on the last day of class, in the very last semester of the program. Each of the focus groups were conducted by the same researcher who was also their professor who taught the special education courses. Because the focus groups were conducted during the last class, they were attended by all participants in Cohort 2, 3, and 4 completing the program ( $n = 28$ ). Between Cohort 1 and Cohort 2 there was a change of both faculty and staff of this program. There was no focus group with Cohort 1. All participants entered the program as members of a cohort, completing all courses together, thus sharing similar experiences, spending much time together and developing a close bond with one another. Therefore, focus groups were used to engage cohorts before graduation, to elicit rich discussion while offering multiple perspectives at once rather than have one-on-one interviews (Glesne, 2011; Marshall & Rossman, 2006). Discussion prompts included: (a) How prepared are you to adapt classroom planning and instruction to meet the educational needs of students who struggle academically and/or behaviorally? (b) What aspects of the [TPRP] coursework do you perceive as valuable in your preparation as future teachers? (c) How confident are you in your ability to collect, analyze, and utilize a variety of student achievement data, to monitor the effectiveness of your instruction, and refine the curriculum as needed for your students? and (d) Discuss your comfort level for applying PBIS strategies in your classroom?

The next data source consisted of an online survey, using Survey Monkey, administered after the fourth, and final cohort had been teaching for one year. This

means, the graduates of the first three cohorts had been teaching for two, three, or four years. The purpose of this online survey was to re-examine the participants' perceptions as teachers regarding the influence of the special education coursework in helping them teach SWD in their secondary mathematics or science classes. Participants were asked to (a) rate the usefulness of each special education course taken as it related to their current teaching positions using a 5-point Likert scale that ranged from "Not at All Useful" to "Extremely Useful," and (b) to rate their own proficiency in teaching SWD using a 5-point Likert scale that ranged from "Not at All Proficient" to "Extremely Proficient".

The fourth data source was a focus group with the in-service teachers who had graduated from this TPRP program. This final focus group was conducted six months after the online survey. Therefore, each in-service teacher participant had taught a minimum of 1.5 years. This focus group was conducted at the home of one of the researchers who was also the director of the TPRP. Twenty-five program graduates who lived within the local geographic area were invited via email to participate; of the 25 invited, seven (28%) participated. Of the seven, two were from Cohort 1 and Cohort 3 and three were from Cohort 4. Four participants were female and three were male, while two were math teachers and five were science teachers.

Participant questions for this focus group were informed by the responses to the online in-service survey (third data source) to allow for a deeper discussion of the teachers' understanding of the usefulness of their special education coursework (Marshall & Rossman, 2006) and their proficiency in teaching SWD. During the focus group, teachers responded to the following prompts: (a) How comfortable and/or proficient are you in your ability to meet the needs of SWD that you teach or have taught?; (b) Respondents to the survey reported the special education coursework was useful and that all secondary teachers would benefit from taking more special education courses during their TPRPs, talk about why; and (c) When faced with a difficult academic and/or behavioral challenge how confident are you in finding a successful solution for your student? Give examples.

### ***Quantitative Data Analysis***

Preservice end-of-course questionnaires were sent to 40 of the original 45 participants. Five students across the cohorts had left the TPRP before completing the special education courses. Different courses had different response rates, with a return rate ranging from 42.5% ( $n = 17$ ) to 90.3% ( $n = 56$ ). It is important to note that during Cohorts 3 & 4 the PBIS in Schools course was spread out over two semesters, so 22 of the 40 ( $n = 62$ ) were sent the questionnaire twice. It is evident that some of the students responded twice to the questionnaire, thus distorting the number of responses. The data for the preservice end-of-course questionnaires are descriptively summarized in Table 1.

A link to the online survey for in-service teachers was sent to the 36 of the 39 program completers. Three of the graduates were currently teaching when this survey was conducted. The questions were directly related to the classroom, therefore only active teachers were invited to complete the survey. Of the 36 sent, 26 responded resulting in a 72.2% return rate. Data for the online in-service teacher surveys are descriptively summarized in Table 2.

**Quantitative Data Results**

A large majority of the participants who completed the end-of-course questionnaires (85.6%) either agreed or strongly agreed with the statement that the content of their four special education graduate courses was meaningful. Also, as preservice teachers, an average of 79.8% of the participants either agreed or strongly agreed that each special education course would help them become effective teachers. These results showed that preservice teachers perceived that all the special education courses provided valuable skills and knowledge to support their teaching.

**Table 1. Comparison of Preservice Teachers' Coursework Ratings (Total Contacted = 40)**

Questions	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Participants (n)
<b>Survey of Exceptionality (response rate 57.5%)</b>						
Content Meaningful	4% (1)	9% (2)	4% (1)	17% (4)	65% (15)	23
Help Become Effective Teacher	4% (1)	0% (0)	22% (5)	9% (2)	65% (15)	23
<b>Educating Students with Mild Disabilities (response rate 42.5%)</b>						
Content Meaningful	0% (0)	6% (1)	0% (0)	24% (4)	71% (12)	17
Help Become Effective Teacher	6% (1)	0% (0)	0% (0)	12% (2)	82% (14)	17
<b>Assessment and Evaluation of Students with Disabilities (response rate 82.5%)</b>						
Content Meaningful	9% (3)	6% (2)	3% (1)	30% (10)	52% (17)	33
Help Become Effective Teacher	6% (2)	6% (2)	12% (4)	18% (6)	58% (19)	33
<b>Positive Behavior Interventions and Supports (PBIS) in Schools (n = 62; response rate 90.3%)</b>						
Content Meaningful	5% (3)	5% (3)	5% (3)	39% (22)	45% (25)	56
Help Become Effective Teacher	5% (3)	4% (2)	16% (9)	21% (12)	54% (30)	56

The majority of in-service teachers strongly agreed on the usefulness of the four courses. Specifically, the usefulness of the four courses ranged from 88% to 96% of being very useful to extremely useful (see Table 2). In addition, the teachers rated their proficiency in teaching students with disabilities. Of the 26 respondents, 88% rated themselves as Proficient to Extremely Proficient in teaching students with disabilities. These results suggest a majority of participants, as in-service teachers, perceived themselves as possessing the knowledge and skill to work effectively with students with disabilities. Our results support those of Fullerton et al. (2011b), that enhancing the curriculum with extensive special education coursework for secondary mathematics and science teachers showed a positive outcome for the participants, contributing to their teacher confidence.

**Table 2. Comparison of In-Service Teachers' Coursework Ratings (total contacted = 36; response rate = 72.2%)**

Course Names	Not Useful	(No Label)	Useful	(No Label)	Extremely Useful	Participants (n)
Survey of Exceptionality	4% (1)	8% (2)	38% (10)	23% (6)	27% (7)	26
Educating Students with Mild Disabilities	0% (0)	4% (1)	31% (8)	35% (9)	31% (8)	26
Assessment and Evaluation of Students with Disabilities	8% (2)	4% (1)	46% (12)	19% (5)	23% (6)	26
PBIS in Schools	0% (0)	8% (2)	27% (7)	31% (8)	35% (9)	26

### ***Qualitative Data Analysis***

Qualitative data sources were analyzed independently using qualitative data reduction strategies to manage, categorize, and interpret data to identify themes (Marshall & Rossman, 2006). First, all the recorded focus group interviews were transcribed. Participants were unidentified in the transcriptions. Before beginning the coding process, the transcriptions were reviewed by a graduate assistant to validate information on the recordings (Poland, 1995). Then, we independently read the transcriptions, and phrases or words related to the usefulness of their course work and perspectives on teaching students with disabilities were highlighted as a way to “search through the data for regularities and patterns as well as for words or phrases related to the topic” (Bogdan & Biklen, 1992, p. 166). When this coding was complete, the data were grouped into categories; then, through constant comparative analysis (Strauss & Corbin, 1998), we sorted and further organized the categories using descriptive statements taken from the focus group transcriptions. Rubin and Rubin (1995) stress the importance of identifying themes in verbal communication because behavioral descriptions can be very revealing.

Next, using the same aforementioned process, we coded the open-ended questions from the end-of-course questionnaires and online in-service survey to examine regularities and patterns in the themes (Feagin et al., 1991). Using constant comparative analysis and axial coding (Charmaz, 2006), the separate categories were sorted and placed into subcategories. “Axial coding relates categories to subcategories, specifies the properties and dimensions of a category, and reassembles the data to give coherence to the emerging analysis” (p. 60).

After we sifted through the responses to gain familiarity with the richness of the data and made notes as initial categories emerged. We then met to discuss the initial categories, sorted the responses, and placed them into nine preliminary themes. After subsequent discussions, we returned independently to the research questions to refine our preliminary themes (Huberman & Miles, 2002). After a deeper analysis of the data (Huberman & Miles, 2002), we met collectively, discussed our themes, refined them a final time, and agreed on the following three themes with descriptive statements: (a) Personal Transformation, (b) Pedagogical Evolution, and (c) Relevancy.

### **QUALITATIVE FINDINGS AND DISCUSSION**

Sorting through participant responses, we found both preservice and in-service teachers reported that the special education coursework changed their concept of the ability of students with special education needs. They also discuss that differentiating both instruction and assessment lead to student success. Similar to the suggestion by Bunch (2015), participants observed that differentiating instruction for students with disabilities was effective in meeting the needs of all students in their classes. The data supports Kim’s (2011) findings that by combining content and special education coursework, teachers tend to be more positive about inclusion. Our participants conveyed an awareness that high expectations for all students resulted in higher achievement for all students (Thurlow et al., 2011). Thus, as we examined preservice and in-service teachers’ perceptions regarding the usefulness of the special education coursework, we uncovered the following themes: (a) Personal

Transformation, (b) Pedagogical Evolution, and (c) Relevancy. The discussion that follows elaborates on each of these three themes to present findings from preservice and in-service teachers. The discussion in each theme begins with our explanation of the theme, then moves to a focus on preservice teachers' perspectives and ends with the in-service teachers' points of view.

### ***Personal Transformation***

Personal transformation refers to the changing of a mindset, lens or set of beliefs held by program participants at the beginning of the program that was influenced as a result of experiences, knowledge and skills obtained in the special education taken en route to their secondary teaching certifications.

### **Preservice Teachers**

It is the job of the university in preparing future educators to alert them to the diversity in schools, ensuring the ability to look beyond personal experiences to understand the many differences found among children in any given classroom. Several program participants echoed similar sentiments when discussing the perceived influence of the special education curriculum on their preparation for teaching. For example, one participant stated:

Designing a curricular pathway that required preservice teachers to take into account the multitudinous needs and learning differences of all students allowed them to examine, not only their approaches to teaching SWD, but also to examine their approach to teaching and education in general.

A number of participants reported entering the program with what Hart et al. (2004) described as views of learning that are predetermined and based on an erroneously developed sense of student ability. These prior beliefs are repeatedly informed by the teachers' assumptions of students' fixed innate levels of intelligence and aptitude. As one participant expressed, "this class helped me view these students as being just as capable as other students." Thus, participants' understanding of how to meet the educational needs of SWD was extended beyond their initial cognitive understanding.

Designing a preservice experience with opportunities to learn about SWD encouraged our participants to view the educational environment differently. As stated by one participant,

It really helped me see through a different perspective, or another lens so-to-speak. I feel like if I had just jumped straight into teaching, I would never have seen how things should have been, and only saw how things are...It also provided me with a way of thinking that even if I didn't have the tools I needed to teach a student, I have the ability to figure out how to make things work. It's kind of like that parable of either teaching a man to fish or giving him a fish.

More than simply offering the opportunity for exposure, the experiences of taking special education courses forced the preservice teachers to examine their thinking and their work through a different context, and to also change their "beliefs and attitudes" leading "to more effective teaching practices with all students" (Jordan et al., 2009, p. 541).

Ultimately, developing and adopting these new perceptions of students and student ability led to behavioral adjustments on the part of the participants. In particular, participants commented on their transformed thinking that occurred when they found themselves changing long-held commonly used nomenclature, in light of their new perspectives,

Even some of the language has changed... they're students with disabilities, they're students first...you know. The disabilities are just part of them, but they're not less than or less capable than... and I think even just using that kind of language gives you a different view... I think that part of it really helps to see them in a positive light.

This comment further supports the findings that these preservice teachers perceived the special education coursework as a positive influence in developing greater levels of understanding and compassion for the needs of all students as a promising precursor for successful teaching.

### **In-service Teachers**

While Srivastava et al. (2017) reported that secondary teachers lacked the preparation to teach SWD, participants noted how they viewed working with SWD once they become teachers, similar to the results of increased levels of teaching efficacy reported by Sharma and Sokal (2015). As one participant noted:

Something that I realized after working with other teachers was... the idea... I have a more positive view of students with disabilities versus other teachers who maybe didn't get the training. I guess that it's really frustrating to have to see that.

For the majority of our participants, completing the special education coursework influenced how they viewed SWD and offered them an insight into working with and teaching these particular students. This coincides with the findings of Sharma and Sokal (2015), who concluded that participants are more likely to be positively inclined to include students with special education needs based on whether or not they participated "in a course that prepares them to include everyone regardless of the label a student may have" (p. 282). Furthermore, our data support the usefulness of integrating multiple special education courses into the teacher preparation pathways for all educators, regardless of teaching certification, to help alleviate problems of ineffective inclusive practice (Nocella, 2008).

The benefits of special education coursework integrated into the teacher preparation curriculum helped participants to realize the positive effect it had on them personally. As one participant stated,

The special education coursework really expanded my view of the educational system as a whole, in a way that many of my co-workers have not experienced. It helped me understand the legal and pedagogical requirements that many students need to be successful. It also provided alternative ways of framing a students' success, failure, strengths, and weaknesses. I felt this was the most valuable aspect of my special education coursework.

This kind of thinking becomes an asset to students and colleagues. Understanding one's thoughts about teaching students with special education needs becomes increasingly significant as educational systems consistently move towards more inclusive educational environments. While some preservice teachers may not have a positive outlook in working with students with disabilities (Kahn & Lewis, 2014), it is vital to prepare aspiring teachers adequately.

Changing long accepted teaching and language practices is indicative of a more comprehensive, fundamental shift in participants' beliefs. Whereas, prior to completing special education courses, some of the participants may never have questioned their own predispositions toward student abilities. Through these courses, participants were not simply learning about students with disabilities and students with learning challenges, but more importantly, they were forced to reflect on their own inherent predispositions and engage in a transformation that was, as one participant explained, "practically a paradigm shift for my perspective". Our findings support similar research (Florian et al., 2010; Jordan et al., 2009; Sharma & Sokal, 2015; Metsala & Harkins, 2020) highlighting the importance of special education coursework within teacher preparation programs with the purpose of shifting future teachers' attitudes about students with disabilities and the value of inclusive classrooms.

### ***Pedagogical Evolution***

Pedagogical evolution refers to the development and growth of praxis that evolved as the participants engaged in the coursework and practice of teaching, including content instruction, intervention strategies, assessment tools for instructional purposes, and proactive classroom management. Bartolome (2004) found when provided with critical pedagogy, teachers develop a deeper understanding of their role to instruct, protect, and advocate for their students with disabilities.

### **Preservice Teachers**

In addition to preparing future teachers for an attitude of acceptance and inclusive classes, learning about students with disabilities and effective teaching methods that work for all students is important (Srivastava et al., 2017). As one participant acknowledged:

The special education classes were the ones that really provided us a lot of the strategies to deal with all kinds of situations in the classroom which I thought were very valuable. I have seen firsthand the effects of different teaching practices on students with special education needs. It was amazing how much of a difference this makes.

Early on, participants realized the need to be proactive in building accepting and positive classroom environments, incorporating a variety of evidence-based instructional approaches, and differentiating based on student need (Anderson et al., 2015; CEC, 2004; Powell, 2015). More importantly, genuine comprehension emerged in the realization that a student's disability creates barriers to learning, but the disability is not the same as an inability to learn (Nocella, 2008). This understanding allowed preservice teachers to understand that students who struggle academically and socially within the construct of a typical classroom, can learn successfully with

an inclusive approach (Anderson et al., 2015; Duchaine & Fain, 2018; Powell, 2015), rather than succumbing to the unconscious bias of lower expectations for students based on school-assigned labels and the desire to segregate SWD (Shifrer & Callahan, 2010). Another participant stated:

I think the big take for me that we've gotten in a lot of these classes time and again is that the goal is to...have a classroom environment where you're able to manage things in such a way that you keep students in the class...with positive behavior supports.

Participants understood the common disability characteristics would help determine which strategies to use in their instructional approaches, and they realized the strategies learned would be effective for all students in the class, with or without disabilities (Anderson et al., 2015). One participant explained:

I think...we've been taught that's part of your job to go in and change what you are doing if it's not working. You need to adapt what you are doing, and if you don't, then...that's a problem. I don't think other teachers see it that way.

This comment conveys understanding of the need to use varied assessments to guide their teaching. One participant stated, "It has really helped me to actually understand the importance of good test questions and how to write effective assessments." While another spoke of developing progress monitoring tools. "Creating online assessments and CBMs were both practical assignments that will be helpful in the classroom," conveying understanding that assessment is a critical tool when teaching (Allsop & Keri, 2015; Conderman & Johnston-Rodriguez, 2009; Darling-Hammond & Bransford, 2005). These participants gained the perspective that effective assessment precedes differentiating instruction to meet the students' educational needs, which is the responsibility of each teacher (CEC, 2004).

As a result of their experience, preservice teachers suggested it would be beneficial to require special education courses in all TPPs for all future teachers by "adding more opportunities for hands-on activities to really experience the variety of disabilities that students face every day." And another added that "more content-related strategy coursework would have been beneficial," in concert with findings from Powell (2015) that suggested teachers may be better prepared to meet the needs of all students in secondary content areas if universities merged content areas (i.e., math) with special education pedagogy, rather than adding special education courses to the degree audit (Powell, 2015) and teaching them separately (Fullerton et al., 2011a.; 2011b). The statements above reinforce how essential it is to spend time practicing with actual SWD in the content areas especially since coursework alone is not enough to ensure understanding (Powell, 2015).

### **In-service Teachers**

Similar to Anderson et al. (2015), we found that competency from the special education pedagogy continued for participants as teachers, with participants summing it up: "I had been trained more than I realized;" and "When I was hired I never felt like a first-year teacher. I was more knowledgeable than some experienced teachers in topics such as IEP meetings, IEPs, PBIS strategies, accommodations, and use of technology, etc." These comments reflect how entering the classroom prepared

to meet the educational needs of students with a wide variety of abilities and learning differences, as well as approaching the IEP process with the belief that all students are capable of learning, helped to foster a sense of confidence. This confidence was not limited only to implementing the skills learned, but to extending them to students without disabilities as a participant noted:

The special education coursework allows me to use best-practice strategies when I teach, that work for all. It allows me to individualize the curriculum towards each STUDENT. Keeps me aware of the diversity of students.”

Applying knowledge gained through the special education coursework to their classroom practice, highlights the assertions made by Darling-Hammond and Bransford (2005) that it is best when teachers make instructional decisions based on a multitude of factors. Another participant expressed:

Many of the techniques and strategies I learned have helped me in differentiating for my [students who are] English Language Learners. Learning the basics of differentiation helped me to teach a classroom of students with a large range of varying skill levels.

In addition, during the focus group, participants shared personal stories demonstrating outcomes of ‘ability thinking’ acquired from the special education pedagogy (Bartolome, 2004; Nocella, 2008), indicating that lessons learned during preservice preparation, extended into their in-service experience. The following statement represents teaching with an attitude of possibility, gained from special education pedagogy that focuses on ability and rejects deficit thinking:

I’ve learned so much from the program that I’m prepared, and I already have that mental expectation of like, okay we’re going to do that. Whereas other teachers may feel overwhelmed and don’t know and that’s when they kind of tend to go towards the negative feelings about, of like okay how am I going to do this?

One participant shared how peers complained in team meetings, blaming students when not successful, rather than taking responsibility for their students’ learning, saying things like, “my kids just can’t do what we planned...my students can’t do this, my kids can’t do this.” This teacher participant disregarded her colleagues’ attitude emphasizing, “I came to the conclusion to ...keep my expectations high and the students definitely have met them!” These comments reflect the power of a deep understanding of what it means to teach students with special education needs, expecting them reach their potential, in spite of colleagues’ adverse thinking.

The participants acknowledged and voiced appreciation for the special education pedagogy in the coursework, and reported they gained a wide variety of skills to complement their content knowledge such as assessing student need, adapting content, adjusting instruction, managing classroom disruptions, and understanding the IEP (CEC, 2004; Conderman & Johnston-Rodriguez, 2009). One participant summed it up by explaining:

I think I recognize when we have team meetings and we all discuss student behavior, or ...we have a lot of parent meetings in the school um, and they go around and I always go to parent meetings, but I rarely have any problems. I go so they can see my face;

the parents can see me. I know the teachers get frustrated with me because they're saying this is happening and this is happening, but I'm not seeing that in my classroom...so they'll come in and they've had new teachers come in and watch me.

The comment conveys this teacher's confidence in the classroom and the increased advocacy for working with students with disabilities by modeling for less confident colleagues.

However, one participant expressed concern stating they find it difficult "dealing with student challenges, differentiating instruction, finding enough time to individualize, and advocating for students during an IEP meeting." While this comment could signal a lack of confidence in managing a very stressful and demanding job, it also indicates that not all preservice teachers benefit as well as others from instruction in their college coursework and perhaps more training is necessary in time management as well as teaching strategies.

### ***Relevancy***

Relevancy refers to participants' perceptions regarding how the information learned from the special education coursework can be applied in an authentic setting. When students perceive coursework as relevant to their future teaching responsibilities, the learning tasks have utility value by connecting the present tasks to future tasks (Simons et al., 2004, p. 127).

### **Preservice Teachers**

Showing teacher candidates how to implement effective practices before working with students is an important aspect central to preservice teachers' understanding and grasp of new learning. When students fail to understand this connection, their tendency is to dismiss theory and express a lack of value for course content (Garza & Werner, 2014). Preservice teachers expressed the impact and useful aspect of the curriculum as reflected in the following comment:

All the Special Education classes were the ones that really provided us a lot of the strategies uh, to deal with um, all kinds of situations in the classroom which I thought were very valuable. Um, but if it hadn't been for the actual being in the classroom and the residency portion of the program it may not have been as impactful as it was. So I think it prepared us pretty well to deal with working in high-needs schools.

This comment supports the need to design assignments that provide preservice teachers practice opportunities combining the theory and necessary knowledge and skills to be successful in an inclusion classroom. Participants also expressed an appreciation for the strategies that were obtained throughout their coursework, similar to findings reported by Cunningham and Sherman (2008). As one participant acknowledged, "This course has helped inform my practice in the variety of available effective strategies to deal with students with a variety of disabilities." The knowledge gained from the special education course work was ample enough to meet the needs of students with varying abilities. This participant recognized the practical application of the course learning as it directly related to the classroom. Another stated, "[Professor]

was very helpful in teaching us about the real-world applications and how best to help students in special education. The case study was especially helpful in learning about IEPs and how to read them.” These comments reflect an understanding of how to use their acquired knowledge and reflect a level of confidence in meeting the needs and affecting change in the lives of students with disabilities. These perspectives indicate that preservice teachers recognized how their coursework has direct relevance to the classroom (Cunningham & Sherman, 2008).

While a majority of the participants expressed how learning practical strategies prepared them for the real world and commented on the beneficial aspects of the special education curriculum, a few did not make the connection between the course content and teacher actions based on student need. One perceived it as irrelevant to their future careers as an aspiring teacher stating, “There was too much busy work and not enough actual meaningful work. Reading and understanding an IEP was very beneficial but was only a brief part of the case study, which was a complete waste of time.” Another stated, “I would like to have seen more of how this knowledge will help me as a general educator.” While the sentiments in these comments could be attributed to a specific incidence, they may convey a personal lack of task understanding, revealing that not all preservice teachers reach an understanding of the connection between theory and practice. In addition, perhaps there was a disconnect between these two students and the instructors when conveying the relevance of course learning to a real-life classroom. Thus, a lack of understanding may lead to less effective results in the classroom when working with SWD. While research (Tillman et al., 2011) reports that teachers lack or receive limited preparation to teach SWD, our findings indicate that most participants in this TPRP found the special education curriculum useful and practical to their teaching context during their preparation.

### **In-service Teachers**

Knowing how to apply their learning can only contribute to their confidence and ability level when working with SWD (Rakap et al., 2017). As Cunningham and Sherman (2008) suggested, coursework helps to support and to guide the application of pedagogical knowledge and skills, this teacher participant confirmed by reporting, “I was prepared to make positive contributions in IEP meetings. It trained me to always ask myself which accommodations would be best for any given lesson.” This comment highlights the importance of aligning course curriculum with authentic experiences to give it relevance rather than just focusing on theoretical knowledge. By providing instructional opportunities with high utility value, in-service teachers are able to effectively link past coursework with current teaching practices. This was expressed with the following comment:

Being taught what the IEP process involved, the importance of it and so that first year when I did have to go to my first [IEP meeting] and knowing exactly what it was, knowing the importance of it. So being prepared going in versus talking to a brand new teacher this year coming to me, not, knowing exactly what you know, they know of it, they know sort of what is going to happen but they didn't really know.

This comment conveys the teacher's application of course learning as a professional while participating more confidently in the IEP meetings. In addition, this type of instruction promoted most of the participants' understanding and confidence of how to adapt instruction to best match a student's education program. Providing an overall understanding of disabilities and the responsibilities of a teacher are needed, however, it is equally important that the practical side of the learning accompany the instruction to make it meaningful and relevant.

Participants expressed an appreciation for the strategies that were obtained throughout their coursework and how it benefited all classes they taught. As one teacher acknowledged,

I think it's important for teachers to be aware of the different disabilities there are and, uh, especially in the special education course that I took, uh, it provided different resources that we can use to help our students. Um, so I think it's beneficial because a lot of Gen Ed teachers without special training are overwhelmed because they don't know, okay, how can I help this student without having the resources available to them?

This comment reflects how some participants were able to depend on their course learning to help them best meet the differing needs of their students. Being prepared to help students with disabilities succeed in the classroom was contingent on their knowledge and skills obtained through the special education course work. Providing appropriate instruction was relevant to the participants' context and their comments convey a critical aspect of being prepared for teaching SWD in a high need school. This positive impression of their pedagogical preparation is similar to findings by Hadadian and Chiang (2007). While Tillman et al. (2011) reported that preservice teachers were inadequately prepared in certain curriculum aspects, such as instructional practices, our findings reflect when special education pedagogy is included in teacher preparation, participants developed a deeper understanding of how to meet the educational needs of students with and without disabilities. In concert with Hadadian and Chiang's (2007) research, participants benefited from the curriculum, as evidenced by their ability to assist and to collaborate effectively with colleagues during the IEP meetings to address the needs of the student with a sense of accomplishment. Participants' comments underscore the importance of providing future teachers with the knowledge and skills that will impact their success in the classroom.

### ***Limitations***

While our results add to research highlighting preservice and in-service teachers' perceptions about the value of special education coursework, caution should be taken when generalizing the conclusions from this study. First, this research is based on one innovative graduate program, at one university, with a relatively small number of participants, majoring in secondary mathematics or science with an emphasis on special education. Second, while receiving a limited response rate, participants in this study self-reported their learning through an open-ended survey or focus groups; therefore, some responses may not have been as thoughtful or complete in nature. Third, participants responses during the focus groups could have been carefully constructed since the grant program's director conducted them.

Finally, there may be an unintentional bias in analyzing the qualitative data resulting from the researchers' close involvement with the program management and course instruction.

### **Conclusion**

Although the alignment of coursework with authentic experiences may be a challenge for some faculty as reported by Garza and Werner (2014), preparing aspiring teachers to meet the needs of students who are academically, culturally, linguistically, and socially diverse is a critical responsibility for teacher educators. Preservice teachers "need time and practical experiences to develop their ideas about inclusion and who they want to become as inclusive educators," (Tangen & Buetel, 2017, p. 70). Deliberate attention to providing preservice teachers with a special education curriculum that is meaningful, useful, and relevant (Brownell & Pajares, 1999) has potential to reduce negative beliefs about inclusion and improve beliefs about ability, particularly at the secondary level (Metsala & Hawkins, 2020). Our findings add to the extant research on teacher preparation by illuminating the benefits of special education coursework during teacher preparation programs. Our examination of four cohorts of secondary mathematics and science teachers' views of their special education coursework during their TPRP provides insight regarding beliefs and perceptions toward teaching students with disabilities, pedagogical growth and development, and relevancy of instruction obtained during teacher preparation. First, our findings indicate these secondary level participants, as both preservice and in-service teachers, believe special education courses are relevant and meaningful, and have provided valuable skills and knowledge that influence their overall teaching and perspectives toward teaching students with disabilities.

Second, the coursework helped to influence most participants perspectives about how to teach students with disabilities and their expectations of students' abilities. Through multiple special education courses focusing on effective instruction and intervention strategies, assessment, and proactive classroom management, participants applied their pedagogical skills and knowledge to improve instruction for all students with particular attention to meeting their diverse needs. Taking four special education courses also led participants to question longstanding beliefs of how and to what extent students can learn, particularly shifting from a mindset of 'disabled' and incapable of learning, to 'able' and having the potential and ability to learn given the right instruction and supports (Jordan et al., 2010; Nocella, 2008; Sharma & Sokal, 2015). Third, participants found their special education coursework as valuable and relevant to their teaching context overall. As Brown et al. (2008) asserted, "Teacher education programs must instill in their general education candidates the skills necessary to instruct and assess children with special [education] needs," (p. 2092).

Furthermore, the special education coursework influenced teacher participants' perceptions of their own competence and comfort level when teaching students with and without disabilities. These findings are in concert with research by Sokal et al. (2013) as well as Marsala and Hawkins (2020) who found that taking special education classes during a preservice program increased teacher confidence and efficacy for teaching in inclusive settings. Therefore, it is critical to prepare all future teachers to develop competence and skill to teach students with special education needs.

Further research is needed to explore these findings in more depth due to the limited number of participants and research in TPPs providing secondary preservice teachers extended coursework in special education along with content. Since this study examined teacher perceptions regarding the value of their coursework, studies focusing on the effectiveness of their skills and knowledge are also warranted. While research suggests the inadequacy of a stand-alone special education course (Brown et al., 2008), or the perils of an over-reliance of inclusive pedagogy that may minimize the importance of specialized instruction (Mintz & Wyse, 2015), our study suggests potential benefits of multiple special education courses for secondary teacher preparation programs. In educational systems where, increasingly, students of varying abilities are placed together in classrooms, the need for teacher preparation programs to promote the importance of inclusion becomes apparent.

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## APPENDIX

***Special Education Course Description: Completed During Graduate TPRP***

<b>Course</b>	<b>Survey of Exceptionality</b>
<b>Description</b>	Course provides information about the various types, characteristics, and etiologies of exceptionalities, identifies state and federal laws related to special education, and serves as an introduction to the education of exceptional students.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• historical foundations, philosophies, major perspectives, and legislation affecting growth and improvement in special education.</li> <li>• laws, regulations, and policies related to individuals with disabilities.</li> <li>• policies regarding screening, referral, eligibility, and placement procedures.</li> <li>• identification criteria and labeling controversies.</li> <li>• current educational terminology and definitions.</li> <li>• academic, social, career, and functional characteristics of individuals with disabilities as they relate to support, services, and educational options.</li> <li>• roles of professional educators in meeting the needs of exceptional children.</li> <li>• instructional strategies for the general education classroom.</li> <li>• collaboration with parents and educators.</li> <li>• sensitivity to cultural diversity and its impact on students with disabilities.</li> <li>• accommodations and instructional adaptations for students with disabilities in the general education classroom.</li> <li>• ethical standards of professional responsibilities consistent with the CEC code of ethics including privacy, confidentiality, and respect for differences.</li> </ul>
<b>Course</b>	<b>Educating Students with Mild Disabilities</b>
<b>Description</b>	Course provides information about instructional and environment modifications for students with mild disabilities. Characteristics of students with special education needs are discussed with the primary emphasis on learning disabilities and differences. Classroom management and the teacher's role with students with mild disabilities are examined. Research-based teaching strategies are investigated as well as methods for differentiating instruction within the class.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• characteristics of struggling learners and students with mild disabilities.</li> <li>• direct instruction techniques correlated with student achievement.</li> <li>• proactive classroom management plans to minimize disruptions.</li> <li>• appropriate academic and nonacademic interventions and instruction.</li> <li>• using professional journals to find and implement appropriate strategies.</li> <li>• six methods of co-teaching</li> <li>• special and general educator's role in successful co-teaching.</li> <li>• the stages of learning applied to planning appropriate ongoing instruction.</li> <li>• appropriate communication regarding individual differences and disabilities.</li> <li>• maneuvering the school environment through the students' eyes.</li> <li>• navigating the multi-tier models of PBIS and RTI.</li> </ul>

<b>Course</b>	<b>Assessment and Evaluation of Student with Disabilities</b>
<b>Description</b>	Course provides information about formal and informal assessment for the identification of cognitive aptitude and academic achievement as well as evaluations for instruction, achievement, and/or remediation.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• common standardized tests utilized for special education.</li> <li>• appropriate uses and limitations of various types of assessment procedures.</li> <li>• basic concepts and technical characteristics of standardized assessment.</li> <li>• understand full individualized evaluation process for eligibility of services.</li> <li>• comprehend legal and ethical concerns related to assessment.</li> <li>• knowledge of informal assessment procedures.</li> <li>• uses and limitations of various types of assessment procedures.</li> <li>• creating various assessments and using data to evaluate student progress.</li> <li>• ability and understanding to differentiate assessments.</li> <li>• appropriate accommodations related to characteristics and learning needs</li> </ul>
<b>Course</b>	<b>Positive Behavioral Interventions and Supports (PBIS) in Schools</b>
<b>Description</b>	Course covers theory, issues, and application of in schools and other settings. Topics include legal, research, and philosophical foundations of discipline in public schools; conceptual foundations of PBIS interventions and practices; historical development and foundations of PBIS; best practices in PBIS programs; steps to development and implementation of SWPBIS systems in school settings and PBIS-based classroom management strategies; assessment; and evaluation of programs.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• current problems and practices in school discipline, common disciplinary problems, traditional approaches to discipline, and evaluations of practices.</li> <li>• conceptual foundations and essential, differentiating features of PBIS.</li> <li>• historical development, theoretical and legal foundations of PBIS.</li> <li>• 3-tier model of PBIS: philosophy, assessment &amp; intervention strategies.</li> <li>• basic ABA terminology and principles relevant to PBIS.</li> <li>• current policy and legislative activities related to PBIS.</li> <li>• best practices in development &amp; implementation of universal level SW-PBIS.</li> <li>• development and implementation of secondary level supports.</li> <li>• identifying students for supports and evaluation of the interventions.</li> <li>• best practices in development and implementation of tertiary level supports.</li> <li>• use Standards of Practice: Individual Level, to guide practice or evaluate skill.</li> <li>• data sources for SW-PBIS systems and classroom PBIS.</li> <li>• research support for PBIS systems in school settings.</li> <li>• PBIS in juvenile justice, alternative schools, mental health facilities, etc.</li> <li>• development of one or more PBIS-based classroom and/or individual student interventions to address a behavior/classroom management problem.</li> </ul>