

Examining Required Special Education Coursework for Middle School Science Teachers: A Content Analysis of Course Descriptions

Zachary Barnes

Austin Peay State University

The United States has seen an increase focus in science education at the same time that more students with disabilities (SWDs) are educated in a general education classroom. Because of this, science teachers must know how to implement best practices of working with SWDs. However, many science teachers report they do not feel prepared for this. This study explored required special education courses that middle school science pre-service teachers are required to take in the state of Tennessee. Overall, the majority of universities required only one course in special education. Themes of course descriptions and future directions are discussed.

Introduction

The Individuals with Disabilities Education Act (IDEA; 2004) set the stage to prioritize educating students with disabilities (SWDs) in general education settings. With approximately 7.1 million SWDs who are served within public schools in the United States, over 60% of those students spend 80% or more of their school day in general education classrooms (Snyder et al., 2019). This has not always been the case. In 1989, only 11% of SWDs spent the majority of time in a general education class (Snyder et al., 2019). As a large portion of SWDs are now included in a general education setting, it is no longer solely the responsibility of special education teachers (SETs) to educate SWDs. General education teachers (GETs) are now expected to teach and be held accountable for the achievement of SWDs in their classrooms (Horowitz et al., 2017). As recent research has explored how GETs and SETs are prepared separately (Billingsley, 2011), less is understood about how GETs are trained to work with SWDs during their teacher preparation program. This is especially true in middle school science, as there is a gap in understanding how middle school science teachers are prepared to work with SWDs in their teacher preparation program.

As the United States moves to focus more on STEM education (Executive Office of the

President, 2008), science teachers feel unprepared to work with SWDs. In fact, science teachers report they have little formal training on working with SWDs (Kahn & Lewis, 2014). Specifically, a third of science teachers have reported they received no training on how to educate SWDs. Those who did report having training working with SWDs reported that the trainings took place on the job, not in preparation programs. The lack of training has significant effects on SWDs as special education interventions and strategies have been shown to be effective in teaching science to SWDs (Kalenberg et al., 2015). However, while we know that teachers feel a lack of training, it is not fully understood how much and the type of special education training these teachers receive as pre-service teachers (PSTs). In this paper, I examine the required special education coursework for pre-service middle school science teachers in the state of Tennessee. Using document analysis, this paper provides a clearer understanding of the amount of coursework required and the themes covered in those required courses.

Teacher Preparation Standards and Assessment

In Tennessee, state policy requires that teacher candidates have the knowledge and

skills to teach SWDs. While the policy does not require specific courses to be taught, the state does require that each program align to Council for the Accreditation of Educator Preparation (CAEP) and Interstate Teacher Assessment and Support Consortium (InTASC) standards. CAEP standards require that teacher candidates understand all 10 InTASC standards. Each of the ten standards have multiple substandards attached for them. There are only a few InTASC substandards that explicitly mention SWDs: GETs must know how to appropriately assess SWDs, implement strategies to work with SWDs, and understand special education laws.

Preparing Content Area Teachers to Work with SWDs

Teachers should be prepared to meet the instructional needs of all students in a classroom, including those with disabilities. In a general education setting, effective GETs know their subject area, they frequently monitor the progress of learning in their class, and they modify and shift instructional practices to meet the needs of all the students (Kauffman et al., 2005). However, there are specific strategies that have been shown to be effective with SWDs (Hughes et al., 2017), highlighting the need for GETs to understand the strategies needed to work with SWDs. Both GETs and SETs report being better prepared for the classroom when their preparation includes extensive work in both pedagogy, through extensive coursework, and practice, through student teaching and other field experiences (Boe et al., 2007). Better preparation to work with SWDs also has links with teacher turnover. The odds that a teacher leaves the profession increases as the percentages of SWDs in their classrooms increases (Gilmour & Wehby, 2020). However, this turnover effect is moderated if those teachers had special education certification, showing the link between

special education preparedness and teacher turnover.

The teacher preparation programs that train GETs and SETs vary on how they prepare their PSTs. Brownell and colleagues (2005) compared successful general education and special education programs to get a fuller understanding of the types of preparation. They found that both types of programs believed in the importance of extensive field experiences and collaboration between faculty, school staff, preservice and in-service teachers. Collaboration was found to be a skill that is necessary to work with SWDs, as it takes teachers and staff working together to provide best services to SWDs. SETs feel more prepared to collaborate with other staff to work with SWDs than GETs (Zagona et al., 2017). In a national survey, teachers report that while they felt supported by colleagues, they also reported “marginal levels of support” when it comes with meeting the needs of SWDs in their classroom (Gesel et al., 2021). This again may be linked to their PST years. Education professors reported that their university’s special education courses did not provide instruction on collaboration or inclusion for GETs, especially so for secondary majors (Harvey et al., 2010). They felt more instruction was needed across all certification areas.

As many programs offer at least one course in special education (Harvey et al., 2010), it is important to make sure that programs are not just preparing PSTs by defining different disability categories. Programs must prepare PSTs to understand the wide range of instructional strategies needed to support SWDs (Fisher et al., 2003). This is important as GET and SET training programs have differing epistemological stances, with special education favoring a more positivist approach and general education emphasizing a constructivist approach (Brownell et al., 2005). This could

affect how differently trained teachers approach the instruction of SWDs. GETs need to be prepared to work with SWDs through both pedagogy and strong field experiences (Forlin, 2010). There is an association between elementary teachers who reported taking a course on inclusive education and being prepared to provide individualized instruction, providing accommodations, and adapting content standards for SWDs (Zagona et al, 2017). Other elementary teachers reported that they felt better prepared to work with SWDs when their university supervisors gave stronger support during field experiences (Gottfried & Kirskey, 2020). However, similar associations were not found with secondary teachers.

Science Instruction for SWDs

According to Brigham and colleagues (2011), there are three things students must know to show competence in science: (1) be familiar with the concepts, models, and theories; (2) understand how the knowledge in the field is created and proven; and (3) be able to combine the first two ideas to engage in inquiry of a new idea. SWDs in science classrooms have difficulties in language, core academic skills, and retaining the knowledge that they have learned (Therrien et al., 2017). These difficulties can lead SWDs to struggle in an inquiry based science classroom. Science teachers must know how to adapt their curriculum, accommodate students to match their Individualized Education Programs (IEPs), and incorporate direct instruction strategies (McGinnis, 2013). Specifically, explicit instruction has been repeatedly shown to help SWDs achieve in science classrooms (Kaldenberg et al., 2015; Mason & Hedin, 2011). These strategies include explicit instruction in vocabulary, reading comprehension strategies, and use of graphic organizers. It is important for literacy practices, like vocabulary instruction, to be

embedded into the science classroom to assist SWDs. Unfortunately, many science teachers do not feel prepared to implement these strategies in their classrooms (Kahn & Lewis, 2017).

Current Study

As many elementary programs prepare teachers for all subject areas, middle school is the first grade span that allows teachers to train to be content specific teachers. Understanding the amount and type of special education coursework that middle school science PSTs are required to take is an important question for understanding why middle school science teachers do not feel prepared to work with SWDs. The current study only examined required special education coursework from Tennessee colleges and universities that offered an undergraduate certification in middle school science. This was done to limit differences between state level policies. The present study analyzed required courses and their descriptions to understand the themes that were taught in those classes. The results of this research have practical implications about how GETs are prepared to work with SWDs. My research questions were as follows:

Research Question 1: How does the number of required special education courses differ across universities and colleges in Tennessee?

Research Question 2: How do practices in both strategy instruction and inclusive practices differ across the state?

Research Question 3: What were the common themes of these required special education courses? Do these themes match with what is required from InTASC standards?

Method

Sample and Data Collection

The sample for this analysis came from traditional educator preparation programs that the Tennessee State Board of Education listed as approved to certify “Middle Grades Sciences.” Only traditional four-year colleges and universities were included in the sample. I excluded alternative licensure programs (e.g., Teach for America) and Western Governors University. I also limited the sample to programs that specifically focused on grades 6-8. For example, programs that were focused on grades 6-12 science education were excluded. The final sample included 11 universities that offered a middle grade sciences degree. After determining the sample, I obtained four-year plans for each of the 11 programs. Then, I pulled the course description of the special education courses from the university catalog to serve as the sample, which totaled 14 documents. Each course description counted as one document.

Data Analysis

I answered the research questions through directed content analyses of catalog descriptions of required special education coursework for middle school science teachers (Hsieh & Shannon, 2005). This method combines both quantitative and qualitative approaches. I used a framework that included starting with prior codes (field experience, strategy instruction) as well as a grounded approach to understand the common themes that emerged from the data. I reviewed all catalog descriptions by reading through the documents with the goal of looking across those units for similarities and differences, and sorting accordingly (Ryan & Bernard, 2003). The themes identified represent the ways in which topics in special education are conceptualized and communicated to PSTs. The present study focused on nine codes: assessment, cultural diversity, disability categories, English

language learners, field experience, general education inclusion, giftedness, special education laws, and teaching strategies for SWDs. From the literature, special education laws, teaching strategies, field experience, disability categories, general education inclusion were already created codes. Assessment, cultural diversity, English language learners, and giftedness emerged from the catalog descriptions. Data analyses were completed in NVivo 12.

Results

Amount of Required Special Education Coursework

After examining the 11 institutions that offered undergraduate middle grade sciences degrees, I found that 3 (27%) programs required two special education courses, 7 (64%) required just one course in special education, and one (9%) university did not have a required special education course. The university that did not have specific special education coursework embedded special education instruction within required general education coursework. That university was dropped from analysis, which still left 14 documents to be analyzed among 10 programs.

Overlap of Language Used Between Courses

Before examining the themes that emerged from the analysis, I think it is important to understand the language that is used across the state of Tennessee to describe special education coursework. Table 1 shows some of the most common words used in the catalog descriptions for required special education coursework. The top three most common words were about education, students, and special.

Strategy instruction. Nine out of ten (90%) programs mentioned in their course descriptions that coursework would be covering strategy instruction for SWDs. Eight of the nine programs specifically mentioned “strategies” in their catalog descriptions while one mentioned “methods,” which was coded as strategy instruction.

Inclusive education. Eight out of ten (80%) programs mentioned that there would be a focus on inclusive practices, by either mentioning “inclusive classroom” or through

stating they would describe “procedures for the regular classroom teacher.”

Disability categories. Seven out of the 10 (70%) programs had courses that specifically mentioned reviewing different types of disabilities that teachers will see in the classroom. Many programs mentioned reviewing “characteristics” or “individual differences” of SWDs.

Table 1. *Frequency of words used in course descriptions.*

Word	Frequency
Educating, education, educational, educators	13
Students	12
Special	11
Disabilities, disability, disabled	9
Instruction, instructional	8
Strategies	8
Classroom, classrooms	7
Exceptional, exceptionalities	7
Needs	7
Diverse, diversity	6
Required, requirements, requires	6
Included, includes, including	6

Special education laws. Five of the 10 (50%) programs specifically mention that the course will go over special education laws. This was mentioned through terms like “legal requirements,” “public laws,” or “special education laws.”

Field Experience. Out of the 10 programs with required special education coursework, only four (40%) of the universities mentioned a required fieldwork requirement. Two of the four programs listed the specific hour requirement (5 & 15), while the other two did not.

Assessment. Only four out of the 10 (40%) programs mentioned assessment in their descriptions. Words that were used included “assessment” and “evaluation.”

Cultural diversity. While Table 1 reports that “diverse” and “diversity” were mentioned 6 times, that was not specifically talking about the diversity of the student’s cultural background. Only three of the programs (30%) mentioned that course would discuss the cultural background of SWDs. This was mentioned through “diverse cultural backgrounds,” “multicultural diversity,” and “sociocultural characteristics.”

Middle school focus. Only one program (10%) required a special education course that specifically focused on a “middle school or secondary setting.”

Giftedness. Only one program (10%) mentioned that the course would also concern “gifted children” as well as students with disabilities. In Tennessee, students who are identified as gifted are eligible for an IEP.

Discussion

The purpose of this study was to examine the course descriptions of required special education courses that middle school science teachers are required to take at universities and colleges in Tennessee. Based on this program-by-program analysis, I found that there are differences in both the amount of special education courses and in the descriptions of what the course covers. Overall, this analysis revealed that, while all 11 programs are guided by the same state policies and standards, the programs have the flexibility to determine the type of coursework. Specifically, the majority of the programs in Tennessee only required one special education course for middle school science PSTs. Three universities in

Tennessee required two courses and one university did not offer specific special education coursework.

These findings demonstrate that science teachers may feel unprepared to work with SWDs because they only experience one course in special education. However, 90% of the programs reported that they focused the course on teaching PSTs strategies to work with SWDs. This shows that the programs are moving away from solely teaching about disabilities categories and are moving towards more strategy instruction (Fisher et al., 2003). This is important as middle school science teachers will be working with SWDs in their general education classrooms. While these programs report that they focus on strategies, more work is needed to explore if one course is enough for PSTs to apply strategies once they are in the classroom.

Tennessee preparation programs report they are prioritizing teaching about inclusive education and/or the role of the general education teacher. It is important for middle school science teachers to understand the roles they play in inclusive education. These roles are also related to how the laws are written around special education. IDEA outlines the roles and responsibility for general education teachers. However, only 50% of programs reported that they go over special education laws with their PSTs. The findings from this study also raise important questions around the InTASC standards that Tennessee preparation programs must align. InTASC standards require that all teachers are prepared to assess SWDs, understand special education laws, and know how to implement strategies to work with SWDs. Ideally, the required special education courses would go over these concepts in their courses, but it is not apparent if programs in Tennessee are training their middle school science teachers to meet all those standards. Tennessee programs report that they are most

likely preparing PSTs to implement strategies to work with SWDs, but only 70% of programs explicitly mention laws and only 40% of programs mention assessment. Therefore, the findings demonstrate there could be misalignment between the coursework and the InTASC standards that programs are required to follow.

The variation between programs in required field experiences could contribute to the feelings of PSTs being unprepared to work with SWDs. Less than half of Tennessee programs require field experiences for their required special education courses. Teachers report that field experiences have helped them be more prepared to work with SWDs, which makes it critical for GETs to have field experiences in special education (Brownell et al., 2005). Field experience was a code that was predetermined before coding, and it was surprising to see so few of the programs not mention a field experience in the course description. Students could make it throughout their teacher preparation without a specific field placement focused on SWDs.

Based on the course descriptions, many programs are not highlighting the importance of being aware of the diverse cultural needs of their SWDs. There is an intersection between race, culture, and special education (Annamma et al., 2013), and it is important for teachers to be aware of that as they become general education teachers. Additionally, only one program offered a special education course specifically for middle and secondary teachers. That specific course offering was an interesting and welcomed finding, as there are differences in strategies for elementary and middle school students.

Limitations

A significant limitation of this study is the focus on a single state. While this study examined eleven programs, it is not known if

these results would generalize to other states across the country. With the flexibility of InTASC standards for programs to decide the courses that are taught, state level standards may influence how preparation programs create required coursework for middle school science teachers. Limiting the sample to a single state did allow for the control of state level policies requirements. As the country has seen through recent legislation in reading legislation, states can require teacher preparation programs to require certain types of coursework (Will, 2019). By examining just one state, I was able to conclude that each program had to abide by the same policies. Another limitation is the fact that course catalogs do not describe what goes on in that classroom.

Recommendations and Conclusion

The results from this study describe the training that middle school science PSTs receive in special education. The majority of programs offered only one special education class to these future science teachers, which could be a reason why many teachers feel unprepared to work with SWDs. Along with just one class, less than half of the programs required field experiences in special education. Expanding field experiences in special education classrooms could be an area of improvement. Field experiences are important in training PSTs to work with SWDs when they are student teaching, but future work should examine if field placement for special education coursework is an effective tool in preparing these teachers to work with SWDs. Future work should be explored to determine if one course in strategy instruction to work with SWDs is sufficient for middle school science PSTs or if those with more courses feel more prepared.

A recommendation for teacher preparation programs is to increase the special education support for teachers during

their student teaching time. Previous research shows that many content area teachers, including science teachers, feel unprepared to work with SWDs. This means that the mentor teachers may also feel unprepared. Providing professional development to both student teachers and mentor teachers related to special education could be a path forward. This has been shown effective with reading teachers. Feng and Sass (2013) found that SWDs achievement increased after special education professional development was given. This will help the preparedness of the teacher candidate and the mentor teachers, allowing for more colleagues in the building that other teachers can reach out to for support. This also means that special education faculty would need to play a larger role in the preparation of all teacher candidates through the educator preparation program.

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Zachary T. Barnes, Ph.D., is an assistant professor of special education at Austin Peay State University in Clarksville, TN. His research interests include reading and dyslexia policy, executive function, and reading development.