HIGH SCHOOL SCIENCE TEACHERS' CURRICULUM, INSTRUCTIONAL AND ASSESSMENT DECISIONS FOR INCLUSIVE CLASSES

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Abstract

This study explored high school science teachers' curriculum, instructional and assessment decisions for inclusive science classrooms. We also attempted to determine the factors that influence their decisions. The sample comprised thirteen science teachers from two high schools in the Midwest of the USA. One of the schools had failed to meet the Academic yearly progress under the federal No Child Left Behind (NCLB) Act in the four years prior to this study because of its Student with Disabilities (SWD) sub-group. Data were collected through a questionnaire and semi-structured interviews. Results show that science teachers' curriculum, instructional and assessment decisions were influenced by factors associated with accountability and personal interests and preferences of science teaching methods. Although science teachers' decisions were within the framework that integrates content and practical classroom knowledge for regular classes, such decisions may not promote effective science teaching and learning in inclusive classes. As such, most science teachers exhibited lack of knowledge about effective science teaching in inclusive classrooms. These findings have implications on science teacher education and science teaching in inclusive classrooms.
Key words*: inclusive, curriculum, instructional, assessment, decision.*

Statement of the Problem

In the USA, the 1997 and 2004 reauthorizations of the Individuals with Disabilities Education Act [IDEA] require that students with disabilities (SWD) receive instruction in the least restrictive environment. Least restrictive environment is often interpreted to mean the general education classroom (Chiappetta & Koballa, 2006; p. 115). As such, inclusive science classrooms have become the norm in high schools, fulfilling the instructional needs of SWD in regular classrooms (Jakupcak *et al*., 1996). In this paper, inclusive classes are those that have both special education and regular students while SWD are those individuals that have been identified with mild disabilities and who receive special education services in schools. Such students have the cognitive aptitudes to construct scientific knowledge, participate in scientific investigations, and apply scientific reasoning for problem solving and decision making inherent in school science curricula (Kearney & Durand, 1992). One might expect that SWD in high schools receive science instruction from special education teachers but this is not the case because special education teachers have little or no exposure to science (Patton *et al*., 1990; Cawley, 1994). Instead, general education high school science teachers are providing science instruction in inclusive classrooms (Lovitt & Horton, 1994). Yet, most high school science teachers are not trained to teach special education students or inclusive classes (Kearney & Durand,

1992; Norman *et al*., 1998; Pyle & Butera, 1997). As such, special education and science educators have raised doubt on whether high school science teachers can effectively execute their new role as inclusive classroom teachers since they have not received training for inclusive classrooms (Kearney & Durand, 1992; Mcintosh *et al*., 1993; Normal *et al*., 1998; Robinson, 2002). In their new role as course designers and instructors for inclusive classes, high school science teachers must make curriculum and instructional decisions that can promote effective science teaching and learning in such settings (Mastropieri & Scruggs, 1994). They must also make decisions on assessment criteria that are effective for such settings. However, research on inclusion shows that most high school science teachers are generally not sensitive to individual needs and are unlikely to make adjustments in their teaching materials or instructional strategies for SWD (Cawley *et al*., 1998). Therefore, the success of providing quality science instruction to all students through inclusion in high schools will largely depend on general education high school science teachers' curriculum, instructional and assessment decisions for inclusive classes and the factors that influence such decisions. Success is also likely to depend on science teachers' knowledge about SWD and their willingness to accommodate them in science lessons. In order to start addressing this educational problem, this study explored general education high school science teachers' curriculum, instructional and assessment decisions for inclusive classrooms. We also attempted to determine the factors that influenced their decisions.

Several studies have emphasized the importance of exploring science teachers' decisions and factors that influence such decisions because they form an ideal base for developing training and support programs (Duschl & Wright, 1989; Sanchez & Valcarcel, 1999; Bell & Lederman, 2003). The underlying assumptions on teacher decision making research are twofold: first, teachers are professionals who make reasonable judgments and decisions within school and classroom environments; and second, teachers' judgments and decisions guide their classroom behavior (Calderhead, 1984). As such, several studies have reported science teachers' curriculum and instructional decisions and factors that influence such decisions for general education classrooms. When teachers make instructional decisions they consider information about student attributes, content, goals and objectives, and outcomes (Shavelson & Stern, 1981; Clark & Peterson, 1986). Factors such as the physical and organizational characteristics of the school and classrooms; teacher's practical knowledge, their beliefs about teaching, and attitude towards subject content and pedagogy also influence teacher decision making (Sanchez & Valcarcel, 1999). Other studies show that teachers' curriculum and instructional decisions are based on personal values, beliefs, internal and external circumstances, as well as what happens while the instruction is taking place (Klimczak *et al*.1995). However, a comparable knowledge base on science teachers' curriculum, instructional and assessment decisions for inclusive classrooms and the factors that influence their decisions doesn't exist. Yet, such a knowledge base is essential for teacher preparation and support programs for effective science teaching in inclusive classrooms. Therefore, the findings of this study are of particular interest to both science and special education communities and teacher professional development providers who wish to understand how general education high school science teachers decide on the curriculum, instructional strategies and assessment criteria for inclusive classrooms. However, this study focused on one particular area of teacher decision making- specifically, pre-active instructional decisions. Pre-active decisions refer to the choices teachers make as they plan for teaching and reflect on their teaching.

Methodology of Research

This study was conducted in two local high schools located in two Mid western towns of the USA. One school is located in a town of 28,000 people while the other one is in a smaller town of 1300 people. The sample for this study comprised thirteen high school science teachers in the two local public high schools. Ten of the participants were female while three were male. There were seven biology, three chemistry and three physics teachers. The average age of the participants was 37 years and their teaching experience ranged from 7 to 16 years. None of the teachers had received training in special education either in their pre-service teacher education program or through a teacher professional development program. These teachers taught grades 10-12 general science and Advanced Placement (AP) chemistry, biology and physics classes. Only two biology teachers co-taught biology courses with special education teachers. Both schools had resource rooms where SWD received

extra help from special education teachers. The average class size in each school was 21 students. The range of SWD in inclusive classes was 7-10. Disabilities among SWD were Attention-Deficit Hyperactivity Disorder (ADHD), sensory disabilities (hearing loss and visual impairment), learning and physical disabilities.

Data were collected through a questionnaire and semi-structured interviews. The questionnaire was categorized into four sections: section one included background information about the participants' teaching experience, teaching specialization and training in special education; section two focused on the curriculum decisions to ascertain how teachers plan lessons and student activities for an inclusive classroom; section three focused on instructional decisions teachers made; and section four focused on the assessment strategies teachers used. After the questionnaires were analyzed teachers were interviewed to allow them to elaborate on their questionnaire responses. The average duration of the interviews was 30 minutes. Sample questions for the interviews were (a) how do you decide on what science content/topic to teach in your inclusive classes? (b) What teaching methods do you use to teach science in inclusive classes? (c) What assessment strategies do you use to assess students in inclusive classrooms?

Data were analyzed using a constant comparative method (Strauss & Corbin, 1998). The procedure involved reading (and re-reading) responses in the questionnaires and interview transcripts. Essentially, each line, sentence, and paragraph in the data sources was read in search of the answer to these two questions: What is this about? What is being referenced here?" Then the participants' responses were open-coded to identify recurring themes. Thereafter, categories were generated through comparing the themes for similarities and differences; these provided the representative profiles of the group being studied. The authors conducted the initial stages of data analysis using this procedure independently. Following each stage they met to discuss the results and resolve any differences in the themes and categorization. However, they collaborated on the last stage of analysis and the final set of categories was a result of this process. Teachers' decisions on curriculum, instruction, assessment and factors that influenced such decisions represented the content categories.

Results of Research

Curriculum decisions: Both questionnaire and interview responses showed that science teachers did not have individualized curriculum for SWD. Instead, they had lessons and units designed for all students in their inclusive classes. This is in keeping with the finding reported by Cawley *et al.* (1998) that SWD are treated by general education science teachers much like other students. To a large extent science teachers' decisions on what to teach in inclusive classes were influenced by mandatory Standardized testing. SWD as well as those without disabilities were expected to pass mandatory standardized tests; otherwise the school will be placed on academic watch list by the State and Federal government. There was a prevailing belief among the teachers that since the desired learning outcomes were identical for all students, then they should all experience the same science content knowledge and science processes skills to enable each student to achieve the outcomes. Other factors that influenced teachers' decisions on the curriculum were curriculum guides from school districts, National and State Science learning Standards, textbooks, available lab materials, and personal interests and preferences. For example Jane, a chemistry teacher said:

> I decide on the content for my courses based on curriculum guides from our school district, textbook, learning standards, standardized tests… and what I think is good for my students beyond high school… It is difficult to include all the things especially with special education students in class (Jane, Chemistry teacher).

Similarly, Jim a Biology teacher in another school said:

> Standards and curriculum guides are key factors in my decision on what to teach at each grade level. I also have some personal preference regarding emphasis on certain topics (Jim, Biology teacher).

Both Jane and Jim relied on the prescribed curriculum materials from school districts which they

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Volume 9, 2008

believe were aligned with standardized tests. As such, many teachers decided to use these teaching materials to help their students learn and pass science tests.

Science teachers also said they begin by thinking of the content to be taught as outlined in textbooks and then choose activities for the lessons. For this, a textbook was the principal source of activities. Teachers justified using the textbooks because they themselves chose them and in their opinions, the textbooks were thorough and contained the basic necessary information. The use of curriculum guides and textbooks supports the previous finding which states that when teachers make their decisions on curriculum they rely on curriculum guidelines from their districts for accountability purposes (Duschl & Wright, 1989; Sanchez & Valcarcel, 1999).

When asked about the SWD, most teachers said they did not take them into account when deciding on the content to teach in their inclusive classes. As such, SWD's influence on teachers' decisions on curriculum was not significant. The curriculum guidelines from the school districts and standardized tests seemed to have outweighed the SWD in teacher decisions on curriculum for inclusive science classes.

Most science teachers also noted that their teaching experience and training played a vital role regarding their decisions on what and how to teach science in inclusive classes. This finding and those stated above support previous studies which reported that teachers make decisions within a framework that takes into account science content, and practical classroom knowledge which includes teachers' beliefs coupled with their experience (Aikenhead, 1984; Sanchez & Valcarcel, 1999; Mumba *et al*., 2007).

Instructional decisions: Questionnaire and interview responses showed that science teachers reported using multiple teaching and learning strategies for all students. In particular, teachers' instructional decisions encompassed several teaching methods such as visual and audio aids, flash cards, hands on activities, lecture, group work, discussion and demonstration. Their instructional decisions were influenced by many factors such as content to be taught, teaching experience, standardized tests, available resources, time, experience, suggestions from peers, available resources, students' abilities, personal interests, and student deficit and attention span. However, some teachers said that they experienced some difficulties such as insufficient time, frequent interruption, academic and behavioral problems in their classes. Only four science teachers out of thirteen teacher said they made special accommodation for SWD such as seating accommodations, and use of microphones during lessons when required. For example Karen, a physics teacher gave one example in her questionnaire responses on how she accommodated SWD.

> I have a number of students with hearing problems in my classes. So I use a microphone in my classes to help them hear me. But it is difficult for them to hear other students who give an answer off the microphone. I also ask them to seat in front row and not at the back (Karen, Physics teacher).

Although Karen and other three teachers wrote in the questionnaire that they helped SWD through special accommodation, it was evident in the interviews that it is very difficult for them to accommodate all SWD because of the different learning needs among SWD. As such, most teachers referred SWD to resource room teachers for extra help.

Assessment decisions: Each of the science teacher's decisions on assessment was guided by a belief that all students including SWD must be assessed in the same way to help them prepare for standardized tests. Generally, assessment strategies employed by this group of science teachers took the form of asking students questions and written tests such as multiple choice questions, quizzes and fill in the blank. Sanchez & Valcarcel, (1999) also found that teachers rely on written tests to assess their students. The factors that influenced teachers' decisions on assessment were State standardized tests, teaching experience, grade level, time, and content. Although special education students were given longer time to take the tests, they took the same tests and were graded in the same way as regular students.

Discussion

The purpose of this study was to explore high school science teachers' curriculum, instructional and assessment decisions for inclusive science classrooms and the factors that influenced their decisions. The results show that the general education high school science teachers made decisions on curriculum, instruction and assessment for their inclusive classes based on the factors that were mainly associated with accountability at the school and State levels. The results also show that science teachers' decisions were within the framework that integrates content and practical classroom knowledge for regular classrooms and not for inclusive classroom. The practical classroom knowledge included their beliefs about science teaching in regular classrooms. To a large extent these results are in keeping with research findings on inclusion that most high school science teachers are generally not sensitive to individual needs and are unlikely to make adjustments in their teaching materials and teaching strategies for SWD (Cawley *et al*., 1998). Research also shows that science teachers' practical knowledge mostly comprises their images of basic beliefs of science teaching in regular classrooms (Aikenhead, 1984; Norman *et al*., 1998; Bell, & Lederman, 2003). Unfortunately, such teacher decisions may not promote effective science teaching and learning in inclusive classrooms. These findings also support the assertion that most teachers lack pedagogical knowledge for effective science teaching in inclusive classrooms (Vaughn, & Schumm, 1994). In addition, the results reveal how far the ideas of the science teachers were from the inclusion science teaching which is also aimed at achieving scientific literacy among all students. Scientific literacy for all students is the central theme of current USA science education reforms (American Association for the Advancement of Science [AAAS], 1993) and science education standards (National Research Council [NRC], 1996). We attribute this problem to general education science teachers' lack of training in special education. For this reason, given the nature of this educational problem, we encourage that science teacher education programs should be aware that many science teachers teach science to a mixture of special education and regular students. Therefore, it is necessary that science teacher education programs should provide special education training to pre-service teachers for them to effectively teach science to both regular students and SWD.

Based on the findings in this study and previous studies there is need for the in-service science teachers to change their existing pre-active decision making process to one that takes the learning needs of SWD into account. However, such a change requires new experience among teachers through a professional development on science teaching in inclusive classrooms (Kearney & Durand, 1992; Robinson, 2002; Kirch *et al.,* 2005). Such changes will also require orientation regarding the curriculum design and pedagogical training for inclusive classrooms. This orientation should be linked with concrete models and theories that underlie inclusion. For the proposed changes to be put into practice, high school science teachers will have to see the sense and usefulness for their newly obtained knowledge and pedagogical skills. Otherwise, science teachers will not be able to address the needs of all students in inclusive classrooms.

There was also limited availability of special education teachers in the two school who could assist with teaching and curriculum modifications. Only two of the thirteen teachers co-taught with special education teachers. As such, many science teachers did not comply with the accommodations listed on students' individualized education plans (IEPs). Lucid deliberations between science teachers and special education teachers would help science teachers learn more about SWD and teaching strategies for inclusive classrooms (Pyle et al., 1999); that is, deliberations may help science teachers to start thinking about SWD when they plan instructional activities for inclusive classrooms.

This study only focused on science teachers' decisions for inclusive classrooms at pre-active instructional phase and the factors that influenced their decisions. Future studies should focus on science teachers' decisions during active and post-active instructional phases to better understand their decision making process for inclusive classes.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Volume 9, 2008

Conclusions

The factors that influenced high school science teachers' decisions on curriculum, instruction and assessment for their inclusive classes were those that are mainly associated with accountability in education system. Science teachers' decisions on how to teach science in inclusive classrooms were influenced by their beliefs about effective science teaching for regular classes. Therefore, it can be concluded that science teachers' pre-active decisions served two functions: accountability in the school system and personal interest and preferences of science teaching strategies. It is also concluded that science teachers' decisions were within the framework that integrates content and practical classroom knowledge for regular classrooms and not for inclusive classroom. Unfortunately, such decisions are not consistent with effective teaching and learning strategies for inclusive classrooms. As such, the high school science teachers, in this study, exhibited lack of knowledge about effective science teaching in inclusive classrooms.

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