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2010

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### Recommended Citation

Pense, Seburn L., Watson, Dennis G. and Wakefield, Dexter B. "Learning Disabled Student Needs Met Through Curriculum Redesign of the Illinois Agricultural Education Core Curriculum." *Journal of Agricultural Education* 51, No. 2 (Jan 2010): 117-127. doi:10.5032/jae.2010.02117.

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# Learning Disabled Student Needs Met Through Curriculum Redesign of the Illinois Agricultural Education Core Curriculum

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*This quasi-experimental pilot study included agricultural education students with Specific Learning Disabilities (SLD) in five high schools in the federally designated economically distressed area called the Illinois Delta Region. A unit of instruction taken from the existing 165 units of The Illinois Core Curriculum for Agriculture was redesigned in a manner appropriate to SLD students. Students from the five selected programs were randomly assigned to treatment and control groups. Results from pre- and posttests in this study found the redesigned curriculum for SLD students effectively increased learning for both SLD and traditional students.*

## Introduction

The number of students with identified learning disabilities in the United States greatly increased over the past 30+ years, from 0.75 million in 1976 to 2.41 million in 2002 (Biddle, 2006; Swanson, 1999). Such dramatic increases indicate a growing need for innovative approaches to improving teaching and learning for secondary learning disabled students. The U.S. Department of Education (2004) further reported a high percentage of learning disabled students aspiring to post-secondary vocational training and/or a college education, while Bajema, Miller, and Williams (2002) reported greater percentages of learning disabled students in rural areas. Pense (2008) reported nearly one-fourth of agricultural education students have Specific Learning Disabilities (SLD).

To adequately prepare this special population for further training, it is imperative that curriculum redesign for the learning disabled student in agricultural education programs be implemented. If the curricular needs of SLD students in the agricultural education classroom are not met, the agriculture industry risks losing 25% of the future workforce.

Training SLD students is not unattainable, as they are not normally low in their Intelligence Quotient (IQ). Messages to the brains of SLD students often become jumbled, causing difficulty with one or more academic areas (University of Illinois Extension, 2003). Such disabilities are of a varied nature, manifesting themselves in behavioral characteristics that may slow academic progress. These disorders include such problems as dyslexia, dysgraphia, dyscalculia, dyspraxia, attention deficit disorder, visual perception problems, and auditory discrimination problems (University of Illinois Extension, 2003). The types of students categorized as learning disabled and the complexities affecting them are numerous.

In a New Mexico study, Dormody and Torres (2002) discovered special-needs students were low in both at-graduation and current ability scores. A need therefore existed to research the challenges teachers face with special-needs students in the instructional process.

In answer to this need, Sorenson, Tarpley, and Warnick (2005) surveyed Utah teachers who rated their ability to teach SLD students as lowest among 31 core competencies. Consequently, those same teachers indicated the need for a high priority on teacher in-service for

instructing the special-needs student. Andreasen, SeEVERS, Dormody, and VanLeeuwen (2007) ranked experienced teachers' perceived levels of importance and competence on the New Mexico Board of Education competencies related to inclusion. The competencies teachers felt needed strengthening were "understanding special education regulations, understanding difference levels of special education services, understanding difference levels of disabilities, and understanding the social needs of special education students" (p. 126).

Student teachers, on the other hand, indicated they were confident in their abilities to provide an appropriate and challenging education for all students in agricultural education classrooms (Kessell et al., 2006a). They also indicated possessing a clear understanding of special education laws and confidence in developing individualized educational programs (IEPs).

In a related study, Kessell et al. (2006b) found student teachers who felt prepared to teach SLD students in agricultural education classrooms, and who had spent time with an SLD student outside of the academic setting, were statistically more confident in teaching SLD students. Further, Kessell et al. (2006b) found a significant association existed between such confidence for teaching SLD students and knowledge of providing the least restrictive environment possible.

To catch current teachers up, and to more adequately equip student teachers entering the field, changes need to be made on the curricular level. According to Kathleen Plesko, Director of Disability Services, Southern Illinois University (personal communication, September 26, 2007), to accommodate the copious disabilities evident in the agricultural education classroom, a redesign of existing curriculum may need to employ a self-paced format, include illustrations with text, use basic English phrases where possible, and include a voice-over application to address the largest number of disabilities. Employing the *Special English* technique advocated for second language learners could also adapt the curriculum for SLD students (Celce-Murcia & McIntosh, 1979). Adapting a fundamentally sound curriculum in these ways and then evaluating through stringent research methods would provide an appropriate approach

to real world application and evaluation of these academic suppositions.

The Illinois State Board of Education (2004) has produced *The Illinois Core Curriculum* to meet state learning standards for five cluster areas in agriculture; the Core included 746 lessons in 165 units, but had never been redesigned in a manner appropriate to the SLD student. While the Core provided necessary content, the development of a technology-assisted curricular design could potentially meet the other requirements. A framework for a technology-assisted curricular design is also necessary. King-Sears and Evmenova (2007) point out that instructional technology allows students to receive information, practice it, and express what they know. They emphasized using technology that is "efficient, cost-effective and gets the job done" (p. 9).

There is debate in the literature regarding delivery media, and whether it influences learning outcomes in and of itself (Joy & Garcia, 2000; Kozma, 1994; Lockee, Moore & Burton, 2001). Citing a meta-analysis study by Rachal (1993), Joy and Garcia (2000) questioned research methodologies employed to determine delivery media effectiveness in the classroom. They identified ten intervening variables that should be accounted for in a study of computer-aided instruction (CAI); including random selection, random assignment, adequate sample size, prior knowledge, student ability, learning styles, teacher effects, time on task, instructional methods, and learner familiarity with technology.

### Theoretical Framework

The framework for this study was based on four theoretical concepts: inclusion, student engagement, assistive technology, and principles of curriculum redesign for the SLD student (Figure 1). To better meet the individual needs of each student, both SLD and traditional, an inclusive environment needs to be established. Students with specific learning disabilities may then be provided curricular services in conjunction with their non-disabled classmates. This encourages a diverse classroom while meeting the individual needs of all students. While collaborating with students, teachers, and non-disabled students, the instructor may also engage in reflective practice and adapt the

curriculum to individual needs (Bloom, Perlmutter & Burrell, 1999).

Assistive technology further helps to accommodate this inclusive effort by allowing individual needs to be addressed through self-paced and interactive lessons. This also balances individual skills with challenges so the SLD student is enabled to complete tasks efficiently (Forgrave, 2002). Further, student engagement through a redesigned curriculum using interactive technology addresses the needed motivation for students to complete tasks and increase learning (Shernoff,

Csikszentmihalyi, Schneider & Shernoff, 2003). Underlying the whole process of redesigning curriculum and testing outcomes for the SLD student population are the six principles affecting curriculum design (Heward, 2009); including big ideas, conspicuous strategies, mediated scaffolding, strategic integration, judicious review, and explicit instruction. As the multiple theories of inclusion, student engagement, assistive technology, and principles of curriculum redesign are integrated, improved performance and greater academic success for the SLD student become possible.

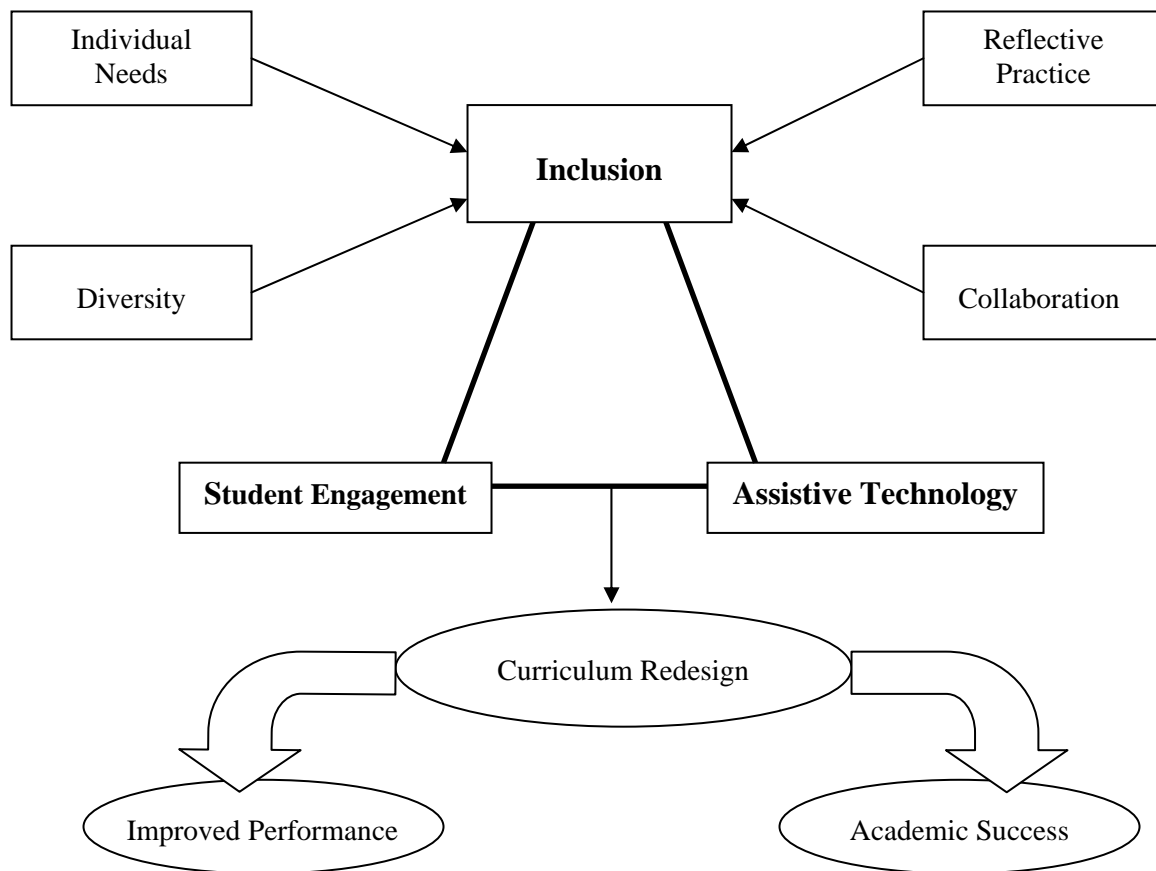


Figure 1. Conceptual model of curriculum redesign for SLD students.

*Inclusion*

Employing an inclusive strategy in the classroom invites SLD students to join society rather than feel ostracized due to the labeling of their specific learning issues. In fact, even using the term *disorder* in the discussion of these students' issues is fundamentally flawed. On a

linguistic level, *challenge* is both more suitable and in keeping with the philosophy of inclusion. Bloom et al. (1999) indicated inclusion is a philosophy that draws students, families, educators and schools together to foster an environment that incorporates acceptance, belonging and community. How can students

truly feel acceptance when the language their caregivers use in discussing them labels their challenges as *disorders*? Elbert and Baggett in their 2003 study quote Salend (2001) in describing inclusion as seeking to “establish collaborative, supportive and nurturing communities of learners that are based on giving all students the services and accommodations they need to learn, as well as respecting and learning from each other’s individual differences” (p. 5). Recognizing differences without negatively labeling them fosters inclusion on a practical level.

Four major principles comprise the inclusion model: diversity, individual needs, reflective practice and collaboration (Elbert & Baggett, 2003).

*Diversity* is achieved when mainstreamed SLD students benefit from interaction with traditional students in the agricultural education classroom. De-labeling and recognizing *disabilities* as *challenges* that each student brings personal differences to the classroom and to student interaction could benefit SLD and traditional student interaction.

*Individual needs* are seen in an agriculture classroom when each student, SLD and traditional, selects one of the various career pathways. Encouraging students to pursue their strengths, rather than pushing them in a specific direction, takes sensitivity and discernment to avoid the negative baggage associated with tracking. *Individual needs* are also observed when the curriculum is adapted to the special needs of the SLD student.

*Reflective practice*, according to Dormody, SeEVERS, Andreasen, and VanLeeuwen (2006), is critical for the teacher who must develop “competency in working with disabled students” (p. 94). Reflection is critical to all teachers but particularly necessary when dealing with the unfamiliar challenges faced when instructing SLD students to navigate the challenges particular to them.

*Collaboration* is observed when the teacher works with parents, specialists, and community, and when interaction takes place between the SLD student and non-disabled peers. Parents know their children better than anyone in this interaction triangle. Seeking their input in how their children learn and interact could save time and energy for both teachers, SLD students and their peers.

### *Student Engagement*

The theory of engagement focuses on student motivation and strategies to increase engaging tasks and activities in the curriculum. In a study by Shernoff et al. (2003) a conceptualization of student engagement addressed motivation through the culmination of concentration, interest, and enjoyment. Based on flow theory, defined as a “symbiotic relationship between challenges and skills needed to meet those challenges” (p. 160), concentration, interest and enjoyment during a learning activity must be experienced simultaneously, thus creating “flow” (p. 161). “When flow is experienced by the learner, it is believed that one’s skills are neither over-matched nor under-utilized to meet a given challenge” (p. 160).

### *Assistive Technology*

Assistive technology will provide the accommodations needed by SLD students with specific learning disabilities (Forgrave, 2002) and may aid in creating flow by balancing skill with challenge for each SLD student. Assistive technology not only helps deliver the information, but will also enable students to complete tasks more efficiently and independently. This leads to improved performance and greater academic success, and can “act as a lifeline to students with learning disabilities” (Hasselbring & Bausch, 2006, p. 72).

### *Curriculum Redesign*

Six major principles of effective instructional design (Heward, 2009) help to guide curriculum redesign for SLD students, including:

- Big Ideas – selected concepts that facilitate knowledge acquisition.
- Conspicuous Strategies – sequence of teaching to make learning steps explicit.
- Mediated Scaffolding – temporary learning support for students; faded over time.
- Strategic Integration – instructional sequencing relates old and new knowledge.
- Judicious Review – adequate sequence and schedule of learning opportunities.
- Explicit Instruction – presenting and monitoring repeated learning opportunities incrementally.

### Purpose/Objectives

The purpose of this study was to redesign a unit of instruction from *The Illinois Core Curriculum* (ISBE, 2004) in a manner appropriate to the SLD student, administer the lessons to students in secondary agricultural courses, and compare gain scores through pre- and posttests for both treatment and control groups. The specific objectives were:

1. Develop a demographic profile of the participating schools in the curricular redesign study.
2. Redesign an existing unit in the Horticulture Cluster of *The Illinois Core Curriculum* (ISBE, 2004) according to the needs of SLD students.
3. Compare/contrast the gain scores of SLD students in agricultural education classes who were administered the redesigned curriculum with the gain scores of SLD students who were administered the existing state curriculum.
4. Compare/contrast the gain scores of non-learning disabled students in agricultural education classes who were administered the redesigned curriculum with the gain scores of non-learning disabled students who were administered the existing state curriculum.

### Methods/Procedures

The target population for this pilot project was agricultural education students enrolled in Introduction to Agriculture courses ( $N = 197$ ) in five high schools in the federally designated economically distressed area called the Illinois Delta Region (Anna-Jonesboro H.S., Carmi-White County H.S., Marion H.S., Pinckneyville Community H.S. and Shawnee H.S.). Utilizing IEP information, the agricultural education teacher at each site identified the SLD students and non-SLD students in each class. Students from each of the two groups were then randomly assigned to treatment and control groups to receive instruction using the redesigned curriculum and *The Illinois Core Curriculum*.

Eight of the ten intervening variables identified by Joy and Garcia (2000) were addressed in this study of computer-aided instruction; including random assignment of groups, adequate sample size ( $N = 197$ ), pre-

testing to account for prior knowledge, grouping by student ability, accounting for differing learning styles through the six major principles for instructional design, teacher effects by utilizing five different sites and their instructors, instructional method by utilizing the state core curriculum as a basis of instruction, and media familiarity by providing instruction for use of a simple but effective computer application.

### Instrumentation

The Illinois State Board of Education (2004) has produced *The Illinois Core Curriculum* to meet state learning standards for five cluster areas in agriculture; the Core included 746 lessons in 165 units. One unit of instruction was redesigned in a manner appropriate to the SLD student. Students from agricultural education programs in the five selected schools in the Illinois Delta Region were randomly assigned to treatment and control groups. Pre- and posttests were conducted in this quasi-experimental study to assess the effectiveness of the redesigned curriculum.

Prior to initiating the study, consent forms were signed by school administrators at the research sites approving the study and assuring parental consent would be obtained. The study was then approved by the university Institutional Review Board for research with human subjects (Assurance # 00005334).

In redesigning the three existing horticulture lessons from *The Illinois Core Curriculum for Agriculture*, technology choices were examined. Since King-Sears and Evmenova (2007) called for technology that is efficient and cost effective, PowerPoint software was selected as the medium. To help integrate the technology into instruction, and to accommodate varied disabilities, the lessons employed a self-paced format, included illustrations with text, used basic English phrases where possible, and included a voice-over application employing the *Special English* technique advocated by Celce-Murcia & McIntosh (1979).

Heward's six major principles of effective instructional design (2009) were employed to guide curriculum redesign. These six principles were also used in a rubric for validation of the redesigned self-paced lessons by peers in both agriculture education and special education. According to Wiersma and Jurs (1990), such a

validation process helps to ensure appropriate language and content.

The pre- posttests (parallel forms) went through a similar process of construction and validation. Content validity was also addressed by adhering to the original lesson plans in *The Illinois Core Curriculum*. The redesigned

curriculum and pre- posttests were pilot-tested the week of February 4-8, 2008 with students enrolled in the Introduction to Agriculture courses at Eldorado High School in Eldorado, Illinois. The pilot of the pre-test yielded an initial Kuder-Richardson Formula 20 (KR-20) reliability coefficient of .68 (Table 1).

Table 1  
*Kuder-Richardson Formula 20 (KR-20) Reliability Coefficients for Pre- and Posttests Prior To and After Test Revision*

	<i>KR-20 Reliability Coefficients</i>	
	1st Pilot Test	2nd Pilot Test
Pretest	0.68	0.90
Posttest	-	0.78

Note. Posttest was a parallel form constructed from 1<sup>st</sup> pilot test resulting in a single reliability coefficient.

An item analysis was then conducted which yielded a difficulty index score and a mean discrimination index for each multiple-choice question. The results helped the researchers to determine whether to retain, reword or remove each test item. The pre- and posttests were also scrutinized to ensure that each item was written according to rules laid down for multiple-choice items by Gronlund & Waugh (2009). A second pilot of the pretest at Eldorado High School yielded a KR-20 reliability coefficient of .90. The posttest was developed from the revised pretest and yielded a KR-20 reliability coefficient of .78 (Table 1).

Researchers on the project went to each of the five school sites during the first two weeks of May, 2008 and, in an effort to model procedures for the teachers, administered the pretests to 209 students enrolled in Introduction to Agriculture courses. Students were then randomly divided into two groups, one group to be given the self-paced redesigned lessons in Horticulture, and the other group to receive traditional classroom instruction from the teacher on the same topics using the lesson plans and power point presentations taken from *The Illinois Core Curriculum for Agriculture*. Both SLD and non-SLD students were included in the treatment and control groups. They were told only one purpose of the study: to compare computer-assisted curriculum with traditionally taught curriculum. They were not told the

curriculum was redesigned for SLD students, so as to keep from singling out the SLD student.

After a week or more, when the three lessons in Horticulture were completed, the teacher was instructed to administer the posttests and return them to the researchers. The pre- and posttests contained 24 multiple-choice items. Students were instructed to record their answers on a Mark Reflex<sup>®</sup> answer sheet by NCS (Pearson NCS, 2008). Given student absences on one of the two tests, 197 useable pre- posttest scores were obtained from the population.

**Results/Outcomes**

Table 2 summarized demographic data for the pilot test site and the study sites. Each research site was a high school incorporating grades 9 through 12 and were located in rural settings, specifically in the Illinois Delta Region. The student population of each school ranged from 158 to 1200. Four of the schools used the traditional 50-minute Carnegie unit based on seven- to eight-period schedules on an 18-week semester. Two of the schools employed an eight-block schedule. The number of minority students in the agricultural education program at each site was negligible, with a maximum of two in any one program. There was considerable representation of SLD students at each site, ranging from 13 to 26 IEPs per program.

Table 2  
Demographic Information on Five Schools in the Study and One School in the Pilot Test

	Research Sites					
	<i>Pilot</i>	<i>Sch. 1</i>	<i>Sch. 2</i>	<i>Sch. 3</i>	<i>Sch. 4</i>	<i>Sch. 5</i>
School Type	Rural	Rural	Rural	Rural	Rural	Rural
Grade Levels	9–12	9–12	9–12	9–12	9–12	9–12
Student Population	345	587	438	1200	506	158
Class Schedule	7 Per.	7 Per.	8 Blk.	7 Per.	8 Blk.	8 Per.
Minority Students	2	2	0	0	2	1
IEPs in Ag Program	25	24	24	16	26	13

Note. Sch.= School, Per.= Period, Blk.=Block.

Except for the smallest school tested in the study, male students far outnumbered the female students (Table 3) in the agricultural education programs tested: 38 males and 11 females in School 1, 32 males and 27 females in School 2, 21 males and 6 females in School 3, 29 males and 17 females in School 4, and 4 males and 4 females in School 5.

Each program again showed a considerable number of SLD students (Table 3) who completed both the pre- and posttests, ranging in number from 3 SLD students in the smallest program to 20 SLD students in one of the larger programs.

Table 3  
Number of Students in Study by Gender and Type of Student

	Research Sites									
	<i>Sch. 1</i>		<i>Sch. 2</i>		<i>Sch. 3</i>		<i>Sch. 4</i>		<i>Sch. 5</i>	
	Trad	SLD	Trad	SLD	Trad	SLD	Trad	SLD	Trad	SLD
Male	25	13	17	15	15	6	18	11	3	1
Female	10	1	22	5	4	2	13	4	2	2
Total	35	14	39	20	19	8	31	15	5	3

Note. 173 subjects of the 197 total provided usable data regarding gender.

A unit of instruction in horticulture composed of three lessons and redesigned by a subject matter specialist included objectives, learning activities, and evaluation instruments and activities. These lessons were produced on CDs, contained voice-over recordings, and employed interactive components to increase student learning and retention for the SLD student. The lessons addressed the following subjects:

- Lesson 1: Understanding horticulture
- Lesson 2: Determining the importance of the horticulture industry
- Lesson 3: Exploring career opportunities in horticulture

The treatment and control groups of both SLD students (Table 4) and traditional students (Table 5) consistently scored higher in the posttest over the pretest. The greater gain scores were obtained for the treatment groups of both types of students, with the traditional students achieving the largest gain scores. It should be noted, however, that the highest mean score achieved by the SLD students in the posttest was 28% (14.03/50) and the highest mean score achieved by the traditional students in the posttest was only 35% (17.31/50).



Table 4  
*SLD Student Pre and Posttest Mean Scores and Gain Scores for Treatment & Control*

Groups	SLD Students						Gain Score
	Pretest			Posttest			
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
Treatment	32	10.34	4.09	32	14.03	4.45	3.69
Control	31	8.87	3.16	31	11.94	4.06	3.07
Gain Score Difference							0.62

*Note.* Gain Score was calculated as posttest minus pretest.

Table 5  
*Traditional Student Pre and Posttest Mean Scores and Gain Scores for Treatment & Control*

Groups	Traditional Students						Gain Score
	Pretest			Posttest			
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
Treatment	65	11.62	3.12	65	17.31	4.02	5.69
Control	69	11.41	3.49	69	15.29	3.62	3.88
Gain Score Difference							1.81

*Note.* Gain Score was calculated as posttest minus pretest.

**Conclusions**

The findings of this study should not be generalized beyond the population of this pre- and posttest quasi-experimental study. However, the amount of data generated does carry implications for agricultural education programs in the whole state, if not the nation. Examination and analysis of the major findings for objectives three and four led to the following conclusions:

1. Redesigned curriculum for agricultural education made a positive difference in student knowledge acquisition for SLD students (treatment group gain score was 3.69; gain score difference between treatment and control groups was .62).
2. Redesigned curriculum for agricultural education made a positive difference in student knowledge acquisition for non-learning disabled students (treatment group gain score was 5.69; gain score difference between treatment and control groups was 1.81).
3. Curriculum redesigned for SLD students resulted in a greater gain scores for non-

learning disabled students in agricultural education than for SLD students.

4. Overall mean scores in the posttest were low for both groups of students; SLD student mean score in the posttest was 28% (14.03/50) while the traditional student mean score in the posttest was 35% (17.31/50).

**Implications**

Maintaining theoretical consistency requires reflective practice on the teacher’s part and is particularly important in addressing the special needs of SLD students. In utilizing reflective practice in the composition of this article, the author realized that even the language and labels used could be detrimental to students faced with learning challenges. The theoretical underpinnings of inclusion run counter to much of the language used in addressing these students. The terms “disabled” and “disability” have negative connotations that could affect consciously or unconsciously a student bearing such a label. Student Learning Challenge (SLC) may be more appropriate than Student Learning Disability (SLD), as each student has strengths

and weaknesses in relation to education. Curricular modification for the more significantly learning-challenged is a start. Teaching with the theoretical moorings of *inclusion*, and incorporating the four major principles of *diversity*, *individual needs*, *reflective practice* and *collaboration* which comprise it, are essential.

A previous study (Pense, 2008) showed that IEPs make up 23% of the students in Illinois agricultural education classrooms. Students with specific learning disabilities must have their needs met if they are to compete or contribute in the agricultural workforce. The literature further shows that rural America faces greater challenges with poverty, and that a correlation exists between poverty and learning disability (Bajema, 2002). Avenues for channeling additional funding should be sought to help rural schools meet the special needs of SLD students through curriculum redesign.

In spite of consistent increases in posttest scores for both SLD and traditional students in agricultural education classrooms, the posttest mean scores were excessively low for both groups (28% and 35%, respectively). In redesigning the agricultural education curriculum, a motivating teaching method should be found. In addition to technology enhancement, voice-over recordings, and curriculum design methodologies, methods such as digital gaming may provide the hook that is needed to capture the interest of secondary learners in the agricultural education classroom.

### Recommendations

Redesign of lessons in *The Illinois Core Curriculum for Agriculture* effectively increased learning for both SLD students and the traditional students in agricultural education classrooms. Therefore, further studies should investigate ways to modify and further develop the state curriculum in agricultural education in order to better educate and train our SLD student population.

This study provided an analysis of only three redesigned lessons. This first attempt begs further study of additional methods/models to include in curriculum redesign. There should also be an investigation into the skill and training needed by instructors. Literature (Sorensen, Tarpley, & Warnick, 2005) indicates a need for in-service training for agricultural educators to become effective teachers of students with specific learning disabilities. Analysis of the teacher's role in implementing redesigned curriculum is warranted. In addition, longitudinal studies to evaluate motivation and engagement would help agricultural educators understand how to better sustain interest and learning over time. It is recommended that:

1. Experimental research be conducted to discover how to further increase motivation in curriculum redesigned for the SLD student; thus, increasing the overall low mean scores.
2. A redesign of the entire *Illinois Core Curriculum for Agriculture* be implemented to accommodate the learning needs of the SLD student.
3. Skills and training in the use of redesigned curriculum for the SLD student be identified, developed, and required in both agricultural education baccalaureate programs and for in-service programs of secondary agricultural educators.
4. Studies be conducted on how to sustain interest and learning over time in redesigned curriculum for SLD students.
5. Additional funding be sought to help rural schools meet the special needs of SLD students.
6. Teacher understanding and working within the theoretical framework of *inclusion* be promoted.
7. Similar enhanced materials addressing multiple learning modalities be developed for all students, including non-learning disabled.

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