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HIGHER-ORDER AND LOWER-ORDER THINKING SKILLS ACHIEVEMENT IN SECONDARY-LEVEL ANIMAL SCIENCE: DOES BLOCK SCHEDULING PATTERN INFLUENCE END-OF-COURSE LEARNER PERFORMANCE?

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Abstract

Block scheduling has been a significant change in the organizational structure of many schools. However, little is known about its effects on agricultural education and on cognition. This study compared higher- (HOTS) and lower-order thinking skills (LOTS) achievement of students enrolled in animal science on a Modified A/B Block schedule to that of students on a Nine- Week (4X4) Block schedule. Twenty-two teachers participated-I2 Modified A/B schools with I89 students and IO Nine-Week (4X4) schools with 136 students. Achievement was measured by an examination consisting of two scales based on Newcomb and Trefz ' (1987) "levels of learning" model. Thirty-three HOTS and 23 LOTS items were included. Teachers responded to a questionnaire describing themselves and their schools. Student achievement for LOTS was slightly more than half of the 'conventional" 70% passing standard and slightly less for HOTS. T-tests revealed student performance on a Modified A/B schedule was significantly superior. However, hierarchical regression analysis revealed that the moderator variables student length of FFA membership and teacher tenure significantly explained student variability for HOTS achievement. After effects of the moderator variables were removed, then scheduling pattern did not explain additional variation.

Introduction and Theoretical Framework

Elmore (1995) stated, "Over the past decade the United States has been engaged in the most sustained period of educational reform since the Progressive Era" (p. 356). Evidence of impetus for this "reform" has been well documented by reports such as Prisoners of Time (National Education Commission on Time and Learning, 1994) and Breaking Ranks: Changing an American Institution (NASSP, 1996). All of these reports called for a restructuring of the fundamental components of the American educational system, and frequently targeted "time" and its use in school-day scheduling patterns as a basic element that must be altered. Moreover, learning theorists (Bloom, 1974; Carroll, 1989) have stated that time and its use is a significant and essential component of student learning. Further, Karweit and Slavin (1981) maintained, ". . .the ambiguity of the research studies to date, make the continuation of studies of time and learning important" (p. 158).

Researchers (Carroll, 1990; Kirby, Moore, & Becton, 1996) have maintained that one of the most constant features of America's high schools is the structure of the school day. In support, Carroll (1990) contended that "For three-quarters of a century-a period characterized by immense social, political, economic, and technological changes-the high school has not changed its basic form of organization" (p. 360). Moreover, investigators have said, "The way time is organized in schools may have contributed to the educational deficiencies in American education identified in such reports as A Nation at Risk" (Wortman, Moore, & Flowers, 1997, p. 440).

However, Cawelti (1997) concluded, "The most visible and perhaps significant change in the organization of the high school is the block

schedule" (p. 41). DiRocco (1998/1999) asserted, "Intensive schedules [i.e., block scheduling] can be a powerful catalyst for change and for improved instruction in our secondary schools when implemented properly" (p. 83). Although, many "variations" of block scheduling exist (Canady & Rettig, 1995), the Modified A/B (Alternating Day) Block Schedule and the Nine-Week Accelerated (4X4) Semester Block Schedule are two predominant patterns. On the Modified A/B Block Schedule, the school day is divided into four instructional blocks of approximately 90 minutes each. Students alternate class attendance between "A" day classes and "B" day classes, and may be simultaneously enrolled for as many as eight different courses. On this schedule, most courses meet every other day for an 18-week semester. Conversely, on the Nine-Week (4X4) Block Schedule the school day is also divided into four instructional blocks of approximately 90 minutes each, but students attend the same four classes each day for the nine-week period.

Watson (1998) asserted, "In a block schedule, the [learning] tasks can be designed to take more time, be of greater depth, [and] require more inductive or higher-order thinking skills.. ." (p. 97). Torres and Cano (1995a) stated, "The use of thinking skills in problem situations is universally recognized as a prominent objective for all educational academies" (p. 46), including agriculture. Moreover, researchers Cano and Newcomb (1990) concluded that agriculture teachers "should purposefully create learning situations which assist in the development of higher cognitive abilities in students" (p. 51). Further, Torres and Cano (1995b) argued, "Cooperative learning, integrating higher-order thinking skills into the current curriculum, and a more constant use of the problem-solving approach to teaching are but a few means by which we can excel in teaching higher-order thinking skills" (p. 9).

Concerning thinking behaviors, Bloom, Engelhart, Furst, Hill, and Krathwohl (1956) described six levels of cognition, that is, levels of thinking often referred to as Bloom's Taxonomy. This approach to describing thinking behaviors delineated cognition into lower- and higher-order thinking skills and conceptualized them in a hierarchical fashion (Bloom et al., 1956; Cano & Martinez, 1989; Newcomb & Trefz, 1987; Torres & Cano, 1995a; Whittington, Stup, Bish, & Allen, 1997). Using Bloom's model as a framework, agricultural educators Newcomb and Trefz (1987) developed a similar model for classifying cognitive behaviors that consist of "four levels of learning": remembering, processing, creating, and evaluating (Figure 1).

Whittington et al. (1997) stated, "Research supports the theory that thinking at higher levels of cognition (thinking critically) is an indispensable skill and must be reinforced in schools" (p. 47). Ware and Kahler (1988) concluded, "that teaching critical thinking is important in vocational agriculture programs" (p. 283). In support of this conclusion, Cano and Martinez (1989) recommended, "Students ofvocational agriculture should be challenged to develop stronger cognitive abilities and critical thinking abilities at higher levels through the instruction they receive" (p. 364). However, Cano (1990) stated that there was "a paucity of findings regarding vocational education students' level of cognitive performance" (p. 74), and, specifically, research in determining the level of cognitive performance of vocational agriculture students was lacking" (p. 74). Further, Whittington (1995) recommended that additional research was needed to investigate non-teacher variables that may be influencing the level of cognition obtained during instruction, Moreover, Shortt and Thayer (1988/1999) asserted:

> How time is used in the classroom and what the relationship may be between classroom instructional time and learning are two variables that need additional study to determine the correlation between

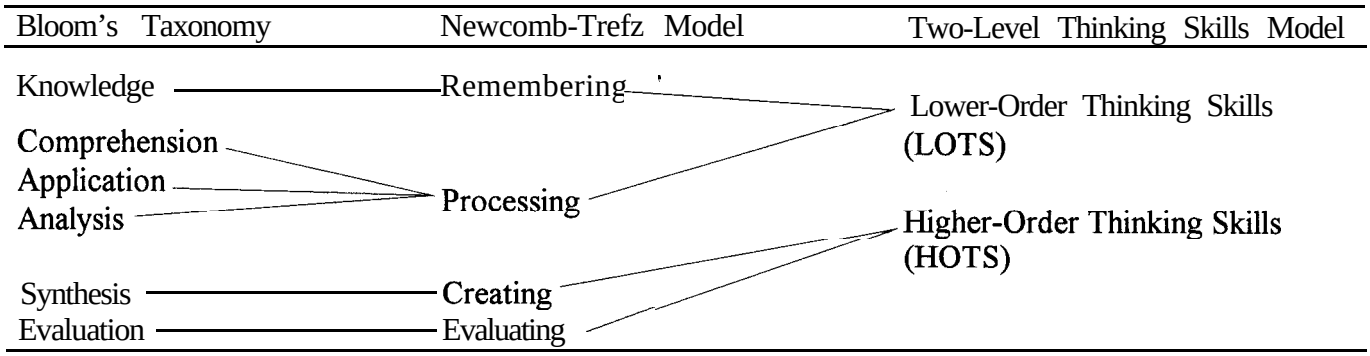

Figure 1. A Comparison of Bloom's Taxonomy, Newcomb-Trefz Levels of Learning Model, and a Two-Level Thinking Skills Model (Extended from a comparison of Bloom's Taxonomy and the Newcomb-Trefz Model (Whittington, 1995) Journal of Agricultural Education)

> time and student achievement as they relate to block scheduling. (p. 81)

However, block scheduling has been accompanied by limited and somewhat conflicting results regarding its effect on student thinking skills and student achievement (North Carolina Department of Public Instruction, 1996; Wortman et al., 1997). North Carolina researchers (Kirby et al., 1996) found agriculture teachers to be "neutral or undecided' (p. 357) when responding to the statement, "Student achievement has improved with block scheduling" (p. 358). Two comparable Texas studies (Connor, 1997; Lindsey, 1997) found similar results. Conversely, researchers in Kentucky (Brannon, Baker, Morgan, Bowman, & Schmidt, 1999) concluded, "Agriculture teachers agreed that as a result of block scheduling learning is more meaningful for all students..." (p. 197). Yet, little is known about the effects of school-day scheduling pattern on secondary-level agricultural education and its potential for influencing the cognitive development of students (Kirby et al., 1996; Wortman et al., 1997). Is there a difference in student achievement for students enrolled in an agriscience course, depending on the block-scheduling pattern?

Purpose and Research Questions

The purpose of this study was to compare the higher- and lower-order thinking skills achievement of students enrolled for a secondary-level course in animal science, across two school-day scheduling patterns. These research questions guided this study:

1. What are selected characteristics of students enrolled in and instructors teaching a secondary-level course in animal science?
2. What is the level of achievement for higher-order thinking skills, as described by Newcomb and Trefz (1987), for students enrolled in animal science? a) Does level of achievement for higher-order thinking skills of students on a Modified A/B (Alternating Day) Block schedule differ from that of students on a Nine-Week Accelerated (4X4) Semester Block?
3. What is the level of achievement for lower-order thinking skills, as described by Newcomb and Trefz (1987), for students enrolled in animal science? a) Does level of achievement for lower-order thinking skills of students on a Modified A/B (Alternating Day) Block schedule differ from that of students on a Nine-Week Accelerated (4X4) Semester Block schedule?
4. Do moderator variables, e.g., student and teacher variables, explain variation in

student achievement, and does scheduling pattern significantly explain variation in student achievement after effects of moderator variables have been removed?

Methods and Procedures

This was a descriptive study that employed the causal-comparative method to describe and explore possible cause-and-effect relationships between school-day scheduling patterns and the achievement of intact groups. Gall, Borg, and Gall (1996) stated that, "the major advantage of the causal comparative method is that it allows us to study cause-and-effect relationships under conditions where experimental manipulation is difficult or impossible" (p. 383).

The target population (Gall et al., 1996) consisted of students and instructors teaching the agriscience course Animal Science (AGSC 332) in Texas public schools during the fall of 1998. Schools that had offered/taught this course for the school years 1996-97 and 1997-98 (N = 3 88) were obtained from the Texas Education Agency and served as the sampling frame.

The "experimental units" for this study were individual agriscience classes and teachers, but individual students were the sampling units within a class. This was a form of cluster sampling, which, according to Gall et al. (1996) "is used when it is more feasible to select groups of individuals rather than individuals from a defined population" (p. 227). The responding sample consisted of 22 "volunteer" teachers and schools, representing two different school-day scheduling patterns, i.e., 12 Modified A/B Block scheduled schools with 189 students and 10 Nine-Week (4X4) Block scheduled schools with 136 students. Because the data for this study were provided by a volunteer sample, the results are generalizable only to subsequent similar volunteer samples.

The students completed a two-part instrument. Part one consisted of selected demographic items, e.g., length of FFA membership. Part two was an end-of-course achievement examination. Glaser (1963) maintained that achievement tests were appropriate for determining "the degree to which the student has attained criterion performance" (p. 5 19). The examination was developed from recommended curriculum materials for the agriscience course Animal Science (AGSC 332) (Instructional Materials Service, n.d.).

The examination included 56 multiple-choice items selected for content validity in the areas of nutrition, reproduction, health, and management of domestic animals. Three agricultural educators-a curriculum specialist, a classroom teacher, and a measurement specialist, reviewed the items for clarity and content. The examination was sub-divided into two scales based on the Newcomb and Trefz (1987) "levels of learning" model (Figure 1). The two scales consisted of 33 higher- and 23 lower-order thinking skills items, respectively (Edwards, 1999). The lower-order thinking skills (LOTS) portion of the examination was made up of remembering and processing items; the higher-order thinking skills (HOTS) scale contained items at the creating and evaluating levels of learning (Newcomb & Trefz, 1987). The Cronbach's coefficient alpha reliability estimate for the lower-order thinking skills scale was .79, while the higher-order thinking skills scale had a reliability estimate of .78. Finally, teachers responded to a questionnaire that included selected multiple-choice items describing themselves and their schools.

A researcher-developed packet consisting of student questionnaires/examinations, teacher questionnaires, pre-coded scan sheets, and postage-paid return envelopes were mailed to the participating agriscience teachers. Due to varying end-of-course dates, two general mailings were necessary. Teachers administered the student questionnaires/examinations and completed their questionnaires at or about the same time.

The student scan sheets were coded so that they could be identified with their particular teacher and school-day schedule. Following scanning, the data were entered into a Microsoft Excel 97 spreadsheet file and then imported into an SPSS 7.5 data file. T-tests were performed to compare means and explore differences for research questions two and three, with an a priori alpha of $p < .05$. Multiple regression analyses with hierarchical order of entry of predictor variables were performed to answer research question four.

Results and Findings

As shown in Table 1, slightly more than one-half of the participating students were male and nearly 46 percent were female. Almost three-fourths were Anglo, while one-fourth identified themselves as "People of Color." Slightly more than one-third had never been an FFA member, and approximately two-thirds had been members for one or more years. Nearly 70% indicated at least "some experience" with domesticated animals, while three-in-ten said they had "little" or no experience. Regarding high school grade classification, slightly more than three-in-ten of the students were twelfth graders, nearly four-in-ten were eleventh graders, one-fourth were in the tenth grade, and approximately one-in-twenty identified themselves as ninth graders (Table 1).

Table 1. Selected Characteristics of Students (N=325) Enrolled in and Instructors (N=22) Teaching Animal Science

Characteristic	9-Week Block n	Modified A/B Block n	Overall N	Overall Percent
	Students			
Gender[a]				
Male	68	105	173	53.2%
Female	67	82	149	45.8%
Ethnicity[b]				
Anglo (White Non Hispanic)	84	152	236	72.6%
People of Color	51	33	84	25.8%
FFA Membership[c]				
Never	73	42	115	35.4%
Less than one year	24	35	59	18.2%
Two years	19	44	63	19.4%
Three years	15	48	63	19.4%
Four years	4	19	23	7.1%
Experience with Domestic Animals[d]				
None	18	9	27	8.3%
Little experience	37	34	71	21.8%
Much experience	22	30	52	16.0%
Some experience	36	43	79	24.3%
Great experience	23	72	95	29.2%
High School Grade Classification[c]				
12th grade	44	59	103	31.7%
11" grade	56	62	118	36.3%
10" grade	31	53	84	25.8%
9" grade	4	14	18	5.5%

(table continues)

Characteristics	9-Week Block n	Modified A/B Block n	Overall N	Overall Percent
	Instructor			
Gender				
Male	7	10	17	77.3%
Female	3	2	5	22.7%
Highest Level of Education				
Bachelor's degree	4	7	11	50.0%
Master's degree	6	5	11	50.0%
Years of Experience as an Agriscience Teacher				
1 – 12 years	7	4	11	50.0%
13 or more years	3	8	11	50.0%
Years of Service at Current School				
1 – 10 years	7	6	13	59.1%
11 or more years	3	6	9	40.9%
Number of School-Day Scheduling Patterns Teacher has Taught Under				
One	1	1	2	9.1%
Two	3	4	7	31.8%
Three or more	6	7	13	59.0%

[a]Three students did not answer this question, [b]Five students did not answer this question, [c]Two students did not answer this question, [d]One student did not answer this question.

Slightly more than three-fourths of the teachers were male and nearly one-fourth were female (Table 1). Concerning their education, the teachers were evenly divided, that is, half held only a bachelor's degree while the other half had earned a master's degree (Table 1). Years of experience as an agriscience teacher was also evenly split with 50 percent of the teachers having taught 12 or fewer years, and 50 percent indicating 13 or more years of service. When asked about years of service at their current school, nearly six-in-ten replied that they had taught at their current school for 10 or fewer years, while slightly more than four-in-ten indicated 11 or more years of service. Four-in-ten teachers had taught under two or fewer schedules, while 59 percent had experience teaching under three or more school-day scheduling patterns (Table 1).

The higher-order thinking skills achievement mean for all students was $\underline{M}$=33.69, $\underline{SD}$=8.34 (Table 2) or less than half of the "conventional" 70% passing standard. Students on a Modified A/B schedule scored significantly higher ($\underline{M}$=37.56, $\underline{SD}$=8.72) than students on a Nine-Week (4X4) Block schedule ($\underline{M}$=29.04, $\underline{SD}$=5.04) (Table 2). Further, the lower-order thinking skills achievement mean for all students was $\underline{M}$=36.42, $\underline{SD}$=1 1.03 (Table 2) or slightly more than half of the "conventional" 70% passing standard. Students on a Modified A/B schedule scored significantly higher ($\underline{M}$=4 1.09, $\underline{SD}$= 11.72) than students on a Nine-Week (4X4) Block schedule ($\underline{M}$=30.82, $\underline{SD}$=7.22).

A t-test was conducted to compare the end-of-course achievement for higher-order thinking skills for the Modified A/B (Alternating Day) Block scheduled students versus those who were Nine-Week Accelerated (4X4) Semester Block scheduled (Table 3). This procedure produced a mean difference of 8.52, $\underline{t}$ (18.04) = 2.86, $\underline{p}$ = .010 (Table 3).

Table 2. Means and Standard Deviations for End-of-Course Thinking Skills Achievement by Scheduling Pattern, (N=22)

School-Day Scheduling Pattern	n	M	SD
Higher-Order Thinking Skills			
Modified A/B Block	12	37.56	8.72
Nine-Week (4X4) Block	10	29.04	5.04
Overall	22	33.69	8.34
Lower-Order Thinking Skills			
Modified A/B Block	12	41.09	11.72
Nine-Week (4X4) Block	10	30.82	7.22
Overall	22	36.42	11.03

The difference was significant at an alpha level of .05. That is, the higher-order thinking skills performance of students on a Modified A/B Block schedule was significantly superior to that of the Nine-Week (4X4) Block schedule students. Further, a t-test was conducted to compare the end-of-course achievement for lower-order thinking skills (Table 3). This procedure produced a mean difference of 10.27, t (18.59) = 2.52, p = .021 (Table 3). The difference was significant at an alpha level of .05. That is, the lower-order thinking skills performance of students on a Modified A/B Block schedule was significantly superior to that of the Nine-Week (4X4) Block schedule students.

To determine if school-day scheduling patterns significantly explain variability in student achievement after the effects of selected student and teacher variables were removed, multiple regression analyses with hierarchical order of entry of variables were performed. This procedure was done to control initial non-equivalence in the two research groups. Correlation analysis revealed that there was a statistically significant relationship between the student variable length of FFA membership and end-of-course higher-order thinking skills achievement (r = .46) (Table 4). That is, the greater the length of time the student had been a member of the FFA, the better they performed on the higher-order thinking skills achievement examination. Moreover, similar analysis demonstrated that there was a statistically significant relationship between the teacher variable teacher tenure and higher-order thinking skills achievement (r = .52) (Table 4). As a teacher's length of tenure increased, the higher-order thinking skills achievement of their students increased. (The variable "teacher tenure" combined an instructor's years of experience as an agriscience teacher and their tenure at their current school. The resulting scale had a reliability coefficient estimate of .82.

Therefore, because ofpositive associations with student achievement on HOTS (Davis, 197 1), these two moderator variables were entered into a multiple regression analysis equation as step one of a hierarchical order of entry procedure. Then, to determine if school-day schedules significantly explained additional student variability for end-of-course achievement, the scheduling pattern variable was entered in step two of the procedure. Thus, step two included the variable Modified A/B versus Nine-Week (4X4) Block.

In Table 5, step one portrays regression of the variable higher-order thinking skills achievement on the variable student FFA membership and teacher tenure. A statistically

Table 3. End-of-Course Thinking Skills Achievement: Contrast of Modified A/B versus Nine-Week (4X4) Block Scheduling

Source	M	Mean Difference	S.E.	t	df	sig.
Higher-Order Thinking Skills						
Contrast[a]						
Modified A/B Block	37.56					
		8.52	2.98	2.86	18.04	.010*
9-Week (4X4) Block	29.04					
Lower-Order Thinking Skills						
Contrast[a]						
Modified A/B Block	41.09					
		10.27	4.08	2.52	18.59	.021*
9-Week (4X4) Block	30.82					

[a]Contrast does not assume equal variances.
*$p < .05$.

Table 4. Relationshins[a] Between Students' End-of-Course HOTS and LOTS Achievement in Animal Science and Selected Student and Teacher Variables

Variables	HOTS Achievement	LOTS Achievement
Student Length of FFA Membership	.46*	.38 ns
Teacher Tenure[b]	.52*	.42 ns

[a]Pearson Product Moment Correlation Coefficient. [b]Combines an instructor's years of experience as an agriscience teacher and their length of service at their current school.
*$p < .05$.

significant amount of student variability for higher-order thinking skills achievement was explained by this entry: $R^2 = .370$, $F = 5.585$, $p = .012$. But, when the variable Modified A/B versus Nine-Week (4X4) Block schedule was entered, there was not a significant contribution to the explanation of variance, R^2 Change = .069, $F = 2.215$, $p = .154$. Further, when the dependent variable lower-order thinking skills achievement was regressed on the independent variables entered in step one, i.e., student FFA membership and teacher tenure, the amount of variance explained was $R^2 = ,245$, $F = 3.083$ $p = .069$ (Table 5), which was not significant at an alpha level of .05. The variable Modified A/B versus Nine-Week (4X4) Block schedule was entered into the regression equation in step two; it did not explain additional student variability for lower-order thinking skills achievement, R^2 Change = .073, $F = 1.939$, $p = .181$ (Table 5).

Conclusions, Implications, and Recommendations

Glaser (1963) contended "achievement tests are employed to discriminate among treatments, that is, among different instructional procedures [e.g., scheduling patterns] by an analysis of group differences" (p. 520). This study compared the higher- and lower-order thinking skills achievement of students enrolled for a secondary-level course in animal science, across two school-day scheduling patterns. The end-of-course higher-order thinking skills achievement for

Table 5. Hierarchical Regression of Thinking Skills Achievement on Selected Student and Teacher Variables and School-Day Block Scheduling Pattern

Variable(s) Entered	R Square	R Square Change	F Change	Sig. of Change
Higher-Order Thinking Skills				
Step 1				
Student FFA Membership and Teacher Tenure	0.37	0.37	5.585	0.012
Step 2				
Modified A/B versus Nine-Week (4X4) Block	0.439	0.069	2.215	0.154
Lower-Order Thinking Skills				
Step 1				
Student FFA Membership and Teacher Tenure	.245	.245	3.083	.069
Step 2				
Modified A/B versus Nine-Week (4X4) Block	.318	.073	1.939	.181

all students was less than half of the "conventional" 70% passing standard, while their lower-order thinking skills achievement was slightly more than half (Table 2). Webster and Miller (1998) found similar results for an animal science examination administered to high school seniors in 12 Midwestern States. They concluded that the students were not strongly intrinsically motivated to excel on the test, and that "this factor most likely explains why the students did not perform better on the exam" (p. 3 18). Other researchers (Enderlin & Osborne, 1992) have supported this conclusion.

However, in this study, was there a significant lack of "alignment" or "congruence" between the curriculum these students were actually taught and the course content on which they were eventually assessed? Hoyle, Steffy, and English (1994) suggested "the result of incongruence is normally lower test performance on the part of the students, particularly if the test has been selected because it was congruent with the written curriculum" (p. 98). The examination used in this study was based solely on recommended curriculum materials for the agriscience course Animal Science (AGSC 332) (Instructional Materials Service, n.d.). Was this is a valid procedure if the requisite "alignment" did not exist?

The higher- and lower-order thinking skills performance of students on a Modified A/B Block schedule was significantly superior to that of the Nine-Week (4X4) Block schedule students (Table 3). Thus, it appeared that the Modified A/B schedule was superior to the Nine-Week (4X4) schedule. Yet, when multiple regression analyses with hierarchical order of entry were performed, and the moderator variables student length of FFA membership and teacher tenure were entered in step one, variability in higher-order thinking skills achievement was significantly explained (Table 5). However, in step two, when the scheduling pattern variable Modified A/B versus Nine-Week (4X4) Block was entered, there was no additional significant explanation of student variability (Table 5). Further, in the case of lower-order thinking skills achievement neither variable significantly explained student variability (Table 5). Thus, only with caution could one conclude that the Modified A/B pattern is the superior schedule.

This study suggests that there may be an "incongruence" between the actual curriculum materials that teachers used to teach animal science and the recommended instructional materials. Hoyle et al. (1994) stated, "curriculum mapping can reveal what was taught, in what order, and for how long.. ." (p. 90). So, a form of "curriculum mapping" should be used to identify the curriculum materialsused by the instructors for this course. It might also be useful to examine the relationship between this study's teachers' use of the recommended materials and the performance of their students.

This study should be "replicated' using quasi- or experimental design procedures that will control potential extraneous variables (i.e., student length of FFA membership and teacher tenure), and thereby improve the generalizability of future results.

Although with reservations, this study did find a significant difference in the performance of learners depending on which block schedule pattern they received instruction. Would this result have been similar for other agriscience courses? Mindful of this, it is recommended that this study be replicated for other agriscience courses.

This research could not significantly explain student variability for the end-of-course lower-order thinking skills achievement of students enrolled on a Modified A/B schedule versus those who received instruction on a Nine-Week (4X4) Block schedule. Are there other moderator variables that significantly explain this variability? Further, are there other variables that significantly explain student variability for higher-order thinking skills achievement beyond those identified by this research? It is recommended that further research be performed to identify this (these) variable(s).

In addition to the two patterns investigated by this study, it appears that there are numerous "variations" of block scheduling regimens (Canady & Rettig, 1995). Therefore, it is recommended that a two-part study be conducted. The purpose of the first part would be to identify and describe these varied block-scheduling patterns. Then, in part two one might conduct a comparative study to determine if there are significant differences in student achievement depending on the learner's school-day schedule (Cobb, Abate, & Baker, 1999).

Further, instructors teaching on aModified A/B schedule may be exhibiting teaching behaviors that are related to their students' superior performance. However, the relationship between the use of school-day time (i.e., scheduling patterns) and student performance remains ambiguous. Other researchers (Canady & Rettig, 1995; Carroll, 1994) have suggested that there is a causal relationship between the use of block scheduling and an improvement in school climate (i.e., classroom environment), and further, the important role that "climate" can play in the behaviors of students and teachers (Bloom, 1974; Hoyle et al., 1994; Kruse & Kruse, 1995). So, research should be undertaken to investigate how changes in school-day scheduling patterns may positively influence factors that comprise a school's "climate," and, subsequently, create learning environments that are more conducive to improved student achievement. For example, instructors teaching on different scheduling patterns may be exhibiting different teaching behaviors that are related to their students' performance. To this end, case studies or other qualitative techniques could be conducted profiling the teaching behaviors of these instructors.

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