

An Evaluation of Timetable Innovation in Ontario

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Une étude faite en Ontario veut connaître les conséquences des différents horaires (un crédit par semestre, un demi-crédit par semestre, un demi-crédit par trimestre) sur la croissance sociale, intellectuelle et affective des élèves du secondaire. L'étude a porté sur quatre aspects principaux: le temps consacré à l'enseignement, les relations interpersonnelles, le rendement de l'élève ainsi que sa motivation.

Les données permettent de démontrer qu'il existe une relation significative entre les divers types d'horaire et le temps consacré à l'enseignement ainsi que les relations interpersonnelles. On émet l'hypothèse suivante: la réorganisation de l'horaire modifie l'emploi du temps consacré à l'enseignement; des changements dans le temps consacré à l'enseignement provoquent des modifications au niveau des relations interpersonnelles.

En conclusion, on y discute des conséquences que peuvent avoir ces découvertes au niveau de l'instauration d'un nouvel horaire et on propose quelques jalons qui peuvent orienter dans l'avenir la recherche.

INTRODUCTION

In the last five years there has been a dramatic increase in the number of Ontario secondary schools that have adopted some form of semestered timetable organization. In 1971/72 there were only 24 semestered schools in the province; by the fall of 1975 there were more than 150. The conversion of Ontario schools to semestering parallels the rapid acceptance of the innovation in British Columbia (Ellwood, 1970), Alberta, and Saskatchewan (Dawe, 1968; Piowar, Note 1) in the late 1960s and early 1970s.

The popularity of semestering is founded on the belief that this organizational change makes a positive contribution to the social, emotional, and cognitive growth of students. Attempts to test the validity of this belief have been infrequent and largely confined to small-scale, school-based research projects, the findings from which cannot be generalized to other contexts because of their failure to control for the effects of intervening variables.¹ The research project reported here attempted to remedy this deficiency by identifying the claims made for timetable reorganization, formulating these claims as verifiable hypotheses, and testing the validity of the hypotheses with data from schools, some having innovative and some noninnovative timetable organizations. The inquiry

was confined to pure forms of full-credit semestering, half-credit semestering, and trimestering.

DEFINITIONS

Full-credit semestering was defined as 4–5 instructional modules per day, each 60–75 minutes in length; each course extends for half a year and has a value of one credit. Half-credit semestering was defined as 7–9 instructional modules per day, each 35–45 minutes in length; each course extends for half a year and has a value of one-half credit. Trimestering was defined as 7–9 instructional modules per day, each 35–45 minutes in length; each course extends for one-third of a year and has a value of one-third credit. A traditional schedule was defined as 7–9 instructional modules per day, each 35–45 minutes in length; each course extends for a full year and has a value of one credit.

HYPOTHESES

The hypotheses used in the study were derived from the explicit and implicit objectives for change articulated by the advocates of semestering. Schools which have adopted semestering and trimestering rarely do so on the basis of a systematic theoretical framework. Rather the decision to adopt is made in anticipation that the benefits of organizational change claimed in other school contexts will accrue. The hypotheses formulated below have been constructed by reviewing the extant school-based evaluation literature (discussed in greater detail in Ross, Ducharme, & Davis, 1976) and attempting to relate the claims to specific components of the timetable organizations in question.

Hypothesis 1. The longer classroom period of full-credit semestering will result in a greater variety of instructional techniques being used in the classroom since there are some instructional strategies that become practical only with a larger time block. In addition the longer classroom period of full-credit semestering will result in a greater reliance upon learning activities which are student rather than teacher performance oriented, for example, greater use of student discussions than teacher lectures. Greater student involvement in learning activities will lead in turn to greater student participation in classroom decision-making. These projected changes in the use of instructional time follow from the longer classroom period of full-credit semestering; since half-credit semestering and trimestering retain the shorter period there will be no changes in the use of instructional time.

Hypothesis 2. Interpersonal relationships between teachers and students will be more positive in full-credit semestering because the number of students a teacher sees in a day is reduced by half; similarly students interact with half as many teachers. Since students in full-credit semestered schools spend more time in each class, student cohesion will increase. Since

the other forms of timetable reorganization do not share these characteristics, half-credit semestering and trimestering will not affect interpersonal relationships between students and teachers or among students.

Hypothesis 3. Student achievement will increase in all forms of semestering and trimestering because of the impact of shorter term course objectives on student motivation and study habits. On a less positive note, the shorter term will render student and teacher absence more detrimental to student achievement than such absences in the context of a traditional timetable. A related issue of high concern to school personnel is that noncontinuous learning patterns will be both more prevalent and more detrimental to student progress in all types of semestering and trimestering. (A noncontinuous learning pattern was defined in this study as an academic program in a sequential subject area that is interrupted for a period of 4 months or more. There are two careful research reports that indicate that the fears of school personnel on this issue are unwarranted: Smythe et al. [1973] and Rachar et al. [1973].)

Hypothesis 4. The shorter duration of the semester and trimester will improve student motivation and study habits at several levels. The prospect of a more immediate reward, the reduced opportunity to catch up if students coast at the beginning of the term, and the possibility of additional entry and exit points from secondary school all suggest that motivation will be higher in semestering and trimestering.

METHOD

A random sample of schools was drawn from a composite list of semestered and trimestered schools in the province of Ontario. The sources for the composite list of schools with innovative timetables were Morgan (Note 2), Gillies (Note 3) and the *Report . . . Conditions of Work* (1974). The sources for identifying school characteristics were *Secondary School Enrolment* (1974), *Municipal Directory* (1974) and *Report of the Committee on Conditions of Work for Quality Education* (1974). These schools were matched with nonsemestered control schools along four variables: school size, size of community, certification of teachers, and median years of teaching experience of staff. After negotiation with school personnel the resulting sample of schools consisted of 7 full-credit semestered, 3 half-credit semestered, 1 trimestered school, and 11 control schools with traditional timetables. All of the schools in the sample had maintained their existing timetables for at least 20 months.

The original intention of the sample design was to include schools representative of the three major forms of timetable innovation in Ontario. The very small number of trimestered schools in the province, together with the decision of one school board not to participate in the study, reduced the sample to a single trimestered school. There were unique historical and community context factors operative in this school which

distorted the comparison drawn between it and its control school. Although some of the data from trimestered school respondents are included in this report, no attempt has been made to generalize the findings; they are presented for illustrative purposes only.

Self-administered questionnaires were sent to 15% of all students, to all teachers in schools with less than 30 full-time teachers, and to 50% of the teachers in schools with 30 or more teachers. Questionnaires were returned by 81% of the students (1965) and 93% of the teachers (527). Attempts to survey the parents of participating students were less successful, with only 47% (685) of the parents responding to the questionnaires. Interviews were conducted with the principals of the 22 schools. The data were collected in a 6-week period in the spring of 1975.

The data were tabulated in three sets of matched schools (full-credit semestered and controls, half-credit semestered and controls, trimestered and control). Comparisons were made with each set to test the hypotheses. A series of 3-way and in some cases 4-way crosstabulations were produced to determine the relationships between independent and dependent variables within each category of a series of control variables.

The control variables used to test relationships varied to some degree from item to item. In general for student items the control variables were age, sex, grade, self-reported marks, program concentration, socio-economic status (defined as a function of number of rooms and occupants in residence) and self-reported academic ability. For teacher items the control variables were sex, subject concentration, number of years of teaching experience, OSSTF category (level of teaching experience), and class composition (grade level and phase of students). In specific instances other control variables were employed, e.g., frequency of courses with prerequisites was a control for determining the relationship between perceived adequacy of review in sequential courses with type of timetable organization.

The purpose of this procedure was to search for a test variable that would eliminate the differences between semestered and nonsemestered responses to particular questionnaire items. If all reasonable test variables failed to nullify the relationships the researchers had strong evidence for the validity of the hypotheses being tested. In this way relationships between timetable organization and dependent variables could be reported with confidence that the effects of intervening variables were not distorting the findings.

The existence of a relationship between a dependent variable and timetable organization does not mean that the differences in the dependent variable necessarily were caused by semestering. The sample of schools used in this study is relatively small: it is possible that other variables, including factors unique to individual schools, account for a major portion of the variance in responses. These untested factors may confound the

results of the study. Although no cause and effect claims are made, the researchers believe that the controls introduced in the analysis are sufficiently rigorous to allow decisions about the hypotheses to be made with confidence.

MAJOR FINDINGS

1. Use of Instructional Time

As anticipated there were some instructional strategies that were more likely to be used twice a month or more in full credit semestered classrooms than in traditional schools; these strategies included field trips of varying lengths, small-group discussions, and others. When questionnaire responses were used to construct a Likert-type scale of teaching variety, it was discovered that teachers and students in full-credit semestered schools were more likely than respondents from nonsemestered schools to receive high scores. This finding, shown in table 1, was statistically significant only for the student responses, although the pattern was similar in the teacher data. This pattern was consistently maintained when control variables were introduced.

Table 1 / Full-Credit Semestered and Nonsemestered Student and Teacher Scores on the Index of Instructional Variety

Score on the Variety Index	Percentage of Students		Percentage of Teachers	
	Nonsemestered	Full-credit	Nonsemestered	Full-credit
Low	37	29	40	34
Medium	35	36	40	43
High	28	35	20	23
	(n = 679)	(n = 449)	(n = 154)	(n = 151)
	$\chi^2 = 9.60257$		$\chi^2 = 1.11324$	
	$p \leq .01$		Not significant	

Similarly, full-credit semestered school respondents were more likely than nonsemestered school respondents to report that a higher proportion of classroom time was devoted to teaching-learning activities in which there is high student involvement. This finding, shown in table 2, was significant only for students, although it was visible in the teacher data as well.

Students in full-credit semestered schools were more likely than students in nonsemestered schools to participate in classroom decision-making; that is, they were more likely to be invited by teachers to modify overall course objectives, to set objectives for specific learning activities, to plan learning activities, to select content, to design student assignments, and to evaluate student performance. The summative student data are shown in table 3.

Table 2 / Full-Credit Semestered and Nonsemestered Student Scores on the Student Involvement in Classroom Activities Index

Score on Student Involvement Index	Percentage of Students	
	Nonsemestered	Full-credit
Low involvement	36	28
Medium involvement	30	31
High involvement	34	41
	(<i>n</i> = 679)	(<i>n</i> = 449)
	$\chi^2 = 8.21067, p \leq .02$	

On each of the summative measures of the use of instructional time, there were slight differences between the respondents of half-credit semestered and nonsemestered schools. The direction of the differences paralleled that of the full-credit semestered set but in the half-credit set the differences were marginal in size and statistically nonsignificant.

The same pattern emerged in the comparisons between responses of teachers and students in trimestered and traditional schools: on each measure respondents from the trimestered school were marginally more likely to report greater variety in classroom strategies, greater student participation in classroom decision-making, and greater student involvement in learning activities. The differences were statistically significant only with respect to the student responses to the latter two measures.

2. Interpersonal Relationships

Student and teacher responses to a series of attitudinal questions were used to construct three summative measures of the quality of interpersonal relationships: an index of student–teacher compatibility and an index of teacher–student compatibility which provided a summary of the perceptions of students and teachers respectively of the quality of relationships

Table 3 / Full-Credit Semestered and Nonsemestered Student Scores on the Index of Student Participation in Classroom Decision-Making

Score on Decision-Making Index	Percentage of Students	
	Nonsemestered	Full-credit
Low student participation	41	31
Medium student participation	28	29
High student participation	31	40
	(<i>n</i> = 679)	(<i>n</i> = 449)
	$\chi^2 = 14.54934, p \leq .01$	

in the school, and an index of student cohesion which summarized student perceptions of relationships within the student body.

There were marginal differences between the respondents of semestered and nonsemestered schools on each of the summative measures, such that full-credit and half-credit students and teachers were slightly more likely than their counterparts in nonsemestered schools to report positive interpersonal relationships between students and teachers and among students. These differences were not sufficiently large to be statistically significant. However, the differences on these measures between the respondents in trimestered and traditional schools were substantial. Table 4 shows that the teachers and students of the trimestered school were significantly more likely to report positive interpersonal relationships.

Table 4 / Trimester and Traditional School Respondent Scores on Summative Measures of Interpersonal Relationships

	Percentage of Respondents	
	Trimester	Traditional
<i>Student-Teacher Compatibility Index</i>		
	(<i>n</i> = 134)	(<i>n</i> = 124)
Low	45	11
Medium	29	34
High	26	55
	$\chi^2 = 38.94939$	
	$p \leq .01$	
<i>Teacher-Student Compatibility Index</i>		
	(<i>n</i> = 29)	(<i>n</i> = 22)
Low	31	18
Medium	55	18
High	14	64
	$\chi^2 = 13.98123$	
	$p \leq .001$	
<i>Student Cohesion Index</i>		
	(<i>n</i> = 134)	(<i>n</i> = 124)
Low	43	31
Medium	40	28
High	18	41
	$\chi^2 = 16.83951$	
	$p \leq .001$	

3. Student Achievement

The indicator of student achievement used in the project was the self-reported mark of students, an indicator that was selected primarily because of its very low cost, but also because of the importance attributed to

Table 5 / Full-Credit Semestered and Nonsemestered Student Perceptions of the Effect of Student Absence, Controlling for Amount of Absence, in Percentages

Effect of Student Absence	Number of Days Student Respondent Absent					
	0-4 days		5-10 days		More than 10 days	
	Nonsem.	Full-cred.	Nonsem.	Full-cred.	Nonsem.	Full-cred.
No effect	64	47	42	29	32	15
Minor ill effect	22	32	45	47	44	54
Considerable ill effect	10	15	9	18	15	22
Major ill effect	5	6	4	8	10	10
	(n = 201)	(n = 165)	(n = 224)	(n = 137)	(n = 206)	(n = 110)
	$\chi^2 = 11.40140$	$\chi^2 = 10.74325$	$\chi^2 = 12.17627$			
	$p \leq .01$	$p \leq .02$	$p \leq .01$			

marks by students, teachers, and parents. However, serious objections can be raised that marks are a relatively poor indicator of achievement. For example, Laxer, Traub, and Wayne (1974, pp. 83–87) found significant differences in the relative weights assigned to different criteria used by teachers to assign student marks, and found significant differences in grades assigned to students in the five schools of their study. Similarly, Breton (1972, pp. 211–212) found a “considerable degree of arbitrariness in the examination system,” and significant variation in failure rates. The absence of valid and reliable achievement data softens the impact of the findings.

Contrary to expectations there were no significant differences between nonsemestered and semestered schools in terms of student achievement. The self-reported marks of students did differ slightly within some categories of age, sex, year level, ability, and program concentration groupings, but no consistent pattern could be discerned. However, significant differences did emerge between the marks of the students in the trimestered and the traditional school. Over 40% of the trimestering students reported grade-point averages at the first-class level (over 75%), compared with a quarter of the students in the control school. But it is difficult to attribute this difference to the timetable organizations of the schools; a more probable explanation is an undetected variance in the evaluation policies of the schools.

Respondents in the semestered and trimestered schools were more likely than respondents in the control schools to report that teacher and student absence has a detrimental effect on student achievement. Although the differences were small, they were consistently maintained; table 5 presents, by way of example, the differences in the perceptions of the effect of absence of full-credit semestered and nonsemestered students, controlling for the amount of absence reported by students.

Noncontinuous learning patterns were more frequent in the semestered than in the control schools. However, contrary to the expectations of many school personnel, but in keeping with previous empirical research findings, the dysfunctional consequences of interrupting sequential academic programs were no more serious in the semestered than in the control schools.

4. Student Motivation and Study Habits

There were very few differences among the schools on this issue. There was slight evidence that particular groups of students in semestered and trimestered schools were more likely to attach personal importance to school experiences than their counterparts in the control schools. Similarly, full-credit semestered students reported that they did more homework than nonsemestered students, although the reverse was the case for trimestered students. There were no differences among the schools with respect to the educational aspirations of students.

IMPLICATIONS FOR SCHOOLS

1. The findings from the project largely support the convictions of those who argue that full- and half-credit semestering make a positive contribution to secondary school life, particularly in the areas of interpersonal relationships and the use of instructional time.

Not all the claims advanced by school personnel for timetable reorganization were validated by the findings; for example, the project found no evidence that semestering improves student achievement. This is hardly surprising, quite apart from the deficiencies of self-reported marks as an indicator of achievement, given the body of research which argues that school achievement cannot be improved to a measurable degree by school changes; see for example, Stephens (1967), Averch et al. (1972), Jencks et al. (1972), Walker and Schaffarzick (1974) and by way of contrast, Good, Biddle, and Brophy (1975). It is probable that increases in student achievement will be both rare and discoverable only through highly refined instruments; such instruments were notably lacking for the present study.

It should be noted that the differences in the sets of data tended to be very small even though the differences were consistently maintained when control variables were introduced. Of greater importance is the discovery of little evidence to indicate that semestering and trimestering produce dysfunctional consequences, with the exception that student and teacher absence is slightly more detrimental to student success in these innovative timetables. Consequently, it can be concluded that the adoption of semestering or trimestering will likely lead to small but significant positive changes in a secondary school.

2. Secondary analysis of the data produced findings that have implications for the implementation of timetable innovations. Implementation is defined here as "the extent to which organizational members have changed their behavior patterns [as] required by the innovation" (Gross et al., 1971, 16). It was reported earlier that the use of instructional time and perceptions of the quality of interpersonal relationships were each related to timetable organization. Table 6 explores these relationships further: the table suggests that in the case of schools in the full-credit and half-credit semestered samples, the relationship between timetable organization and the interpersonal dimension is largely a function of a logically prior relationship between timetable organization and time-use variables. It suggests the following sequential arrangement of interactions: timetable reorganization leads to changes in the use of instructional time; changes in the use of instructional time in turn lead to changes in interpersonal relationships.²

The implications of this finding for schools is that changes in the use of instructional time, defined in the project as increased variety of

Table 6 / Summary of F Scores Resulting from Analyses of Variance on Interpersonal Relations Indexes

	Student-Teacher Compatibility		Student Cohesion		Teacher-Student Compatibility	
	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>
<i>Full-credit semestered vs. nonsemestered schools</i>						
All time-use variables	17.390	.001	8.780	.001	6.191	.001
Timetable organization	.194	NS	.899	NS	4.348	.036
<i>Half-credit semestered vs. nonsemestered schools</i>						
All time-use variables	4.415	.005	7.591	.001	4.813	.003
Timetable organization	.174	NS	.305	NS	.103	NS

instructional strategies, increased student involvement in classroom activities, and greater student involvement in classroom decision-making, can constitute implementation goals for timetable innovation. These variables can be treated as process goals or intermediate criteria of program impact that enable evaluators to determine the extent to which organizational change has actually modified the behavior of teachers and students. A formative evaluation focusing on these variables is a sensible prerequisite to a summative evaluation. As Berman and McLaughlin (1976, p. 350) point out, following Charters and Jones (1973), “It makes sense to put first things first and to measure the effectiveness of implementation before examining potential student impacts.”

A further implication of table 6 is that strategies to implement semester-ing will wisely focus on the use of instructional time as the content of in-service activities for teachers.

DIRECTIONS FOR FUTURE RESEARCH

The research reported here suggests two directions for future R&D activities.

Fullan and Pomfret (Note 4) discovered in a review of unpublished implementation literature that the most difficult components of an innovation to implement are those related to changes in role relationships, especially teacher-student roles. One of the implications of the research reported here is that it may be possible to effect changes in student-teacher relationships by applying strategies to change patterns of instructional time usage. An R&D project designed to test this hypothesis in appropriate school settings would be a logical consequence of the present project.

A second direction for research emerges from the inadequacy of

achievement data reported here. The present project was constrained by existing evaluation technology. There are no instruments extant to measure consensually important educational objectives in Ontario secondary schools; consequently there is no way to produce valid and reliable data relevant to the anticipated relationship between timetable innovation and cognitive outcomes. Recent changes in Ministry of Education evaluation policy encourage the development of criterion-referenced student achievement instruments based on core objectives in different subject domains. If and when accurate measures become available, it will be possible to test the hypothesis that timetable reorganization is positively related to increased student achievement.

NOTES

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1. The most salient of these intervening variables are student demographic factors (especially grade level and sex), and school descriptors (especially school size and size of community). It was anticipated that teacher characteristics, particularly number of years of teaching experience, would influence responses to the innovation (for a rationale for this anticipation see Leithwood, 1976, pp. 117ff). However, this was not the case in the study reported here.

For the review of the school-based literature see Ross, Ducharme, and Davis (1976), especially chapter 1. A recent exception to the school-based evaluations is the research conducted by Brophy (Note 5) in a small sample of semestered and nonsemestered schools.

2. An attempt was made to discover whether there were sequential interactions of a similar type with respect to the other dependent variables in the study. Zero order and partial gammas were computed in order to determine the effect of controlling for different measures of time utilization on the relationship between timetable organization and a series of dependent variables. The findings were inconclusive.

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