The effect of year-round education on student achievement

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Abstract
The year-round calendar has generated interest among many educators as a way to increase student achievement by reducing learning loss that often occurs during long summer vacations. This paper explores various assertions made about year-round education (YRE) as it compares with traditional-calendar education (TCE). Achievement results in the core subjects of math and reading are discussed and compared in school districts that have utilized either a multi-track, a single-track, or a traditional 9-month calendar:

The outcome of this review indicates mixed results regarding YRE and student achievement. Because many of the studies contained incomplete data and confounding variables such as length of time of implementation, class size, and demographic differences, further research of YRE is suggested.
THE EFFECT OF
YEAR-ROUND EDUCATION ON
STUDENT ACHIEVEMENT

A Graduate Review
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Department of Curriculum and Instruction
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of the Requirements for the Degree
Master of Arts in Education
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by
Rebecca Okerlund
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has been approved as meeting the research requirement for the Degree of Master of Arts in Education.

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Abstract

The year-round calendar has generated interest among many educators as a way to increase student achievement by reducing learning loss that often occurs during long summer vacations. This paper explores various assertions made about year-round education (YRE) as it compares with traditional-calendar education (TCE). Achievement results in the core subjects of math and reading are discussed and compared in school districts that have utilized either a multi-track, a single-track, or a traditional 9-month calendar. The outcome of this review indicates mixed results regarding YRE and student achievement. Because many of the studies contained incomplete data and confounding variables such as length of time of implementation, class size, and demographic differences, further research of YRE is suggested.
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Introduction

For most of a century, Americans have equated the Labor Day holiday with the end of summer vacation and the beginning of a new nine-month school year. This traditional calendar has become a cultural icon and almost universally accepted by educators, parents, and students. Is the traditional agrarian calendar our best choice for education, or is it an antiquated notion that has outlived its purpose? How much academic knowledge is lost over the summer? Would year-round schooling be a better alternative, or just another quick-fix option for districts facing budget restraints, booming enrollments, or decreasing standardized test scores? If student achievement is a prime objective of education, stakeholders require authentic information from a variety of valid sources when determining which school calendar is best for their school. Year-round calendar education (YRE), or traditional-calendar education (TCE)? The purpose, therefore, of this paper is to review the scholarly literature related to year-round education with particular emphasis on its impact on student achievement.

To research the effects of year-round education on student achievement, three sources of information will be used. These include the electronic journals available through the Rod Library at U.N.I.: resources found in the North Iowa Area Community College Library in Mason City; and on-campus resources of the Rod Library at U.N.I. Specific questions to be explored will include:
1. Which core subject, math or reading, reflects a significant gain in student achievement as a result of YRE?
2. Which calendar--multi-track, single-track, or traditional-calendar--appears to contribute to a gain in student achievement?

3. Which elementary grade levels seem to benefit the most from YRE?

4. Does the research suggest that the socio-economic level of the student population influences the success or failure of YRE?

5. Does gender influence the success or failure of YRE?

To place a more personal face on the review of literature, administrator responses to YRE will be compared to the results of the literature review. Data on administrator response will be collected from the literature and from first-hand interviews with four administrators presently working in the field. Specific administrator interview questions include:

1. Why is your school presently utilizing a year-round calendar?

2. Compared to traditional-calendar schools in your district, which core subject--math or reading--reflects the most growth each year in student achievement?

3. Compared to traditional calendar schools in your district, which grade levels seem to benefit the most from the year-round calendar?

4. As an administrator, do you prefer to work in a year-round calendar school or a traditional nine-month calendar school? Why?

Definition of Terms

Before addressing specific questions regarding achievement, it is important to define year-round education. The term "year-round" is most frequently used to describe programs where the traditional number of school days is rearranged into
several instructional blocks interspersed with vacation breaks that are shorter and more frequent than is the case with the traditional school calendar. YRE is a reorganization of the school calendar into instructional blocks and vacations distributed across the calendar year so that learning is continuous throughout the year (Quinlan, George, & Emmett, 1987). Year-round education takes many forms. In its broadest definition, it is a redesign of the school year to make instruction more continual and the traditional summer periods substantially less (Ballinger, 1988). Children in both year-round and traditional-calendar schools attend school the same number of days, approximately 180 days. Whereas the traditional calendar (TC) generally runs from the first of August through May, with summer vacation of approximately 10 to 12 weeks, the year-round calendar (YRC) usually runs from the first of August through May, with summer vacation of no longer than eight weeks. Therefore, the YRE calendar is differentiated by the length and schedule of the learning periods (Kneese, 2000).

Within the concept of YRE there are differences, as well, for there are two organizational types: single-track and multi-track. In single track YRE all students follow the same attendance schedule, as in the traditional-calendar school. In multi-track YRE, however, students are assigned to one of several tracks which are on staggered attendance schedules. This is due to the fact that the two YRE schedules are implemented to serve different purposes. Single-track is usually implemented for the purposes of reform since it purports to enhance student learning by providing a schedule which minimizes learning loss (Hazelton, Blakely, & Denton, 1992). On the
other hand, multi-track is generally implemented to increase capacity (Bradford, 1992), but can also be used to reduce class size (Brekke, 1992).

There is a multiplicity of designs within the framework of the two organizational types of YRE. The most popular YRE program (favored by 69% of YRE districts) is the “45/15 plan” (Gee, 1997). In this single-track plan students are in class for 45 days and out on a 15-day vacation. Those districts with a school population that can be housed in existing facilities can use the 45/15 plan. All students are in school during the same 45 days each quarter. If the student body is too large for the district’s facilities, as is the case with many urban districts, then the district may adopt a 45/15 multi-track plan, in which there are four “tracks” and 25% of the students are on vacation at any given time.

Within both single-track and multi-track plans the vacation days are often referred to as intersessions. These breaks in the YRE schedule are used in a variety of ways. During intersession, students have opportunities for remediation and enrichment. Intersessions include short breaks, remedial classes, planned activities, and special programs.

Math and Reading Achievement

According to the available research, the impact on math and reading achievement varies depending on the study. The variables or conditions for each study may play a decisive role on how the results are interpreted. Several studies were analyzed to determine which core subject, math or reading, has been most influenced by YRE. In Dayton, Ohio, a comparison study of sixth grade students revealed no significant
difference in math or reading achievement (Roby, 1995). However, according to Roby, a statistically significant advantage for the YRC was found with the Verbal covariate, which is the section of the Iowa Tests of Basic Skills (ITBS) that has been found to have the highest correlation to the Basic Composite score. Roby also indicates that the “year-round school schedule appears to be beneficial when students attending this structure are compared with students attending a traditional nine-month school schedule for academic achievement in math and reading” (Roby, 1995). He attributes shorter vacation periods within the YRC—three weeks after each nine-week term and five weeks in the summer—to greater retention of academic material.

The Southwest Educational Development Laboratory (SEDL) published an overview of YRE in 1993. The article synthesized YRE’s impact across the U.S. in areas such as cost, community acceptance, and student achievement. Although math achievement is not discussed within the SEDL report, reading achievement is explored. The article revealed that the San Diego Unified School District released a longitudinal report in March, 1991, comparing test scores for reading in traditional and year-round schools from spring 1982 through spring 1990. Results of the Comprehensive Test of Basic Skills (CTBS) for grades 1-6 and the California Assessment Program (CAP) for grades 3 and 6 were included (Alcorn, 1991). The report revealed significant differences in the percentage of year-round schools that maintained or improved student scores compared to the results for traditional schools. The average percent change in scores was also significantly higher in year-round schools.
In 2000, the Educational Research Service (ERS Spectrum, 2000) presented the results of a study of six matched YRE and TCE schools in one California school district. After four years of implementation, the YR schools seemed to show consistent achievement advantages in reading and math scores. When comparing reading and math achievement gains, the statistical analyses suggest the benefits of YRE were much larger in math than in reading. However, the gain difference between the YRE and TCS math students was significantly different for the group of students who were in the 5th grade at the time of the posttests, but not for the 6th grade. When comparing math and reading achievement gains in this study, the overall mean in math achievement was 13.34 compared with a reading achievement gain of 11.03. Since the gain scores for all YRE students were positive and statistical significance was found in approximately half of the comparisons, it appears that the single-track YRE calendar may enhance academic achievement, in math in particular, and in reading in some instances. However, the gains from the YRE program appeared to slow after several years. The authors recommended that districts research for a period of four years or longer before making final recommendations to raise achievement scores in either math or reading.

Another study comparing math and reading achievement scores in YRE and TCR schools occurred in North Carolina during the 1997-98 school year (McMillen, 2001). In this study, the author included data for over 345,000 students from 1,470 schools serving Grades 3-8. One hundred six public schools in North Carolina operated on a year-round calendar. The data for this study came from historical databases of the
North Carolina Testing Program. Over 95% of public school students in North Carolina participate each year in this statewide testing program. Testing program data in Grades 3-8 in North Carolina are gathered from end-of-grade (EOG) assessments in reading and mathematics and are reported in the form of normed developmental scale scores. With respect to content, EOG tests are aligned closely with the North Carolina Standard Course of Study, which is the state curriculum. Test scores are scaled separately for each grade level and subject area, and the normative distribution of scores in each subject area shifts upward slightly from one grade level to the next. Therefore, a student’s scale score is expected to increase naturally from one grade level to the next. Because of that feature, scale scores cannot be directly combined or compared across multiple grade levels because the distribution of possible scores is not the same scale location from one grade level to the next. Scale scores, therefore, cannot be directly combined or compared across multiple grade levels because the distribution of possible scores is not in the same scale location from one grade to the next.

Students in this study were very similar with respect to gender. However, patterns of differences occurred between the groups regarding grade level, ethnicity, and parental education level. TCE students were more likely to be Caucasian and less likely to be African American than were YRE students. Also, YRE students reported slightly higher levels of parental education.

The results of this study indicated no statistically significant differences in either reading or mathematics achievement between students attending school by a YRC
and those attending by a TSC during the 1997-98 school year after controlling for prior achievement, student gender, student ethnicity, and parent education level. The author found some interactions implying that lower achieving and Caucasian students may benefit slightly from being on a YRC. One part of the study also suggested that students whose parents have high levels of education may do better under a TSC. The effects were small, however, and were not found for all subjects and grade levels. The author conceded that although increased achievement is often touted as a benefit of YRE, the results of this investigation suggest that the merits of YRE might best be judged on factors other than achievement.

Another North Carolina study was conducted by the North Carolina Educational Research Center, Chapel Hill. Regarding student achievement in reading and mathematics, this research article analyzed 32 studies between the years 1977 and 1992. The article states that the “preponderance of evidence suggests that YRE students' performance on measures of academic learning (e.g., reading, math) is about the same in most studies as their performance while on traditional schedules” (Worthen & Zsiray, 1994). The article did indicate, however, that some YRE programs were found to yield significantly higher student achievement scores. In a rigorous review of 27 studies on the impact of YRE on student achievement in math and reading, Grotjohn and Banks (1993) reported that 12 studies found YRE increases achievement in both subject areas, 11 showed neutral or mixed results, and 4 found negative results of YRE. Overall, according to this North Carolina study,
there appeared to be a slight but not overwhelming advantage for YRE students in
learning basic content.

A study entitled “The Effects of Summer Vacation on Achievement Test Scores: A Narrative and Meta-Analytic Review” by Cooper, Nye, Charlton, Lindsay, and Greathouse (1996) revealed that summer loss appears more dramatic for math-related subject areas than for reading or language. Murname (1975) provided a possible explanation for this differential effect when he suggested that reading and language skills are learned both at home and in school, while mathematics learning may be more restricted to formal school settings. That is, children's home and community environments may provide more opportunity to practice reading skills and to learn new words than to practice and learn mathematics. If so, one would expect the differential effect of the long vacation on the two skill areas.

The results of the meta-analysis indicated that when the overall effect of summer vacation on standardized test scores is at issue, students appeared at best to demonstrate no academic growth over summer. At worst, students appeared to lose one month of grade-level equivalent skills relative to normal norms. When performance change was gaged relative to the student's own fall scores, the worst-case scenario seemed to be that the average student's score in the fall was about one tenth of a standard deviation below the spring average.

This study also revealed that prior to 1975 achievement test results indicated that summer vacation had a detrimental effect on the math and spelling skills of students in middle grades. Also, there was no consistent effect of intelligence on the impact of
summer vacation. A single test of gender as a moderating factor revealed no
difference, while a single test of students' socioeconomic status suggested that
summer vacation led to reading and vocabulary gains for students of higher
socioeconomic status, but losses for those of lower socioeconomic status.

According to Cooper, et al. (1996), 66 studies were analyzed since 1975 for a
more recent indication of reading and math achievement. Of these 66 study samples,
31 were described in reports in the 1970s, 27 appeared in the 1980s, and 8 appeared
in the 1990s. Twenty-three of the samples were reported in four journal articles, 25 in
two technical reports, 6 in two convention presentations, 8 in one book, and 4 in two
master's theses or doctoral dissertations. The total number of students in all the
samples was 47,994 with sample sizes ranging from 24 to 683 students and
averaging 153 students.

The average number of days between the spring and fall testings reflecting TCE
was 131 days with a range of 92 to 153 days.

The data set containing the 66 independent samples providing d-indexes was
examined. This analysis estimated the unweighted overall effect of summer vacation
to be $d = -.09$. Thus, the average student's fall scores in math and reading was one
tenth of a standard deviation below where it had been in the spring. The
corresponding unweighted DGLE (difference in grade-level equivalents) was -.09, or
a loss of about one month.

The d-indexes were examined to determine whether their magnitudes were
systematically associated with the years in which they were reported. This analysis
indicated that the least negative effect of summer vacation was found in studies conducted in the 1980s, and the most negative effect was found in the 1990s. Also, the longer summer intervals were associated with greater gains or lesser losses in achievement scores for both math and reading.

Single-Track, Multi-Track, or Traditional Calendar

According to a University of Minnesota study (Palmer & Bemis, 1999), there were 2,986 year-round schools in 1998 throughout the United States, Canada, and the Pacific Region. Ninety-eight percent of those were in the United States. Of those, 59 percent were single-track and 41 percent were multi-track. These figures represent a five-fold increase from 10 years earlier, when only 494 public schools in the United States were on a year-round calendar. Within that ten-year span, the number of students enrolled in YRS had increased almost 400% from 428,961 in 1988-89 to 2,040,611 ten years later. Since 1998, the number of schools utilizing a YRC has increased to 3,181 schools with a total of 2,320,730 students in 46 states (NAYRE, 2003).

With regards to improving overall student achievement, which calendar appears to be most effective; YR single-track, YR multi-track, or the traditional nine-month calendar? Again, it depends on the study being analyzed.

A North Carolina study (Public Schools of North Carolina, 2000) reported that in 1998, 45 of its districts had 133 schools utilizing a YRC. Most of the YRC schools (87%) were single-track, and most were on an approximate 45/15 schedule. That is, most students attended school for 45 days (9 weeks) and then went on break for 15
days (3 weeks). Most of the YR schools were at the elementary (81%) or middle school (13%) level. To study further the issue of academic achievement in its state, the North Carolina's Evaluation Section of the Department of Public Instruction studied a matched sample of single-track YR schools and traditional schools using data from the 1996-97 and 1997-98 school years. Sixty-five YR schools were matched with 65 TC schools in grades 3 through 8 with similar socio-economic statuses. Since end-of-grade test were given only in grades 3 through 8 and because the study was designed to look at achievement gains from 1996-97 (Year 1) and 1997-98 (Year 2), the study used all of the available data from students who took EOG tests in grades 4 through 8 during Year 2. The final sample included almost 28,000 students who took EOG tests in either math or reading in Year 2 at a given grade level, and also took the EOG test in that same subject area in Year 1 at the previous grade level.

After controlling for possible effects due to district, grade level, gender, ethnicity, parental education level, prior achievement and average school-level achievement, this study revealed no significant achievement differences between year-round and traditional calendar students in either reading ($F = 0.91, p < .48$) or math ($F = 0.89, p < .85$). Neither group appeared to perform any better than the other between the 1996-97 and 1997-98 school years.

Although a single-track YRC is usually implemented for purposes of reform to enhance student achievement (Hazelton, et. al., 1992), a study was done within a meta-analytic review comparing achievement results of both single-track and multi-
track students. One must keep in mind that a multi-track format provides intersession periods of 15 to 20 days, and can be as high as 40, while that of single-track is also generally 15 to 20 days, but can be as low as 10 days. The study, entitled Review of Research on Student Learning in Year-Round Education (Kneese, 1996), examined many avenues of YRE. The overall purpose of Kneese's article was to present a meta-analytic comprehensive review of research conducted in the last decade that has evaluated the effects of both single-track and multi-track calendars on student achievement. The review addressed many issues including differences in: (a) achievement effects of YRE and TCS students, investigated by mean scores; (b) achievement of students in multi-track versus single-track; (c) achievement of subgroups within YRE schools; (d) achievement effects of YRE and TCS students, investigated by gain scores; and (e) achievement of students in differential lengths of program implementation. Out of 82 studies, 13 were chosen taking into consideration the vast differences in design and reporting procedures.

According to the article, multi-track programs were initially implemented to increase capacity. Multi-track programs were typically found in high growth, poor, and inner-city areas. These students were generally low income, transient, minority, and limited English proficient. Single-track programs, on the other hand, were generally found in lower growth, suburban, and more middle class districts. Students from single-track programs were typically less difficult to educate and performed relative to other students with similar background characteristics. One would expect the single-track program to outperform the multi-track program.
Of the 13 studies reviewed in Kneese's research, only 2 involved single-track education. Eight studies involved only multi-track, and 3 commingled the two tracks in the results of the studies. The results suggested that the multi-track YRE schools slightly outperformed the TC schools, while single-track YRE schools had a greater effect. The author related that the number of days of instruction is an important variable, and it was impossible to determine in all the studies whether the program included the intersession. In many of the single-track and in some of the multi-track YRE programs, the intersession is utilized for enrichment and remediation, and may have contributed to the differences in gains observed.

In an article published by the National Association of Year-Round Schools (NAYRE, 2003), single-track YRE achievement results were reported in another study by Dr. Kneese (Kneese & Knight, 1995). The study investigated the impact of the YRE calendar on achievement, and the degree to which it differentially affects students. Three hundred eleven students enrolled in single-rack YR classes were individually matched with students in traditional calendar classes in the same schools on both reading and math. There were statistically significant differences in favor of YRE in both math and reading achievement for all students, and especially in reading for at-risk students. The YRE program appeared to provide many academic opportunities in terms of outcome pertaining to equity.

Timber Lane Elementary School in Fairfax County, Virginia, initiated a single-track calendar in 1998 in order to "teach massive amounts of curriculum in just 180 days" (Lewis & McDonald, 2001). The teaching staff believed the a series of four 45-
day sessions, from August 1 through June 30, alternating with 15-day intersessions, would fulfill their need to use academic learning time more efficiently. During each intersession, teachers would have time to assess student progress and plan their lessons for the next 45-day session. For students, the intersessions would be opportunities for reinforcement and enrichment. The article about Timberlane purports obvious gains (Lewis & McDonald, 2001). Within 3 years, the school’s students were outscoring their peers in traditional-calendar schools on standardized tests. Students in the comparison study had “similar demographic profiles.” This article had limited information regarding actual achievement gains and factual information about the students involved in the study.

Within the ERS Spectrum article entitled The Impact of Year-Round Education on Student Learning: A Study of Six Elementary Schools (ERS Spectrum, 2000), researcher Carolyn Kneese described an evaluation in 1996 of a single-track, YR program in a school district on the West Coast. The purpose of the study was to determine whether fifth grade and seventh grade students in YRE programs in the district sustained greater academic growth than did their peers in paired TCS programs from the 1992-1993 to 1995-1996 school years, or at the very least, maintained acceptable growth. In July of 1992, the district implemented year-round education in three elementary schools. Each school was situated within one of three geographic areas of the district—east end, central, and west end—in order to give all families a choice between the two school calendars (YRC and TC) within their
neighborhood. A committee was established to determine the impact of YRE within the district, particularly in regard to student achievement.

According to this West Coast study, the pretest scores of all TCS students were slightly higher than those of all YRE students in the analysis. However, the mean gain scores for the total population favored the YR education schedule in every comparison but one. The results of this study indicated that the school district's single-track YR programs produced acceptable academic growth, particularly in math, and in some instances, reading.

Multi-track year-round schools and traditional calendar schools are compared in another study entitled "What Can We Learn from the Data?" (Shields & Oberg, 1999). The authors' study compared achievement data in a metropolitan area in Utah. Using academic and nonacademic student measures, their study compared the performance of students from the Delphi School District's elementary TCS with the performance of students from schools using a multi-track YRC. Since 1990, the state has mandated annual testing of all students in fifth, eighth, and eleventh grades using the Stanford Achievement Test. Norm-referenced data was available only for 5th grade students at the time of this study. Eight schools were chosen: 2 single-track, 3 traditional-calendar, and 3 multi-track. With similar demographic profiles set, the percentage of both YRS and TCS with scores falling below their predicted range decreased over the 6-year period. However, it was clear that year-round multi-track schools outperformed traditional schools with respect to having more scores fall within the predicted range. The data from this study support the findings from other
studies of YRS in that the organizational effect on student achievement is associated with generally higher levels of achievement in YRS.

Another study was conducted in 1991 by the San Diego Unified School District to measure the academic success of its YRE programs (Mortan & Inger, 1994). San Diego implemented YR schools in 1972 to alleviate overcrowded classrooms. It began as a multi-track program in six elementary schools. In 1973, the option was extended to other San Diego schools to start single-track YR programs. By 1979, there were 29 schools using a single-track year-round plan aimed at improving achievement.

From 1982 to 1990, San Diego reviewed its standardized test scores to measure the success of this predominantly single-track program. A total of twenty-seven comparisons were made between single-track YR schools and TC schools at three grades (third, fifth, and sixth) in three subjects; reading, language, and math, at three time intervals. In seventeen of the twenty-seven comparisons, YR school students did significantly better. In nine of the comparisons there was no significant difference between YR single-track schools and TC schools, and in one instance the TC school outperformed the YR single-track schools. The authors suggested that students in low socio-economic groups, at-risk students and students from non-English speaking homes tended to benefit in particular from the YR single-track schooling.

An article entitled “Year-Round Education with Intersession Programs” (1990) recounted a small study conducted in El Paso County Texas by the Socorro Independent School District in 1990. The district began phasing in YRE with
intersession programs to improve academic achievement and better serve a rapidly increasing population. The school followed a multi-track 60 weekdays on, 20 weekdays off for three consecutive years, 1990-1993. Intersession activities occurred during the first two weeks of each month-long break. Academic programs focused on tutoring, acceleration, and enrichment activities. About 33 percent—and in some cases as much as 70 percent—of all students participated in the intersession programs. Some of the intersession programs were grade-specific depending on the number of children that signed up in each grade.

According to the article, more of the district's third-graders showed mastery of reading, writing, and mathematics on three Texas basic skills subtests than did their counterparts statewide. For example, 74 percent of the district's students mastered the writing test, compared with 68 percent of the students statewide. High schools in the district had less success in the first year of multi-track YRE. After three years, however, 64 percent of the district's eleventh-graders mastered all three subtests on the state assessment; traditionally less than half had done so previously utilizing the traditional calendar. In addition, the rate of students failing one course during the first semester dropped from 60 percent to 40 percent. Because this article reflected secondary research rather than primary, empirical data was notably lacking. Also, much of the information appeared biased in favor of YRE.
Socioeconomic Status

Does the socioeconomic status of a school's population reflect the success or failure of year-round education? Several studies have analyzed socioeconomic status (SES) regarding achievement in year-round schools and traditional-calendar schools.

According to the meta-analytic review on achievement and test scores by Cooper et al., middle-class children showed a significantly greater gain in reading achievement over summer ($d = +.23$) than did lower income students ($d = +.07$). Both the middle- and lower-income student gains were significantly different from $d = .00$.

The relative measures of reading achievement also revealed a significant difference between middle- and lower-income students. In the study, lower-income students showed an average loss in reading achievement over summer ($d = -.21$), while middle-income students showed an average gain ($d = +.06$). The loss by lower-income students was significantly different from $d = .00$, but the middle-income student gain fell just short of significance. The DGLE (difference in grade-level equivalents) revealed a difference between the two income groups of about 3.5 months.

On an individual basis the analysis revealed that the influence of student income level on measures of reading comprehension and recognition was significant. Summer vacation had a significantly greater negative effect on the reading comprehension of students coming from low-income families ($d = -.27$) than on students coming from middle-income families ($d = -.14$). Overall, the study indicated that the effect of summer was negative for both groups of students. DGLEs indicated
that low-income students lost about 0.7 months more than did middle-income students.

The Cooper et al. analysis revealed a differential negative effect of summer on the mathematics skills of middle- and lower-class students. All students lost math skills over summer ($d = -0.18$). However, the average $d$-indexes revealed that summer vacation had a significant greater negative effect on lower-income students' achievement in math computation ($d = -0.32$).

According to the article about a statewide evaluation of academic achievement in year-round schools by McMillen (2001), no statistically significant differences in either reading or mathematics achievement was discovered when comparing lower-income and middle-income students. That is, there was no significant difference in achievement scores by those attending a YRS and those attending by a traditional August-May calendar during the 1997-98 school year after controlling for prior achievement, student gender, student ethnicity, and parent education level. The author did find some interactions implying that lower achieving and Caucasian students may benefit from being on a year-round calendar. Another result of this study suggested that students whose parents have high levels of education may do better under a traditional school calendar. However, according to McMillen (2001), the effects were small in magnitude, and were not found for all subjects and program types.

Opheim and Mohajer (1995) also conducted a study in Texas. The article, "Evaluating Year-Round Schools in Texas" had a primary purpose of examining the attitudes of both year-round and traditional elementary school principals in Texas on
several YR school issues. Regarding the SES of the student populations the article revealed that YRE had “beneficial effects on disadvantaged, special education, or bilingual students”. Because students lose significantly more knowledge in the summer months than advantaged students, the authors argued that special education students, in particular, adjusted well to a YRS schedule because it instituted a larger measure of routine. The benefits of YRE favored the bilingual, limited English, and English as a second language student. In addition, the authors found additional exposure to English speaking environments was an asset to those students who might otherwise spend their traditional summer vacations in non-English language situations.

The Socorro Independent School District article “Year-Round Education with Intersession Programs” (1990) disclosed that the SES portrayed a predominately Hispanic student population. The district had a strong bilingual, bi cultural emphasis. Intersessions in the YRC reinforced this. At one school, parents requested that the intersession focus on teaching Spanish to monolingual English students and English to Spanish-speaking students. The article related that the program was so successful that the school offered similar classes during the regular sessions.

According to the above-mentioned article the Socorro district's class failure rate dropped by half for middle schools, where a high percent of students were failing one or more courses. In addition to academic achievement, the year-round/intersession program helped diffuse the overcrowding in many schools across the district.
In her meta-analytic primary research article on student learning in YRE, Kneese (1996) provided much empirical information regarding SES and its impact on YRE and TCE. Within her analysis she related that two studies investigated SES mean differences. In one study, the effect size for high SES was .00 and for low SES was +.15. Based on this single study, one might conclude that students from a high SES would do equally as well as in a YRS as in a TCS. Students from a low SES would perform only slightly better academically in a YRS. However, for the second study, opposite results were found. The effect size for the high SES school was +.25 while the effect size for the low SES school was -.13. Since only two studies were considered in her research, producing radically different results, the author advised that the findings be viewed with caution.

Kneese (1996) also analyzed scores favoring YRE in studies by Quinlan, George, and Emmet (1987) and Van Mondfrans and Moody (1985). The studies suggested that students of a low SES level achieved some gain in the area of mathematics, but sustained greater gains in reading and language in the YRS. However, these two studies could not be included nor effect size calculated, as there was no control for the low SES group. In the Quinlan, et al. (1987) study, low SES showed a standardized gain of 3.1 in reading and a standardized gain of 2.65 in mathematics. In the Van Mondfrans and Maddy (1985) study, low SES showed a gain of 5.66 in reading, a gain of 6.66 in language, and .33 in mathematics. It appeared that, for these studies, the YRE was reporting better gains for students from a low SES background. The
author suggested that “YRE may in fact alleviate the disparity which now exists” (Kneese, 1996).

An article entitled “Challenging the Assumption of Generalized Losses over Summer” (Wintre, 1986) addresses the vacation regression issue in a primary study conducted in Canada. According to the author, there is no reason to believe that children learn academic skills only in school. In this study Metropolitan Achievement Test results were analyzed from English-speaking middle-class students attending a suburban Toronto elementary school. Pretesting had taken place during the first week in June, two weeks prior to school dismissal. Posttesting was done during the second week in September. The three grade levels tested were 1st, 3rd, and 5th in the spring becoming grade levels 2nd, 4th, and 6th in the fall. When all three grades were combined, three of the content areas showed gains following the summer vacation. The content areas were word knowledge, reading, and mathematics. Mathematics computation did not show a gain. One possible explanation for losses in mathematics computation and not in the other content areas is that mathematics computation requires specific drills and practice for fluency. The overall mean scores for spring and fall with grade level and content combined were spring $M = 59.50$; fall $M = 61.67$.

The author admits that this study had limitations including a single school population, a single achievement test, only three grades represented, and lack of information about the students' summer activities. However, the absence of generalized losses in academic skills over the summer is important to note.
Nonetheless, it is difficult to know from the study analyzed in this article if SES can account for the gains over the summer vacation period.

Another Canadian study was featured in an article entitled "The Effect of Year-Round Education on Student Achievement in Mathematics" (Ferguson, 1999). The author related that her primary research study focused on standardized achievement test results of 84 5th and 6th grade students at an elementary school in northern Ontario. She compared results of 44 students on a YRE schedule with 40 students utilizing a TC schedule. Regarding SES, the participants' school was located in a small town in which students were primarily from lower-middle to middle-class families. There were no minority students in the grade levels studied.

The mean score for tested traditional students returning in September was 34.47, and the mean score for tested TRY students who returned in August was 33.3. There was no significant difference between these means (p = .05). The traditional students demonstrated a significant improvement in their test scores after the summer break (t = 2.64, p = .05).

The December scores showed improvement for both groups, with the traditional grade 6 students scoring an average of 41.33 and YRE grade 6 students averaging 38.76. The grade 5 TC students averaged 24.11 and YRE students' mean was 27.31. Again, there was no significant difference in these scores.

The findings in this Canadian study seem to be inconclusive, with TC students actually improving significantly over the summer and continuing to achieve higher scores than the YRE students later in the school year. The author relates, however,
that the YRE students' scores were more consistent overall, which supported what the districts' teachers observed about YRE students being less fatigued and frustrated and had more staying power. These factors may lead to improved long-term learning.

In yet another Kneese and Knight article entitled “Evaluating the Achievement of At-Risk Students in Year-Round Education,” (Kneese & Knight, 1995) the authors compared achievement data from ten schools in a suburban school district located near a major city in the Southwest. The district served 25,500 students with a wide range of ethnic background and SES. The ethnic makeup was 81.9 percent white, 10.7 percent Hispanic, 6.1 percent African American, and 1.3 percent other. The SES of students in this 1992-1993 study was 26.4 percent economically disadvantaged and 3.7 percent Limited English Proficiency. A major focus of this research was the impact of YRE in schools regarding efficiency, equity, and excellence. The study examined 4th, 5th, and 6th grade students' test results from the Norm-referenced Assessment Program for Texas (NAPT) over a four-year time span from 1989 to 1992.

The results of this primary study discussed in this article indicated that at-risk YRC students' achievement in reading was 2/3 of a standard deviation higher than their peers in the TC program. At-risk YRC students' achievement in math was approximately 1/3 of a standard deviation higher which was not a statistically significant difference.

Regarding low, middle, and high SES schools YRC schools, statistically significant differences were found in the subject of reading at the low and high SES
schools. In math, statistical significance in favor of the YRE was found at the low SES schools only. The findings indicated that there were small to medium positive increases in academic achievement for all students in the single-track YRC. In other words, both statistically and practically significant differences were found in student achievement favoring the YRE calendar. According to the authors, “YRE appears to be especially effective for at-risk students in reading” (1995). The authors expressed that the results of this study can provide a basis for future research and program design in the education of disadvantaged students. It appeared that YRE increased the academic performance of at-risk learners as well as that of the entire student body in this study.

**Gender**

Does gender have an effect on achievement results in YRC schools and TC schools? Three articles examined the role of gender and achievement.

According to Roby's study comparing YR and TC schools' reading and math achievement results, sixth grade boys' math mean scores were not statistically different in YR schools and TC schools (Roby, 1995). Reading mean scores for sixth grade boys, however, indicated a statistically significant difference favoring the YR school. For girls, no significant achievement differences were found in either math or reading.

Kneese related in her meta-analytic research that “Although there were only two gender studies that met the criteria for inclusion, the findings indicate that males appear to perform better than females in a year-round calendar” (Kneese, 1996).
Summary of Literature Review

The reviewed literature indicates that many variables determine which core subject—math or reading—reflects a significant gain as a result of YRE. Most literature suggests, however, that math scores tend to increase more significantly than reading scores when influenced by YRE, especially at the upper elementary level.

Regarding the question of which calendar—multi-track, single-track, or traditional—having the most influence on gains in student achievement, it seems that the single-track calendar is most beneficial for at-risk students especially in the subjects reading and language acquisition. Also, the single-track calendar appears to maintain and/or slightly increase achievement scores, particularly if the calendar has been utilized over a number of years. According to the literature, a multi-track calendar is more often adopted by school districts needing more space, rather than for purposes of student achievement. Most of the literature, however, indicates that both the single-track and multi-track calendars have a more positive influence on student achievement than the traditional calendar.

The reviewed literature does not conclusively indicate which particular grade levels reflect a significant gain in achievement scores as a result of YRE. Although this review analyzed achievement predominantly for grades 3 through 8, it remains unclear which grade levels benefit the most from any specific calendar.

The question relating to socio-economic status of the student population and the success or failure of YRE can be addressed as follows: YRE appears to significantly enhance achievement of low SES students, especially in the subject of reading.
Several studies indicate that disadvantaged, special education, and bilingual students reap the most benefits from a single-track YRC.

According to the literature, the question of YRE's impact on a specific gender appears to be insignificant. It is suggested in one study, however, that boys may benefit more from a YRC than girls.

Cooper, Nye, Charlton, Lindsay, and Greathouse related in their narrative and meta-analytic review, "Neither student gender nor student race appeared to have a consistent moderating influence on the effect of summer vacation." (Cooper, et al., 1996, p. 262). The authors of this study mentioned that although several studies have examined gender differences in summer effects, none provided a "theoretical rationale" for why this individual difference might be important, so perhaps the lack of effect is not surprising.

Summary of Administrator’s Comments Found in the Literature

What are the thoughts and reactions of school administrators regarding YRE? To address this question, several relevant articles were examined.

Within a recent article, a study of five school districts' administrators revealed that views were mixed (McGlynn, 2002). Robert Smotherman, Superintendent of Bardstown, KY, related that with YRE, attendance was up 1 percent in his district. Also, the percentage of As and Bs on student report cards was up nearly 4 percent, while the percentage of Ds and Fs had declined more than 2 percent. The ACT composite score for the district was up about a point. The percentage of seniors who attend postsecondary schools rose from 62 percent to 80 percent and discipline
referrals were down 20 percent since 1994-1995, the last year on a traditional calendar. "Kids are more relaxed, teachers aren't as burned out. It's not a panacea, but to the opponents, I would say let your cultural and personal traditions at least sit on the sidelines while you examine the issue." (McGlynn, 2002, p. 37).

Assistant Superintendent Sue Shook of Socorro Independent School District in Texas related that her district, which borders Mexico, had seen its enrollment of poor students steadily increase to 50 percent since the mid-1990s. The number of non-English speakers also escalated. Consequently, the district's 28 schools decided to go year-round to alleviate overcrowding. The district has remained on a YRC even though building projects are relieving overcrowding pressures. The YRC costs the school an additional $30 per student. Two teachers left when the YRC started, but now "100 teachers apply for every open position. It has built a lot of pride, bonding and camaraderie. We're a better community because of it." (McGlynn, 2002, p. 35).

Assistant Superintendent John Lukancic of Valley View School District 365U in Illinois related that his district turned to YRE to ease booming growth. In 1970, the district went to a multi-track YRC. Children were grouped by neighborhood. Teachers had several contract options. The YRC worked until the enrollment growth stopped. YRE was no longer needed to solve space problems and the district did not have the money to keep a YR schedule for educational purposes. "We fought to get on and we fought to get off." (McGlynn, 2002, p. 36). The district ended YRE in 1980, 10 years after its start there.
Murrieta Valley School District near San Diego also adopted a multi-track YRC in 1990 to ease enrollment growth. In 1989, the district had 2,400 students compared with a current enrollment of over 13,000 students. In 2000, the district went to a single-track calendar as building projects curtailed the need for more space. Guy Romero, director of assessment, research and academic projects related his views about the multi-track YR schedule. “You're going to kill your administrators. Planning time is cut back and staff development is hard to accomplish with teachers on different schedules. You do begin to tear apart at teamwork.” (McGlynn, 2002, p. 38).

Superintendent David Markward of Rock Island-Milan School District in Illinois said his district is currently on a five-year trial basis of single-track YRE. His district sent out a survey asking the community if it wanted a change in the calendar. An overwhelming majority said yes. According to Markward, “We looked at our calendar as perhaps there was something better to do. We said if the community does not want to do this, we won't.” (McGlynn, 2002, p. 36). Administrators, school board members and the community will evaluate students' progress annually. “We knew with great confidence it would do no harm. We believe it will do some good.” (McGlynn, 2002, p. 38).

Proponents of YRE argue that implementation of the non-traditional calendar creates significant improvement in four areas: administrator burnout, teacher, staff, student absenteeism, utilization of facilities, and student discipline. Supporters maintain that both administrators and teachers benefit from shorter, more frequent
breaks. Less burnout and less tension among administrators, teachers, and students reduces absenteeism (Loyd, 1991).

Donna Lewis, Principal of Timber Lane School in Fairfax Virginia expressed that her school decided on a YRC to “decrease summer learning loss, strengthen student learning, give teachers time to plan, assess, and evaluate student achievement, provide ongoing intervention to keep students from falling behind, and make schooling more interesting and relevant to the learner.” (Lewis, D., & McDonald, J., 2001. p. 25). She also advised other districts' stakeholders to: include everybody in the change process – especially those who may not agree, be ready to move easily between looking at the big picture and taking care of details, and finally, make sure that every change decision focuses on the academic, physical, social, and psychological well-being of the children in their care.

Oberg and Shields (2000) presented results of an interview with Superintendent Gene Henderson and principal Wilma Cole in an article about their Francis-Howell School District near Jefferson City, Missouri. When asked why his district initially started YRE, Henderson declared, “For us it was not a matter of saving money, but of accommodating kids in school. It was amazing that we got state, teacher, and parent approval in just a few months.” (p.150). The interview revealed that Francis-Howell may have been the first district in the United States to initiate a multi-track YRC back in 1969. Wilma Cole admitted she and her colleagues had many questions when the district adopted a YRC. “There were no experts. No one else had tried it. We didn't have the luxury of calling anyone. If a problem arose we pretty much had to resolve
it. There was a lot of grass roots problem solving” (p.154). Regarding a study on achievement after the first year of YRE, Henderson stated, “It really didn't show anything. Most of the findings were inconclusive and those that seemed to show a difference were, unfortunately still meaningless because it was to soon to assess achievement” (p. 160). Cole concluded the interview declaring, “I think we have served the cause of year-round schooling well — although that was never our intention. The fact that YR schooling has lasted so long here ... has given the calendar some real credibility” (p 162).

Summary of Administrator’s Comments Gathered in First--Hand Interviews

Four interviews with administrators were conducted to explore their reactions to YRE. Two of the interviews were carried out using e-mail, two interviews were done by telephone conversations.

Four basic questions were asked of each administrator: 1) Why is your school presently utilizing a year-round calendar? 2) Compared to traditional-calendar schools in your district, which core subject – math or reading – reflects the most growth each year in student achievement? 3) Compared to traditional calendar schools in your district, which grade levels seem to benefit the most from the year-round calendar? 4) As an administrator, do you prefer to work in a year-round calendar school or a traditional nine-month calendar school? Why?

An administrator in a large urban elementary school in Minnesota, answered the four e-mail questions as follows:

Thanks for your interest in year round education. We have this
schedule because the parents were interested in the schedule. It has been a huge success and last year another school began using the schedule. As an administrator, I feel that it is an excellent way for kids to learn. Since we have shorter breaks during the year the kids have an opportunity to learn in a continuous manner. Test results for all of our schools are available on our district web site.

Interestingly, the district web site did not reveal any test results.

Another administrator from a smaller metro area in central Iowa, answered the four e-mail questions in the following manner:

I would be happy to answer each question. Irving started the year-round program as a calendar option for parents and students seven years ago. It is currently in its eighth year of operation. We have not collected any data on comparing the two calendars at Irving for core subjects. I would also have to say that we don't have any data to support grade level comparisons. The contract I have currently is only ten days longer than the other two elementary principals in [our district]. The district has talked about giving everyone 260 day contracts in the future. I came from a district last year where I had a 260 day contract so working during the summer and over breaks if necessary isn't an issue for me. If you have any other questions don't be afraid to contact me again.
A telephone interview with a former principal of a YR elementary school in central Iowa revealed the following:

It was the parents. They wanted more for their kids. Parents of TAG and at-risk kids asked if there was a way to have more than the traditional 180 days of school for their children. A parent committee of about 13 started the ball rolling. By choice, about half of the student body is presently on a YR calendar. Teachers are on a waiting list hoping to be given a YR assignment. Teachers reported less stress and felt more efficient on a YR calendar.

Although this interview did not specifically answer the four original questions, an overall positive regard for YRE seemed apparent.

A phone interview with an elementary principal from a large urban YR elementary school in Iowa revealed similar results. This administrator indicated that low SES students seemed to benefit the most from her school's YR program particularly in reading. However, this administrator did not produce specific data regarding achievement scores. This administrator also revealed that the YR calendar allowed her ample time off from her administrative duties when compared to other administrator's contracts in the district.

The attitude of the principals interviewed regarding YRE was largely based on perception and community opinions rather than specific data on student achievement. That is, many practical factors need thorough examination when considering the implementation of YRE. For school principals and school leaders other more
functional elements such as teacher preference, budget restraints, increasing or decreasing student enrollment, parental requests, daycare issues, etc. all come to bear on this decision. It seems the power of the four interviews lies in the fact that they illustrate the multiple factors that principals think about when making this type of change. It is interesting to note, however, that none of the four interviewed principals had the concrete data to support their thinking on this issue.

Conclusions and Recommendations

The results of this review have shown mixed results regarding student achievement in math and reading when comparing traditional-calendar schools and year-round schools.

The impact of YRE appears to be most significant, however, in the core subject of math, especially in the upper elementary grades. The research suggests this positive differential effect in math could be a result of most math learning being restricted to formal school settings, whereas reading and language skills are learned both at home and in school throughout the year.

There are perceived advantages and disadvantages of single-track, multi-track, and traditional-calendar schools and evidence to support or refute such claims. Overall, however, the reviewed literature suggests that multi-track YRC schools slightly outperform the traditional-calendar schools, while single-track YRE schools have an even greater effect on achievement.

The reviewed literature does not specifically indicate which grade level(s) benefit most significantly from YRE. Although each individual study analyzed scores from a
variety of grade levels, no meta-analytic study was completed that would disclose which overall grade level had the most achievement gains as a result of YRE.

YRE’s impact on achievement as it relates to gender appears to be insignificant, according to the literature. One of the reviewed articles suggests that boys may benefit more from a YRC than girls.

According to the interviews with administrators, YRE has proven to be a successful alternative to the traditional calendar. Parental interest, booming enrollments, and/or a demand for higher achievement all play decisive roles when deciding how best to utilize time and space.

Much of the empirical data regarding the effects of year-round education on student achievement and other related outcomes suffer from poor research designs or incomplete data making it difficult to draw conclusions. Confounding variables such as demographic differences, length of time of implementation of year-round education, class size, and the purposes of implementation present definite limitations. Still, it is reasonable to conclude that year-round education at least at the upper elementary school level has a positive effect on student achievement.

Locally, with impending budget cuts in education, it is doubtful that many Iowa school districts will implement year-round education in the next few years. Unfortunately, start-up costs may appear too risky as does breaking tradition. A balanced year-round calendar could possibly benefit Iowa by retaining more young teachers. That is, there would be less burnout, more time for planning, reflecting, and relaxing. A three-week intersession in February or March would allow students and
teachers a chance to recharge or learn a new skill. This could be a flexible learning period limited only by the creativity and inventiveness of the staff and students.

If student achievement is a prime objective of education, stakeholders deserve to know as much as possible about alternative educational methods, including how best to use allotted time.
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Year-Round Education


