Volume 17 Issue 16
Originally issued as G5

Global Journal of human-social science: G
Linguistics & Education
Volume 17 Issue 5 Version 1.0 Year 2017
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-460x & Print ISSN: 0975-587X

# Compressed School week Cultural bias against English Second Language Student Performance on Standardized Exams

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*Abstract-* Financial constraints have driven K-12 schools in the isolated mountain regions of USA to reduce costs by shortening the teaching week. These regions have a high relative population of Hispanic Mexican immigrants who are English Language Learners (ELL). Hispanic immigrants come to USA to work but generally at low wages so it is a financial strain to pay childcare during the week to avoid losing a day of work. At the same time teachers are under pressure from the No Child Left Behind national initiative to ensure all students pass standardized tests. There is some evidence that shorter school weeks does not negatively impact student learning. However, we argue that a shorter school week negatively impacts ELL student performance on standardized exams, and if this were true it would be unfair to immigrants so the practice should be changed. We empirically tested the effectiveness of various school week formats using a large sample of rural schools in Oregon with a high concentration of ELL students from Hispanic Mexican cultures (N=628).

*Keywords: hispanic mexican culture bias; english language learner (ell); compressed school week; rural schools; standardized exam; no child left behind.*

*GJHSS-G Classification: FOR Code: 200303*

COMPRESSEDSCHOOLWEEKCULTURALBIASAGAINSTENGLISHSECONDLANGUAGESTUDENTPERFORMANCEONSTANDARDIZEDEXAMS

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## I. Introduction

A common trend in education around the world is to pay less attention to knowledge building in lieu of more emphasis on marketing goals (Song & McCarthy, 2016) and cost reduction (Herring, 2010; Marcotte & Hemelt, 2008). In the USA, this has resulted in pressuring teachers to increase enrolment and to ensure that children pass standardized exams that are required as part of the No Child Left Behind initiative. A secondary trend in the USA has been to compress the school week from five to four days in order to conserve costs. Several researchers found that Hispanic students did not perform well in a compressed school week (Graves, 2011; Herring, 2010) while other studies were inclusive about the learning impact of a shorter week with longer days (Hewitt & Denny, 2011). At least one researcher reported racism and learning problems that negatively impacted learning within Hispanic and minority students especially in the dominantly-white culture mountain regions of USA (Rudge, 2017).

An important issue driving this study was that school administers and community stakeholders were questioning whether alternative school week formats (such as four versus five days) were effective (Supovitz, 2009). Only 68% of all 11th grade students passed or exceeded the Oregon Assessment of Knowledge and Skills (OAKS) standardized exam (Oregon, 2016).There was very little empirical research about the effectiveness of a compressed school week schedule(Bell, 2011). More so, "research gauging the impact of a four-day school week on student learning is scant" (Herring, 2010,p. 26).In fact, Hewitt and Denny (2011)called for "further examination" of non-traditional school week effectiveness in terms of student performance on exams (p. 29).

Qualitative feedback of utilizing a compressed school week at participating schools in other American states were mixed, ranging from ineffective to effective (Graves, 2011; Herring, 2010; Hewitt & Denny, 2011).Interestingly, arecent public opinion debate hosted by Juggle LLC of Swansea IL USA revealed that 68% of the poll participants were in favour of a four-day school week (Debate.org, 2017).The rationale for the votes was polarized - there were 185 constructive comments at the time of writing.

An administrator argued: "The pros outweigh the cons! Our school would save 382,000 switching to a 4 day school week and you can do other sports on the free day. Tests show 4day school week benefits include less disciplinary action was taken and less absents and better grades. Plus more family time and you can schedule dentist appointments and vacations on the free day instead of taking a day off"(Debate.org, 2017, p. 14). A student also posted a positive reflection: "5 days is too much I'm 19 years old and doing my 2nd year of grade 12. It's just too tiring" (Debate.org, 2017,p. 82).

A contrasting public opinion from a student was: "Most people have to work so what about the families than can't afford to take every Friday (or any for that matter) and now have to find somewhere for their kids to go and pay for day care and such and such"(Debate.org, 2017,p. 178). A teacher added another negative: "No, the USA needs a longer school year. Other countries have recently out done the United States by putting us behind as the number thirteen county based on standardized tests. Therefore, if we plan to actually regain our place as a greatly educated nation, we need to offer better education. The way to do

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that is not to shorten school weeks" (Debate.org, 2017,p. 122).

An important socio-economic issue impacting school administrative decisions is that the ELL students have different needs (Aguirre-Muaoz & Amabisca, 2010; Barr & Clark, 2012; O'Day, 2009; York-Barr, Ghere & Sommerness, 2007; Rudge, 2017). ELL students are estimated to be 5.5 million of the USA school population and this is expected to double by 2025, to the extent that ELL students will comprise 25% of the public school population (Shim, 2013). In Oregon the Hispanic population has increased 163% since 1997 (Oregon, 2016). Testing the learning of Hispanic students is important because 76% of that segment are ELL but unfortunately only 21% of the population pass the OAKS proficiency level set by NCLB (Oregon, 2016). One researcher found that ELL students do not adapt well to a non-traditional school week configuration (Cannon, Jacknowitz & Painter, 2011). Other researchers have reported mixed results in terms of ELL student performance during traditional school week schedules (Datnow, 2011; Graves, 2011; Shim, 2013).

The purpose of this study was to examine if Hispanic Mexican ELL student performance was decreasing in the four-day week configuration. To investigate this, a two-year study was designed to compare ELL student performance on standardized exams while utilizing different school week configurations at selected rural secondary schools in Oregon (N=628). An individual level of analysis was taken (evaluating individual ELL student scores) because the researchers felt prior compressed week research in other states at the school level was less precise for detecting performance differences. In keeping with a post-positivist ideology the researchers collected quantitative data from the Oregon Department of Education and applied parametric as well as nonparametric statistical techniques to test hypotheses associated with a between-groups design.

## II. Literature Review

*a) Standardized exam impact on ELL students*

The push for using standardized exams in schools was propelled by the No Child Left Behind Act (NCLB) of 2001 in USA. The NCLB legislation was designed to increase state-level accountability for the results of student performance on national assessments, to provide parents with more school choices, as well as to provide stability for students by increasing local control for states government, school districts, and school administrators(Ellis, 2007).

The movement to standards-based curriculum along with high-stakes testing of student knowledge referenced to the curriculum fall in the realm of essentialism theory. Essentialists believe in the existence of certain basic skills that each citizen requires in addition to what schools must teach (Gutek, 1997). The measurement of accountability for teaching and learning of basic skills reflects an essentialist philosophy (Gutek, 1997). In fact NCLB requires states to delineate a rigorous, standardized curriculum with exams for each grade level, while the exam results must be reported to the public and United States Department of Education (USDOE) every year (USDOE, 2010).

High stakes tests refer to exams that carry serious consequences for students, their parents and educators, such as anxiety, stress, lack of retention (students may drop out of school if they fail), reduction in district funding or there may impacts on teachers in their performance evaluations (Loeser, 2008). Since the OAKS exam has been established as the mandatory measure of learning achievement to meet the NCLB mandate, this places great pressure on all stakeholders; thus, the OAKS exam is considered high stakes. This partially substantiates the significance for conducting this research.

The OAKS standardized exam is a criterion-referenced test written by a consortium of state educators in Oregon and it has been established as the accountability measure for students in Oregon to measure progress toward meeting requirements of NCLB (Oregon, 2012). A criterion-referenced test is a standardized instrument developed to provide another means to measure student achievement as defined by a standard or objective instead of comparing students to one another using a raw score (Loeser, 2008).

The OAKS exam was longitudinally retested with large samples of students in Oregon to achieve a high degree of reliability (Oregon, 2012).At the time of writing the pass level benchmark is 236to indicate mastery of the math body of knowledge taught in high school grades 9-12 (Oregon, 2012). However, the longitudinal pass level for the Oregon student population established through the validation processes was 237, with a standard deviation of 2.7333 (Oregon, 2012).

The greatest challenge schools currently face is the accountability to meet high standards of student achievement within the general and at-risk populations, such as ELL students (Supovitz, 2009). Of critical importance for school districts across the nation is the ability to achieve and maintain high levels of success for the ELL population, one of the sub-categories that NCLB addresses. ELL refers to students who have been identified as speaking a language other than English as their primary language (Oregon, 2016). In the state of Oregon, ELL students are predominately Hispanic Spanish-speaking. According to longitudinal evidence that dates back to the 1997-1998 school year, Oregon has seen an increase of 163.32% in its Hispanic student population. Currently, 13.63% of Oregon public school students are of Hispanic origin, and 76.47% of those students are ELL status (Oregon, 2016).



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As the deadline for 100% student proficiency on benchmark tests grows closer, school districts and government agencies are looking for additional ways to improve student performance on high-stakes tests. At the time of writing, only 68% of the entire population of Oregon students passed or exceeded the OAKS exam (Oregon, 2012). The ELL population lags even further far behind with only 21% of the population meeting the OAKS benchmark math test (Oregon, 2012). Therefore a hypothesis was developed to confirm that sampled ELL students were not meeting the OAKS benchmark:

- The mean OAKS score the ELL student sample will be less than the population mean of 237 (SD=3.733).

*b) School week length impact on ELL student performance*

Educational leaders are concerned with how their schools can continue to meet the criteria for Adequate Yearly Progress (AYP) established under the NCLB national initiative, and in particular to help the ELL student population succeed (Yell et al., 2006). To continue meeting the mandates of NCLB and to accommodate new graduation requirements, schools are turning to specialized instruction programs and alternative scheduling. The latter (scheduling) is an important factor investigated in this study.

Several variations of how high schools structure the time spent in school include the following: traditional five-day weeks, daily bell schedules, and increasingly four-day school weeks (Beesley & Anderson, 2007). A traditional school week schedule consists of a standard five day week with six to eight periods per day in which class length is less than one hour (Zelkowski, 2010). The traditional class schedule is broken into eight class periods each typically lasting 45 to 55 minutes; while the seven-period class schedule consists of sessions that last 50 to 56 minutes (Zelkowski, 2010).

In contrast, the four-day school week typically consists of classes scheduled Monday through Thursday. School days and the school year are typically lengthened to make up for the missed instructional time from Fridays (Beesley & Anderson, 2007).Historically, the four-day school week was implemented to help cut costs in staff and transportation. The shorter school week also gives students opportunities to receive remedial help, catch up on homework, and participate in extracurricular activities (Darling-Hammond, 2000).

The four-day work week is not a new concept. Business organizations and government agencies have implemented alternative work week schedules to attract higher quality workers, reduce employee absenteeism and turnover, and improve productivity (Zelkowski, 2010). The four-day work week increases flexibility in production schedules, reduces monotony of certain jobs, increases time with family, and increases worker morale (Beesley & Anderson, 2007).

The most important argument in favour of implementing a four-day week with longer days is that academic learning time is correlated with achievement, in that the longer students are in the classroom, the more they will learn (Zapeda & Mayers, 2006). It is also possible through that the accountability for higher achievement test scores is placing demand on school administrators to switch to the four-day week in order to simply lengthen the amount of educational contact time with students (Beesley & Anderson, 2007). The relationship between time and achievement, however, is not as simple as it seems. Instead, time spent in school during the week may affect the achievement of students on standardized math tests (Zelkowski, 2010). Additionally, the amount of time students spend daily in each class can have a significant impact on student performance (Beesley & Anderson, 2007).

High schools across the state of Oregon have demonstrated a small but steady increase of 16% over the course of the last four school years in their OAKS math scores. However, math scores for ELL continue to lag behind those of their peers, growing only 5% in the same time frame (Oregon, 2012).The general problem is that as of 2008, only 50% of ELL in the United States scored at the proficient level on high stakes math tests (Oregon, 2016). As reported on the 2010-2011 Oregon state-wide report card, only 21% of ELL students tested at the proficient level in Oregon (Oregon, 2012). Specifically, the concern regarding low scores for ELL students across the state of Oregon has resulted in state-wide initiatives of targeted interventions that focus on improving the test scores of ELL students (Oregon, 2012). The most popular and heralded initiative has been the modification to the number of days in the school week and the number of class periods in the school day.

Yarbrough and Gilman (2006) concluded from their empirical study that the standardized achievement scores of students in schools operating on a four-day schedule was the same as or slightly better than those operating on a five-day schedule. Reeves (1999)found that some schools showed slight gains in student achievement when using the four-day week. Beesley and Anderson (2007)concluded from empirical analysis that the four-day schedule did not impact student achievement one way or the other. There was no research concerning the impact of the number of periods per day about ELL student performance on standardized exams, although the studies cited above suggested longer days (more periods per day) would improve student achievement. Thus, the gap in the literature is there was limited research about the effectiveness of these modified program schedules with regard to ELL student achievement on the standardized exams (Bell, 2011; Darling-Hammond, 2000; Zapeda & Mayers, 2006; Zelkowski, 2010). Thus, in consideration



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of the literature review and practitioner experience, these hypotheses were proposed:

- The mean OAKS score will be significantly lower in four-day week cohorts versus the traditional five-day school week configuration for ELL students at rural Oregon schools;
- The mean OAKS score will be significantly higher in eight-period five-day cohorts versus the seven-period four-day format for ELL students at rural Oregon schools.

*c) Socio-demographic factors impacting standardized exam scores*

A number of researchers have identified several common factors which impact student performance on standardized exam scores, with the most significant being: socio-economic status (poverty) and teacher quality (Barr & Clark, 2012; Bell, 2011; Ellis, 2007; Oregon, 2012; Rudge, 2017; Yell et al., 2006). Socio-demographic factors such as race, language or age may not be a factor impacting this research since the entire sample will be Hispanic ELL students of similar ages in high school (Ellis, 2007; Oregon, 2012). Gender could certainly impact performance on standardized exams as found by Strang (2014) in his research, but this factor was beyond the scope of the current study.

In education there is a lot of pressure on teachers world-wide to perform, as well as to recruit and retain students. "For students this is evident in the imperatives to study for market positioning and not for knowledge per say." (Song & Mc Carthy, p. 83). In other words, students are focused on obtaining good grades to qualify for higher education or employment and teachers are playing into the neoliberalism philosophy where high enrolment and high pass rates are more important than actual learning.

The quality of teacher has been argued to impact student performance regardless of ELL status (Barr & Clark, 2012; Darling-Hammond, 2000; Schroeder, Scott, Tolson, Huang & Lee, 2007; Zapeda & Mayers, 2006). Teachers are expected to use time efficiently and make good use of research based instructional methods. This assumption is enforced through the evaluation process and therefore it could be asserted that teacher may not impact ELL student performance (Oregon, 2012).

Another important control is that teachers responsible for working with ELL students in math classes fall under the classification of being 'highly qualified' as defined by NCLB (2004). In addition to the requirements of NCLB, each state is allowed to set their criteria for highly qualified status. Oregon requires that teachers instructing math classes be certified by having at least a bachelor's degree as well as passing a proficiency test for the content area (Oregon, 2012). Currently, 97% of Oregon's teachers meet the requirements of being highly qualified (Oregon, 2012). This requirement helps to ensure that students, regardless of their economic, social, or ethnic backgrounds, are receiving quality education from teachers trained in the appropriate subject matter.

The sample selection methodology should concentrate on schools where the teacher is certified for math which would eliminate having to statistically control for differences in the teacher (despite the fact that obviously there will be some individual differences in personality and pedagogy). Nonetheless it is logical to test this assumption which can be done by examining any differences between cohorts at schools since one teacher is responsible for a class at a rural Oregon school. The following hypothesis was created as a control to ensure the teacher is not impacting ELL student performance on OAKS: The mean OAKS score will not be significantly related to teacher of the school class cohort.

Culture may be the key factor explaining why ELL students performed better in the five-day 8 periods per day school week format. According to the generally accepted global culture models, there are five basic polar dimensions used to describe a national level socio-cultural profile (Strang, 2012b):

PDi: Power acceptance (versus democratic/consultative) is the level of social acquiescence for the unequal distribution of power; meaning the extent subordinates accept unequal power is socially determined such as by a class system (India), by government, or by military (communism).

- UAi: Uncertainty avoidance refers to the extent to which people usually feel threatened by ambiguous situations; which means not taking risks, or in a business context formal rules and procedures are usually designed to provide more security and more career stability.
- ICi: Individualism instead of collectivism, whereby the former refers to the tendency of people to be capitalistic, look after their selves and be unique; collectivism refers to a clan culture meaning to work together seeking group rewards and loyally caring for/respecting elderly family members.
- MFi: Masculinity (as opposed to femininity) refers to values such as assertiveness, materialism, and lack of concern for others; while femininity emphasizes caring, concern for others, nurturing longtime relationships with others, and experiencing a high quality of life.
- LTi: Time orientation (long-term versus short-term), whereby in many parts of the world (particularly Asia, South America and African countries), people are long-term, eternal, destiny-oriented, based on religious beliefs; whereby in short-term oriented North American and European societies time must be scheduled and controlled to achieve timely



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results and to avoid waste (adapted from Strang, 2012, p. 5).

In particular, the individualism-collectivism and uncertainty-avoidance dimensions have been identified in some studies as significant factors impacting international student success in quantitative courses as well as in team-based university projects. Strang (2008) found that international students at an Australian university with high collectivism indexes (low ICi factor scores since the dimension measures individualism so the opposite low score is collectivism) and high uncertainty avoidance (high UAi) had lower grades in quantitative courses, mainly due to their desire to work together (and sometimes copy), as well as to avoid trying new things (high uncertainty avoidance means low risk taking).

In another study Strang (2010) found that Asian students from China, South Korea and India with high collectivism cultural dimension indexes performed better in team projects as compared to American and Australian students with high individualism profiles. Furthermore, Strang (2012) found similar cultural behavior within international students from Europe and Asia – participants with high individualism (low ICi meaning collectivist nature) and low uncertainty avoidance (low UAi) were more successful in completing their Doctor of Business Administration dissertations, which he attributed to their being willing to try new approaches (low UAi) and be self-managed (self focused, achievement-driven, high ICi). This potential for a difference on standardized exam score due to socio-cutural difference between ELL and non-ELL students is the unit of analysis in this study. This factor gives rise to another hypothesis: The ELL student performance will be lower than the non-ELL students.

*d) Literature review synthesis and hypotheses*

Based on the literature review, there were conflicting findings regarding the academic performance of ELL students in both traditional as well as non-traditional four-day school weeks at high schools. The researchers propose that ELL students will score lower on the OAKS standardized exam at schools that have been using a four-day. Additionally, common demographic characteristics such as socio-economic status, age and teacher quality were ruled out as likely factors impacting OAKS exam scores since the sample was Hispanic ELL, and gender was beyond the scope of the current study. Nonetheless, teacher quality needed to be established as a control, and it made sense to reorder the hypotheses as per below, since it would not make any sense to continue testing if teacher were highly correlated with score:

- H1: The mean OAKS score will not be significantly related to teacher (of the school class cohort);
- H2: The mean OAKS score for ELL students will be less than the population mean of 237 (SD=3.733);
- H3: The mean OAKS score will be significantly lower in four-day week formats versus the traditional five-day school week configuration for ELL students at rural Oregon schools;
- H4: The mean OAKS score will be significantly higher in eight-period five-day cohorts versus the seven-period four-day format for ELL students at rural Oregon schools.

## III. Methods

The researcher sheld a post-positivist ideology concentrated on cause-effect hypothesis testing that was driven by both an empirical literature review and from practitioner experience. The unit of analysis was school week length impact on standardized exam score. The level of analysis was group (students in a four or five day week class). The dependent variable was ELL student standardized exam score. Quantitative-oriented techniques were selected to test the hypotheses because metric performance data were collected for the dependent variable.

The general class of design was ex-post-facto non-experimental between-groups comparison with randomly selected intact groups. The key independent factor was the school representing a group of students which corresponded to a traditional or compressed school week. There were two formats of traditional and compressed week configurations in the schools, which resulted in four levels of the group factor. The ex-post-facto design strategically eliminated any influence of the researchers on the dependent variable which is a common limitation in empirical studies.

Descriptive statistics, correlation (preliminary analysis only), ANOVA and regression were applied at the 95% confidence level. SPSS version 22.0 was used for the statistical tests. Both parametric and nonparametric statistical tests were utilized, the latter as a contingency against violations of the assumptions for the chosen techniques.

ANOVA is appropriate for testing the difference in the variance of means for continuous independent variables across groups of nominal or ordinal factors; ANOVA is also appropriate for detecting predictor interactions by coding linear and quadratic factor interaction terms as parameters. Additional parametric post-hoc techniques can be applied if the hypotheses are supported (Keppel & Wickens, 2004).

## IV. Participants

In terms of sampling method, stratified simple random was used to selectintact groups of 29 existing rural secondary schools in the state of Oregon, so as to achieve roughly equivalent subgroup sizes, according the four levels of the main independent factor (week length and periods per day). The selection was determined by categorizing the schools by rural district



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in Oregon, identifying only those utilizing either a four or five day week (not both), and then seven or eight periods per day, while also filtering in data for schools that contained at least 30 ELL students.

The minimum required sample size of 255 was determined by setting the minimum effect size of 0.21 which is based on the literature cited earlier in that only 21% of the population meet the OAKS proficiency level set by NCLB (Oregon, 2016). We set the confidence level at 95%, the power at 0.80 and a 5% margin of error. Cohen's (2003) proportion formula was utilized, using 21% as the expected ELL students to pass: $N = .21(.79)(1.96/.05)^2 = 254.9$; which the actual sample size surpassed.

The Oregon public data was downloaded to preselect high schools (grades 9-12) that were rural and contained predominately ELL students. School superintendents were contacted using a collaboration agreement (informed consent was not required as the researchers accessed public school district data). The superintendents were asked if they considered their school rural and normal in terms of standardized exam performance. The latter was a criterion in the stratified selection methodology (to filter out small subgroups and low performing rural schools which may be attributed to the difficulty in attracting qualified teachers).Only classes with ELL students were targeted. Another criterion in the selection process was to ensure the school reported sufficient data for analysis, such as length of week, periods per day, along with basic demographic characteristics of the students. Additionally, the sampling criteria included that the teacher of the ELL classes was certified for math.

The researchers collected the standardized exam scores and demographic characteristics for secondary school ELL students from two 2011-2013 academic years, for the selected sample. This selection was made because the focus was on high schools for generalizing to Oregon high school ELL student populations. Repeated students were removed from the sample. This resulted in an approximately equal number of traditional versus compressed week formats in the sample as well as being balanced between the two academic years (N=628).

## V. Procedures

All demographic data was coded as nominal or ordinal to ensure the sampling methodology was performed correctly (e.g., ELL students, rural school, teacher certified for math, four and five day week, seven and eight periods per day). Grade level was entered as an ordinal (9-12).

School was coded as a nominal factor in order to control for teacher quality (in Oregon rural schools, one teacher was assigned to a class, and there were never more than two classes per grade level). A nonparametric correlation test was planned to test the hypothesis that teacher was not significantly related to the ELL OAKS exam score. 'Group' was the more important independent factor of interest in this study because this identified the length of periods in the day. Group was coded as a nominal factor, according to one of four levels: compressed week with 7 or 8 daily periods and likewise for the traditional five-day week with 7 or 8 periods per day. A nonparametric correlation test was planned to ensure that this factor was significantly related to the OAKS standardized exam score prior to ANOVA comparisons.

OAKS standardized exam score was the dependent variable. This was a continuous ratio data type representing the raw score from each student. As explained earlier, OAKS is a standardized exam which has been validated by the State of Oregon and has been found to be reliable in an academic subject matter expert panel using a test/re-test methodology (Oregon, 2012). The national average of the OAKS exam scores also confirms the reliability of the instrument (237, SD=3.7333). Normality tests were conducted on the dependent variable to confirm the exam scores in the sample met the assumptions of the parametric statistical tests.At the time of writing, only 68% of all students passed or exceeded the OAKS exam during the 2011-2013 school years (Oregon, 2012).

## VI. Results and Discussion

*a) Preliminary data analysis, validity and reliability*

First the data was checked for missing items, outliers and normality assumptions on the dependent variable. There were no missing data but only three grade 12 exam marks were available. Retaining these three records would have proposed a problem for certain statistical tests that require cell sizes to be at least five, such as generalized linear models and post-hoc tests. Therefore these three records had been dropped from the sample (N=628) which now meant data for grades 9-11 were included.

Normality tests were conducted on the standardized exam score since it was the dependant variable and parametric tests were planned. Ahistogramanalysis was done with each of the compressed school week configurations in the sample: four-day, 7-8 periods and five-day, 7-8 periods. A Kolmogorov-Smirnov test of the sample indicated it did not approximate a normal distribution (M=230.786, SD=6.64, $p<.000$) but all four groups were similar in shape. The researchers continued with the analysis since the planned ANOVA statistical technique was robust to this minor violation of distribution normalcy.

Descriptive statistics of the standardized exam score are shown in table 1 broken down by group (school week length) and grade. The groups were: 1 (4-day 7 periods), 2 (4-day 8 periods), 3 (5 day-7 periods,



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and 4 (5-day 8 periods).The kurtosis and skewness estimates were calculated to determine if each sub group did not deviate too far from normal distribution expectations. The kurtosis should be less than or equal to ±3 and skew should be at or below ±1 (Tamhane& Dunlop, 2000, p. 118). Nevertheless, a skewed distribution1 point beyond these benchmarks is commonly accepted in educational settings when the dependent variable is a standardized exam score. Additionally, the hypotheses in this study anticipate a lower standardized exam score for certain groups in the sample, so the data is expected to be skewed.

Teachers generally prefer a negatively-skewed distribution (median > mean with a more prominent left tail), instead of a positive skewed distribution even when the means are identical between two sample distributions, because more of the data frequency values are in the higher x-axis part of the scaleof a negatively skewed sample. Although a zero skewis statistically desired (symmetrical distribution) in education a positive or negative skewed distribution is typically accepted for exam scores because this would indicate more students were scoring a high grade scale. Since kurtosis is a quadratic transformation of skew, deviations from this statistical benchmark may also be tolerated. Therefore the skew and kurtosis estimates were found acceptable in this sample for the purposes of this study.

Internal validity refers to the risk of alternative reasoning for the observed results (Neuman, 2000). The three common threats to internal validity for quantitative studies are: sample selection bias, maturation, and statistical regression. Sample selection bias was reduced by randomly selecting rural schools, through a stratification methodology (categorizing the schools by rural district in Oregon, identifying only those utilizing either a four or five day week, and also by focusing on schools that contained at least 30 ELL students). Maturation was not a threat since the participant exam scores were examined ex-post-facto using archival data. Statistical validity is discussed next.

Since the dependent variable was collected from historical data over a time distribution, and all participants were Spanish-speaking ELL students, the majority of the threats to internal validity are null, largely because the study is based upon historical, publicly filed data using the *a priori* OAKS instrument. The participants were considered normal because as noted earlier the ELL demographic characteristics were similar among all students. Nevertheless, since there was a two year period involved, the learning curve effect could have impacted teachers (later year students could have scored higher because everyone would have learned how to work any loop holes in the OAKS math test). A Spearman correlation test indicated that there was a small but significant positive correlation between year and OAKS exam score (Rho=0.095, p<0.05).

Homoscedasticity (variance homogeneity) of the dependent variable OAKS exam score means the variance will be the same in terms of a distribution from one level of the independent factor to another. This was confirmed from the kurtosis coefficients whereby the kurtosis coefficients of the math score did not vary from group to group. For example, no single group had a flatter, steeper distribution as compared to the others. Independence was achieved in that the records were not linked other than students being in the same class.

Multicollinearity of independent factors means that there should be no variance shared between factors. Since the first hypothesis will test the relationship between teacher (via school) and exam score, this leaves only the group factor remaining. Thus, multicollinearity was not a threat in this study.

External validity means that the finding could be generalized to the greater population of ELL students in Oregon and other states. External validity concerns are beyond the scope of the current study although it is anticipated the results would generalize to rural schools in other states.

Reliability means that the results could be obtained if the study were repeated. Given that archival data were used, reliability should be very high.

## VII. Hypothesis Test Results

Spearman correlation was used to test the first hypothesis (H1) that the mean OAKS score will not be significantly related to teacher (of the school class cohort). The result was that there was no relationship between teacher and OAKS exam score (Rho=0.03, p>.05) as judged by comparing school and score. This test result also established that there were no relationships between other contextual factors within the school environment which significantly impacted the OAKS exam score.

The second hypothesis (H2: mean OAKS score for ELL students will be less than the population mean of 237, SD=3.733) was tested using a one-sample T-test against the population mean. As hypothesized the ELL students scored significantly lower (M=230.779, SD=6.66) than the OAKS pass mark; T-test(637)=-23.07, p=.000, having a score 6.2213 lower with control intervals (-6.743,-5.699).

The third hypothesis (H3: the mean OAKS score will be significantly lower in four-day week formats versus the traditional five-day school week configuration for ELL students at rural Oregon schools) was tested using a two-way ANOVA with a multilevel independent factor (group, representing the 5 or 4 day format). There was no statistically significant difference in variance of OAKS exam score between the four-day versus five-day school week configurations in the sample, F(1,627)=-1.925 , p=.166 which did supported the hypothesis. The ETA measure of association between school week



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format and OAKS exam score was 0.55 with an effect size of 0.003 which is very slight and insignificant. The OAKS exam score mean for the five-day week was 231.169 (SD=6.1024) while the four-day mean was 230.431 (SD=7.1127). Interestingly, the OAKS score was slightly higher for the traditional five-day week, although insignificant, which was similar to the findings of Beesley and Anderson (2007).

The fourth hypothesis (H4: mean OAKS score will be significantly higher in eight-period five-day cohorts versus the seven-period four-day format for ELL students at rural Oregon schools) was tested using a multilevel two-way ANOVA. Interestingly, there was a statistically significant difference of variance in ELL student OAKS exam score across the school week/periods per day combinations. The overall Levine test was significant, F-test (3,624)=11.745, p=.000 (N=628). The ANOVA results indicated a difference between groups, with an F-test (3,624)=3.113, p=.026 (significant at 5%).Group 4 (five-day week, 8 periods per day) had the highest OAKS mean. The results are summarized in Table 1.

*Table 1:* Descriptive statistics from OAKS exam score by periods per week-day groups

| Group | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Lower Bound | Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| 1 | 161 | 229.851 | 7.7478 | .6106 | 228.645 | 231.057 | 208.0 | 245.0 |
| 2 | 171 | 230.977 | 6.4333 | .4920 | 230.005 | 231.948 | 211.0 | 245.0 |
| 3 | 151 | 230.325 | 6.9786 | .5679 | 229.202 | 231.447 | 211.0 | 242.0 |
| 4 | 145 | 232.048 | 4.9023 | .4071 | 231.244 | 232.853 | 216.0 | 240.0 |
| Total | 628 | 230.779 | 6.6606 | .2658 | 230.257 | 231.301 | 208.0 | 245.0 |

*Table 2:* Post-hoc Tukey HSD comparisons of OAKS exam

| Group | N | Subset for alpha = 0.05 | |
|---|---|---|---|
| | | 1 | 2 |
| Tukey HSD[a,b] | 1 | 161 | 229.851 | |
| | 3 | 151 | 230.325 | |
| | 2 | 171 | 230.977 | |
| | 4 | 145 | | 232.048 |
| | Sig. | | .437 | .049 |

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 156.383.
b. The group sizes are unequal. The harmonic mean of the

A post-hoc analysis was conducted to identify which of the group means was significantly different. Tukey HSD was applied, which indicated that ELL students in group 4 (five-day week with 8 periods per day) had the higher OAKS standardized exam score, at 232.08 (p=0.049). The results are summarized in Table 2. An observation from these results was that even the highest group of ELL student OAKS exam score means were lower than the benchmark of 237 established by Oregon. ELL students scored higher on the OAKS standardized exam when the school week had 8 periods per day, with the highest score being in the five-day week format.

## VIII. Conclusions

The purpose of this study was to investigate ifdifferent school week configurations at selected rural secondary schools in Oregon has a statistically significant impact on ELL student OAKS standardized exam score (N=628). The individual level of analysis was applied using individual ELL student scoresacross an approximately equally balanced sample of school classes using different school week configurations.

The literature had indicated four-day week formats may not impact standardized exam scores, although some researchers found negligible differences or none. In one case the standardized exam scores decreased when the four-day week format was used as compared to the traditional five-day configuration. However, since there was very little empirical research comparing four versus five-day week impacts on exam scores, and no research involving ELL students in Oregon or variations of the periods per day, the researchers focused on these factors in the current study.

Furthermore, prior literature had indicated that demographic factors such as culture and age could impact standardized exam score, along with quality of



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the teacher. These factors were controlled or ruled out in this study. Culture did not vary as all students in the sample were Hispanic. Teacher differences were controlled through the sample selection method that requires teachers to be certified in math and the relationship between teacher to OAKS exam score was found to be insignificant through a nonparametric Spearman correlation test (Rho=0.03, p>.05).

Unfortunately (for schools and ELL students), the mean OAKS score for ELL students was found to be significantly less than the population mean of 237, based on a one-sample T-test(637)=-23.07, p=.000, with a mean score of 230.779 (SD=6.6606) that was 6.2213 points lower than the pass benchmark.

Although the researchers hypothesized that the mean OAKS score will be significantly lower in four-day week formats versus the traditional five-day school week configuration for ELL students at rural Oregon schools), there was no significant difference in scores, based on a two-way ANOVA F-test(1,627)=-1.925, p=.166 which did support this hypothesis. Ironically, the ELL student OAKS standardized exam score was slightly higher for the traditional five-day week, although insignificant, which was similar to the findings of Beesley and Anderson (2007).

The most interesting finding was that the mean OAKS score was significantly different for one of the eight-period five-day cohorts as compare to the seven-period in both four-day formats and the five-day seven periods per day configurations. Although small, there was a statistically significant difference of variance in ELL student OAKS exam score across the school week/periods per day combinations, based on the ANOVA F-test (3,624)=3.113, p=.026 (significant at 5%).

The post-hoc tests indicated that ELL students scored higher on the OAKS standardized exam when the school week had 8 periods per day, with the highest score being in the five-day week format.This could be interpreted as more periods per day in the five-day week configuration produced the best results for ELL students in the sample. The may be due to the fact that more periods per day (eight versus seven) mean shorter class periods, with more breaks, yet ELL students receive more face time with the teacher and with one another, by being at school for five days. Perhaps ELL students would do better with more time spent at school but with shorter duration teaching times to accommodate attention spans.

The socio-cultural backgrounds of the ELL students in the sample were examined. All of the ELL students were Hispanic and they immigrated from Mexico or other Latin American countries. The global cultural profile of Mexicois in direct contrast to USA on three of the five basic cultural dimensions (PDi, ICi, UAi), as summarized below:

- Mexico: PDi=81, ICi=30, MFi=69, UAi=82, LTi=30*; (*extrapolated from Latin America);
- USA: PDi=40, ICi=91, MFi=62, UAi=46, LTi=25;(adapted from Strang, 2012, p. 19).

Given the contrast between USA versus Mexico global culture on the ICi and UAi dimensions, it is possible that the high collectivism (ICi) of the ELL students clashed with the individualism style and expectations of the USA-based teachers and in general the USA high school environment. Mexico UAi at 82 is almost twice that of USA UAi at 46. In a similar contrast, Mexico ICi of 30 is three times lower than USA's ICi of 91.Even more importantly, based on the empirical culture research cited above, it is very likely that the ELL students were high in uncertainty avoidance (UAi) and therefore were less willing to try new approaches to learning. The integration and interaction of these two polarized cultural dimensions – collectivism and uncertainty avoidance - may have had an exponentially negative impact to impede ELL student learning in rural Oregon schools, since by definition, a person with high UAi and low ICi would prefer to work with members of their own clan and avoid new things (not take any risks).

Another study may be relevant to explain this because Strang (2012) found global cultural dimensions tend to abate for younger people when immersed into a different culture. In particular he found that international students in Australia generally become socialized and adapted to the new culture by the second year although their accents and family customs remain unchanged (Strang, 2012). If the above propositions were valid in describing the rural ELL high school students in this sample, the recommendations to improve the situation would be to use a more gradual socialization process in the school week configuration, starting with longer days and five days per week, combined with inviting ELL students to work more in groups to learn quantitative skills (such as working on puzzle problems), so as to accommodate their collectivist preferences, and to reduce the risk taking threat. Furthermore, to reduce the uncertainty, more materials should be made available in their native language during the transition process, so ELL students will have a reference to fall back on when they struggle with the uncertainty of ambiguous terms in their second language. It would be expected that gradually, as students reach their grade 12 level, the socialization process would have dramatically progressed.

In summary, there are two school district implications from this research when also considering the findings cited by other studies. First, changing to a four-day school week saves costs and does not statistically lower the ELL student scores on standardized exams. There was also evidence in the literature that this also holds true for non-ELL students. Second, longer days (8 rather than 7 periods per day) in



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a five-day week format, was the best configuration for ELL students, in terms of higher standardized exam scores. Third, culture, rather than school week format, was posited as the underlying factor, in that ELL student uncertainty avoidance and clan-oriented collectivist nature are not beneficial for succeeding in a USA individualist, risk taking context. Therefore, modifications to the instructional approaches would likely improve ELL student performance more so than merely more time with the instructor. For example, more team oriented quantitative activities and Spanish background reading materials (for backup) were recommended to help these students self-actualize and gain self-efficacy in the USA high school system.

The large sample size of 628 ELL students in rural Oregon schools make these results credible and generali zable to the targeted population. Another unique feature of this study was that the data was recent, being drawn from a current sample that went back two years. The reason data currency is important is that a lot has changed since the two major global events of 911-terrorism and the 2008 financial crisis. When also considering the NCLB mandate implementation curve that education practitioners have experienced from 2001 through to the final target of 2014, it makes sense to sample more current data when conducting these types of student school performance studies.

Data needs to be current, closer to political deadlines, because as target dates approach stakeholders react faster and then processes tend to change more quickly. Change events are occurring with respect to resisting NCLB accountability policies for measuring learning. At the time of writing students and their supporters successfully launched several large publicized protests against the use of standardized exams to measure their learning. For example the *Portland Tribune* reported that "Oregon Chief Education Officer Rudy Crew says the state has gone completely crazy with test mania" (Anderson, 2013,p. 1). One school principal pointed out that "if five percent of students at a school opt out of a test, the federal government will label the school in need of improvement, which would surely affect [their] image and impact future enrollment" (Anderson, 2013,p. 5). The induction from this is that if 79% of ELL students are failing the OAKS standardized exam, it seems very probable that soon they and their parents will make their voices heard which in turn will negatively impact many rural schools in Oregon.

*b) Limitations and future research*

A key limitation in this research, which affects any generalization, is due to the sampling design that focused only on Hispanic ELL students at rural high schools in Oregon. Additionally, gender – a commonly known confounding factor on math tests – was purposefully not examined.

The findings in this study were similar to those in the literature where the four-day week did not impact test scores. Hewitt and Deny ( 2011), Lefly and Penn (2009), Sagness and Salzman(1993), Feaster (2002), as well as Daly and Richburg (1984) found the four-day week had no significant effect on test results. This corroborates with this study although those researchers did not purposively sample Hispanic students.

On the other hand, none of the above cited studies employed the same standardized exam, and in fact most used a school-based instrument but the reliability was not clearly established. In older studies (prior to NCLB and the 2008 financial crisis) other researchers found contrary results to this study, namely that the four-day week impacted test performance. In particular Yarborough and Gilman (2006),Grau and Shaughnessy (1987) along with McCoy (1983)found evidence that the four-day week actually increased test scores although the effect sizes were small. Clearly more replication of this study is needed.

The logical recommendation for researchers, to overcome these limitations, would be to replicate the experiment to other states and countries using rural schools and ELL students, and then introduce contrast comparisons with non-ELL students, including analysis of gender and grade level as predictors of exam score. If such a study were done, no doubt alternative standardized exams could also be employed to investigate if the exam scores could be predicted by ELL versus non-ELL students when controlling for other factors. This could identify if current exams discriminate against ELL students. If this were attempted, it would require some assurance of exam validity and reliability including a comparison to the Oregon OAKS score distribution.

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