

Statistical Analysis of the Relationship Between Literacy Programs and Third-Grade
ELA State Assessment Scores in Tennessee

by

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Dedication

First, I want to thank one of the most important people in my life who was always willing to answer any one of my million questions: my mom. My love for education started with her and will continue growing for the rest of my life.

I thank my roommate for listening to my ramblings, my schemes, and my frustrated sighs. Eating ice cream and drinking coffee made me feel better about writing this thesis, but nothing compares to the comfort he gave me. Joshua Seay is truly a once-in-a-lifetime friend, and I will be forever grateful for his support.

Lastly, while she may never know my name, I want to offer my gratitude to Taylor Swift. Her music kept me sane through this process, and that is not an easy task.

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Abstract

This thesis sought to understand the relationship between literacy programs and the ELA test scores of third-grade students in Tennessee. Using data from Tennessee Comprehensive Assessment Data (TCAP) and programs made public by Tennessee Foundational Literacy Skills Plans, a quantitative analysis is performed. Using a multiple linear regression model, including data from per pupil expenditures of each district, no statistically significant relationship was found between the observed test scores and literacy programs.

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List of Acronyms

ANAR	A Nation at Risk
EL	English Learners
ERIC	Education Resources Information Center
ESSA	Every Student Succeeds Act
FLSP	Foundational Literacy Skills Plans
NCES	National Center for Education Statistics
NCLB	No Child Left Behind
OECD	Organization for Economic Co-operation
PIAAC	Program for the International Assessment of Adult Competencies
PISA	Program for International Student Assessment
RTT	Race to the Top
TCAP	Tennessee Comprehensive Assessment Data
TDOE	Tennessee Department of Education
TISA	Tennessee Investment in Student Achievement
TLSA	Tennessee Literacy Success Act

Introduction

The Organization for Economic Co-operation and Development (OECD) and the National Center for Education Statistics (NCES) are two well-known agencies that report findings on literacy competency in the US. The OECD places the U.S., among countries from all over the world, at slightly above average in adult literacy (2017). In 2018, the OECD's Program for International Student Assessment (PISA) that tests 15-year-olds for their proficiencies in various subjects placed the United States at thirteenth in reading per PISA's scoring system. Although the United States' international ranking may not be as worrisome, individual state data serves to be more troubling. The NCES reported the findings of the Program for the International Assessment of Adult Competencies (PIAAC) that reveals one out of five Americans have difficulty completing tasks that require basic literacy skills (2019). The NCES claims Tennessee reports one of the highest rates of low literacy skills in adults, with only fourteen states ranking higher in low literacy (2017). Seeing as the OECD reports that in the U.S, "higher proficiency in literacy and numeracy has a positive impact on several non-economic outcomes, such as trust in others, political efficacy, participation in volunteer activities and self-reported health," the need for increased literacy is more than necessary (2017).

With so much attention being paid to education in the United States and Tennessee, proposed legislation is constantly looking to increase the positive effects of literacy among Americans. When standard instruction in schools is deemed insufficient, services and programs are contracted out by states and school systems. Currently, market projections for the educational services industry are valued at 2.2 trillion dollars in the

United States (IBIS World 2023). In Tennessee, a significant portion of state spending goes towards education as it is continually occupying more than a quarter of the budget making education spending the second largest categorical allocation in the state budget, healthcare being the first (Transparent Tennessee 2023). Most recently, Governor Bill Lee has proposed a sharp increase in state funding towards a new funding formula, Tennessee Investment in Student Achievement (TISA).

Due to students in elementary school scoring “Below Expectations” five percent more on the ELA Tennessee Comprehensive Assessment Program (TCAP) than before the pandemic, among other state and national reading concerns, the legislation seeks to alter the foundational literacy of students in Tennessee (TDOE 2022). Statewide initiatives such as TN All Corps and Reading 360 have been implemented in the last few years by the state as solutions to this impending issue. However, these programs are too new to analyze their impact on test scores and literacy improvement. On the other hand, the literacy programs individual school systems have purchased for the use of increasing the ELA scores and literacy of students have been in use for far longer. As the state does not dictate how funds may be used for specific supplemental literacy programs, many school systems opt to embed these programs into instruction because of the perceived benefit of enhanced student learning.

These programs, purchased from for-profit companies, act as a supplement to reading instruction in schools with goals focused on improving student learning and literacy. The use of literacy programs predates even national initiatives such as the largely influential Reading First program derived from NCLB (NCES 2008). Although

most, if not all districts use these literacy programs, reports of which programs districts use specifically were not available until the passing of the Tennessee Literacy Success Act (TLSA) in 2021. Despite districts utilizing literacy programs before 2021, the study of such programs was constrained due to data limitations. With this new available data, this thesis hopes to make use of this new opportunity for research.

Since the profound impact of the “A Nation at Risk” report to the National Commission on Excellence in Education in 1983, education accountability continues to evolve. From legislation at the Federal level including the Elementary and Secondary Education Act under President Johnson to No Child Left Behind under President Clinton, the legislation seeks to increase accountability measures. As recently as the Every Student Succeeds Act, passed under the Obama administration, the interactions between federal and state education bodies have produced a complex, and often complicated relationship. Products of federal legislation include most notably, the Reading First and Race to the Top initiatives. To both comply with legislation and receive funding from supplemental programs, states have to create education policy that balances federal regulations and the unique needs of the state.

One federal requirement that states have to adhere to is the increase in data collection. While there are various areas of data that the United States Department of Education requires of states, arguably the most analyzed data is student scores on standardized assessments. As federal law mandates the collection of student’s test scores, states have aimed to analyze this data for how best to help their students. In the wake of recent studies reporting the lack of literacy attainment among school-age children, states and districts have sought increased measures to increase proficiency.

In 2021, Tennessee’s General Assembly passed two key pieces of legislation concerning literacy: the Tennessee Learning Loss Remediation and Student Acceleration Act and the Tennessee Literacy Success Act (TLSA). Since its passage, the state legislation on remediation has been updated to allow for more exemptions. However, the following sentiment still stands; third-grade students who are not deemed proficient in reading will not be promoted to the next grade level *without* additional support. In addition to new remediation policies, the TLSA aimed to require districts to create and provide the Tennessee Department of Education with plans that “use foundational literacy skills instruction as the basis of K-3 English language arts instructional programming.” One component in the Foundational Literacy Skills Plans (FLSP) is the requirement to record what literacy curriculum and materials each district uses.

In light of the historical and recent context, the research question persists: what is the relationship between 3rd party literacy programs and third-grade ELA state assessment scores? Despite these programs being used by teachers employed by the state, the programs themselves are purchased by for-profit companies by districts. Due to the instruction of these programs being neither wholly public nor private in nature, the analysis of the relationship between the programs and students is complicated, yet necessary. When considering a program that every student in the 3rd grade is at the very least exposed to and more likely used to learning from daily, the relationship between reading programs and the tests they take is important.

While many studies choose to explore educational curricula and products catered to remediation when focusing on students struggling with literacy, this study opts for a different approach. Instead, the research question utilizes district-wide programs to best

account for the relationship between them and district-wide data. In order to effectively explore this research question, this thesis will provide visualizations of the data collected, analyze literature concerning early literacy and education policy, detail the methodology used, publish the results, and discuss the findings.

Research Question

This thesis seeks to answer the following research question: What is the relationship between literacy provider programs and the ELA TCAP scores of third-grade students in Tennessee?

In a larger sense, answering this question can help to understand more about how third-party programs interact with public education systems. This will aid future research in education administration in finance on the state and local level, and possibly future policy on literacy provider programs. Both researchers and policymakers alike might be interested in seeing the results of the study mentioned previously on how large the educational services market has grown and continues to grow.

Literature Review

The importance of literacy dominates every region of the world, the United States being no different. Although the term “literacy” can be applied to many topics, such as “financial literacy” or “media literacy,” this review utilizes works concerning the ability of students to read and write. The first step to better understanding early literacy, student assessment, and third-party literacy programs is surveying the literature.

The analysis of these topics is currently conducted by studying the educational attainment of teachers, the socioeconomic status (SES) of students, and many other factors. These areas are well documented in the study of literacy attainment of young students; however, this review seeks to analyze literature from less studied factors. While there is existing literature assessing curriculum, most of these sources concern the educational research performed. On the other hand, curricula in the field of education policy or administration are typically analyzed for actor perspectives or implementation. In the field of education finance, these programs are infrequently studied for their philosophical implications in practice. In an age of research where mixed methods and multidisciplinary approaches are becoming more popular, an approach that reviews literature from more than one field can provide a more informed analysis.

So, the question emerges: How does literature from public administration, policy, and economics frame important policies concerning literacy and state assessments? This question is posed to align with the larger research question of the thesis. “What is the relationship between third-grade ELA test scores and literacy programs?” The reach of this review will include many disciplines such as economics, political science, and education due to the wide scope of this topic. To explore this question through available

research, the evolution of education accountability standards will first be explored in the literature pertaining to federal education policies. The financial and economic components will be analyzed second to bridge the connections between literacy policy and literacy programs. Lastly, select reading curriculums and programs concerning early literacy will be briefly discussed for the results of their original research and as consequences of previously mentioned federal acts and policies. This organizational method allows for connections between disciplines to be clear, yet the disciplines to stand alone in the dissection of their literature.

Once a source has been discussed for its relevance and contribution to existing knowledge in either the field of education, public policy, or public administration it will be assessed for how it applies to the topic of third party literacy curriculums. For this review to be sufficient in its exploration of literacy and curriculum, various databases were utilized. The Education Resources Information Center (ERIC) and Journal for Education Policy databases were independently searched for articles about the question at hand, among others.

Federal Influences: A Nation at Risk

This section reviews a key influence on literacy policy: A Nation at Risk (ANAR). Despite the No Child Left Behind and Every Student Succeeds Act (ESSA) being largely influential policies, the scope of this review concerns the most relevant factors in the literature regarding state testing and reading programs. Seeing that the reach of federal policy is wide, much too wide for the focus of this review, only programs with

the most historical significance to literacy today were selected. Being as notorious as ANAR was, literature was selected for its increased contribution to existing knowledge.

While incremental improvements to education accountability were made prior to ANAR the effect of the document on education continues to be profound. While many pieces of literature mention its name as a historical nod to the earliest efforts of increased education accountability measures, the report itself is quite controversial today. Masini's "Never a Nation at Risk: Exorcizing the Ghost of Education Past" compares U.S. adult literacy rates to other comparable countries. The article analyzes committee comments and the published writings finding discrepancies in the facts they presented. One glaring issue was the committee's confusion on assessment and the definition of literacy (Masini 2000). Despite the majority of the paper concerning global adult literacy rates, the first part of the paper prodded at the report in a critical manner. Rather than solely looking at the aftermath of the report, crucial components of *why* "A Nation at Risk" was so influential highlight why the report is so highly cited today. Masini ultimately emphasizes how empty the assertion that America is drastically behind in education and concludes the committee's conclusions to be inaccurate (2000).

Seeking to further explain the influence behind the creation of the committee and report, Nelson and Jones point to a political influence that also participated in the spread of fear of American labor not being competitive in the global market (2007). The article of *Teacher Education Quarterly* made the connection between education and national security relative to ANAR (Nelson and Jones). This is a common criticism of the document because of the noted influences on public education from the space race with the Soviet Union. While the two events may not seem related, Sputnik is mentioned twice

in ANAR (Foster 2020). Ultimately, Nelson and Jones critique the document for encouraging the uptick in for-profit corporations inserting their products into schools. In a historiographical analysis of literacy policy, ANAR is not only criticized for its call to panic and privatization, but its dismissal of poverty being an influential factor (Foster 2020). While Foster mentions privatization trends as being influenced by concerns about student achievement, SES and poverty status are cited far more frequently as being the true culprits behind achievement gaps stressed in ANAR (2020).

In the accumulation of research on ANAR, the commentary is rarely positive. In the most scathing critiques, ANAR is depicted as an empty call to panic. In the least heated analysis, the findings of ANAR are found to be made in confusion of the reality of literacy in America. This short spectrum of literature on ANAR seems there may be potential bias in the writers such as Nelson and Jones. However, each publication was selected because of its firm data supporting their contradictory statements to the results of the report. Due to the heated tone of Nelson and Jones's writing, there may be a potential emotional bias, but this does not detract from the validity of their arguments overall. Overall, the vigor against the report does not subtract from the work of each article, but it is something to at least consider as a potential factor for bias.

When discussing the topic of the privatization of schools, many may turn to examples of wholly private institutions, however, Verger et. al clarifies that privatization is “far from being a monolithic phenomenon,” (2017). Although this article describes the spectrum of privatization in education, the authors present the complex nature of the governmental institutions and federalism in the United States. noting “A Nation at Risk” as a hallmark of the 1980s in pushing for market-driven solutions (Verger et. Al

2017). In another conclusion, Verger et. al's article asserted that the "fragmentation of political power" in the United States prevents more drastic privatization measures from being implemented (2017). On the other hand, Foster claims ANAR became a "de facto policy" uniting both political wings in the United States (2020). With staggering progress in private efforts such as voucher systems and charter schools, less extreme examples of private influences in education are more achievable to implement and support through legislation. This political analysis goes beyond the common connection between ANAR and the effect on schools and policy. Instead, Foster and Verger et al tackle the political ramifications of the report which should be considered more in depth in future research in political science.

Neoliberalism and Education

Neoliberalism in education policy presents as a complicated web of economic and political theories emboldened in over 30 years of practice. As an economic philosophy, neoliberalism represents the positive view toward limited intervention by the government and free markets. In an educational context, neoliberalism promotes the privatization of public education. Although there are many ideologies concerning education policy, the discussion of neoliberalism repeatedly appears in literature when discussing 3rd party programs and standardized testing. Despite the plethora of knowledge on neoliberal and neoconservative effects on federal policy and thus federal program spending, the literature is far too vast to be relevant to the relationship between literacy programs and student achievement. However, these political influences do relate to the larger thinking behind federal legislation and in turn can be used to better understand the pressure to use educational services from for-profit companies.

Albeit a popular frame of ideological reference when analyzing federal policies, neoliberalism is approached from many angles. Bulkley and Burch, while defining private actors as both non- and for-profit businesses, investigate the changing dynamics between public and private education actors (2011). The concepts of “social goods” and “privatization” are related to the relationship and further explain how districts have become more reliant on outside support to implement accountability reforms (Bulkley and Burch 2011). The article makes a crucial distinction between previous private reach in K-12 education and the explosion of both new services and companies in the market. One of the examples of this expansion is the transition from “firms that once just developed tests” to “designing interventions for failing students and schools,” (Bulkley and Burch 2011).

Researchers concerned with the social equity of education point towards neoliberalism interfering with critical feminist ideologies. While an outlier in the traditional literature on education policy, this unique perspective on the privatization of education analyzes the consequences of competition among teachers and students. Additionally, from the feminist perspective, neoliberalism is framed not only in overhead federal policies but also within the organizations of teachers themselves (de Saxe et al 2020). Citing the teaching profession as predominantly female, de Saxe et al understand neoliberalism to be an affront to women teaching as it discourages collaboration and unions (2020). In a different discussion of actors' positions being altered in the face of economic restructuring, school chancellors appointed by city mayors are described as limiting democratic processes while also providing power to individuals with little to no professional experience in education (Scott 2011). An example Scott provides is the

appointment of Joel Klein and later Cathleen Black as school chancellors of New York City's school system despite neither working in the education field prior to their position.

Not all literature is as overtly critical of privatization as those criticizing neoliberalism. In an effort to better understand the effect of government contracting on education as well as school budgets, Rho investigates public choice theory and previous empirical research (2013). The article approaches the polarized knowledge of contracting by including studies with results supporting the cost-saving benefits of privately offered goods alongside studies showing mixed results on the quality of services (Rho 2013). Additionally, Rho comments on the benefits to contracting food or transportation services to lessen the administrative burden on schools (2013).

Neoliberalism in the context of education unfolds in various scenarios. In the case of critical assessments of education policy, the strong dislike for privatization and neoliberalism is seen as barriers to true social equity. Scholars such as de Saxe et al and Scott find this system of reform to damage integral positions in education through teachers and chancellors. On the other hand, using more quantitative evidence such as Rho, finds privatization of some services to be beneficial given the right circumstances. Going beyond the overall idea of contracting, the specific area of standardized testing is also analyzed.

In another analysis of equity in education, the relationship between high-stakes testing and neoliberalism is analyzed by Del Carmen Unda and Lizárraga-Dueñas. These scholars assess standardized testing for not only its sustainment of neoliberalism but also its negative impact on the learning of students (2021). Discussing solutions, Del Carmen

Unda, M. and Lizárraga-Dueñas point towards the use of multiple measures of accountability that allow states to use more than standardized test scores to show the progress of students (2021). While ESSA already allows the use of multiple measures, the State of Texas continues to solely use standardized tests to evaluate their students (Del Carmen Unda, M. and Lizárraga-Dueñas 2021).

Reading Programs

The Reading First program presents an interesting intersection between education policy and education science. As ANAR and NCLB were a report and policy, respectively, Reading First acts as both a grant program and curriculum. In a study of six different reading programs, Brenner and Hibert stress how the program compelled schools to employ their own programs to teach literacy. When looking to increase reading materials to students in a prior study on Reading First schools, teachers responded that Reading First mandated they not deviate from the curriculum. In response, Brenner and Hibert's next study looked to reading volume. They discuss the controversial nature of reading volume in literature because of studies wavering on whether or not increased reading volume leads to improved literacy outcomes. Upon looking to the teacher's editions of these programs, the researchers doubted the reality that teachers could adhere to the programs with fidelity as programs such as Reading First recommend. Second, they found none of the six programs provided differentiation between texts for students with different reading levels.

This study relied on many assumptions and implications. While this study contributes to the volume of literature on reading programs, its addition to the knowledge

of the subject seems relatively small. The fault of the significance of this research is not due to shoddy methodology, rather, this comparative review of reading programs is not often conducted. At the time of writing this, Brenner and Hibert state, “we know of no studies that validate the entirety of any particular core reading program, even at an individual grade level.” While this study was published in 2010, not much has changed in over a decade of research on reading programs.

Circling back to Reading First, Barone studied the implementation of Reading First in schools in Nevada over the course of its implementation and wrote about their findings from the data collected on student achievement. Stemming from the proficiency scores of students, Barone reflected that the achievement differences between third-grade students in and out of the program were less than 10% apart (2013). Additionally, schools with different needs for instruction, such as high versus low numbers of proficient kindergarteners or number of English Learners, showed outcomes that did not always reflect the time, money, increased instruction, progress monitoring, and additional coaches of the program (Barone 2013). Again, the lack of differentiation mentioned in both this study and Brenner and Hibert’s study on other programs appear.

In a less involved analysis than Barone, Moser tackles the key components to literacy outlined by Reading First on how the program performed in aiding those skills. When comparing the research provided by the National Reading Panel and the focus of Reading First, Moser saw an incongruity (2009). Vocabulary instruction, for example, was listed as a crucial component by the National Reading panel to success in literacy attainment, but Reading First schools did not increase instruction time in this area to be statistically significant (Moser 2009). Brenner and Hibert, while noting its investigation

would be outside the scope of their article, inquire about how scientific the reading programs truly are. Whether it be questioning the soundness of the research behind the development of a reading program or its specific attention to a lack of following scientific recommendations, most literature on reading programs are skeptical of its success.

In the case of Reading First's counterpart, Early Reading First focusing on preschool, prior studies on the program found that there was a gain in letter awareness, but no statistically significant effect on oral language scores (Gonzalez et al 2009). In Gonzalez et al's own study of the program, they witnessed increased skills in vocabulary but students on average still scored one standard deviation below national levels (2009). In comparison, Gonzalez's study incorporated elements of instruction that reacted to student's response to the material (2009). Tiers of instruction or methods and intensity of instruction were differentiated based on student's test results, something either not present or mentioned in the prior two pieces of literature.

In a slightly less conventional study, a reading program (READ 180) is studied not through the lens of achievement data, but rather students' learning experiences. While directed toward EL students and students with learning disabilities, the program continues to describe the overarching conclusion by most studies in this review: it is not individualized enough. Instead of focusing on vocabulary advances or other reading skills, Wu and Coady interview four children about their experiences in the program. While a relatively small group, the researchers concluded that the lack of cultural materials in READ 180 creates a need for effective teachers to implement supplemental resources to bridge the gap. Even departing from the quantitative studies, Wu and Coady

research contributes to the larger call and discussion of differentiation in reading programs.

Upon combining real-life experience teaching with research, a dissertation on student achievement and literacy peered into the efficiency of commercially developed reading programs. Utilizing data supporting the heterogeneous literacy skills within a group of students, Dennis questioned whether these programs could effectively cater to an array of proficiencies and deficiencies (2008). Considering school districts' lack of individualized planning to use these programs, Dennis was further concerned with how well the Tennessee Reading Policy could address the variation of literacy skills among students (2008).

Continuing to be concerned with the lack of research in the field of adolescent literacy, Dennis explores first how reading disabilities and difficulties begin in early education. High-stakes assessments are detailed not only to limit curriculum to “phonemic awareness, decoding, and fluency” but also to prematurely label student’s skills to be below standards (Dennis 2013). As the heterogeneity of reading skills and needs are understood, the intervention programs are deemed “superfluous” because of their inability to account for the variety among students (Dennis 2013).

Although the literature available in the study of literacy is vast, the programs used to instruct students is less commonly studied. Limitations to these studies such as difficulty to isolate variables such as poverty levels, may be the cause behind a lack of research. An overarching theme among the limited research does present as questions and concerns to differentiation. As the popularity of rigid reading programs arose from Reading First, the attention to its effects in the classroom is important to the historical

component of this review. Albeit important to recognize the influence Reading First had on the rise of commercial programs, moving forward must require more literature on the subject. With a vast majority of schools using some form of purchased program, it is imperative to understand the effect of these programs on students' ability to read and write.

Upon relating the studies pertaining to reading programs to neoliberalism and federal influences, interesting connections arise. Despite spanning different disciplines, the literature on ANAR, neoliberalism, and literacy programs did present connections. First, most literature used a methodology that involved analyzing test score data. Whether it be the notions founded by ANAR, or the criticism of standardized test scores, or to describe the effects of reading programs, testing students is a crucial component to how research is conducted in any field involving literacy. Second, the privatization noted in ANAR and neoliberalism literature often resulted in the criticism of lack of individualization. Albeit not entirely the same, the lack of differentiation argued by literacy researchers can connect to the disciplines critiquing privatization's erasure of individualized learning. In future reviews, this multidisciplinary approach should be utilized again to perhaps different federal policies, other economic philosophies, and programs to find new connections. Other issues in education influenced by policy or financial factors should also consider developing a multidisciplinary approach as done here.

Methods

This thesis utilizes the methods most suited to a quantitative study with an emphasis on a multiple linear regression analysis. A descriptive research design is best suited for this study as describing the relationship between state test scores and literacy programs is the main goal of this thesis. Statistical analysis, in the form of a statistical regression model, will be applied to test scores, financial reports, and types of literacy programs.

The data collected for this study encompassed three crucial elements from each district in the years 2018 to 2022. These elements include 1) the literacy programs utilized by each district; 2) the percentage of students earning a score of "Below Expectations"; and 3) the combined state and federal per pupil expenditure. It is important to note that due to the unavailability of test scores for the year 2020, this data was omitted from the study. Federal requirements for reporting these scores were waived during the COVID-19 pandemic.

Data Sources:

Due to the state law, Tennessee Literacy Success Act, schools are required to publish to TDOE their Foundational Literacy Skills Plans (FSLP). These plans include reporting the literacy programs they use and how they plan to support students who struggle with reading. To obtain data on the literacy programs used by districts, data was collected from each district's FSLP, which are updated online when changes occur. The most recent change to an FSLP was recorded on August 25th, 2023. The latest programs

used by districts is included in this study. These FSLPs are publicly accessible on the Tennessee Department of Education (TDOE) website. The combined state and federal expenditures on pupils were also accessed from TDOE's under the section District Report Cards.

Additional considerations were given to districts that listed using more than one literacy program for third-grade instruction. In cases where districts either recorded more than one program or received a waiver to implement a program not on the approved list by the Tennessee Textbook Commission, these districts were categorized as "Other" to maintain data integrity.

The results from third-grade ELA TCAP tests, being directly reported to TDOE by school districts, were chosen as the primary data source. Data limitations presented in the inclusion of charter schools in Tennessee due to their differences in reporting by TDOE. Since FSLP plans are reported at the district level, the inclusion of district-level test scores would not have been relevant to individual charter schools, thus necessitating their exclusion.

Data Collection

The data collection process was relatively simple, in part due to the comprehensive education reporting requirements already in place. The large sample of districts aimed to account for most student scores in Tennessee, aligning with the study's inspiration from the Tennessee Learning Loss Remediation and Student Acceleration Act of 2021 and subsequent policies expanding retention laws. This vast dataset allowed for

the generalizability of the findings, which can be applied to neighboring states with similar educational contexts if repeated.

Analysis Methods

Once data was collected, the program used for data organization and the regression model was Microsoft Excel. This research opted to use Excel as it is capable of performing the analysis the project requires and it is the most beginner-friendly for undergraduate research. This approach was selected through careful consideration to best analyze the large amounts of data this project requires. A quantitative approach was selected to determine if/what relationship literacy programs have on student's test scores. Although this research focuses on schools in Tennessee, this research design is compatible with almost any state that requires districts to report literacy programs and test scores. With the data available, this study can be repeated in other parts of the country or can even be repeated with test scores in Tennessee in the future.

Results

To reiterate, the research question I constructed for this thesis is: What is the relationship between the outcomes of student test scores and literacy programs? The results from the linear regression model did not answer this question in the way I had predicted. Seeing how fundamental these programs are to the FSLP plans and daily instruction, I had predicted there would be an identifiable relationship between the two variables. However, there is more nuance to my research question than a “yes” or “no” relationship. After calculating the multiple linear regression, I measured three elements of the results; the relationship found, the statistical significance, and the limitations.

Upon analysis for relationship and statistical significance, the regression yielded interesting results. First, upon analyzing the multiple R-values of each year’s data, only one year came close to the value of 1 needed to convey a slight relationship between the test scores and programs. The year, 2018, was also the only regression year to have a single statistically significant variable.

Statistical Measure	2018	2019	2021	2022
Multiple R	0.339996095	0.279518535	0.292283692	0.298603398
R Square	0.115597345	0.078130611	0.085429756	0.089163989
Adjusted R Square	0.044489218	0.004927269	0.011580699	0.017308332
Standard Error	6.740849796	7.751176345	10.01786341	9.156296693
Observations	136	137	135	138

When considering the statistical significance, the significance level chosen was 0.05 as it is standard in social science research. Of each p-value associated with each independent variable, only one p-value is less than the standard 0.05 p-value. The per

pupil expenditure for the year 2018 ($p=0.020516$) is the only value able to reject the null hypothesis.

Table 2: Regression Results From Year 2018			
Variables	Coefficients	Standard Error	P-value
Intercept	5.153948553	6.478928586	0.427822268
Amplify	2.340731001	2.96299065	0.431018227
Benchmark	1.241635534	3.043132534	0.683957123
Wit & Wisdom	2.59354789	3.125414945	0.4082071
HMH	-3.72748728	4.791887376	0.438101154
LZ Guidebooks	-2.756563354	3.752699039	0.463975487
LZ Expeditionary	0	0	#NUM!
McGraw Hill	1.071430583	3.236449875	#NUM!
Open Up	4.237057472	3.489240817	0.226896259
Other	-3.198189962	3.642818071	0.381645185
2018 PPE	0.001352597	0.000576454	0.020515572

Table 3: Regression Results From Year 2019			
Variables	Coefficients	Standard Error	P-value
Intercept	17.31960089	7.073184616	0.015704876
Amplify	2.2191868	3.204618947	0.489889985
Benchmark	0.946306142	3.276351174	0.773182939
Wit & Wisdom	1.600210546	3.392924702	0.637999012
HMH	-4.082199924	5.391745825	0.450380209
LZ Guidebooks	-3.110431204	4.147879003	0.454711033
LZ Expeditionary	0	0	#NUM!
McGraw Hill	-0.681310421	3.481537215	#NUM!
Open Up	2.621848752	3.824491634	0.49425158
Other	-5.356780233	4.014511554	0.184475392
2019 PPE	0.000157698	0.000666498	0.813343336

Table 4: Regression Results From Year 2021			
Variables	Coefficients	Standard Error	P-value
Intercept	13.97576343	10.02365612	0.165706963
Amplify	4.607106337	6.02417695	0.445850254
Benchmark	6.072134855	6.096859144	0.32120104
Wit & Wisdom	5.744868302	6.186335686	0.354866325
HMH	0	0	#NUM!
LZ Guidebooks	-0.609398708	6.937184867	#NUM!

LZ Expeditionary	9.352906338	6.914599255	0.178615045
McGraw Hill	5.260548327	6.325961299	0.407231315
Open Up	10.06080613	6.59616128	0.129722531
Other	-1.650294404	6.786531051	0.808270746
2021 PPE	0.000908468	0.00079479	0.255211154

Table 5: Regression Results From Year 2022			
Column l	Coefficients	Standard Error	P-value
Intercept	26.43489257	7.563014247	0.000651246
Amplify	-0.725779281	3.796117451	0.848679759
Benchmark	2.036927747	3.904618683	0.602800673
Wit & Wisdom	-2.782079831	4.020586361	0.490216531
HMH	-6.996564354	6.320943438	0.270419026
LZ Guidebooks	0	0	#NUM!
LZ Expeditionary	-4.755606605	4.906807908	#NUM!
McGraw Hill	-5.376780937	4.151242072	0.197574778
Open Up	-4.652751767	4.53164794	0.306486796
Other	2.44443072	4.758835656	0.608374215
2022 PPE	7.20709E-05	0.000569637	0.899518207

When analyzing the few viable results from this research, it is important to consider the limitations of both the data available and the model itself. One, the data available to complete this research was not fully available. Before 2018, TDOE opted to report the scores of the TCAP and alternative test, in one figure. Prior to TDOE reporting the scores from the two tests in 2018 separately, it would have been impossible to analyze test score data pertaining to only the TCAP. Additionally, after contacting TDOE, the PPE data for the year 2023 is not available till the spring of 2024, making the year 2023 unavailable for this project as well.

The second limitation to consider is the inability for the regression model to *entirely* disprove that a relationship exists. While the model was unable to show results supporting a statistically significant relationship between programs and PPE on test

scores (except for one value), the inclusion of more variables such as teacher education or SES of students, could change the outcome of the results.

Conclusion

Is there a relationship between reading programs and test scores? Maybe is the best answer this thesis can provide. Despite not finding a statistically significant relationship, this research adds to the limited scope of existing knowledge of how reading programs affect student learning and test score results. The study of literacy is a constantly evolving field that, as shown in the review of literature, is filled with inconclusive results and discourse over best practices. Being that this research analyzes one of the largest arrays of programs and district data in hopes of understanding more about reading programs, perhaps with more intervening variables or years available, a relationship can be found in the future.

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