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Evaluating Learning Gains Using Mastery Learning

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ABSTRACT

The Interstate Teacher Assessment and Support Consortium (InTASC) dispositions are essential to teacher effectiveness, often resulting in higher performance on standardized tests. This study highlights the influence and importance of dispositions as it evaluates the impact of differentiated instruction using alignment and mastery learning on the learning gains of 46 students. The study used pre-and post-tests, specifically the Stanford Achievement Test's reading section percentile scores, and analyzed the results using a t-test and effect size. All instructors employed the same teaching method for an equal amount of time. A statistically significant mean difference of 8.28 and a Cohen's d of 0.63 were reported. Results indicate that Exemplary Center for Reading Instruction (ECRI)-based reading interventions likely played a role in student improvement. The results of this study can be used to help further the understanding of mastery learning for both future and practicing educators.

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Introduction

Numerous reviews have confirmed the effectiveness of mastery learning in enhancing student achievement across various subjects. To ensure all students succeed, it is crucial to implement teaching practices that promote mastery learning. This study aims to address this need by identifying effective teaching practices that lead to student success. With this in mind, we can look at how this information can be utilized to increase teacher dispositions, specifically through making data-driven decisions.

Statement of the Problem

Research supports the effectiveness of mastery learning in instruction, with multiple reviews highlighting its positive impact on student achievement across various subjects and content areas. To ensure the success of all students, it is essential to examine instructional strategies that contribute to academic achievement. This study addresses this need by identifying effective teaching practices that promote student success.

Review of Relevant Scholarship for Mastery Learning Relation to Previous Work

Throughout history, educators have sought to enhance and improve their instructional practices with the goal of fostering student learning. Many have operated under the assumption that such improvements would benefit all learners. Effective teaching requires a teacher to have professional attitudes, values, and beliefs, a disposition that supports student learning and development (Council of Chief State School Officers, 2013). These dispositions correlate with student success and higher performance on standardized assessments (Sing & Stoloff, 2008; Thompson et al., 2005). The dispositions outlined by InTASC encourage teachers to adapt to changes and innovations, a critical skill in the dynamic and fluid educational landscape (Altan & Lane, 2018; Garner & Kaplan, 2020). The dispositions outlined by InTASC encourage teachers to adapt to changes and innovations, a critical skill in the dynamic and fluid educational landscape (Altan & Lane, 2018; Garner & Kaplan, 2020). They influence their teaching practices and interactions with students, building rapport and managing classrooms effectively, which are key components of successful teaching (Laughter et al., 2020; Thornton, 2006). Early educational theorists, including Comenius, Pestalozzi, and Herbart, explored methods for improving instruction in their writings (Bloom, 1974). This sustained commitment to instructional refinement serves as the foundational principle of mastery learning.

Carroll (1963) explained with the model of school learning how a learner will succeed with a given task to the extent the learner uses the time needed to succeed with the given task. Bloom (1968) and others carried this idea forward and analyzed essential elements of mastery learning, including feedback, correctives, and enrichment with individual and multi-analytic studies (Arhin & Bonsu Opoku, 2020; Basar et al., 2016; Bizimana,et al., 2022; Bloom, 1971; Bloom, 1988; Clark et al., 2014; Cook et al., 2013; Ede & Igbokwe, 2018; Guskey & Gates, 1986; Guskey & Pigott, 1988; Guskey, 2015; Guinness et al., 2021; Hattie, 2018; Kulik, Kulik, & Bangert-Downs, 2010; Reid, 1990; Reid, 1997; Reid, 2001; Reid, 2006; Vladescu, 2020; Winget & Persky, 2022; Yildiran & Aydin, 2005).

Hypothesis, Aims, and Objectives

Hypothesis

Does daily reading instruction using Exemplary Center for Reading Instruction (ECRI) -based methods lead to statistically significant improvement in students' SAT reading percentile rankings from Fall 2023 to Spring 2024?

Null Hypothesis (Ho):

There is no statistically significant difference in SAT Reading percentile ranks between Fall 2023 and Spring 2024 among students receiving daily ECRI-based reading instruction.

Alternative Hypothesis (H1):

Students who receive daily ECRI-based reading instruction demonstrate a statistically significant increase in SAT Reading percentile ranks from the Fall of 2023 to the Spring of 2024.

Aims

All the teachers used differentiated instruction to instruct and assess the forty-six students. The aims were to evaluate if mastery learning strategies and differentiated instruction led to learning gains.

Objectives

This study investigates the extent to which specific strategies incorporating mastery learning influence reading standardized norm-referenced test scores. Additionally, it examines the impact of aligned instruction and assessment under specific conditions on learning gains. Furthermore, the study explores whether these two objectives can assist educators in critically evaluating their instructional effectiveness by addressing the fundamental questions: "Did I teach?" and "Did the students learn?"

Method

Inclusion and Exclusion

All the teachers were studied using mastery learning methods designed at the Exemplary Center for Reading Instruction (ecri.cc/about.html). ECRI provides elementary and secondary educators with comprehensive training on effective reading and language arts instruction, classroom time management, and the implementation of essential teaching strategies to prevent student failure. It also supports content-area teachers by providing strategies that enhance students' reading, speaking, listening, and writing skills while fostering vocabulary development, comprehension, and study skills (ESSA, 2025). The Exemplary Center for Reading Instruction qualified for inclusion in the national Every Student Succeeds Act signed into law on December 10, 2015, with a study yielding a 0.74 effect size. Evidence for ESSA (https://www.evidenceforessa.org/program/exemplary-center-for-reading-instruction-ecri/) Earlier, ECRI was included in the first and second editions of the National Catalog of School Reform Models. (Northwest Regional Educational Laboratory 2006). ECRI was approved by the U.S. Department of Education as an effective program for inclusion in the National Diffusion Network in 1974 and reapproved in 1990. (Education Commission of the States, 2001). ECRI's instructional designs were reviewed by Patterson, et, al. (2008)

Participant Characteristics

All study participants attended school in a small western private

elementary school, grades two through eight with a middle-class socioeconomic status.

There were 46 participants in the study. All participants were students who attended school in a small western private elementary school in grades two through eight and were of middle-class socioeconomic status. The school is 89% white, and 10.1% of enrolled students identified as two or more races, Asian/pacific Island, or American Indian/Alaskan Native. As a private school, there is a tuition requirement; however, there are scholarship opportunities for those who may not be able to meet the financial obligation.

Eight students were in second grade. Six students were in third grade. Ten students were in fourth grade. Five students were in fifth grade. Eight students were in sixth grade. Eight students were in seventh grade. One student was in eighth grade.

Grade Level	No. of Participants
2nd	8
3rd	6
4th	10
5th	5
6th	8
7th	8
8th	1

Sampling and Procedures

All the students in the second through eighth grades in the school participated in the study. Data was collected for about 45 minutes in a western, private elementary school using the Stanford Achievement Test 10 reading section on October 23-24, 2023, and April 24-25, 2024. Stanford Achievement Test 10 Edition (https://www.pearsonassessments.com/store/usassessments/en/Store/Professional- Percentile scores were computed, and *t*-tests were computed using these percentile scores. No payments were offered to students and school personnel. The Georgia Southern University Institutional Review Board reviewed the details explained in the report.

Sample size, Power, and Precision

Forty-six students in second through eighth grade participated in the study. All the students in these grades participated in the study.

Quality of Measurement

All the teachers used the directions provided by the Stanford Achievement Test 10 to administer the reading section.

Instrumentation

The Stanford 10 Achievement test is a standardized assessment used to measure students' academic performance in various subjects, including reading, mathematics, language arts, science, and social studies. It is designed for students in kindergarten through 12th grade and is widely used by schools to evaluate student progress, inform instruction, and compare achievement levels across different groups. It assesses students' knowledge and skills based on national curriculum standards and provides norm-referenced scores, meaning student performance is compared to a national sample of peers. The test is often used for accountability purposes, instructional planning, and placement decisions in both public and private schools. The Stanford Achievement Test received an alpha reliability rating of .87. It is used as a tool for meeting state standards in academics. The test has been used for over 100 years. The Pearson Correlation Coefficient for the Stanford Achievement Test 10 ranges from 0.25-0.69.

Administration and Assessment

All teachers adhered to the standardized administration procedures outlined in the Stanford Achievement Test, Tenth Edition (SAT-10) when administering the reading section, ensuring consistency and fidelity in test implementation.

Naturally Observed Conditions and Instructional Design

Teachers in this study demonstrate teaching practices that directly align with InTASC Standards 1 and 4: Subject Matter and Instructional Strategies. The educators in this study, whose classes we collected data from, demonstrated an understanding of central concepts and implementation of instructional literacy strategies and practices. They utilized research-

based instructional literacy strategies developed by ECRI. All the students were given an Informal Reading Inventory created at ECRI. Children were given different passages to read, with the levels being determined using the Revised Spache Readability Formula (https://readable.com/readability/spache-readability-formula/) and the Revised Dale-Chall Readability Formula (https://readabilityformulas.com/learn-about- the-new-dale-chall-readability-formula/) Teachers timed each student, recorded omission, insertion, repetition, and mispronunciation errors, and asked literal, interpretative, critical, and creative comprehension questions as the children read at various levels. Teachers used this information to place the students into reading groups at their instructional reading levels to differentiate instruction and assessment. Additional detail regarding instruction follows, and a brief explanation of nine areas is described in further detail.

Teachers met with each reading group daily and taught reading skills at their instructional reading levels using methods developed at ECRI. The teachers first reviewed all the vocabulary words the students had been studying and had yet to pass, taught new vocabulary from the stories in their readers, reviewed the vocabulary taught that day, and taught comprehension at the literal, interpretative, critical or creative levels, or writing, or critical thinking, and specialized study skills, grammar, or literature. When the students study new vocabulary, they write, spell, and read the words, proof their spelling, use them in oral sentences, read them in a sentence, and answer questions about the word's meaning.

Read-A-Story

While one reading group was with the teacher for skills, another reading group was doing Read-A-Story, where they read independently from enrichment reading sources or from sources connected with their science, social studies, or reading from other content areas. A specific reading assignment was given that may correlate with what was taught the day before in skills instruction. The students timed their reading using a graph to keep track of their reading fluency.

Write-A-Story

Usually, the classroom had three reading groups. One group was with the teacher for skills instruction, another group was doing Read-A-Story as described above, and the third group was in Write-A-Story. During Write-A-Story, the students wrote for ten minutes on a specific topic, counted their words, wrote the number at the top of the paper, and read their writing to another student. The students completed another untimed writing assignment and read their writing to another student. The timed writing was connected to a specific topic, perhaps to what was taught the day before. The untimed writing was for a general topic.

Practice Time for the Students

All the students were given twice the amount of time they spent in skills instruction for practice time. During practice time, they practice independently and with other students to pass reading, spelling, and comprehension criterion-referenced tests. During the first three weeks of school, the teacher taught several practices for students to use during practice time. Each student selected from among these practices to practice and pass the criterion-referenced tests

efficiently.

Practice Time for the Teacher

While the students practice independently and with others, the teacher gives reading, spelling, and comprehension criterion-referenced mastery tests at their instructional reading levels for one-third of the practice time. The students learn to tell the teacher when they are ready for the tests. No student waits for another.

While the students practice independently and with others, the teacher gives individual conferences for one-third of practice time, listening to the students read orally, reteaching vocabulary needed if misread, and checking their

writing from among their writing notebooks, asking comprehension questions after the child reads and makes decisions about what may need additional teaching for the student. The teacher records the conference results.

While the students practice independently and with others, the teacher gives one-third of the practice time for small group discussions. This time is divided into thirds, and each reading group discusses with the teacher the stories they are reading in their readers. During the first three weeks of school, the teacher taught the children to discuss what they were reading. The children are discussion leaders, tell their ideas and what they think or feel, and use other discussion skills taught earlier. The teacher makes notes about comprehension for further comprehension lessons.

Back-Up Skills for Skills Taught Earlier

Back-up skills require the same amount of time for skills instruction. If skills instruction is 30 minutes, then back-up skills are 30 minutes. The time is divided into thirds for spelling instruction, penmanship instruction, and proofing through dictation.

Spelling Instruction

Each reading group receives three spelling exercises efficiently that match the vocabulary words taught that day during skills instruction. One lesson is for the whole word, another lesson is for word formation, and a third lesson is for word discrimination. The children write, spell, and read their words orally.

Penmanship Instruction

Several penmanship lessons are taught during the first three weeks of school. This time is used for teaching penmanship for other upper- and lower-case letters not taught and for connecting strokes if cursive penmanship is being taught. Once all the letters are taught, half of this time can be used for spelling instruction and half of this time for dictation. Rate building practices are provided.

Proofing Through Dictation

Students in each reading group are provided with dictation exercises efficiently at their instructional reading levels to evaluate the quality of their writing and spelling and to improve their auditory and visual sequential memories.

This section explains how teachers in this study effectively integrated ECRI-based instructional literacy strategies, aligning with InTASC Standards 1 and 4, to enhance student learning through a structured approach that reinforced subject matter understanding, literacy development, and instructional best practices.

Results

A paired-sample t-test was conducted to determine whether there was a statistically significant mean difference between the Total SAT Reading percentile ranks from Fall 2023 to Spring 2024. There were no outliers in the data, as assessed by inspection of a boxplot. The assumption of normality was not violated, as assessed by Shapiro-Wilk's test ($p = .966$). Participants scored higher in percentile ranks in Spring 2024 ($M = 65.41$, $SD = 30.19$) than in Fall 2023 ($M = 57.13$, $SD = 29.36$), a statistically significant mean increase of 8.28, 95% CI [4.34, 12.22] in percentile ranks, $t(45) = 4.24$, $p < .001$, Cohen's $d = 0.63$, indicating a medium effect size.

Discussion of Results

Results indicated a statistically significant difference between the Spring 2024 and Fall 2023 SAT Reading percentile ranks. The paired-samples t-test showed that students scored significantly higher in Spring 2024 ($M = 65.41$, $SD = 30.19$) compared to Fall 2023 ($M = 57.13$, $SD = 29.36$), with a mean increase of 8.28 percentile points, 95% CI [4.34, 12.22], $t(45) = 4.24$, p < .001. Given the statistically significant p- Value (p < .001), the null hypothesis (which stated that there was no significant difference in SAT Reading percentile ranks between the two time points) was rejected in favor of the alternative hypothesis, which proposed that students

demonstrated a meaningful improvement in their reading performance over time.

The effect size, measured by Cohen's d (0.63), represents the magnitude of the difference between the Fall and Spring semesters. An effect size of 0.63 falls within the medium range, indicating that the observed improvement resulted from the instructional intervention. The results indicate that the increase in SAT Reading percentile ranks was statistically significant and moderately impacted student performance. A medium effect size implies that the instructional methods, such as the daily ECRI-based reading interventions, likely played a role in student improvement. Due to the medium effect size, other contributing factors cannot be discounted on the differences between Fall 2023 and Spring 2024. Further research could explore whether specific elements of the instructional approach were particularly influential in driving these gains.

Similarity of Results

These results support earlier evidence supplied with similar statistically significant mean increases and effect sizes (ESSA, 2025; Kulik, Kulik, & Bangert-Downs, 2010; Reid, 1990; Reid, 1997; Reid, 2001; Reid, 2006; Vladescu, 2020; Winget & Persky, 2022; Yildiran & Aydin, 2005).

Interpretation

One variable that may have set this evaluation study apart from others is the differentiated instruction and assessment used. All the students read from an informal reading inventory (Reid et al., 1996) and were placed and taught at their instructional reading levels. Some children come to school reading well and need to be taught what they do not know. This happened to the students in this study. If they had the reading ability to be taught at an advanced level, they received this instruction.

Other variables included that may have contributed to the results were all the teachers using the same effective teaching practices. They provided the time and practice the students needed to learn by efficiently teaching vocabulary, writing, literature, critical thinking and study skills, comprehension, grammar, and spelling at their instructional reading levels. Manuscript and cursive penmanship were taught. Formative assessment was used immediately during instruction when needed. All lesson objectives were stated aloud before the lesson began and then modeled explicitly. Teachers worked with the students after modeling the lesson using formative assessment during guided practice. Students demonstrated the objective during independent practice. The teachers continually told the students what they were doing well, creating a positive learning environment. During instruction, the students were required to read, write, speak, and listen, as these responses met the needs of visual, auditory, and kinesthetic learners. Reading and writing activities supported each other. Time was provided for the students to write and read from pleasure and/or content books each day. Time was provided for the students to choose practices they learned to practice and pass criterion-referenced spelling, reading, and comprehension tests. It can be implied that the teachers believed the students could learn because they used formative assessment as needed continually during instruction. All the instruction and assessment special conditions were aligned by the teachers in this study (Cohen, 1987; Cruz, 2008; Polikoff, 2012). Cohen reported effect sizes of 1.2-3, and Cruz reported effect sizes of 0.87 and 0.96.

Implications

Future research should focus on both present and future teachers. It should investigate the implementation of mastery learning in conjunction with differentiated instruction to provide empirical evidence of its effectiveness in preparing teacher candidates for classroom management, particularly in the areas of differentiated instruction and assessment. Future research should also target educator preparation programs, investigating the evolution of teacher-candidates disposition throughout their field experiences using instructional methods outlined in this study.

Conclusion

InTASC dispositions are vital for assessing and improving teacher effectiveness. They are crucial for student achievement, professional growth, and comprehensive teacher evaluation. By focusing on these dispositions, educators can ensure that they are committed to fostering a supportive and positive learning environment. The findings from this study highlight the significant role of differentiated instruction and mastery learning in student achievement. These instructional approaches align with key teacher dispositions essential for fostering effective learning environments. Teacher dispositions, including adaptability, reflective practice, and commitment to student success, are critical in implementing mastery learning effectively.

Author Contributions

John J. Hobe: Conceptualization (equal), Methodology (equal), Qualitative Analysis, Writing –original draft, Writing –review & editing

Nedra L. Cossa: Methodology (equal), Quantitative Analysis, Writing –review& editing

Timothy Hinchman: Methodology (equal), Quantitative Analysis, Writing –review& editing

Ethical Considerations

The Georgia Southern University Institutional Review Board approved this study.

Consent to Participate

Following directions from the Georgia Southern University Institutional Review Board (IRB), Gardner Reid, the Reid School principal, sent written confirmation to the authors and IRB that students can participate in the study.

Consent for Publication

Gardner Reid, the Reid School principal, provided consent for publication.

Declaration of Conflicting Interest

The authors declared no potential conflicts of interest with respect to research, authorship, and or publication of this article.

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