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University of Nevada, Reno

Precision Teaching: Communication of Impact Informed by a Report from the Field

A thesis submitted in partial fulfillment of the requirements for the degree of Bachelor of Arts in Psychology and the Honors Program

by

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Abstract

This report from the field assessed the effectiveness of using supplemental data displays and national norm data on communication with laypersons. Accordingly, a web-based data management tool with access to data displays and national norms data was implemented into a behavior analytically oriented learning center located in Reno, Nevada. Fit Learning, a learning center that uses Precision Teaching to instruct learners in reading, mathematics, comprehension, and problem solving was the study site for this analysis. The systematic assessment and associated analyses included an examination of the use of multiple data displays for communication, comparison of pre- and post-test data on client satisfaction surveys, and a comparison of Fit Learning student data to that of the national norms. The reading and mathematics curriculum areas at FIT Learning were targeted for this assessment. Crucial to the study was the implementation of the web-based data management system called AIMSweb. The results of the national norms comparison demonstrated Fit Learning students were progressing faster than the average students nation-wide. Moreover, the results of the client satisfaction survey analysis demonstrated complimentary data displays had a clinical significance in regards to client satisfaction.
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Introduction

Psychologists’ concentration and influence on education can be traced back to the early 1900s with the development of the “teaching machine” patented to Pressey in 1928 with around 700 of the devices patented to be used in education. (Dean & Ripley, 1997). The teaching machine was a device that presented information to the learner, prompted the learner to respond, and then provided feedback regarding that response’s accuracy. The immediate feedback of the device emphasized a core principle in behaviorism—a subset of psychology that developed fully in the mid-1950s with B.F. Skinner. The behavior analytic approach to instruction can be dated almost as far back as the beginning of behavior analysis itself with Skinner’s emphasis on immediate feedback and reinforcement. Dean and Ripley (1997) quoted Skinner’s words from 1965, “The most widely publicized efforts to improve education show an extraordinary neglect of method. Learning and teaching are not analyzed, and almost no effort is made to improve teaching as such” (p. 25). Skinner’s belief that learning should be analyzed was the foundation behind instructional techniques within the field of behavior analysis. Multiple instructional techniques have since stemmed from Skinner and behavior analysis including Personalized System of Instruction (Austin & Carr, 2000), Active Student Responding (Austin & Carr, 2000) Programmed Instruction (Dean & Ripley, 1997) and Precision Teaching (Austin & Carr, 2000), among others.

The first of these techniques, Personalized System of Instruction (PSI), was different from traditional instruction since it focused on self-pacing, unit mastery, and the use of lectures, written communication and undergraduate proctors. In the PSI technique, the learner is responsible for learning the material within the given term. Moreover, their success in learning the material is accepted if a designated performance outcome on the tests are met. The instructor
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communicates the material using lectures, which are optional as all of the material can be learned from the assigned readings within the class (Austin & Carr, 2000).

Active Student Responding and Programmed Instruction (PI) were some of the other instructional approaches that stemmed from Skinner. Austin and Carr (2000) discussed Active Student Responding in terms of Dewey’s belief that “students learn by doing” (p. 459). Dewey’s principle is seen in PI because of PI’s focus on active response. PI was implemented by Markle and had three main focuses: small steps, active response, and the immediate knowledge of results (Dean & Ripley, 1997). The small steps can also be referred to as component skills that allow for the student to reach the desired behavior. The learner is then given immediate feedback on the accuracy of that response, as seen in PSI.

While Active Student Responding promoted by PSI, has been an important instructional technology that has emerged within the field of behavior analysis, the instructional technology that will be focused on within this paper is PT. Lindsley, a student of Skinner, founded PT in 1965 as a method to verify the effectiveness of instruction (Austin & Carr, 2000). The most recently articulated definition of PT comes from Kubina & Yurich (2012); PT is “a system for precisely defining, measuring, recording, analyzing, and facilitating the subsequent decision-making of behavior” (p. 18). PT precisely defines a behavior in a way that is measurable, unlike other methods that have less concrete ways of measuring behavior. Using the determined definition of the behavior, the behavior can then be recorded so that analyses and appropriate interventions can be made (Kubina & Yurich, 2012).

Adoption of Precision Teaching by Pioneers in the Field of Behavior Analysis

Effective instructional approaches have been adopted into practice by private schools and learning centers scattered across the U.S. and extending to other countries. The Comprehensive
Application of Behavior Analysis to Schooling (CABAS) has five schools focusing on behavior science that is learner-driven. (CABAS, 2012). In Ireland, five “Sapling” schools use applied behavior analysis to predominately target children with Autism (Saplings, 2000). Other places where behavioral approaches to instruction are being impactful on the surrounding community are: Morningside Academy located in Seattle, Washington; Haughton Learning Center in California; The Fluency Factory in Massachusetts; and Fit Learning located in Nevada, Oregon, and New York (Binder & Watkins, 2013).

CABAS schools focus on the individual child and apply Lindsley’s “the child knows best”–approach to their school philosophy. Instead of allowing the blame of a child’s failure to lie with the child or the parents, CABAS schools focus on changing the instruction and school to fit the child’s needs (CABAS, 2012). CABAS is not limited to instructing any specific type of learner as the schools instruct learners with disabilities as well as typically developing learners. It is also not limited to maintaining schools within the U.S.–CABAS schools exist in England and Ireland. Research suggests that the CABAS schools are highly effective, with one school’s statistics indicating that the method used Accelerated Independent Learner) shows 4 to 7 times more learning control than baseline (CABAS, 2012).

Applied behavior analytic schools targeting children with Autism in Ireland are called the “Sapling” schools. The Saplings schools accept learners from ages four to eighteen and design curriculum around autism-specific needs. The Sapling schools maintain that “The worst effects of autism can be prevented in many cases. It is now known that early, intensive behavioral programs can eliminate completely the symptoms of autism in some children and greatly improve the lives of others.” (Saplings, 2000). The schools are committed to using a behavioral approach to treat and educate learners with Autism.
Other private and public schools within the U.S. use behavior analysis as the foundation behind their instructions and have also been shown to be effective (Binder & Watkins, 2013). The Standard Celeration Society is the organization that connects the various schools using PT. The society offers publications within the field, information on the Standard Celeration Chart (SCC)—a tool used by the PT community to track responses—and access to conferences specific to PT. A collaboration to constantly advance and contribute to the field of PT is available because of the society.

The PT research conducted demonstrates the effectiveness of the technology, but also shows there is a lack of dissemination (Binder & Watlkins, 2013). Multiple case studies have been conducted to establish the usefulness of PT in regards to a variety of skill sets including reading literacy, identification of objects, and common tasks for individuals with impairments (Ayers, Potter, & McDearman, 1975; Kerr, Smyth, & McDowell, 2003; Lindsley, 1992; White, 1986).

**Precision Teaching Case Studies**

In the 1970’s, the Great Falls Precision Teaching Project assessed math, reading, comprehension, language expression and writing through four separate studies (White, 1986). Each study compared PT schools with a matched non PT school and the results consistently showed that there were significant differences in learner improvement between the two. The studies showed a large range in learner grade level, capability, and disability. White (1986) also discussed the Haring, Liberty, and White study as well as the Bohannon study that once again showed significant results between correctly implemented PT and non PT instruction.

Case studies have been conducted on individual students with learning disabilities. Lindsley (1992) discussed the impact of PT techniques on a girl, Lisa, who was identified as
learning disabled. Lisa, who was in the second grade, began her reading instruction with a frequency of eight correct words read per minute with 50 incorrect words. Within her first two weeks of PT based instruction, Lisa began displaying an improvement in her reading with a deceleration in errors. With her instructor charting her progress on the SCC, a prediction of her level of performance in the following month was attained and flash cards were added to her programming to ensure Lisa would be able to reach her goal in the desired time. The observation and data-based decision allowed Lisa to reach her goal on time (Lindsley, 1992).

Outside of traditional targeted skills such as reading, studies have been conducted on the use of PT in the acquisition of daily tasks. Kerr et al. (2003) showed similar results with a four-year-old boy with autism, Sean. The skill targeted for this participant was the ability to identify objects. Baseline data showed that Sean was able to identify about two objects with eight errors per minute. After two months of using PT and the SCC to track the progress of Sean’s ability to correctly identify objects, Sean was able to accurately identify all ten objects presented to him. His ability to identify all the objects was checked two months later and Sean demonstrated that he was able to retain the skill.

**Failure to Disseminate PT**

Private schools and grant-funded programs have emerged using behavior analytic approaches and PT, case studies have shown the implications of PT for learners in a group setting, and case studies have shown the effectiveness of PT on individual learners of all levels and skill sets. However, the public school system has not adopted PT as a technology into classrooms. The failure to disseminate the technology could be attributed to the lack of effective communication between the behavior analytic community and laypersons.
Awareness of the effectiveness of PT based learning centers is clear to the PT community, but a lack of effective communication with laypersons could attribute to why there have not been more overall understanding and infiltration of PT into public schools. While behavior analysts have excellent methods of assessing, recording, and analyzing learner progress, those methods can be difficult to convey to laypersons. It is possible that in order to improve communication, standardized tests and the use of supplemental data display tools could be used (Smith, Newsome & Newsome, 2013).

One difficulty in conveying information is the prevalence of the SCC as the predominant tool for recording the progress of a learner. For all its technical precision and utility, the SCC can be a cumbersome communication tool for laypersons. The chart is difficult to orient to because of its logarithmic scale and surplus of information. Training to fully understand and utilize the SCC is required for precision teachers, a training not undertaken by the general public. This report from the field used Fit Learning, a PT learning center located in Reno, NV, as a site to assess the effectiveness of using supplemental data displays and national norm data on communication with laypersons. The web-based data management system, AIMSweb, was the tool used to provide standardized progress monitoring as well as supplemental data displays. The following sections provide an overview of this web-based data management system in addition to the associated discussion pertaining to its utility as a decision making tool for behavioral interventions.

**AIMSweb as a Medium to Improve Communication**

AIMSweb is a web-based data management tool which has been utilized by schools and teachers across the U.S. Supplemental data displays, national norms data, and protocols for administering progress monitoring—Curriculum Based Measurement (CBM)—are some of the
important features offered by AIMSweb. The national norms data was taken from the 2009-2010 school year sampling 55,000 students nation-wide (Shinn & Shinn, 2002). In the sample taken, students were stratified based on sex, ethnicity, and socioeconomic status to correspond with the national demographic percentages (Shinn & Shinn, 2002).

The AIMSweb system allows each school access to their own account where the schools can input students’ data and organize the students by school, teachers, and grade level. Figure 1 shows what a typical screen would look like when entering the system.

![AIMSweb Home](image)

**Figure 1: AIMSweb Home**

The left side of the screen displays the different options available when beginning to enter data. This screen shot is specific to the account held by Fit Learning located in Reno, Nevada.

AIMSweb also provides standardized CBM procedures for writing, reading, math, and spelling CBMs in their prospective manuals. Each manual gives a script of directions to verbalize to the learner, a correct timing length, and rules for scoring. The Reading-Curriculum
Based Measurement (R-CBM) is standardized at a one minute timing length and the behavior targeted words read correctly (Pearson, Inc., 2012a). As per AIMSweb protocol, the learner is given a passage to read that corresponds to a grade level. There are multiple passages for each grade level to ensure the learner receives a novel passage when they are assessed.

Two mathematics CBMs exist within the system: math computation CBM (MCOMP) and math application CBM (MCAP). The MCOMP is standardized at an eight minute timing length and measured correct responses to mathematics computation problems such as thirteen times twelve. The scoring for the problems is weighted depending on the difficulty of the problem (Pearson, Inc., 2012b). The M-CAP differs in timing length per grade level, allocating eight minutes to grades two through six and ten minutes to students in grades seven through eight (Pearson, Inc., 2012c). Math application problems call upon multiple skills at once including solving word problems, interpretation of graphs and figures and other forms of mathematics. The score is also weighted depending on the difficulty and complexity of the problem.

The data accessible through AIMSweb allowed for comparisons to be made across differing instructional practices. The standardization of the protocols was specific and detailed enough that there was consistency across the nation. The norms data gave an opportunity for more comparison to be made in relation to the national average and provide an additional communication tool when interacting with clients.

**Data Displays as Tools for Data Based Decision and Communication**

Visual representations of data, or data displays, are used for a multitude of purposes including recording information, communication of information within and outside of a specific discipline, and the analysis of information. In the field of PT the standard data displays in use is the SCC, which has been shown to be valuable in analyzing and recording data accurately.
(Calkin, 2005). However, data display preferences and accurate understanding vary by preferences as shown through the case study conducted by Hojnoski et al. (2009). As Luke (2013) states, “It is important to evaluate the communication components that will ensure the data are presented in a way that is valuable to the audiences. This [evaluation] is especially relevant when an audience does not have in depth training in data analysis, as in the case in most situations outside of one’s own scientific community or organization.” (p. 3-4). While displays such as the SCC have been proven to be conducive in analyzing data and making decisions about the data, the chart has not been assessed in terms of its applicability in communicating impact to laypersons.

Calkin (2005) discussed the use and unique properties of the SCC (which originated with Lindsley and has been in use since 1967). The SCC, shown in Appendix A, displays ‘celeration’—the growth of learning across time—and frequency of behaviors on a logarithmic scale (Calkin, 2005). The x-axis of the chart shows time intervals which vary depending on the type of SCC used. The Timings SCC shows each behavior tracked in a day, the Daily SCC displays days in a six month period, the Weekly SCC displays weeks, and the Yearly SCC displays years. The y-axis of each SCC shows the count per minute on a logarithmic scale. The bottom of each chart also shows learner information including name, grade level, and behavior charted.

The standardized display of celeration and frequency of behaviors is unique to the SCC and makes it an important tool for precision teachers to analyze behavior and predict future frequencies. Analysis and prediction has been accomplished through the use of generating celeration lines on the SCC. Celeration lines can be drawn on the chart to quantify change in behavior over time and represent an increase in behavior. Using the chart, the value of the
CELERATION can be determined as a number such as a ‘x2’ (times 2) celeration and indicates a
doubling in the behavior over time (Potts, Eschleman & Cooper, 1993). The inclusion of a
quantifiable number to display behavior change reaffirms the claim that the SCC allows for a
scientific approach to data analysis and a standardized form of communication across trained
individuals.

The logarithmic scale is an important feature of the chart. As Calkin (2005) stated,
“behavior grows by multiplying, not by adding.” (p. 207). For example, a behavior that
increases in frequency from one response in one minute to two responses in one minute is
doubling in frequency of that response. On the SCC, the difference between one and two is
physically larger than the difference between 100 and 101 even though the numerical difference
is the same. The unequal spacing between numbers on the x-axis of the SCC allows practitioners
to visibly analyze data more accurately than a standard spacing scale, but is much more difficult
to understand and orient to for individuals who have not been trained.

There have been published examinations of the effectiveness of the SCC, but there have
been no found studies looking at the SCC from a perspective outside of the field. Lefebre,
Fabrizio, and Merbitz (2008), for instance, discussed the comparison of equal-interval graphs,
semi logarithmic charts, and data tables in relation to their efficiency in data-based decision
making. Participants included Board-Certified Behavior Analysts holding at least a master’s
degree, a population not indicative of individuals not trained in the use of the SCC. The study
showed using the SCC was the most effective method in making decisions. Lefebre et al. (2008)
maintained the SCC should be used in terms of the analysis of data, but was unable to
incorporate how that analysis should be communicated. There is a lack of research around the
SCC and its practicality when demonstrating the impact of the data to people who have not been
exposed to interpretation and utilization of the SCC. Lefebre et al. (2008) used individuals who held a master’s degree because they are the experts that must analyze the data to find the difference between multiple data displays, indicating that individuals who have a different educational background could not show the difference.

While there has not been much research on the ability of laypersons to interpret complex data displays such as the SCC, there have been studies evaluating less complex data displays including line graphs, bar graphs, tables, and narratives (Hojnoski, Caskie, Gischlar, Key, Barry, & Hughes, 2009). They evaluated which graphs are correlated with the most consistent interpretation, acceptability, and preference. The participants included 200 head start teachers who were given a survey to assess their accuracy and preferences in regards to each data display. They were also asked by the researchers which displays were easy for them to understand. As stated by Hojnoski et al. (2009), “teachers view methods of data display differently and their accuracy varies per method.” (p.46). The participant pool was compromised of Head Start teachers indicating they had an educational background in reading and interpreting data displays. Although they have had exposure to data displays, the teachers were not able to demonstrate consistent accuracy for any one data display. Even with data displays that are more commonly used, there is no guarantee that they are understood by everyone. In order to combat the discrepancies between accuracy on multiple data displays, a supplement to commonly used data displays could be useful in communication.

By using graphs depicted by AIMSweb as a supplement to the SCC, a more overall understanding of the data may be attained by consumers and stakeholders. Figure 2 and Figure 3 offer a comparison of the SCC to a line graph. Both displays portray the same data set recorded at Fit Learning regarding a learner’s Grade 1 Reading progress. The count for this data set was
words read correctly in one minute. One difference in the depictions of the data is the AIMSweb graph takes the median words read correctly per AIMSweb protocol, instead of using all three data points per day as depicted in the SCC. The other main difference between the two graphs is the y-axis. The SCC shows the data on a logarithmic scale, while the AIMSweb display shows the data on a linear scale. The SCC scale is more accurate in terms of tracking progress of a learner, while the linear scale is more easily understood by untrained individuals.

Figure 2: AIMSweb Graph (Reading, Grade 1)

Data display developed by AIMSweb, student being assessed in 1st grade R-CBM (Reading Curriculum Based Measurement—progress monitoring). The x-axis displays the number of words read correctly, the y-axis displays dates per week for one year. Red dots indicate the correctly read words in one minute. The red dotted line is the projection of how many words read correctly the learner will read in the remainder of the year. Green dots indicate the words read incorrectly or the words that were given to them by the instructor because of a large delay in responding of the learner. The solid black line displays where the learner ‘should be’ if they were progressing as an average first grader in reading.
The SCC contained more information relevant to real-time decision making, as seen by the phase change lines and logarithmic scale, but the AIMSweb graph showed the same data set in a simplified format. Use of the SCC has been very important for practitioners who need all the information displayed on the SCC to effectively instruct learners. Individuals who want to see the progress of the learner in a way that is understood by them may find the format of the

Figure 3: SCC (Reading, Grade 1)

Weekly SCC with data from a 1st grade learner in R-CBM (Reading Curriculum Based Measurement—progress monitor) recorded at Fit Learning. The x-axis is a logarithmic scale displaying a count per week of responses. The y-axis shows weeks per month from December of 2012 to August of 2013. The dots represent words read correctly in each week. The ‘p’s’ represent prompts given (when a learner cannot say the word or takes more than 3 sec to try the word). ‘x’s’ represent errors, and question marks indicate there were no errors in the indicated week. Dark vertical lines represent interventions that took place, in this case there were changes to the ways which goals were set, allowances for the learner to track the words with their finger, grade level changes, and specific protocols used by Fit Learning to help the student read faster. The sideways ‘H’ on the x-axis indicates where the child should be to demonstrate fluency—a metric of speed and accuracy.
AIMSweb display more appealing as it focuses on molar level progress and filters out the detailed information that primarily benefits decision makers.

**CBM as a Tool to Offer Systematic Comparison**

In addition to allowing for complementary data displays, using AIMSweb allows for a comparison to be made across Fit Learning data with that of the national norms which could aid in communicating effectiveness to laypersons. The key tool at the core of this comparison is Curriculum Based Measurement (CBM). CBM is beneficial in comparison as it is used in PT practices and public school practices as a tool for progress monitoring.

Cone (1992) discussed the applicability of CBM to practices such as PT. He supported CBM as a tool used in PT, and maintained that both PT and CBM are behavior analytic in nature (Cone, 1992). In R-CBM, for example, a student is assessed on words that are read correctly and words read incorrectly. Because these are behaviors of the learner, CBM focused on an identifiable and concrete count. In addition, Cone (1992) addressed an argument that has existed against using CBM as an assessment tool by stating that although behavior may vary in different environments or stimuli, the change in itself is a valid way to assess the learner’s behavior. If behavior indicated that words read in the presence of one educator vary differently than the words read in the presence of a different educator, there is an inconsistency between educator. Noticing such a difference could result in better practices for the learner.

Deno (2003) asserted that CBM was originally used in order to allow teachers to evaluate their instructional techniques and discussed the various important characteristics of using CBM. After evaluation research was conducted at the University of Minnesota Institute on Learning Disabilities, progress monitoring procedures were put in place for reading, spelling, and written
expression and were the start of CBM. In addition, CBM can be used to compare individual students to the norm in a way that is easy to see and comprehend (Deno, 2003).

In his work, Deno maintains that CBM procedures are reliable, standardized, and efficient. These claims are an important aspect of CBM as it makes it possible for all educators and school systems to use CBM as a way to measure and make evaluations of student progress. One evaluation that CBM is commonly used for is to assess students who may be at risk academically. The progress monitoring assessment tool lasts from one to three minutes depending on the type of reading CBM (Deno, 2003). This makes it possible for educators to assess each student even if there is a high student-to-teacher ratio.

Clarke supports the claims of both Deno and Cone in a more recent research study written in 2009. She elaborates on the discussion pertaining to the important characteristics of CBM by adding that it can be an effective feedback mechanism for tracking student progress. This continues the assertion that CBM allows for data-based decisions to be made in regard to placement of students who are struggling academically and prediction of where student’s progress will be. CBM, Clarke (2009) asserts, can assist in communication with parents, guide teachers when they are analyzing the data, and may result in less referrals to special education classrooms.

Patton and Reschly (2013) continue to support the effectiveness of CBM in their study which used CBM to assess reading loss over the summer. CBM was chosen as the form of measurement in this study over other standardized forms of progress monitoring because it can quickly assess student progress on an individual basis. Patton and Reschly (2013) concluded that CBM would be the most fitting tool for the study because it is more sensitive to the effects of changes for the learner, making it the best choice for studying changes in reading capabilities.
over a break period.

Using CBM as a form of progress monitoring is conducive not only because it is efficient and applicable on an individual basis as discussed in the previous articles, but also because it allows for comparisons across differing teaching methods. Educational settings nationwide including schools and private institutions use CBM as a way to measure their students’ progress and assess their needs. Each CBM can then be recorded through a system such as AIMSweb. Because of the efficient standardization of CBM that is discussed by Deno (2003), the system has been able to gather national norms data through using CBM measures. These norms have been collected in both the reading and mathematics subject areas.

**Methods**

**Overview**

The current analysis used a PT learning center to assess effectiveness of using supplemental data displays, standardized forms of progress monitoring, and national norms data on communication with laypersons provided by AIMSweb. In order to provide an analysis regarding communication between Precision Teachers and laypersons, two studies were conducted that used the PT company Fit Learning as the study site. The first study was a national norm comparison that used both Rate of Improvement (ROI) and percentile rankings. The second study was an analysis of pre- and posttest data on the implementation of AIMSweb data displays as a complement to the SCC in client meetings through the use of client satisfaction surveys. Traditionally, Fit Learning has utilized AIMSweb materials, but has not used the AIMSweb data management systems out of preference for the precision of the SCC and other ‘in house’ reporting tools. The complementary information attained from AIMSweb norm
referencing data and data displays is hypothesized to further effective communication with clients.

A pilot study was conducted and included data from percentile rankings and ROI from students enrolled in the reading curriculum before December of 2013 (Smith & Alavosious, ND). The pilot study focused only on archival data sets from the reading curriculum area and showed a difference between Fit Learning student data with that of the national norms. Results indicated that students moved 22 percentiles within the first 40 hours. The ROI analysis was conducted on eight first graders and the study concluded the average national ROI was 1.31 and students from Fit Learning were at 1.30. However, these numbers are not completely comparable as the Fit Learning sample was taken from archival data sets indicating that all learners had a disability. As previously mentioned, AIMSweb National Norms sample does not include students with disabilities. The pilot study showed reason for further analysis.

Setting

The Site. Fit Learning started in 1998 as part of the University of Nevada, Reno and was privatized in 2004. The learning center maintains university affiliation and is one of three Fit Learning establishments located in New York, Oregon, and Nevada, respectively. The study site used for this analysis was Fit Learning located in Reno, Nevada.

The center individualized instruction in the areas of mathematics, reading, problem solving, expressive writing, spelling, and handwriting and maintains about 40 enrollments at any given time. An enrollment was comprised of a specified subject area, 40 hours of instruction at the center (spending at least three hours a week at the center), and 50 minute sessions. Within the 50 minute sessions, there was a 1:1 teacher-to-student where the instructor followed
curriculum customized to the learner. Because the enrollments are specified by subject area, learners may be enrolled in multiple enrollments at once.

**Staff.** The center was directed by doctorates of psychology. There was a team of masters level BCBAs and undergraduate students at the University of Nevada, Reno participating in various degree tracks. Twenty staff comprised the roles of directors, office administrator, case managers, learning coaches, and interns. Staff members are in training for three to six months before working with any clients.

**Participants**

**National norms comparison.** Twenty-three archival data sets out of approximately 200 data sets from the learners at Fit Learning enrolled in the reading and/or math curriculum areas were designated to be included by the Principle Investigator (PI). Archival data sets include student name, subject area, grade level, intake assessment raw data sheets per subject area, reassessment raw data sheets per subject area, and permanent products written by the learner. The data are separated into two groups—current students and past students—and filed accordingly into separate filing cabinets. They are then separated by student into hanging file folders and placed in alphabetical order.

Data sets not pertaining to the aforementioned curriculum areas, data sets containing less than forty hours in the curriculum area, and/or incomplete data sets were excluded by the PI from the study. Participants were then randomly assigned a numeric identifier so no personal identifying information could be attached to their coded data.

The PI coded the participant data by their functional grade level, R-CBM ROI, M-COMP ROI, M-CAP ROI, intake data, reassessment date, intake score, reassessment score, intake percentile, and reassessment percentile. Functional grade level was defined as the level at which
the student was performing and did not pertain to their age. Rate of Improvement (ROI) was the rate at which the student was progressing. ROI is designated by AIMSweb for the student and is based on their intake scores and subsequent scores per grade level. The intake score and 40 hour reassessment scores were documented so the percentile ranking at each level could be coded.

**Satisfaction survey data.** Eight archived client satisfaction surveys out of approximately 60 surveys were included by the PI. The clients were parents and caregivers of the learners at Fit Learning who were asked to complete satisfaction surveys throughout their child’s enrollment. Archived client satisfaction surveys were excluded if the client did not have both pre- and posttest data. Participants were randomly coded to ensure no identifying information could be attached to their data.

Clients were asked to complete surveys regarding their satisfaction with Fit Learning practices and procedures. Clients were asked to rate their satisfaction in the four following areas on a scale of one to six: 1) I am satisfied with my overall experience at Fit Learning, 2) I would recommend Fit Learning to a friend, 3) My child’s progress is evident at home and/or at school, 4) The level of communication with Fit Learning about my child’s progress has been adequate. The surveys also contained a few line entitled “Comments” to allow for the clients to write any additional information. A sample of the Reassessment Satisfaction Survey can be found in Appendix B.

**Experimental Variables**

The independent variable within this study was the implementation of the AIMSweb data management system. The key dependent variables in this study were raw reading fluency scores, math computation scores, math application scores, rates of improvement, national percentile rankings and consumer satisfaction assessments.
PROCEDURE

The PI attained IRB approval for the analysis at Fit Learning as well as written consent from the directors. The first step was to implement standardized procedures in conjunction with AIMSweb protocols throughout Fit Learning. To accomplish standardization, the PI constructed an ‘AIMSweb Manifesto’ divided into four sections: Navigation, CBM Protocols, Forms, and Analysis (see Appendix C for AIMSweb Manifesto). The Navigation section contained information on how to login to AIMSweb, how to add student data, and how to access student data displays. CBM Protocols detailed the correct procedures for running each CBM including introductory scripts, timing lengths, and scoring procedures. The Forms section contained forms for the case managers to put into the learners’ individualized Fit Learning book so an efficient transfer of student information could be made into the AIMSweb system from the learners’ book. Lastly, the Analysis section held the national norms tables for all CBMs. Each section of the manifesto could be used to input student data into the AIMSweb system, which the PI inputted for all students used in the study.

All six case managers were trained on appropriate procedures for implementing AIMSweb protocols as case managers are the only staff members who administer CBMs to learners. The AIMSweb Manifesto allowed for self-paced training for the case managers. Each case manager is in charge of one enrollment, so case managers were able to train only in the specific CBMs they needed for their learner. Any additional questions were asked to the PI or the directors.

National norms comparison. Student assessments, a standard protocol used to track the progress of the students with CBMs, were used to determine the data sets that could be used for the study based on the inclusion criteria. The data sets meeting the inclusion criteria were then
CODED BY THE PI FOR FUNCTIONAL GRADE LEVEL, INTAKE DATES, REASSESSMENT DATES, INTAKE PERCENTILE RANKING, AND REASSESSMENT PERCENTILE RANKING. FUNCTIONAL GRADE LEVEL WAS DETERMINED BY THE CBM GRADE LEVEL THE LEARNER WAS INITIALLY ASSESSED AT. THE INTAKE DATE AND REASSESSMENT DATES WERE FOUND DIRECTLY FROM THE ASSESSMENT TABLES AS STANDARD FIT LEARNING PROTOCOL DictATES THAT DATES ARE A PART OF EACH ASSESSMENT. THE PERCENTILE RANKINGS FOR BOTH INTAKE AND REASSESSMENT WERE FOUND USING THE AIMSWEB NATIONAL NORMS TABLE MATH COMPUTATION, AND AIMSWEB NATIONAL NORMS TABLE READING-CURRICULUM BASED MEASUREMENT (PEARSON, 2014). EACH PARTICIPANT’S CBM GRADE, INTAKE DATE, INTAKE SCORE, REASSESSMENT DATE, REASSESSMENT SCORE, INTAKE PERCENTILE AND REASSESSMENT PERCENTILE CAN BE FOUND IN APPENDIX D.

ABBREVIATED VERSIONS OF THE NORMS TABLES USED TO FIND THE PERCENTILE RANKINGS CAN BE FOUND IN APPENDIX E. THE TABLE APPLIED FOR ANALYSIS OF EACH STUDENT’S DATA WAS DEPENDENT ON THE STUDENT CBM SUBJECT AREA. THE TABLE SEPARATES PERCENTILES BY SUBJECT AREA, GRADE LEVEL, SEASON, AND CBM SCORE. FOR EACH PERCENTILE, THE FOLLOWING STEPS WERE TAKEN: 1) USED THE AIMSWEB NATIONAL NORMS TABLE THAT CORRESPONDS TO THE STUDENT’S CBM TYPE, 2) FIND THE CORRESPONDING SEASON (I.E. FALL, WINTER, OR SPRING) TO THE INTAKE OR REASSESSMENT DATE, 3) FIND THE CORRECT GRADE LEVEL FOR THE STUDENT’S FUNCTIONAL GRADE LEVEL, 4) FIND WHERE STUDENT’S SCORE LIES IN THE SECTION WITH THE CORRECT GRADE AND SEASON, THEN 5) MATCH THE SCORE TO THE PERCENTILE. IF A RANGE OF PERCENTILE RANKINGS WERE GIVEN FOR A PARTICULAR SCORE, THE LOWEST CORRESPONDING PERCENTILE FOR THAT DATA POINT WAS RECORDED. THE RESULTING CODED DATA ANALYSIS CAN BE FOUND IN APPENDIX D.

CLIENT SATISFACTION ANALYSIS. AIMSWEB DATA DISPLAYS WERE IMPLEMENTED IN CLIENT MEETINGS TO FURTHER FACILITATE COMMUNICATION OF IMPACT. CLIENT MEETINGS WERE HELD WITH THE DIRECTORS OF FIT LEARNING AND THE CLIENT TO DISCUSS THE CHILD’S PROGRESS. BEFORE THE AIMSWEB
implementation, the directors used the SCC as the only source of data display to discuss learner progress. After the implementation, directors oriented clients to both the SCC and the AIMSweb display. Orientation to the AIMSweb display included information about the average learner across the U.S., the changes in correct responses, and the changes in incorrect responses.

The satisfaction survey was given to the clients by the directors to rate their satisfaction with Fit Learning procedures on a scale from one to six (see Appendix B). The survey was given to them throughout their child’s enrollment and included dates both pre and post AIMSweb data display implementation into meetings. Questions three and four on the survey were targeted because they were hypothesized to shift after the implementation of AIMSweb displays.

**Results**

**National Norm Comparison**

The average was taken of the twenty-three intake scores for each participant data set from Fit Learning. The average intake percentile was found to be 25.71 (within the range of 0%-100% with 100% being the highest level of performance). This number depicted the level of student’s performance as ranked in the national sample. The same was conducted for the reassessment percentile after 40 hours and was found to be 46.71. To find the average change in percentile for the sample of Fit Learning students, the average intake percentile was subtracted from the average reassessment percentile and was found to be twenty-one. As demonstrated in Appendix D, an average increase of twenty-one percentile in performance (in M-COM, R-CBM or M-CAP) among 23 participant in the first 40 hours of enrollment at Fit Learning.
Client Satisfaction Survey Analysis

A t-test was conducted to analyze statistical significance in pre- and posttest survey responses on the last two questions in the survey as they were targeted. The t-test did not show significance. However, the t-test is not the most appropriate test due to the limited range of the data. Since there is a limited range for scores and baseline scores were already large, there were procedural barrier to detecting statistical significance. One outlier was excluded from the analysis in the posttest data set as it was more than three standard deviations from the mean of the set.

In order to assess clinical significance, a comparison was made in regards to how many participants moved from a lower satisfaction rating to a higher satisfaction rating. As shown in Table 1, two of the eight client survey responses displayed an increase in satisfaction, five out of eight client survey responses stayed the same, and one out of eight client survey responses showed slightly less satisfaction with the statement: “My child’s progress is evident at home and/or at school”. In response to the question “The level of communication with Fit Learning about my child’s progress has been adequate”, three of the eight client survey responses showed an increase, five out of eight client responses stayed consistent, and no participants showed a decrease in satisfaction.
An analysis of the mean ratings of the participants showed an overall increase in satisfaction per question. The pre-intervention mean for the question, “My child’s progress is evident at home and/or at school” was 5.357 and the post-intervention mean was 5.50. The pre-intervention mean for the question, “The level of communication with Fit Learning about my child’s progress has been adequate” was 5.357 and the post-intervention mean was 5.69. These results can be seen in Figure 4.
National Norms Comparison

The analysis of percentile rankings showed students entering Fit Learning come in with a percentile average much lower than the national sample. However, when the students have completed 40 hours of instruction at Fit Learning, they average very close to the national average. The average increase in percentile ranking is particularly important because the Fit Learning sample included students with various disabilities. As stated in the AIMSweb manual, the national sample was only stratified based on gender, sex, and socioeconomic status and did not include stratification for learners with disabilities.

Discussion of Results

Figure 4: Data from Mean Ratings in Pre and Post Client Satisfaction Surveys

The x-axis displays the question answered from the survey. The y-axis displays the average score given by the participants. Pre-AIMSweb intervention is shown in blue, while the red shows the Post-AIMSweb intervention means.
Client Satisfaction Survey

The analysis of the client satisfaction survey showed no statistical significance; however, statistical significance was difficult to achieve in this study due to the possible ceiling effects of the data. No client rated either question lower than a score of five on a six point scale. The high ratings in the pretest condition meant that there was not much room for statistical improvement within the data. However, the data did show clinical significance. Although the ceiling effect displayed that a high standard of communication was already being met by the protocols already in place at Fit Learning, clients saw some room for improvement in the area of communication. For a client to see room for improvement before the implementation of complementary data displays, then see no room for improvement after the implementation meant some clients became completely satisfied in the specified area.

Conclusion

Limitations

National norm comparison. Fit Learning had a limited number of qualifying archives, as the center has only been producing standardized scores since the implementation of AIMSweb. As there are only about 40 enrollments at a given time, the yearlong study was not long enough to include more data with the new standardized scores in place. The study was also limited to the reading and mathematics curriculum areas because of the newly implemented standardization procedure designated by AIMSweb.

Client satisfaction analysis. There were a limited number of client satisfaction surveys that were able to be used for the study due to the exclusion criteria. Clients may have their child enroll in one enrollment or they may have multiple enrollments, which leads to a variable turnover rate. Both pre and post data were needed for the study, which meant that clients who may
have been introduced to the AIMSweb system were not familiar with parent meetings prior to the implementation or that parents who stopped their enrollment before the AIMSweb implementation were not eligible.

The survey questions were created as part of Fit Learning protocol before the implementation of AIMSweb, so there were no direct questions regarding AIMSweb. Because the questions never specifically identified AIMSweb data displays or norm referencing information, there was no actual test of parent understanding of the information communicated to them, there was only self-reports indicating client increase in satisfaction overall.

**Follow-up Impact for Fit Learning**

Fit Learning has been able to establish concurrent and social validity through the implementation of AIMSweb standardized protocols, data display tools, and national norms data. While Fit Learning had established the center is effective through its own analysis, the comparison to other instructional practices nationwide allowed for another avenue to measure effectiveness. Access to comparison was not attainable before AIMSweb standardization as Fit Learning’s procedures differed from most other practices in use throughout the U.S. Because standardization protocols have been set in place, Fit Learning will be able to continue to analyze the progress a learner makes from Fit Learning as compared to the progress that an average student in that grade level is making.

Social validity in regards to communication with parents has also been an impact of implementing AIMSweb into the center. While Fit Learning practices have been recognized in the PT community and the behavior analytic field at large, the effectiveness has not been widely accepted by outside individuals including parents, clients, stakeholders, and the public education system. Through the analysis of how to better communicate with laypersons, Fit Learning has
been able to further communication with the individuals who could benefit most through the instructional services offered.

**Future Research**

The current study was conducted through one local learning center. Replication of the current study would aid in the analysis of what effective methods of communication exist between technical individuals and laypersons. Any technical field or technology must communicate effectiveness with individuals unfamiliar with specific language or data displays specific to the field. Additionally, studies conducted with direct responses to AIMSweb or similar measurement tools would aid in the analysis of better communication. The current study did not directly ask participants about the AIMSweb system, but took a correlational approach between the implementation and the satisfaction. Direct responses would allow for more insight into effective methods of communication. Possible future survey questions could include target information such as “Has the AIMSweb system increased your understanding of your child’s progress?” or “How would you rate the effectiveness of using AIMSweb data displays in client meetings?”.

**Implications**

The increase in the percentile ranking of students in the first 40 hours of instruction displayed catch up growth within the learning of the average student of Fit learning. The information given through the comparison of differing practices, such as Fit Learning and other instructional practices, allows for a common vocabulary to be used when discussing the benefits of each practice. Understanding other practices is the first step in assessing effectiveness and possible implementation of that practice. Furthermore, adding different methods of communication with data displays allows for more opportunity for understanding. AIMSweb
graphs allowed a complementary tool to display information and offer another way for laypersons to understand the information given to them.

The results within the current study can be applied to other Precision Teaching companies, behavior analytic companies, or any other settings that use highly technical means of communicating with laypersons and stakeholders. In analyzing the effectiveness of communication of a practice, the effectiveness of the practice may be able to be more predominately disseminated. Communication is the key component of successful practices and of the dissemination of those practices.
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Appendix A:
The Standard Celeration Chart

Figure 4: Daily Standard Celeration Chart

Shown is a blank Daily SCC. The x-axis displays days of the week over a six month period. The y-axis shows a count per minute of responses on a logarithmic scale.
Appendix B:
Reassessment Satisfaction Survey

Date: ________________________

At Fit Learning we take great pride in delivering extraordinary academic instruction and customer service. Your feedback is requested to help us grow and improve our practices with every enrollment. Thank you for your contribution.

Please rate your agreement with the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am satisfied with my overall experience at Fit Learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would recommend Fit Learning to a friend.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My child’s progress is evident at home and/or at school.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The level of communication with Fit Learning about my child’s progress has been adequate.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We invite you to use the space below to submit questions, comments, concerns or testimonials.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Appendix C:
AIMSweb Manifesto

AIMSweb Manifesto
Contents

Navigation
- Login Information (Excluded for confidentiality purposes)
- Enter New Student and Data
- Add PM
- Access PM Report

CBM Protocols
- M-COMP Description
- M-CAP Description
- R-CBM Description
- MAZE Description
- WE-CBM Description
- S-CBM

Forms
- Tracking Log

Analysis
- Norms Tables
- ROI Tables

*Login information has been excluded for confidentiality purposes.
*Norms tables included in the AIMSweb Manifesto can be found in Appendix E
Process for New Student

**Add Student**

- Left hand side of the screen, click *Students* Tab
- District Name: Fit Learning Nevada
- School Name: Fit Learning Reno
- Use service code: General Ed
- Meal Status: None
- Mobility: Yes
- Fill in every other category with appropriate information
- Click Add

**Add Progress Monitor**

- Click Progress Monitor Tab
- On left hand side, click *Schedules* Tab
  - District: All
  - School: All
  - User Type: AIMSweb District Manager
  - User's Name: Kendra
  - Click Search
  - Click *Go to Caseload* in blue
- Click blue *Manage Students* button
- Go to kid’s name
- Add Progress Monitor (*Add PM*)
- When pop-up appears, click Yes
- Select which CBM
- Click Next

**Adding Data**

- Set date range
  - Make sure capturing from beginning of enrollment
  - Set goal end date one year from the first data point
  - Under “Assessment Schedule and Frequency” highlight weekly circle in blue
  - Click Save
- Taken back to *Progress Monitoring Caseload*
- Find kid’s name and click *Enter SLA, BaseLine and Goal Scores*

**Entering Initial Scores**
- Assessment Grade Level: Not student’s grade, but the grade they grade they are reading at.
- Initial score: Only the first data point from the initial assessment
  - Find the student’s initial assessment under
    - Dropbox
    - Assessment_Reno_Carson
- Initial Probe: Use P04 (the grade level will be the first number)
- Leave Initial Program Level and Initial Program Description blank
- Goal Criterion for Success
  - Use AIMSweb norms table
  - Look at grade level we are assessing at
  - Find group ROI mean for that grade
  - Plug in algorithm for goal: Mean group ROI times 52 plus initial corrects
    (For Kindergarten assessment grade level use the ROI for 1st grade)
  - Goal errors: always 0
- Click Save

Adding Scores

- Find Student’s name
  - Click the blue date under the Next Score category
- Prompts and skips are not counted as part of errors
- Use mean for all scores
- Click missed when more than a week has passed in between
  - When kid moves to a different grade level, use different PM.
  - You will only be adding one score per week; it will always be on the Monday of that week.
- When done, click Save
- You will be taken back to Progress Monitoring Caseload with Dr. Kendra
- To see graph, click under Progress Report (Below Target, Insufficient Scores, Near Target, or Above Target)

Add to Class

- Go back to brown Manage tab at top of screen
- Go to Schools
- In Fit Learning (Reno) on bottom of screen click Select under Action category
- Go to kid’s grade level and click Edit Roster
- Look up kid using last name
- Click red Add button
M-COMP

Timing Length: 8 minutes

If student finishes earlier than the allotted time: leave at total time.

Students can put an X over the problems that they do not know how to do—no prompts are given.

Students should be discouraged from “skipping around” consistently. However, if a problem is skipped, the student can come back to it if time allows.

Scoring:

Correct Response:

- Is consistent with the answer key
- If put in a different form, but is still correct and satisfies what the problem is asking
- If not written in blank, but it is clear that it is the student’s final answer
- Digits are backwards or upside-down but clear what was intended (not applicable for 6 and 9)

Incorrect Response:

- Crossed out
- Illegible
- Is not the same as the answer key

If correct, circle number in the ‘corrects’ column

If incorrect, circle 0 under the ‘incorrect’ column

If an X has been put through the problem, no score is circled in either column

To score, use answer key to circle the number corresponding to if the problem was correct or incorrect. Each number in the ‘correct’ column corresponds to the difficulty of the problem. Add up the total for each problem, and that is your number of correct responses. (Pearson, Inc, 2012b).

* Put the AIMSweb score on the CBM checklist in the book.

*Continue charting digits and numbers (the AIMSweb score is not charted)
Program Description M-COMP

“We’re going to take an 8-minute math test.

Read the problems carefully and work each problem in the order presented, starting at the first problem on the page and working across the page from left to right. Do not skip around.

If you do not understand how to do a problem, mark it with an X and move on. Once you have tried all of the problems in order, you may go back to the beginning of the worksheet and try to complete the problems you marked.

Although you may show your work and use scratch paper if that is helpful for you in working the problems, you may not use calculators or any other aids. Keep working until you have completed all of the problems or until I tell you to stop.

Do you have any questions?
Answer any questions the students may have, then hand them their probes, and say:

Here is your test.

Begin. Start timing.
Make sure the student is working the problems in order.
If you notice that the student is skipping ahead without attempting each problem, say:

Try to work each problem. Do not skip ahead unless you do not know how to work a problem.
If the student asks a question or requests clarification, say:

I can’t help you. Work the problem as best you can. If you don’t understand the problem, you may move on to the next problem.
After 8 minutes, say:

Stop and put down your pencil.
Collect the probe and any scratch paper.” (Pearson, Inc, 2012b, p. 4)

Note: Script has been modified to accommodate individualized instruction instead of group instruction.
M-CAP

For Grades 2-6 there is an 8 minute timing length
For Grades 7-12 there is a 10 minute timing length

If student finishes earlier than the allotted time: leave at total time.

Students can put an X over the problems that they do not know how to do, no prompts are given.

Students should be discouraged from “skipping around” consistently. However, if a problem is skipped, the student can come back to it if time allows.

Scoring:

Correct Responses:

• If multiple parts to the problem, all parts must be correct.
• Correct if in different format than the answer key, but still the correct answer.
• Writing numbers backwards or upside down, but clear that it is still correct answer. (This is not relevant for 6 and 9)
• If answer is not in the designated area, but it is clear that it is their final answer.

Incorrect Response:

• Student answer does not match the answer key
• Right response is crossed out
• An X was drawn through the problem, or problem not answered
• Improper placement of mathematical symbols
  o Ex: for $1.58 these are not correct: 1.58$, 1:58, etc.
• Rounding is incorrect unless problem specifies to do so

To score, use answer key to circle the number corresponding to if the problem was correct or incorrect. Each number in the ‘correct’ column corresponds to the difficulty of the problem. Add up the total for each problem, and that is your number of correct responses. (Pearson, Inc., 2012c).

* Put the AIMSweb score on the CBM checklist in the book.

*Continue charting digits and numbers (the AIMSweb score is not charted)
Program Description M-CAP

“Say to the students:
(Grades 2–6) We’re going to take an 8-minute math test.
(Grades 7–12) We’re going to take a 10-minute math test.

Read the problems carefully and work each problem in order. Do not skip around.

Some of the problems may be easy, and some will be more difficult. If you do not know how to work a problem, mark it with an X and move on. Once you have tried all of the problems in order, you may go back to the beginning of the worksheet and try to complete the problems you marked. Write the answers to the problems in the blanks. For multiple choice questions, write the letter (A, B, or C) of the correct answer in the blank.

You do not have to show your work, but you may if it helps you. Keep working until you have completed all of the problems or I tell you to stop.

Do you have any questions? Answer any questions the students may have. Distribute the probes to the students, and say: Here is your test.

Begin. Start timing.
Make sure that the student is working the problems in order.

If you notice that the student is skipping ahead without attempting each problem, say: Try to work each problem. Do not skip ahead unless you do not know how to work a problem.

If the student asks a question or requests clarification, say: I can't help you. Work the problem as best you can. If you don’t understand the problem, you may move on to the next problem.

After 8 minutes (grades 2–6) or 10 minutes (grades 7–12), say: Stop and put down your pencil.

Collect the probes and any scratch paper.” (Pearson, Inc, 2012c, p. 5)

*Script has been modified to accommodate individualized instruction instead of group instruction.
R-CBM

Prompts for words that the student does not know count as errors. Tell the student the word if student does not know within 3 seconds.

The R-CBM is administered in one minute timing lengths.

**Scoring:**

**Correct:**
- Student pronounces the word correctly
- Corrects their mistake within 3 seconds
- Accents in speech and common speech problems are taken into consideration.
  - Says ‘warsh’ instead of ‘wash’
  - If student has a lisp—says ‘petht’ for ‘pest’

**Incorrect:**
- Pronounces the word incorrectly or replaces it with an incorrect word
- Skips a word or a line
- Struggles with word for more than 3 seconds
- Flips words that are next to each other
  - Sentence actually reads: I want to play Frisbee.
    Student reads: I want to Frisbee play.
    Count as 2 errors.

**Neither Incorrect or Correct:**
- Word that is repeated
- Word that is added to the sentence but is not there.

(Pearson, Inc, 2012a)

*Record the AIMSweb score on the CBM Checklist*
**Program Description R-CBM**

“Say to the student:
*When I say “Begin,” start reading aloud at the top of this page. Read across the page* (demonstrate by pointing across page). *Try to read each word. If you come to a word you don’t know, I’ll tell it to you. Be sure to do your best reading. Are there any questions?*

Answer any questions the student may have. Say:

**Begin.**

Start timing when the student says the first word. If the student does not say a word after 3 seconds, say the first word. Mark the word that you provided as incorrect. When the student says the next word, start timing.

As the student reads, mark any errors (words read incorrectly, skipped, or out of order).

**Paper administration:** Draw a slash (/) through the incorrect word. Record any insertions by writing them above the line of text where the insertion was made. If the student self-corrects within 3 seconds, mark the self-correction with “SC.”

At the end of 1 minute, place a bracket ([ ]) after the last word the student attempted. Let the student finish reading the sentence and then say; **Stop.**

For universal screening, administer the second and third probes the same way, but shorten the directions. Say:

In universal screening, if the student reads **0** words or less correctly on the first or second probe, do not administer the remaining probe(s).” (Pearson, Inc, 2012a, p. 6).

*Script has been modified to accommodate individualized instruction instead of group instruction.*
MAZE

3 min. timing length

If student finishes before 3 minutes, prorate the students score.

Prorating

- Record the time it took the student and the number of correct responses.
  2 minutes, 40 correct
  1. Convert the minutes into seconds.
     2 minutes = 120 seconds
  2. Divide the number of corrects by the number of seconds to get
     ‘correct responses per second’ score
     \( \frac{120}{40} = 3 \)
  3. Know that 3 minutes = 180 seconds
  4. Divide 180 seconds by the number correct per second.
     \( \frac{180}{3} = 60 \)
  5. So the prorated score for 3 minutes from 2 minutes would be 60.

Don’t give the student the MAZE task before you start the timing.

Correct

- Student circles the correct word

Incorrect

- Student circles incorrect word
- Student does not circle any of the three choices that they read

(Shinn & Shinn, 2012a).

MAZE Program Description

“Say to the students “When I say ‘Begin’ I want you silently read a story. You will have 3 minutes to read the story and complete the task. Listen carefully to the directions. Some of the words in the story are replaced with a group of three words. Your job is to circle the 1 word that makes the most sense in the story. Only 1 word is correct.” (Shinn & Shinn, 2012a, p. 14)

*Script has been modified to accommodate individualized instruction instead of group instruction.
WE-CBM

This document includes Total Words Written, Correctly Spelled Words, and Correct Writing Sequence.

Title and the ending are included

Administering WE-CBM
When administering the WE-CBM, no prompts about the quality of the writing are to be given. A ‘Story Starter’ is what the student will write about can be found on AIMSweb.

- Emphasize the importance of quality over quantity.
- Words written should not be shared with learner to ensure that they do not just add words that may not have quality.
- Timing is only used as a standardization procedure, not to make the student write faster.
- If student stops writing for 10 seconds or more, prompt them to write as best they can by saying “Keep writing the best story you can.”

Standardized Steps to Administer CBM
1. Select Story Starter
2. Give student pencil and lined paper
3. Say “You are going to write a story. First, I will read a sentence, and then you will write a story about what happens next. You will have 1 minute to think about what you will write, and 3 minutes to write your story. Remember to do your best work. If you don’t know how to spell a word, you should guess. Are there any questions? Put your pencil down and listen.”
   “For the next minute think about (Say Story Starter)”
4. After reading the story starter, give the students one minute to think, ensure they are not writing yet.
   After 30s say “You should be thinking about…”
5. At the end of the minute, tell them to start writing and time them for 3 minutes.
6. After 90s say “You should be thinking about…”
7. After 3 minutes, say “Stop. Put down your pencils.”
8. If student wants to write the rest of their story, they can but it must be on a different piece of paper.

TWW (Total Words Written)
Count all words that are written, even misspelled words
Counts for examples are given in parenthesis at the end of the sentences.

Hyphenated words:
Count separated parts if they are words by themselves
- His twelve-year-old was there. (6)
- If they are not words by themselves, count as one.
- His ex-wife came back. (4)
Abbreviations
Count common abbreviations as words as one
- I live in the U.S (5)

Numbers
Numbers are counted when they are spelled out or are part of currency or dates
Counted
- My birthday is August 21, 1990. (6)
- I would like to win $500. (6)
- I would like to win 500 dollars. (7)
- Six people are here. (4)
Not Counted
- 8 elephants were at the zoo. (5)
- I would like 500. (3)
- I want to go there 2. (5)

Symbols
Symbols are not counted as part of words
- I would like to win $500. (6)

WSC (Words Spelled Correctly)
Underlined words are spelled incorrectly.
- It is fun to play the peano. (6).

Hyphenated Words
If separated parts are words by themselves, count only the one word that is spelled incorrectly as wrong, not the whole hyphenated word.
- The twlve-year-old wanted to play. (6)
If the each part is not a word by itself, count the whole hyphenated word as incorrect.
- His ex-wyfe came back. (3)
Abbreviations
All correct abbreviations are counted as words spelled correctly.
- I went to Sunset Blvd. (5)

Capitalization
Words must have proper capitalization to be counted.
- I went to 47ren’t47. (2)

Reversed Letters
Words that have reversed letters in them, but are still a correctly spelled word count as correct. However, if a word has a reversed letter that makes an incorrectly spelled word, it is not counted.
- I think that is a bad idea. (7)
PRECISION TEACHING: COMMUNICATION OF IMPACT

- I think that is a dad idea. (7)
- I want to paint the wall. (6)
- I want to qaint the wall. (5)

Contractions
There must be an apostrophe present unless the word is a word without it.
- She isn’t going to play. (5)
- She 48ren’ going to play. (4)

CWS (Correct Writing Sequence)
This can be counted after WSC has been identified. A caret will be placed to show what correct sequence can be counted. For sequences to be counted, the words must be spelled correctly, be correct in the meaning and have all the correct syntax.

Correct Spelling
The first caret in these examples assumes there is a space before the word.
- ^The^ocean^is^deep.^ (5)
- ^Many^people^like^dinosors.^ (3)

Capitalization and Punctuation
Commas are an exception to this rule. But words must have correct capitalization and punctuation to be counted as for CWS.
- ^The^ocean^is^deep.^ ^We^like^to^go^there.^ (11)
- the ocean^is^deep.^ ^We^like^to^go^there (8)

Syntax
The words that are next to each other must make sense together.
- ^She^has^always^loved^dogs.^ (5)
- ^She^always^love^dogs.^ (4)

Semantics
The word must be spelled correctly with respect to the context of the sequence.
- ^He^is^at^their^house.^ (6)
- ^He^is^at there house.^ (4)

Spelling
All of the rules from the count of WSC apply here. This includes contractions, reversed letters, and abbreviations.
- ^We^aren’t^going^to^see^my^dad^on^Sunset^Blvd.^ (11)
- ^We 48ren’t going^to^see^my^bad^on^Sunset blved. (7)

Hyphenated Words
Words that have been hyphenated are not separated even if the individual words are words on their own. If one word within the hyphenated sequence is not spelled correctly, the whole sequence is not counted.
- ^His^ex-wife^came^back.^ (5)
• "The"twelve-year-old"is"playing." (5)
• "The twelve-year-old is"playing." (3)

Numbers and Symbols
The same rules apply for numbers and symbols as TWW.
• 4 people"played." (2)
• "We"won"$500." (4)

Titles and Ending
All parts of the title and ending must be capitalized.
• "The"End." (3)
• "The end." (2)

(Powel-Smith & Shinn, 2004)

*Add the score to the CBM checklists in the book based upon which measure is being used.
S-CBM

Grades 1-2: there is a 2 minute timing length, words are dictated every 10 seconds
(Number the lines 1-12)

Grades 3-8: there is a 2 minute timing length and words are dictated every 7 seconds
(Number the lines 1-17)

Count: Correct Letter Sequence (CLS)
  Words Spelled Correctly (WSC)

Can repeat the word in the middle of the timing interval, but can only repeat once.
  For grades 1-2, 5s after saying word
  For grades 3-8, 3.5s after saying the word.

For homonyms, say a sentence with the homonym to clarify which word is wanted.
  “Say word – say sentence – repeat word”
  Ex: Say: “There. Go over there. There.”

Prompting on where the word should be written if student is confused is acceptable.

Scoring:
Words Spelled Correctly (WSC)
  • If word is spelled correctly, count as 1.

Correct Letter Sequence (CLS)
  • It is a pair of letters correctly placed within a word.
  • Total CLS= Number of letters in word + 1.
    o Ex: Dog, CLS=4
  • Count correct spaces before the word and correct spaces after the word.
    o Ex: ^D^o^g^ CLS=4
  • Examples with the word ‘break’. If student writes:
    o Break ^b^r^e^a^k^ CLS=6
    o Beak ^b_e^a^k^ CLS=4
    o Breaks ^b^r^e^a^ks CLS=5
    o Brk ^b^rk^ CLS=3

  • Short Cuts:
    o Any missing letter is 2 subtract two from total CLS
    o Any 2 letters together that are missing subtract 3 from total CLS
    o Any incorrectly inserted letter subtract 1 from total CLS
Program Description S-CBM

“Say to the Students:

(Grades 1-2) We are going to take a 2 minute spelling test and I am going to give you a new word every 10 seconds.

(Grades 3-8) We are going to take a 2 minute spelling test and I am going to give you a new word every 7 seconds.

Listen to the words carefully and write the words in order next to the number on your paper. I will repeat the words only twice.

Give the numbered paper to the student.

Begin. Start timing. Make sure the student is writing the words in order.

If the student asks a question, say I can’t help you. Spell the word as best as you can.

After 2 minutes say: Stop and put down your pencil.

Collect the probes and any scratch paper." (Shinn & Shinn, 2002c, p.8)

*Script has been modified to accommodate individualized instruction instead of group instruction.
### CBM Tracking Log

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**Figure 5: CBM Tracking Log**
Appendix D:
National Norms Data

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Table 2: National Norms Comparison Data
Appendix E
Norms Tables

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Num = Number of Students  pts = Points  ROI = Rate Of Improvement
ROI is Spring Score minus Fall Score (or Winter minus Fall) divided by 36 weeks (or 18 weeks).
### Table 3: Math Computation Norms Table

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|       | 75   | 29   | 38     | 46     | 0.47     |
|       | 50   | 19   | 27     | 32     | 0.36     |
|       | 25   | 12   | 17     | 19     | 0.19     |
|       | 10   | 7    | 10     | 11     | 0.11     |
| Mean  |      | 22   | 28     | 32     | 0.28     |
| StdDev|      | 13   | 15     | 17     | 0.11     |

| 8     | 90   | 38   | 42     | 50     | 0.33     |
|       | 75   | 28   | 32     | 39     | 0.31     |
|       | 50   | 19   | 23     | 28     | 0.25     |
|       | 25   | 10   | 15     | 17     | 0.19     |
|       | 10   | 6    | 9      | 10     | 0.11     |
| Mean  |      | 20   | 24     | 29     | 0.25     |
| StdDev|      | 13   | 13     | 15     | 0.08     |

**Num = Number of Students, pts = Points, ROI = Rate Of Improvement.**

ROI is Spring Score minus Fall Score (or Winter minus Fall) divided by 36 weeks (or 18 weeks).
### AIMSweb® National Norms Table

#### Reading - Curriculum Based Measurement

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**Num** = Number of Students, **WRC** = Words Read Correct, **ROI** = Rate Of Improvement
Table 4: Reading Norms Table

*Abbreviated versions of the Norms Tables have been included to display Norms Tables format. Complete versions may be found at aimsweb.com