OPPORTUNITY TO LEARN THE INTENDED CURRICULUM: MEASURING KEY INSTRUCTIONAL INDICATORS AND EXAMINING RELATIONS TO ACHIEVEMENT FOR STUDENTS WITH DISABILITIES

By

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DEDICATION

Gavin and Zak. You have been the source of inspiration and guidance during my darkest hours. Your little hearts and minds are already wise beyond their years. I can't wait to see the beauty of your beings unfold into the world.

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CHAPTER I

INTRODUCTION

Concrete Statement of the Problem

This study was designed to develop an OTL measurement tool for the purpose of quantifying the extent to which students with disabilities have the opportunity to learn the intended curriculum as measured by instructional indicators of the enacted curriculum. The findings of this study have implications for the validity of test score interpretations, equity, compliance with federal legislation, and student achievement. The concept of opportunity-to-learn (OTL) generally refers to schooling inputs and processes necessary for producing important student outcomes (McDonnell, 1995). Standards-based reform has required states to define these important outcomes via rigorous content and performance standards available to all students. As such, a student's *intended curriculum* is largely comprised of state-specific academic standards (Porter, 2006). Empirical associations with student achievement have supported three broad OTL research strands focused on classroom instruction, the so-called *enacted curriculum* (Kurz, 2011). Empirically supported OTL indicators of the enacted curriculum are related to *instructional time* (e.g., extent to which allocated time is used for instruction), *content coverage* (e.g., extent to which instructional content is aligned with academic standards), and *instructional quality* (e.g., extent to which empirically supported instructional practices are implemented). The concept of OTL thus can be operationalized and measured along these three instructional dimensions—time, content, and quality—all of which must occur in conjunction with one another whenever instruction is enacted (Kurz, 2011). Programmatic research and measurement based on a conceptually integrated definition of OTL, however, has been absent heretofore.

The importance of examining OTL for students with disabilities is substantiated by both a theoretical and an empirical rationale. The former is grounded in compliance with federal legislation such as the Individuals with Disabilities Education Act (IDEA, 1997), which mandates students' *access* to the general education curriculum including its academic standards (Karger, 2005). In addition, the participation of students with disabilities in tests that assess grade-level standards further necessitates their exposure to the content of these standards to ensure the *validity* of certain test score inferences (Wang, 1998). The empirical rationale is based on recent findings that raise concerns about OTL for students with disabilities along all three instructional dimensions: limited use of allocated time for instruction (Vannest & Hagan-Burke, 2010), low exposure to standards-aligned content (Kurz, Elliott, Wehby, & Smithson, 2010), and inconsistent use of evidenced-based practices (Burns & Ysseldyke, 2009), as well as other issues related to instructional quality (Vaughn, Levy, Coleman, & Bos, 2002). Operationalizing and measuring OTL thus can quantify students' access to the general education curriculum, support valid test score inferences, and identify areas of classroom instruction in need of intervention. Existing measurement options based on concepts such as alignment, however, address only limited aspects of OTL and fail to account for OTL as a differentiated opportunity structure, a vital concern for students with disabilities who ought to receive individualized instruction according to their disability related needs (Kurz & Elliott, 2011).

Guiding Questions

Given the stated problem, the following fundamental questions informed the design and focus of this study:

1. To what degree do students with disabilities have the opportunity to learn the intended curriculum?
2. To what degree do students with disabilities experience a differentiated opportunity to learn the intended curriculum compared to their class?
3. To what extent does opportunity to learn the intended curriculum relate to student achievement?

This study was part of a federally funded research grant designed to explore the use of instructional data and student screening test results by Individualized Education Program (IEP) teams to make large-scale assessment placement decisions for students with disabilities.[2]

Theoretical Statement of the Problem

The present research problem of measuring students' opportunity to learn the intended curriculum is situated in a theoretical model of the educational environment. This model is relevant for specifying the concept's general referents and subsequently developing the rationales for the invention and solution of the research problem. The purpose of this sequential argument is to (a) clarify the context and relevance of OTL, (b) resolve the conceptual and methodological challenges of OTL, and (c) culminate in specific research questions on the basis of operationalized OTL indices.

The current test-based accountability system is based on a theory of action, which assumes coordinated design and implementation among all elements of the educational environment for purposes of effective schooling (Baker & Linn, 2002; Roach, Niebling, & Kurz, 2008). Researchers have developed several curricular models to delineate these elements and explain their interrelations (e.g., Anderson, 2002; Elliott, Braden, & White, 2001; Porter, 2002). Three elements have been referenced consistently across models: (a) the intended curriculum (i.e., academic standards), (b) the enacted curriculum (i.e., classroom instruction), and (c) the assessed curriculum (i.e., student achievement tests). Building on work by Petty and Green (2007), Kurz (2011) expanded the traditional three-part model to detail how the intended curriculum unfolds across the system, teacher, and student level in the context of general and special education. Figure 1 displays the intended curriculum model (ICM) for general education.

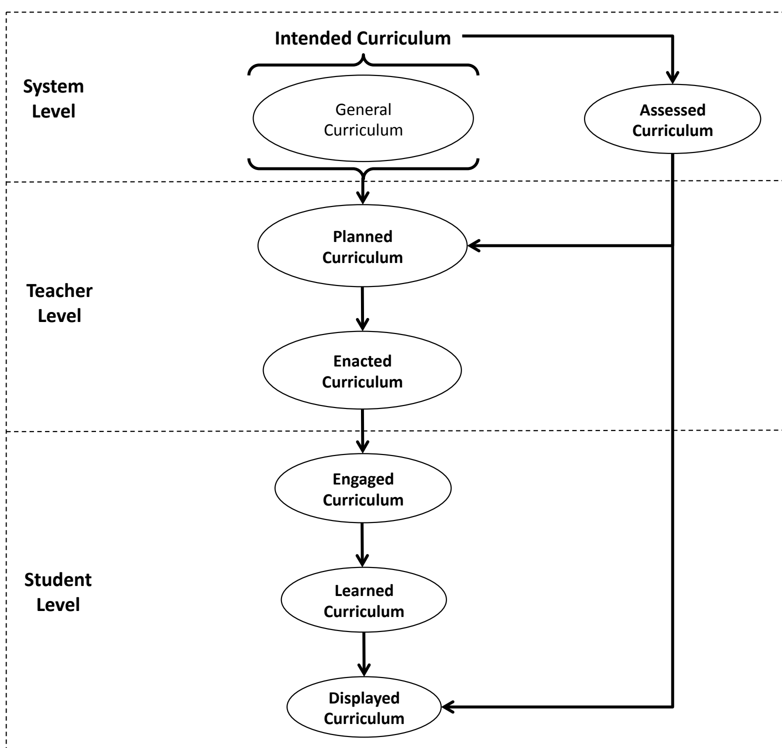


Figure 1. The intended curriculum model for general education.

The ICM for General Education[1]

At the system level, the ICM posits the intended curriculum as the primary target of schooling. The intended curriculum hereby represents a collection of educational objectives, which in their entirety encompass the intended purposes of schooling (i.e., what students are expected to know and be able to do). Ideally, the intended curriculum identifies all valued and expected outcomes via operationally defined and measureable objectives at different levels of aggregation such as subject and grade. Under the No Child Left Behind Act (NCLB, 2001), states have been required to develop challenging academic content and performance standards that specify "what" and "how much" is expected of students in mathematics, reading/language arts, and science (Linn, 2008). This federal mandate was intended to compel states to define and improve the so-called "general curriculum" (Karger, 2005). NCLB further described the general curriculum as applicable to *all* students—hence the term "general." The statute's implementing regulations, for example, stated that NCLB requires "each State to develop grade-level academic content and achievement standards that [NCLB] expects all students—including students with disabilities—to meet" (67 F.R. 71710, 71741). Additional legislative mandates that circumscribe or augment this general curriculum are not available for students without disabilities. The academic content and performance standards that comprise the general curriculum at the system level thus signal the entirety of the intended curriculum for students without disabilities. In other words, the general curriculum *is* the intended curriculum in the context of general education. For students with disabilities, however, the intended curriculum is not under the exclusive purview of the general curriculum—as will be discussed shortly.

The assessed curriculum for accountability purposes is designed at the system level in alignment with the intended curriculum. That is, the tested content of a state's large-scale assessment is used to sample exclusively across the various content domains of the intended curriculum to permit valid test score inferences about the extent to which students have achieved the intended curriculum. It would be unreasonable to expect state tests to cover all skills prescribed by the intended curriculum due to test length and time constraints. Figure 1 therefore displays the assessed curriculum as being slightly smaller than the intended (general) curriculum. Under the NCLB Act (2001), all states are required to document alignment between the intended and assessed curriculum (Linn, 2008). Alignment methodologies such as the *Surveys of Enacted Curriculum* (SEC; Porter & Smithson, 2001) and the Webb method (Webb, 1997) allow stakeholders to provide evidence of alignment beyond a simple match of content topics using additional indices such as content emphasis and match of cognitive process expectations (see Martone & Sireci, 2009; Roach et al., 2008). Lastly, it is important to note that the uniform description of the intended curriculum via the general curriculum results in only *one* assessed curriculum for accountability purposes: the annual state achievement test.

At the teacher level, the ICM posits the planned curriculum as the first proxy of the intended curriculum. The planned curriculum represents a teacher's cumulative plans for covering the content prescribed by the intended curriculum. Although the intended curriculum informs what content should be covered for a particular subject and grade, a teacher's planned curriculum is likely to be constrained as a function of the teacher's subject matter knowledge or familiarity with the intended curriculum. For example, a teacher may deliberately plan to emphasize certain content domains and omit others, while another teacher may simply be unable to plan for comprehensive coverage of the intended curriculum due to missing content expertise or professional development experiences. To date, the content of teachers' planned curriculum and its alignment with the intended curriculum has received limited research attention. As part of their alignment study, Kurz et al. (2010) adapted the SEC methodology to examine alignment between teachers' planned curriculum and the state's intended curriculum for 18 general and special education teachers. Results based on the SEC's alignment index, which represents content alignment along two dimensions (i.e., topics and cognitive demands) on a continuum from 0 to 1, indicated that approximately 10% of teachers' self-reported planned curriculum (for the first half of the school year) was aligned with the intended curriculum. Although more research is needed, the planned curriculum represents a viable target for professional development, because a teacher's planned curriculum directly informs and potentially constrains his or her enacted curriculum. In the Kurz et al. study, for example, alignment between the planned and enacted curriculum was significantly greater (about 45%) than between the intended and enacted curriculum (about 10%). That is, teachers appear to adhere first and foremost to their own planned curriculum (rather than the intended curriculum). Lastly, the model indicates that the planned curriculum is informed by both the intended and assessed curriculum. In the context of test-based accountability, the content of the assessed curriculum exerts a strong influence on what teachers plan to cover and ultimately implement. Under the NCLB Act (2001), the intended and assessed curriculum have to be aligned, which should allow teachers to focus their planning and teaching efforts on the intended curriculum. Misalignment, however, may pressure teachers to focus on the assessed curriculum, because inferences about their effectiveness are made on the basis of test scores—in short, teachers may "teach to the test" rather than the broader intended curriculum.

The next proxy of the intended curriculum at the teacher level is the enacted curriculum, which is largely comprised of the content of classroom instruction and its accompanying materials (e.g., textbooks). Teachers also make pedagogical decisions about the delivery of this content including instructional practices, activities, cognitive demands, and time emphases related to the teaching of certain topics and skills. The enacted curriculum plays a central role in the proposed concept of OTL thus far (i.e., students' opportunity to learn the intended curriculum), because it is primarily through the teacher's enacted curriculum that students access the intended curriculum. The enacted curriculum consequently represents one of the key intervention targets for increasing OTL. As seen in Figure 1, the model again illustrates the potentially attenuated uptake of the intended curriculum by each subordinate curriculum. At this level, the day-to-day realities of school instruction may prevent teachers from enacting their entire planned curriculum in response to students' rate of learning, school assemblies, absences, and so on. The extent to which students have the opportunity to learn the intended curriculum via the teacher's enacted curriculum, however, is critical to their performance on achievement tests, even after controlling for other factors (Cooley & Leinhardt, 1980; Porter, Kirst, Osthoff, Smithson, & Schneider, 1993; Stedman, 1997). Moreover, providing students' with the opportunity to learn the content that they are expected to know represents a basic aspect of *fairness in testing*, particularly under high-stakes conditions (see American Educational Research Association [AERA], American

Psychological Association [APA], & National Council on Measurement in Education [NCME], 1999). OTL also plays a role in the validity of certain test score inferences such as those that interpret assessment results as a function of teacher instruction or that explain mean test score differences between subgroups of examinees: “OTL provides a necessary context for interpreting test scores including inferences about the possible reasons underlying student achievement (e.g., teacher performance, student disability) and suggestions for remedial actions (e.g., assignment of PD training, referral to special education)” (Kurz & Elliott, 2011, p. 39).

At the student level, the engaged curriculum represents those portions of content coverage during which the student is engaged in the teacher’s enacted curriculum. Considering data from the 2006 High School Survey of Student Engagement, on which 28% of over 80,000 students reported being unengaged in school (Yazzie-Mintz, 2007), it seems reasonable to suggest that some students are unlikely to engage in a teacher’s entire enacted curriculum as it unfolds across the school year. Moreover, a student’s engaged curriculum is likely to constrain his or her learned curriculum. That is, a student will presumably learn only those portions of the enacted curriculum during which he or she is actively engaged. The ICM thus indicates the potential for further attenuation as the intended curriculum reaches the student level via the teacher’s enacted curriculum. At the end of the intended curriculum chain, the model posits the displayed curriculum, which represents the content of the intended curriculum that a student is able to demonstrate via classroom tasks, assignments, and/or assessments. Given the current focus on annual summative state testing, a student’s displayed curriculum may not reveal the entirety of his or her learned curriculum due to various factors including interactions between test-taker characteristics and features of the test that do not permit the student to fully demonstrate his or her knowledge of the target construct (see Beddow, Kurz, & Frey, 2011) or constraints related to the actual test. The latter constraints can pertain to *alignment* (i.e., achievement of the intended curriculum can only be "displayed" to the extent to which the assessed curriculum is aligned with the intended curriculum) or *instructional sensitivity* (i.e., achievement of the intended curriculum can only be "displayed" to the extent to which the test was sensitive enough to register instructional differences related to the enacted curriculum). While alignment between intended and assessed content has been federally mandated since the passage of the NCLB Act in 2001, the psychometric property of instructional sensitivity remains a largely unexamined assumption of the current test-based accountability system (D'Agostino, Welsh, & Corson, 2007; Polikoff, 2010).

So far, I have discussed how the intended curriculum unfolds across the system, teacher, and student level in *general education*. It is within this educational context that most states use the general curriculum (i.e., the academic content and performance standards applicable to all students) to define their students' intended curriculum. As such, it is not surprising that researchers have failed to see the need to distinguish between the general and intended curriculum at the system level: both curricula are indeed synonymous in the context of general education. However, an uncritical adoption of traditional curriculum models in the context of special education can blur important distinctions among curricula that determine the intended outcomes of schooling for students with disabilities (i.e., what students are expected to know and be able to do). In fact, an ongoing debate in special education centers around the perceived tension between two federal policies relevant to standards-based reform and questions about the extent to which the newly established standards should circumscribe the intended and assessed curriculum for students with disabilities: “There is increasing recognition of a fundamental tension between the prevailing K-12 educational policy of universal standards, assessments, and accountability as defined through [NCLB] and the entitlement to a Free Appropriate Public Education (FAPE) within IDEA” (McLaughlin, 2010, p. 265). Figure 2 presents the ICM for special education.

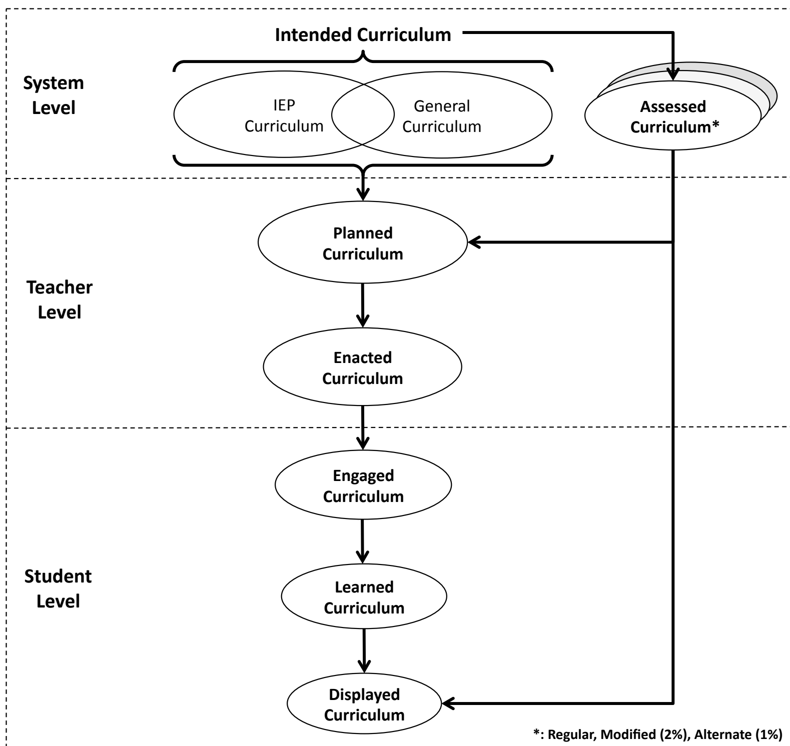


Figure 2. The intended curriculum model for special education.

The ICM for Special Education[1]

In the context of special education, the ICM posits the intended curriculum as dually determined by both the general curriculum and the student’s IEP curriculum. That is, neither the IEP curriculum nor the general curriculum exclusively represents the intended curriculum for a student with a disability. The implementing regulations for the reauthorization of the IDEA in 1997 identified the intended purposes of special education as follows: "To [(a)] address the unique needs of the child that result from the child's disability; and [(b)] to ensure access of the child to the general curriculum, so that he or she can meet the educational standards within the jurisdiction of the public agency that apply to all children" (34 C.F.R. § 300.26(b)(3)). Both reauthorizations of the IDEA in 1997 and 2004 further emphasized the IEP as the central mechanism for detailing a student's access, involvement, and progress in the general (education) curriculum (Karger, 2005). The IEP is further used to document educational objectives relevant to the student's present levels of performance as well as accommodations and modifications that facilitate the student's access to enacted and assessed curricula (Ketterlin-Geller & Jamgochian, 2011). The IEP curriculum can thus include content that goes beyond the knowledge and skills put forth in the general curriculum. A student's IEP, for example, can include social and behavioral goals or other functional goals that are not part of subject- and grade-specific academic standards. The requirement to document a student's access, involvement, and progress in the general curriculum also has promoted the development of so-called "standards-based IEPs," which refers to the practice that links IEP objectives to a state's grade-level standards and assessments (Ahearn, 2006). As such, a student's IEP may include specific objectives that come directly from the general curriculum of his or her peers. In short, the IEP curriculum delineates the extent to which the general curriculum is part of the student's intended curriculum and includes a set of specific (intended) educational objectives, which, depending on the student's unique disability related needs, may fall within or outside the general curriculum. To this end, the ICM depicts “overlap” between the IEP curriculum and the general curriculum. The degree to which both curricula overlap is specified in each individual student’s IEP and thus varies from student to student. Consequently, there is no uniform intended curriculum in the context of special education: the intended curriculum for students with disabilities is *student-specific* by law.

The possibility of individualized intended curricula has direct implications for the remaining curricula within the ICM framework. Most importantly, the notion of only one assessed curriculum fully aligned with the general curriculum and applicable to all students is no longer tenable. For purposes of the assessed curriculum, the ICM therefore reflects the three assessment options currently available to students with disabilities: the *regular* state assessment, the alternate assessment based on *modified* achievement standards (AA-MAS), and the alternate assessment based on *alternate* achievement standards (AA-AAS). The AA-MAS is intended for students with disabilities who receive grade-level instruction but are unlikely to score proficient on the regular assessment, whereas the AA-AAS is intended for students with significant cognitive disabilities who receive grade-level instruction of reduced breadth, depth, and complexity (see Cortiella, 2007). According to the model, the varying degrees of overlap between the IEP curriculum and the general curriculum can be grouped into three broad categories of the intended curriculum that correspond to the three assessed curricula: regular, modified, and alternate.

For students with disabilities whose IEP curriculum largely overlaps with the general curriculum, the intended curriculum should lead to planned and enacted curricula that offer students’ the opportunity to learn grade-level subject matter content and progress toward predetermined NCLB achievement goals. The content of the *regular* achievement test thus represents the appropriate assessed curriculum. As for students without disabilities, the resulting displayed curriculum would be used to monitor educational progress.

For students with disabilities whose IEP curriculum moderately overlaps with the general curriculum, the intended curriculum should lead to planned and enacted curricula that continue to offer students' the opportunity to learn grade-level subject matter content and progress toward predetermined NCLB achievement goals. However, we would expect the non-overlapping portions of the IEP curriculum to include modified outcomes for some general curriculum objectives, a set of non-academic educational objectives (e.g., social and behavioral goals), as well as more intensive and specialized accommodations and related services that support OTL. The content of the *modified* achievement test thus represents a more appropriate assessed curriculum. Progress monitoring via the resulting displayed curriculum would be benchmarked to modified and regular achievement standards.

For students with disabilities whose IEP curriculum barely overlaps with the general curriculum, the intended curriculum should lead to highly individualized planned and enacted curricula that offer students the opportunity to learn subject-matter content that is linked to a limited and not fully representative sample of grade-level content. We would expect the non-overlapping portions of the IEP curriculum to represent alternate outcomes for most general curriculum objectives, a large set of non-academic educational objectives (e.g., social, behavioral, and functional goals), intensive and specialized accommodations and modifications, and several related services that support OTL. The content of the *alternate* achievement test thus represents a more appropriate assessed curriculum. Progress monitoring via the displayed curriculum would occur against highly differentiated outcomes likely related to functional independence and self-sufficiency.

As for students without disabilities, the intended curriculum is subject to change on an annual basis as students advance from one grade to the other. Beside subject- and grade-specific changes in the general curriculum, students with disabilities also experience an annual review and update of their IEP. Additional changes in the IEP curriculum are therefore very likely. Ongoing feedback loops from the displayed curriculum to the curricula at the teacher level (i.e., planned and enacted) and system level (i.e., intended) should further permit changes in the content of the intended curriculum and the planning and implementation of classroom instruction. Lastly, it should be noted that the discussed intended curriculum categories serve illustrative purposes and do not suggest separate "tracks" of intended special education curricula.

At the teacher and student level, the intended curriculum unfolds in much the same way as described previously in the general education context. However, the student-specific nature of the IEP curriculum implies that the content of a teacher's planned and enacted curricula ought to reflect each student's unique intended curriculum. Differentiated instruction according to the specific needs and abilities of each student, of course, represents the very essence of special education and summarizes much of the teacher training content for special educators. The sources of instruction for students with disabilities responsible for implementing their intended curriculum, however, are rarely comprised of only special education teachers. In most cases, general and special education teachers share the responsibility of providing a student with the opportunity to learn his or her intended curriculum, supported by paraprofessionals, teacher consultants and specialists, and other related services providers. The fragmentation of OTL sources therefore presents an important measurement challenge that must be addressed in OTL research.

Curricular Context

Based on the curricular context of the ICM, it is now possible to specify OTL's general referents—*students'* opportunity to learn the *intended curriculum*. First, specification of the antecedent referent is critical to the definition of the consequent referent. For students without disabilities, the intended curriculum is synonymous with the general curriculum, which is most explicitly captured via the subject- and grade-specific academic standards of a particular state. For students with disabilities, the intended curriculum is determined as a function of the "overlap" between the general curriculum and the student-specific IEP curriculum. The possibility of individualized intended curricula therefore requires researchers to establish the extent to which the general curriculum standards and any other IEP objectives are applicable for measuring OTL. This challenge appears to be the greatest for students with severe cognitive disabilities for whom the IEP determines a highly individualized general curriculum of reduced depth, breadth, and complexity that is not fully representative of grade-level content (Cortiella, 2007). However, the intended curriculum for about 90% of all students with disabilities includes the same general curriculum applicable to students without disabilities as a consequence of being included in assessments of grade-level content (Thurlow, Altman, & Wang, 2009). Nonetheless, the possibility of additional intended

IEP objectives in addition to the academic standards of the general curriculum remains and must be considered in OTL research on a student-by-student basis.

Second, the ICM highlights students' primary curricular access point to the intended curriculum, namely the teacher's enacted curriculum. Not surprisingly, researchers interested in OTL have focused on instructional indicators at the classroom level (e.g., Pianta, Belsky, Houts, Morrison, & National Institute of Child Health and Human Development [NICHD], 2007; Rowan, Camburn, & Correnti, 2004; Smithson, Porter, & Blank, 1995). Rowan and Correnti (2009) noted that a long line of OTL research has substantiated the following:

> Student learning is driven largely by exposure to the 'enacted curriculum,' where this is defined as exposure not only to specific academic content but also to content-specific teaching practices including for example, the nature and cognitive demand of students' reading tasks and the explicitness of instruction in a particular content area, and so on. (p. 120)

The implications are twofold. First, the concept's consequent referent—the intended curriculum—must be placed in the context of the enacted curriculum for purposes of measuring OTL. It is the extent to which a teacher's classroom instruction addresses the intended student outcomes that most directly captures students' opportunity to learn the intended curriculum. OTL is thus a teacher effect that cannot be judged dichotomously but instead must be measured as *a matter of degree*. The second implication of situating OTL in the context of the enacted curriculum is the large number of potential instructional indicators. As noted by Rowan and Correnti (2009), indicators can address content coverage, cognitive demands for student learning, or use of certain instructional practices. Indeed, researchers have examined a wide range of indicators under the OTL acronym, which has lead to a considerable amount of conceptual confusion and has been identified as one of the key impediments to programmatic OTL research (Anderson, 1986; Kurz & Elliott, 2011; Roach et al., 2009; Ysseldyke, Thurlow, & Shin, 1994).

In summary, the ICM provides the theoretical model that underpins the main purpose of the study stated at the outset, namely to measure the extent to which students with disabilities have the opportunity to learn the intended curriculum using instructional indicators of the enacted curriculum. Specifically, the ICM was used to explicate the "intended curriculum" for students with and without disabilities and the rationale for measuring OTL via "instructional indicators of the enacted curriculum." In addition, three major theoretical challenges for purposes of measuring OTL were identified: (a) establishment of a clear conceptual definition of OTL, (b) identification of relevant instructional indicators of OTL at the enacted curriculum, and (c) development of operational OTL indices. Prior to resolving these challenges, I provide the rationale for measuring students' opportunity to learn the intended curriculum.

Rationale for Invention of the Problem

The rationale for the invention of the problem can be separated into a theoretical rationale and an empirical rationale. The theoretical rationale for measuring OTL is grounded in a legislative and legal framework related to curricular access and educational testing with implications for educational equity and the validity of test score inferences. The empirical rationale for measuring OTL is grounded in research findings that suggest limited OTL for students with disabilities with implications for student achievement and the development of instructional interventions.

Theoretical Rationale

Most legislative and legal decisions focused on equal educational opportunities for all students were initiated during the civil rights era and included court cases such as *Brown v. Board of Education* (1954) and federal policies such as Title IV of the Civil Rights Act (1964). The established framework prohibits unequal educational opportunities on the basis of race, ethnicity, or national heritage that could lead to limited access and opportunities to learn for certain segments of the student population (Roach et al., 2009). The inclusion of individuals with disabilities in this framework was made explicit through additional federal legislation such as Section 504 of the Rehabilitation Act (1973), the IDEA (1975), and the Americans with Disabilities Act (ADA, 1990). For example, Section 504 requires schools receiving federal funds to provide students with disabilities equal access to, and participation in, educational programs and activities; the original IDEA entitles students with disabilities access to a free and appropriate public education in the least restrictive environment under a range of guaranteed procedural safeguards; and the ADA expands the provision of equal access into areas of the public and private sector including transportation, hiring practices, and physical access to facilities (Kurz & Elliott, 2011).

The issue of *curricular access* for students with disabilities became a central legislative concern following the 1994 reauthorization of the Elementary and Secondary Education Act (ESEA), which required states to establish rigorous academic standards as well as measure and report student achievement thereof. To prevent the exclusion of students with disabilities from these initial test-based accountability efforts, the 1997 reauthorization of the IDEA mandated the inclusion of students with disabilities in state- and district-wide assessment programs. More importantly, the IDEA included the so-called "access to general curriculum mandates," which established the right of students to access the same general curriculum that is offered to all students (Karger & Hitchcock, 2003). As noted by McLaughlin (1999), the law signaled "a clear presumption that all students with disabilities should have *access to the general curriculum* [emphasis added] and to the *same opportunity to learn* [emphasis added] challenging and important content that is offered to all students" (p. 9).

The latest reauthorization of the ESEA in 2001, known as the NCLB Act, significantly expanded previous accountability and testing provisions and strengthened the requirement to include all students in state assessments (Malmgren, McLaughlin, & Nolet, 2005). Under the NCLB Act, states were explicitly required to define the general curriculum through subject- and grade-specific standards for grades 3 through 8. Subsequently, the vague "general curriculum" introduced through the IDEA in 1997 acquired state- and district-specific definitions: "For all intents and purposes . . . the general curriculum is best delineated or defined by state and district standards that have been set as part of standards-based reform efforts" (Wehmeyer, Lattin, Lapp-Rincker, & Agran, 2003, p. 263). The current reauthorization of the IDEA in 2004 further aligned the goals of the IDEA with the goals of test-based accountability (see Roach et al., 2008), while maintaining the requirements of general curriculum access, involvement, and progress in the least restrictive environment:

> Almost 30 years of research and experience has demonstrated that the education of students with disabilities can be made effective by having high expectations for such children and ensuring *access to the general education curriculum in the regular classroom* [emphasis added] to the maximum extent possible." (20 U.S.C. § 1400(c)(5)(A)(2004)

Measurement of students' opportunity to learn the intended curriculum responds to the aforementioned legislative directives in the several important ways. First, the concept assigns students' access to the *academic standards* that define the general curriculum a central role in the instruction of students with disabilities—as mandated by the current reauthorizations of the ESEA (2001) and IDEA (2004). Second, the concept posits *individualized* intended curricula for students with disabilities as a function of the general curriculum applicable to all students and the student-specific IEP curriculum—as expressed by the core requirement of the IDEA granting students an appropriate education reflective of their individual abilities and needs. Kurz (2011) thus concluded that OTL should not be equal across all students but *equitable* according to each student's intended curriculum:

> OTL as defined within the ICM highlights equitable OTL in the context of special education. That is, opportunity to learn the intended curriculum should not be equal across students due to the student-specific nature of the intended curriculum in special education (as attested by special education practices such as modified instructional content, additional time on task, or differentiated instruction). In short, students with disabilities should receive equitable OTL according to their individual abilities and needs. (p. 18)

Third, measuring OTL through instructional indicators of the enacted curriculum operationalizes access broadly moving beyond an exclusive focus on academic standards—as acknowledged in the 1997 amendments of the IDEA. That is, the "[IDEA mandated] access by itself does not denote any standards or benchmarks" (Karger, 2003, p. 10). Curricular access is multifaceted and can include physical access (e.g., least restrictive environment), instructional access (e.g., content, practices), and temporal access (e.g., time spent in certain physical locations or instructional activities). Operationalizing and measuring OTL using several instructional indicators of the enacted curriculum thus can provide empirical data about the extent to which the current legislative goal of individualized access to the standards of the general curriculum is being accomplished in the classroom.

Empirical data on OTL, in particular on students' opportunity to learn the standards of the general curriculum, is further critical to the validity of certain test score inferences. The inclusion of students with disabilities in test-based accountability is intended to provide reliable test scores that permit valid inferences about student achievement and the extent to which teachers and schools can be held accountable for this achievement. As such, "educational achievement essentially refers to what [a student] knows and can do in a specified subject area as a consequence of instruction" (Messick, 1984, p. 217). Not surprisingly, current accountability provisions thus include inferences about the instructional effectiveness of teachers and schools on the basis of test scores. However, such test score interpretations go beyond inferences about what students know and are able to do. These interpretations generally seek to attribute high student achievement to adequate instruction and low student achievement to inadequate instruction. These types of test score interpretations are therefore subject to additional evidence that would support their validity including evidence of the test's instructional sensitivity or evidence of students' opportunity to learn the material that is subject to being tested (Burstein & Winters, 1994; D'Agostino et al., 2007; Kurz & Elliott, 2011; Wang, 1998). Unfortunately, evidence for the instructional sensitivity of large-scale achievements tests is virtually non-existent (Polikoff, 2010). Moreover, the importance of measuring OTL is not only critical to the validity of test score inferences but also to the overall premise underlying standards-based reform. The reform's theory of change suggests that setting rigorous academic standards in the context of test-based accountability will compel teachers to align their instruction to the standards and cover them more effectively as evidenced by higher test scores. If these test scores are unable to accurately reflect instructional differences among teachers, then unintended consequences of testing could range from loss of teacher commitment to wrongfully imposed sanctions. D'Agostino et al. argued that "teachers' commitment to the reform will diminish if the assessments fail to register their efforts to provide students the opportunity to learn the standards [and that] if teachers lose commitment, standards-based reform stands little chance of improving student learning" (p. 6).

The *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999) acknowledge the relevance of students' opportunity to learn the material covered in achievement tests for some uses and interpretations of achievement tests, but ultimately situate the issue of OTL as a matter of fairness:

> Achievement tests are intended to assess what a test taker knows or can do as a result of formal instruction. When some test takers have not had the opportunity

> to learn the subject matter covered by the test content, they are likely to get low scores. The test may accurately reflect what the test taker knows and can do, but low scores may have resulted in part from not having had the opportunity to learn the material *as well as* [emphasis added] from having had the opportunity and having failed to learn. When test takers have not had the opportunity to learn the material tested, the policy of using their test scores as a basis for withholding a high school diploma, for example, is viewed as *unfair* [emphasis added] (p. 76)

The *Standards* thus echo the importance of collecting OTL data in the context of test score inferences that seek to explain student achievement as function of instruction that covered the standards. Put succinctly, OTL data can provide a more direct and valid way of ascertaining whether teachers covered the standards of the general curriculum than test scores alone. Moreover, the position that high-stakes decisions necessitate OTL data is consistent with prior court rulings. In *Debra P. v. Turlington* (1981), a class action lawsuit was brought against the state of Florida for failure of having provided students with the opportunity to learn the content of a minimum competency exam required for graduation. The court ruling established that all students must have the opportunity to learn what is covered on a high school graduation test. The court hereby described the OTL documentation requirement as a matter of "instructional validity," which refers to "a measure of whether schools are providing students with instruction in the knowledge and skills measured by the test" (McClung, 1979, p. 683). Subsequent court rulings upheld the OTL documentation requirement in similar contexts and operationalized OTL using indicators such as time, coverage of test content in IEP objectives, and teacher self-report of content coverage (see Pullin & Haertel, 2008).

Empirical Rationale

In addition to the theoretical rationale framed by legislative and legal considerations related to access, equity, and validity, recent research findings have also raised concrete concerns about OTL for students with disabilities along several instructional indicators of the enacted curriculum. Findings by Vannest and Hagan-Burke (2010) related to time use by special education teachers indicated that only 13% to 18% of a given school day was spent on academic instruction. With respect to content coverage of academic standards, the results of an alignment study by Kurz et al. (2010) indicated that about 10% of the enacted instruction of special education teachers was aligned with the topics and cognitive demands of the state-specific general curriculum standards. Concerns about the quality of instruction provided to students with disabilities have been expressed repeatedly including low expectations for students with intellectual disabilities (e.g. Wehmeyer, Sands, Knowlton, & Kozleski, 2002), inconsistent use of effective instructional practices for students with emotional and behavioral disorders (e.g., Cook, Landrum, Tankersley, & Kauffman, 2003; Wehby, Symons, Canale, & Go, 1998), and overuse of independent seatwork and worksheets for students with learning disabilities (e.g., Vaughn et al., 2002). In 2009, Burns and Ysseldyke surveyed 174 special education teachers who reported inconsistent use of evidenced-based instructional practices. The two most frequently implemented practices were direct instruction and modality instruction. However, the latter practice of providing students with instruction through their “preferred modality channel” (e.g., visual, auditory, kinesthetic) has received little theoretical and empirical support (see Clark, Nyugen, & Sweller, 2006;

Kavale & Forness, 2000); thus raising concerns about consistent use of empirically supported instructional practices in special education.

The need for additional research based on these initial findings is evident. The limited data available highlight potential instructional deficit areas that can adversely affect students' opportunity to learn the intended curriculum. Moreover, students with disabilities tend to learn at slower rates than students without disabilities (Bransford, Brown, & Cocking, 2000) and have been unable to achieve at comparable levels on state and national achievement tests for over a decade (Abedi, Leon, & Kao, 2008; Malmgren et al. 2005; Ysseldyke et al., 1998). This suggests that students with disabilities are particularly vulnerable to limitations in instructional time, content coverage, and instructional quality. In fact, it is seems reasonable to argue that their disability related needs necessitate *increased* OTL compared to their peers without disabilities. The procedural safeguards of the IDEA (1997, 2004) related to an appropriately individualized education that provides access, involvement, and progress in the general curriculum implicitly support this call for equitable OTL (Pullin, 2008).

The noted instructional deficits areas fall along distinct research strands of OTL related to time, content, and quality—all of which have resulted in instructional indicators predictive of student achievement (see Anderson, 1986; Kurz & Elliott, 2011; Stevens & Grymes, 1994). Concerns about the extent to which limitations in OTL have contributed to the persistent achievement gap between students with and without disabilities on state and national achievement tests have been raised (Abedi et al., 2008) and further underscore the need to examine OTL for students with disabilities. Moreover, time usage of allocated time for instructional purposes, content coverage of academic standards, and regular implementation of empirically supported instructional practices represent *malleable factors* of the enacted curriculum that are under the influence of the teacher. Replication of previous findings through systematic research on students' opportunity to learn the intended curriculum thus can lead to the identification of instructional areas in need of improvement and the subsequent development of teacher interventions (Kurz, 2011).

In summary, measurement of OTL using instructional indicators of the enacted curriculum can provide a comprehensive assessment of empirical concerns about instruction yielding vital data about instructional access and equity for students with disabilities. The necessity of such data greatly increases in the context of test-based accountability, whenever test score inferences are drawn about the adequate provision of instruction. The potential for programmatic research leading to interventions that target malleable factors of instruction, however, rests upon a sound conceptualization and operationalization of OTL. The importance of OTL has been apparent to stakeholders in the policy and research realm for decades (e.g., Anderson, 1986; McDonnell, 1995; O'Day, 2004) and has even led to the inclusion of voluntary OTL standards into federal legislation through the Goals 2000: Educate America Act (PL 103-227). However, difficulties defining the concept of OTL and operationalizing its indicators have contributed, at least in part, to the failure of OTL standards gaining a foothold in our current test-based accountability system. The next section is therefore dedicated to providing a solution to the conceptual and methodological problems underlying the measurement of OTL.

Rationale for Solution of the Problem

The present research problem of measuring OTL cannot be resolved without first addressing the challenge of defining OTL. Given the manifold indicators of OTL across the various levels of the educational environment, I adopt a positivist approach to define OTL focusing on empirically supported indicators of OTL at the classroom level. The focus on the enacted curriculum is consistent with the description of OTL established thus far in the context of the ICM. That is, the teacher's enacted curriculum represents the most proximal element of the educational environment to the instructional lives of students and their opportunity to learn the intended curriculum: "Students' opportunities to learn specific topics in the school curriculum are both the central feature of instruction and a critical determinant of student learning. The importance of curricular content to student learning has led researchers to become increasingly interested in measuring the 'enacted curriculum' …" (Rowan et al., 2004, p. 75-76). Therefore, I begin the conceptual synthesis of OTL with a review of the three dominant OTL research strands, their respective indicators, and major empirical findings for students with and without disabilities. Subsequently, I establish a conceptually integrated definition of OTL, provide the respective OTL indicators, and suggest operationally defined indices. I conclude this section by discussing relevant methodological considerations for the measurement of OTL.

Time on Instruction[1]

The first research strand emerged with John Carroll (1963), who introduced the concept of OTL as part of his model of school learning: "*Opportunity to learn* is defined as the amount of time allowed for learning, for example by a school schedule or program" (Carroll, 1989, p. 26). Carroll included OTL as one of five variables in a mathematical formula, which he used to express a student's degree of learning (i.e., ratio of the time spent on a task to the total amount of time needed for learning the task). Subsequent research on time and school learning (see Borg, 1980; Gettinger & Seibert, 2002) began to empirically examine this OTL conceptualization using general indicators such as *allocated time* (i.e., scheduled time to be allocated to instruction) or more instructionally sensitive and student-oriented indicators such as *instructional time* (i.e., proportion of allocated time actually used for instruction), *engaged time* (i.e., proportion of instructional time during which students are engaged in learning), and *academic learning time* (i.e., proportion of engaged time during which students are experiencing a high success rate).

Frederick and Walberg (1980) conducted one of the first major reviews of studies that examined the relation between time and learning outcomes. Overall, the authors found moderate and persistent correlations across various time and outcome measures ranging from .13 to .71. They noted that "refining the measure of time to reflect actual time devoted to the outcome being measured was successful in increasing the association" (p. 190). Fisher et al. (1980) introduced such a refinement by establishing the concept of academic learning time (ALT) as part of the *Beginning Teacher Evaluation Study* (BTES). To this end, they considered allocated time, engagement, and success rate via multiple regression analyses controlling for prior achievement. For one school year, they observed the reading and mathematics instruction for students nested in 21 second-grade and 25 fifth-grade classes. Allocated time, engagement rate, and high success rate each accounted for unique variance proportions in student achievement across several reading and mathematics domains ranging from .02 to .22 for allocated time, .01 to.13 for engagement rate, .01 to .14 for high success rate, and .01 to .30 for the combined ALT variables. Other related findings included (a) allocated time per subject and subskill varied widely between teachers and (b) student engagement in instruction ranged between 50% and 90% of the allocated time. Brown and Saks (1986) reanalyzed the BTES data using a log-linear model to evaluate whether the learning outcomes varied across students, teachers, and subjects as a function of allocated time. Results confirmed the relation between allocated time and achievement and further indicated that the size of the effect varied across mathematics teachers and across subject and grade levels. In addition, the authors identified an interaction effect between allocated time and prior achievement: "a given increase in time adds more to the score of a lower-ability than a higher-ability student" (p. 498).

Since the BTES, the amount of time dedicated to instruction has received substantial empirical support in predicting student achievement (Caldwell, Huitt, & Graeber, 1982; Clark & Linn, 2003; Patall, Cooper, & Allen, 2010; Walberg, 1988). In a research synthesis on teaching, Walberg (1986) identified 31 studies that examined the "quantity of instruction" and its relation to student achievement. Walberg reported a median (partial) correlation of .35 controlling for other variables such as student ability and socioeconomics status. In a meta-analysis on educational effectiveness, Scheerens and Bosker (1997) examined the effect of allocated time on student achievement via multilevel modeling using 21 studies with a total of 56 replications across studies. The average Cohen's *d* effect size for time was .39 (as cited in Marzano, 2000). Both research reviews, however, provided insufficient information about the extent to which time usage was reported by special education teachers and failed to disaggregated the relation between time and student achievement for students with and without disabilities. Considering that time usage related to instruction represents one of the best documented predictors of student achievement across schools, classes, student abilities, grade levels, and subject areas (Vannest & Parker, 2010), it is not surprising that research regarding time on instruction continues across the system (i.e., allocated time), teacher (i.e., instructional time), and student level (i.e., ALT).

Special education has been marked by significant changes in teacher roles, settings, and instructional arrangements over the last few decades, which have increased the number of activities that require substantial amounts of teacher time such as paperwork, consultation, collaboration, assessment, and behavior management (e.g., Conderman & Katsiyannis, 2002; Kersaint, Lewis, Potter, & Meisels, 2007; Mastropieri & Scruggs, 2002). Despite the fact that NCLB has posited increased time on instruction as an important avenue for improving the academic achievement of *all* students (Metzker, 2003), little is known about the extent to which special education teachers spend time on instruction (Vannest & Hagan-Burke, 2010). During the 1980s, researchers in special education conducted several time-based OTL studies focused on differences between allocated and engaged time for students with disabilities as a function of placement in more or less restrictive environments. Overall, the results of these studies indicated that students across disability categories experienced (a) more allocated time for academic activities and whole class instruction in less restrictive settings; and (b) more engaged time and individual instruction in more restrictive settings (Ysseldyke, Thurlow, Mecklenburg, & Graden, 1984; Thurlow, Ysseldyke, Graden, & Algozzine, 1984; Rich & Ross, 1989; O'Sullivan, Ysseldyke, Christenson, & Thurlow, 1990).

In one of the first studies that analyzed special education teacher time use via self-reports in conjunction with continuous and interval direct observation data, Vannest and Hagan-Burke (2010) reported on the results of 2200 hours of data from 36 special education teachers. Two findings are noteworthy: (a) time use for 12 different activities ranged from 2.9% to 15.6%, which indicates that no single activity took up the majority of the school day; (b) academic instruction, instructional support, and paperwork occupied large percentages of time with 15.6%, 14.6%, and 12.1%, respectively. Vannest and Hagan-Burke concluded that "the sheer number of activities in which [special education] teachers engage is perhaps more of an issue than any one type of activity, although paperwork (12%) certainly reflects a rather disastrously large quantity of noninstructional time in a day" (p. 14). Differences in time allocation by setting (i.e., self-contained behavior, self-contained resource, pull-out, co-teaching) examined via a factorial design indicated that special educators in self-contained resource settings spent significantly more time on academic instruction than special educators in any other setting. However, these comparisons did not account for academic instruction provided to students through multiple teachers. For example, students in co-taught settings might experience more time on academic instruction than students in self-contained resource settings once instructional time provided by both general and special education teachers is being considered.

In summary, time on instruction represents an important instructional dimension of the enacted curriculum and has received substantial empirical support as at least a moderate-strength predictor of student achievement. The strength of this relation increases for measures that reflect instructional time relevant to the outcome being measured as well as those that consider student engagement and success rate. Unfortunately, research data on time usage for special education teachers are scarce, especially in relation to student achievement. Moreover, the limited research available for special education teachers indicates that large percentages of time are occupied by noninstructional activities, which raises concerns about the total amount of time a special education teacher can dedicate to instruction (see Vannest & Hagan-Burke, 2010). Lastly, time-based OTL studies have offered little insight about *how* instructional time is allocated across the content domains and skills of the intended curriculum both at the class and student level.

Content of Instruction[1]

The second research strand emerged with studies that focused on the *content overlap* between the enacted and assessed curriculum (e.g., Comber & Keeves, 1973; Husén, 1967). Husén, one of the key investigators for several international studies of student achievement, developed an item-based OTL measure that required teachers to report on the instructional content coverage for each assessment item via a 3-point scale: "Thus opportunity to learn from the Husén perspective is best understood as the match between what is taught and what is tested" (Anderson, 1986, p. 3682). As such, mean correlations between teachers' content coverage and student achievement in mathematics across 10 countries ranged between .11 and .20. Comber and Keeves (1973) obtained similar results with a mean correlation of .12 for their international study of science education. Both international studies relied on teacher recall of test-content-based OTL for individual students across multiple years. To advance prior research, Borg (1979) focused on more immediate teacher recall (4 days) and controlled for student ability and socioeconomic status (SES). Test-based content coverage accounted for 16% of the variance in student achievement. The content overlap conceptualization of OTL remained dominant in several other research studies during the 1970s and 1980s, all of which focused on general education teachers (e.g., Cooley & Leinhardt, 1980; Winfield, 1987, 1993). For their meta-analysis, Scheerens and Bosker (1997) reviewed 19 studies focused on teachers' content coverage of tested content and reported an average Cohen's *d* effect size of .18 (as cited in Marzano, 2000).

Another line of research on content overlap focused on students' opportunity to learn important content objectives rather than tested content (e.g., Armbuster, Stevens, & Rosenshine, 1977; Jenkins & Pany, 1978; Porter et al., 1978). Porter et al., for instance, developed a basic taxonomy for classifying content included in mathematics curricula and measured whether different standardized mathematics achievement tests covered the same objectives delineated in the taxonomy. Porter continued his research on measuring the content of the enacted curriculum during the advent of standards-based reform (e.g., Gamoran et al., 1997; Porter, Kirst, Osthoff, Smithson, & Schneider, 1993) and developed a survey-based measure that examined the content of instruction along two dimensions: *topics* and *categories of cognitive demand* (Porter & Smithson, 2001; Porter, 2002). The findings of Gamoran et al. indicated that alignment between instruction and a test of student achievement in high school mathematics accounted for 25% of the variance among teachers. Porter's measure, now called the SEC, is presently the only method that can assess alignment among various enacted, intended, and assessed curricula via a content translation of each curriculum into individual content matrices along two dimensions (i.e., topics, cognitive demands). For purposes of the SEC, Porter (2002) developed an alignment index (AI) to determine the content overlap between two matrices at the intersection of topic and cognitive demand. Researchers have utilized this continuous alignment variable as an independent variable in correlational studies predicting student achievement (Kurz, et al., 2010; Smithson & Collares, 2007).

Smithson and Collares (2007) used simple correlations, multiple regression, and hierarchical linear modeling (HLM) to examine the relation between alignment (using the SEC's AI) and student achievement. The average correlation between alignment (of the enacted to the intended curriculum) and student achievement was .34 ($p < .01$). Smithson and Collares subsequently used multiple regression analyses to control for the effects of prior achievement, grade level, and SES. The results supported alignment (of the enacted to the intended curriculum) as a significant predictor of achievement with adjusted R^2 ranging between .41 and .70. Smithson and Collares further noted that the results of the multilevel analysis supported alignment as significant predictor of achievement at the classroom level (Level 2) controlling for grade level and SES as well as controlling for prior achievement at the student level (Level 1). Herman and Abedi (2004) conducted similar analyses to Smithson and Collares's (2007), using their own item-based OTL measure (i.e., asking students and teachers about the extent to which valued mathematics content was covered). As such, the OTL construct related to the content of instruction was aimed at the content overlap between the teacher's instruction on 28 Algebra I content domains and an aligned mathematics assessment. The correlation between student-reported OTL (at the class level) and class achievement was .72 ($p < .01$), and the correlation between teacher-reported OTL (at the class level) and class achievement was .53 ($p < .01$). Their multilevel analyses further indicated that the proportion of English language learners in a class and OTL have significant effects on student achievement, even after controlling for students' prior achievement and background.

Rather than asking teachers to report on OTL via a single retrospective survey, Rowan and colleagues examined content-based OTL through the use of multiple teacher logs across the school year (e.g., Rowan et al., 2004; Rowan & Correnti, 2009). For the *Study of Instructional Improvement* (SII), they examined students' opportunity to learn and engage in important literacy skills and activities in grades 1 through 5 on the basis of more than 75,000 logs from nearly 2,000 teachers. Key findings indicated that (a) content and difficulty of skills varied widely from day to day in a given teacher's classroom (even among teachers from the same grade level at the same school) and (b) students in the same classroom received little instructional differentiation in terms of the amount or skill level of reading comprehension or writing instruction (Rowan et al., 2004). In addition, reading/language arts instruction was of low cognitive demand across all grade levels with little variation in instructional practices based on students' prior achievement or learning histories (Rowan & Correnti, 2009).

Research data on content-based OTL and the relation between OTL and student achievement in the context of special education are presently very limited. Roach and Elliott (2006) used student grade level, teacher reports of students' curricular access, percentage of academic-focused IEP goals, and time spent in general education settings as predictors of academic performance on a state's alternate assessment. Results indicated the model accounted for 41% of the variance in student achievement. Teacher-reported coverage of general curriculum content was the best predictor in the model accounting for 23% in the variance in student performance. Kurz et al. (2010) used the SEC alignment methodology to examine the relation between OTL (i.e., alignment between the enacted and intended curriculum was used as an OTL proxy) and student achievement averages for general and special education teachers. The content of instruction delivered by general and special education teachers as measured by the SEC did not indicate significantly different alignment indices between the two groups. The correlation between OTL and (class averages of) student achievement was .64 ($p < .05$). When general and special education teachers were examined separately, the correlation between alignment and achievement remained significant only for the special education group with .77 ($p < .05$). Unfortunately, these findings have limited generalizability due to the study's small sample size. A multilevel (re)analysis of the Kurz et al. data via HLM allowed for variance decomposition of students' end-of-year achievement using predictors at the student level (i.e., prior achievement) and classroom level (i.e., classroom type, classroom alignment). The intraclass correlation coefficient (ICC) was $\hat{\rho}$ =.34 (i.e., 34% of variance in students' end-of-year achievement was between classrooms). The final (main effects) model predicted individual student achievement as a function of overall mean classroom achievement, main effect for classroom type (i.e., general education, special education), main effect for classroom alignment, prior achievement as a covariate, and random error. All four fixed effects were significant ($p < .001$), while the random effects were not significant ($p > .05$). The results of the reanalysis thus supported classroom type and classroom alignment as significant predictors of individual student achievement even after controlling for prior achievement at the student level. In addition, both classroom type and classroom alignment accounted for virtually all variance in student achievement that was between classrooms.

In summary, content-based conceptualizations of OTL have focused narrowly on tested content and more broadly on valued content and skills related to particular subjects. Available data support an empirical association between the content of instruction and student achievement. The quality of the data, however, is limited, which makes it difficult to generalize findings and develop interventions. First, the measures of students' opportunity to learn instructional content vary across studies. Researchers have repeatedly employed two approaches for collecting OTL data on the content of instruction: (a) item-based OTL measures, which teachers use to report on the relative content coverage related to each test item (e.g., Husén, 1967; Winfield, 1993); and (b) taxonomic OTL measures that provide an exhaustive list of subject-specific content topics, which teachers use to report on the relative emphases of enacted content according to different dimensions (e.g., Porter, 2002; Rowan & Correnti, 2009). Second, the quality of achievement measures used across studies is unclear. That is, little information is available on the reliability of achievement test scores and the test's alignment to the intended curriculum. The latter concern is about the extent to which the achievement test in question measured the content that teachers were supposed to teach (i.e., the content prescribed by the standards). That is, alignment between the enacted and intended curriculum cannot be expected to correlate highly with student achievement, if the test fails to be aligned with the respective content standards. In addition, the instructional sensitivity of assessments used to detect the influence of OTL on achievement typically remains an unexamined assumption among researchers (D'Agostino et al., 2007). Another limitation in the presently available data on OTL related to the content of instruction is the paucity of research involving special education teachers and students with disabilities.

Quality of Instruction[1]

The third and most diverse research strand related to an instructional dimension of OTL can be traced to several models of school learning (e.g., Bloom, 1976; Carroll, 1963; Gagné, 1977; Harnischfeger & Wiley, 1976). Both Carroll's model of school learning and Walberg's (1980) model of educational productivity, for example, featured quality of instruction alongside quantity of instruction. The operationalization of instructional quality for purposes of measurement, however, resulted in a much larger set of independent variables related to student achievement than instructional time. In his research synthesis on teaching, Walberg (1986) reviewed 91 studies that examined the effect of quality indicators on student achievement, such as frequency of praise statements, corrective feedback, classroom climate, and instructional groupings. Walberg reported the highest mean effect sizes (*ES*) for (positive) reinforcement and corrective feedback with 1.17 and .97, respectively. Brophy and Good's (1986) seminal review of the process-product literature identified aspects of giving information (e.g., pacing), questioning students (e.g., cognitive level), and providing feedback as important instructional quality variables with consistent empirical support. More recently, the focus shifted to the implementation of evidenced-based instructional practices (Slavin, 2002).

Specifically in the context of special education, researchers have identified a range of evidence-based instructional practices in the content areas of reading and mathematics. Based on the results from a meta-analysis of intervention studies for students with learning disabilities (SWLDs), Swanson (2000) identified a combined strategy instruction (*ES* = .68) and direct instruction (*ES* = .72) model as an effective instructional procedure for positively influencing academic performance of SWLDs (*ES* = .84). Relevant instructional practices included (a) controlling task difficulty, (b) conducting instruction in small interactive groups (6 or less students), and (c) promoting "think alouds" (see Vaughn, Gersten, & Chard, 2000). In the area of writing and reading comprehension, Vaughn et al. further identified explicit instruction (i.e., writing process steps and genre conventions), guided feedback, and meta-cognitive strategies (i.e., teaching students to monitor their comprehension and ask themselves questions about what they read) as effective practices. With respect to mathematics instruction for SWLDs, Gersten et al. (2009) conducted a meta-analysis and identified five instructional practices with significant effect sizes: (a) providing explicit instruction (i.e., modeling and engaging students in a step-by-step approach to solving a problem); (b) using visual representations; (c) selecting and sequencing instructional examples; (d) eliciting student verbalization; and (e) providing ongoing feedback. Lastly, Elbaum et al. (2000) conducted a meta-analytic review of instructional grouping formats related to reading outcomes for students with disabilities. In comparison to whole class instruction, alternative grouping formats such as pairs, small groups, and multiple grouping formats (e.g., pairing and small groups) resulted in an average effect size of .43.

OTL research related to the quality of instruction also has considered teacher expectations for the enacted curriculum (i.e., cognitive demands) and instructional resources such as access to textbooks, calculators, and computers (e.g., Boscardin, Aguirre-Muñoz, Chinen, Leon, & Shin, 2004; Herman et al., 2000; Porter, 2002; Wang, 1998). Based on the findings of Gamoran et al. (1997), Porter (2002, 2006) argued that accounting for cognitive demand in conjunction with topics taught is essential for explaining variance in student achievement. Wang (1998) provided one of the first multilevel OTL studies that examined the quality of instruction alongside three other content variables (i.e., coverage, exposure, and emphasis). Wang's findings supported students' attendance rate, content coverage, content exposure, and quality of instruction as significant predictors of student achievement (controlling for ability, gender, and race). Wang further noted that content exposure (i.e., periods allocated to instruction) was the most significant predictor of written test scores, while quality of instruction (i.e., lesson plan completion, equipment use, textbook availability, material adequacy) was the most significant predictor of hands-on test scores. Although Wang considered the multi-dimensional nature of OTL, she did not include time on instruction and used an unconventional measure of content coverage, namely the teachers' predicted pass rate for students on each test item. The latter measure of instructional content, however, is difficult to interpret without knowing the extent to which the test covered the teachers' enacted curriculum. Moreover, questions that ask teachers to predict students' pass rates on items are likely to be confounded by their estimates of student ability. This caveat notwithstanding, Wang demonstrated that quality of instruction can serve as a significant predictor of student test scores even with other key OTL indicators in the model. The empirical relation between quality of instruction and student achievement, however, is mostly based on the reports of general education teachers and the academic achievement of students without disabilities.

In summary, many researchers interested in OTL have started to consider the dimension of instructional quality. Herman et al. (2000) identified two broad categories of interest in this instructional dimension related to (a) *instructional resources* such as equipment use and availability of textbooks; and (b) *instructional practices* as mentioned previously. However, numerous other indicators of quality associated with student achievement are found in the literature including teacher expectations for student learning (i.e., cognitive demands), progress monitoring, and corrective feedback (e.g., Brophy & Good, 1986, Porter, 2002). The wide range of available instructional quality indicators underscores the importance for researchers to provide a rationale for their particular operationalization of instructional quality.

Conceptual Synthesis and Operational Indices

For nearly five decades, researchers have used the concept of OTL to examine the inputs and processes necessary for producing important student outcomes. To this end, they have operationalized OTL using various indicators along three broad instructional dimensions related to the time, content, and quality of classroom instruction (Kurz, 2011). Anderson (1986) acknowledged the prolific use of the OTL acronym under different conceptual definitions and was one of the first researchers to suggest a merger of the various OTL conceptualizations: “A single conceptualization of opportunity to learn coupled with the inclusion of the variable[s] in classroom instructional research . . .

could have a profound effect on our understanding of life in classrooms" (p. 3686). Based on a review of the OTL literature, Stevens and Grymes (1993) established the first "unified conceptual framework" of OTL to investigate "students' access to the core curriculum" using four elements: content coverage, content exposure, content emphasis, and quality of instructional delivery. Table 1 lists their definitions for each of the four OTL elements.

Table 1

Conceptual Framework of OTL by Stevens and Grymes

Element	**Definition**
Content Coverage	Teacher arranges for all students to have access to the core curriculum. Teacher arranges for all students to have access to critical subject matter topics. Teacher ensures there is curriculum content and test content overlap.
Content Exposure	Teacher organizes class so that there is time-on-task for students. Teacher provides enough time for students to learn the content of the curriculum and to cover adequately a specific topic or subject.
Content Emphasis	Teacher selects topics from the curriculum to teach. Teacher selects the dominant level to teacher the curriculum (recall, higher order skills). Teacher selects which skills to teach and which skills to emphasize to which groups of students (ability grouping and tracking or regrouping).
Quality of Instructional Delivery	Teacher uses teaching practices (coherent lessons) to produce students' academic achievement. Teacher uses varied teaching strategies to meet the educational needs of all students. Teacher has cognitive command of the subject matter.

Note. Table from Stevens and Grymes (1993, p. 8).

Despite the fact that Stevens and Grymes did not develop an empirical program of research on the basis of this framework, their conceptualization of OTL has been adopted frequently thereafter (e.g., Abedi, Courtney, Leon & Azzam, 2006; Aguirre-Munoz et al., 2006; Wang, 1998; Herman & Abedi, 2004). This "unified" framework, however, fell short of a conceptual synthesis, instead providing three separate "content elements" and one "quality element." In addition, Stevens and Grymes' definitions were too vague to be operational leading researchers to develop a range of disparate indices for each OTL element. Nonetheless, their framework clarified OTL as a teacher effect related to the allocation of adequate instructional time covering a core curriculum via different cognitive demands and instructional practices that produce student achievement.

The OTL model introduced by Kurz (2011) is situated in the context of the ICM and based on the aforementioned research strands of OTL (see Figure 3). According to Kurz, empirically supported research on OTL at the classroom level has resulted in indicators that fall along three broad instructional dimensions measuring aspects of time, content, and quality that typically co-occur together:

> Neither aspect of OTL can occur in isolation for all practical intents and purposes. That is, instructional content enacted by a teacher always unfolds along (at least) two additional dimensions: time and quality. For example, a teacher's instruction is not adequately captured by referring solely to the content of instruction such as *solving algebraic equations.* In actuality, the teacher may have asked students to *apply* strategies related to *solving algebraic equations* for *15 minutes* in *small groups* while providing *guided feedback*. The different sets of italicized words refer to various aspects of OTL—time, content, and quality of instruction—that have to occur in conjunction with one another whenever instruction is enacted by a teacher. (p. 34)

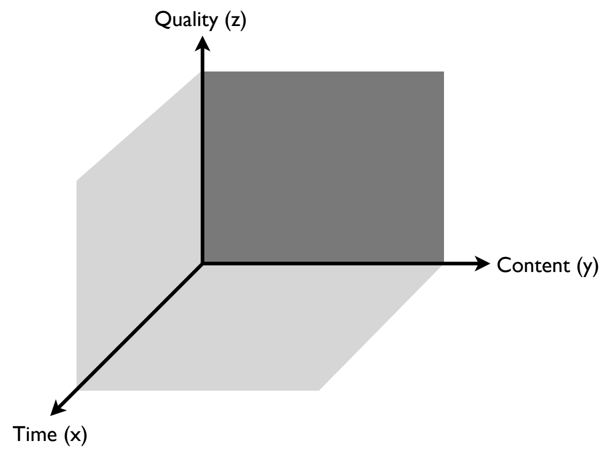


Figure 3. The instructional dimensions model of OTL.

Based on this model, students' opportunity to learn the intended curriculum is a matter of degree represented along three orthogonal axes with distinct zero points. Each axis delineates one of the aforementioned instructional dimensions of the enacted curriculum. The model therefore incorporates time-based, content-based, and quality-based OTL conceptualizations as equally valid but limited definitions of OTL that address aspects of the same underlying enacted curriculum. The focus on the enacted curriculum and its temporal, curricular, and qualitative aspects was established on empirical grounds, while the co-occurrence of all three aspects was acknowledged for practical reasons. The conceptual synthesis is further substantiated by a theoretical rationale related to the ICM, which circumscribes the provision of students' opportunity to learn the intended curriculum.

According to the instructional dimensions model of OTL, the first necessary conceptual ingredient of OTL is *time*. To provide students with the opportunity to learn the intended curriculum, teachers must invest instructional time dedicated to the respective knowledge and skills implicated in the intended curriculum. As such, previously used indicators of time such as “allocated time” are not suitable for operationalizing this OTL dimension. Of interest is a teacher’s *instructional time* spent on teaching the academic standards of the general curriculum and, if applicable, any intended skills prescribed by a student’s IEP. Prior research on time and learning further provides empirical support for examining student engagement and success rate in conjunction with instructional time.

The next instructional dimension that must be integrated into the concept of OTL is *content*. To provide students with the opportunity to learn the intended curriculum, teachers must cover the content implicated in the intended curriculum. Of interest is a teacher’s *content coverage* of the academic standards of the general curriculum and, if applicable, any intended skills prescribed by a student’s IEP. As such, the “core curriculum” mentioned by Stevens and Grymes (1993) becomes defined in congruence with the legal and legislative mandates of test-based accountability. Previously used OTL indicators related to “tested content” are no longer applicable. As discussed earlier, the normatively desirable target of classroom instruction should be the broader intended curriculum, which subsumes the content of the assessed curriculum.

Only knowing how much time is spent on instruction and what content of the intended curriculum is being covered fails to indicate “how” this time and content were enacted, which requires the integration of a third instructional dimension into the concept of OTL: *quality*. To provide students with the opportunity to learn the intended curriculum, teachers can employ a range of instructional practices that have received empirical support across multiple studies including guided feedback (e.g., Brophy & Good, 1986), reinforcement (e.g., Walberg, 1986), direct instruction (e.g., Gersten et al., 2009), student "think alouds" (e.g., Vaughn et al., 2000), and visual representations (e.g., Gersten et al., 2009). In addition, researchers have identified grouping formats other than whole class (e.g., Elbaum et al., 2000) and cognitive expectations for learning, so-called cognitive demands (e.g., Porter, 2002), as important qualitative aspects of instruction. With respect to cognitive expectations, several classification categories ranging from lower-order to higher-order cognitive processes have been suggested, most notably in Bloom's taxonomy of education objectives (Bloom, 1976). Figure 4 compares three classification categories of cognitive process expectations: (a) Webb's Depth-of-Knowledge (DOK) levels (see Webb, 2006); the categories of cognitive demand used by the SEC (see Porter, 2002); and the six categories of the cognitive process dimension from the revised Bloom's taxonomy (see Anderson et al., 2001). It should be noted that the latter taxonomy situates all educational objectives within a two-dimensional framework that includes both a knowledge dimension and a cognitive process dimension. Three quality indicators can be identified: *cognitive expectations*, *evidence-based instructional practices*, and *grouping formats*. A clear theoretical or empirical rationale to preference one indicator over the other is presently not available. All three indicators are therefore retained as part of the quality dimension.

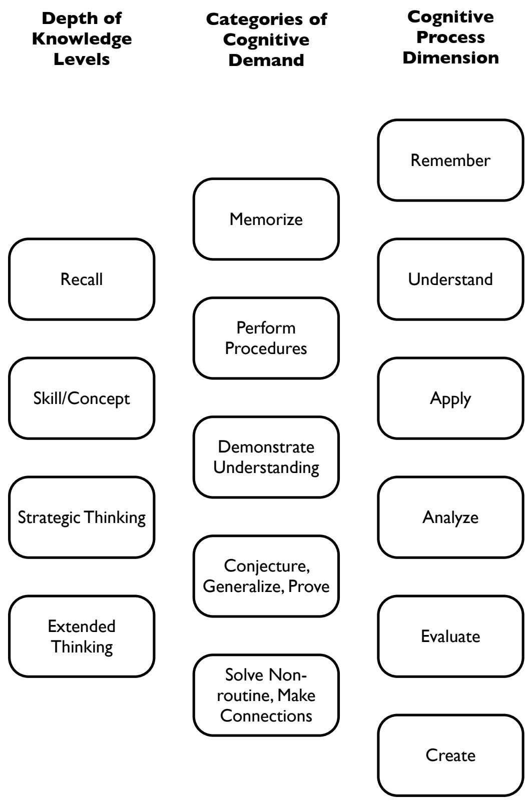


Figure 4. Comparison of several classification categories for cognitive expectations.

The proposed OTL model further represents each instructional dimension as a continuum that originates in zero. The origin for the *x-axis* indicates that a teacher dedicated zero minutes to teaching the intended curriculum objectives. Conversely, students' opportunity to learn the intended curriculum can be increased by dedicating more instructional minutes to teaching the intended curriculum. Upper constraints are based on allocated time and the total number of school days. Given that the number of school days is very consistent across states ($M = 180.4$, $SD = .12$), the suggested operational index for instructional time (*IT*) is the *average amount of instructional minutes spent on the intended curriculum objectives per day*.

The origin for the *y-axis* indicates that a teacher covered none of the intended curriculum objectives. Students' opportunity to learn the intended curriculum thus can be increased by covering more of the intended curriculum objectives. Upper constraints are based on each state's total number of subject- and grade-specific general curriculum objectives as well as the number of applicable IEP objectives. The suggested operational index for content coverage (*CC*) is the *percentage of addressed intended curriculum objectives*.

The origin for the *z-axis* relates to three quality indicators (i.e., cognitive expectations, evidence-based instructional practices, grouping formats). Placing each indicator on a continuum requires a brief explanation. The cognitive process expectations for learning can be grouped along several categories (see Figure 4). Although all categories are important for purposes of a learning progression, meaningful learning must move beyond expectations of recall/memorization for a transfer of knowledge to occur (see Mayer, 2008). Anderson et al. (2001) further argued:

> When the primary goal of instruction is to promote retention, the focus is on objectives that emphasize *Remember*. When the goal of instruction is to promote transfer, however, the focus shifts to the other five cognitive processes, *Understand* through *Create*. (p. 70)

As such, it seems reasonable to suggest that a teacher's instructional emphasis on high-order/transfer processes can improve the quality of OTL. In addition, the general curriculum standards of virtually all states demand deeper learning beyond recall (e.g., Porter, 2002). The first suggested operational instructional quality index (*CP*) is thus a weighted score that represents the *sum of differentially weighted percentages of* *instructional time dedicated to each cognitive process expectation*. The two remaining quality indicators can be operationalized in a similar fashion. Teachers are likely to employ a range of generic and evidence-based instructional practices as well as a range of grouping formats from individual to whole class instruction. However, it seems reasonable to argue that teachers who spend more time on evidence-based practices than generic teaching practices improve the quality of students' opportunity to learn the intended curriculum, especially for students with disabilities—likewise for alternative grouping formats. As such, the second suggested operational quality index (*IP*) is the *sum of differentially weighted percentages of instructional time dedicated to each instructional practice*. Similarly, the third suggested operational quality index (*GF*) is the *sum of differentially weighted percentages of instructional time dedicated to each grouping format*. In the Method section, these weighted scores—*CP, IP, GF*—and their specific weights will be further operationalized based on the methodological conventions of the OTL measure used in this study.

The origin for the *z-axis* thus indicates that no teaching occurred at all. Whenever a teacher spends time on instruction, he or she must place instructional emphases along different cognitive expectations, instructional practices, and grouping formats. As such, instructional quality can only range from low to high, depending on which type of expectations (low-order vs. high-order), practices (generic vs. evidence-based), and formats (alternative vs. whole class) were emphasized. Table 2 summarizes the instructional dimensions of the proposed OTL model and its respective indicators, definitions, and suggested operational indices.

Table 2

Instructional Dimensions, Indicators, Definitions, and Operational Indices of OTL

Dimension	**Indicator**	**Definition**	**Index**
Time	Instructional Time	Instructional time dedicated to teaching the general curriculum standards and, if applicable, any intended IEP objectives.	***IT***: Average amount of instructional minutes spent on intended curriculum objectives per day.
Content	Content Coverage	Content coverage of the general curriculum standards and, if applicable, any intended IEP objectives.	***CC***: Percentage of addressed intended curriculum objectives.
Quality	Cognitive Processes	Emphasis of cognitive process expectations along a range of lower-order to higher-order thinking skills.	***CP***: Sum of differentially weighted percentages of instructional time dedicated to each cognitive process expectation.
	Instructional Practices	Emphasis of instructional practices along a range of generic to empirically supported practices.	***IP***: Sum of differentially weighted percentages of instructional time dedicated to each instructional practice.
	Grouping Formats	Emphasis of grouping formats along a range from individual to whole class instruction.	***GF***: Sum of differentially weighted percentages of instructional time dedicated to each grouping format.

Note. Emphasis can be operationalized as the amount of instructional minutes.

In summary, the conceptual synthesis of OTL has resulted in defining students' opportunity to learn the intended curriculum on the basis of three empirically supported instructional dimensions: time, content, and quality. On the basis of theory and research, I established five OTL indicators and provided suggestions for operationally defined indices. This integrated concept of OTL is consistent with the legal and legislative demands of test-based accountability and builds upon previous curriculum and OTL frameworks. As such, I define OTL for purposes of this study as *the degree to which a teacher dedicates instructional time and content coverage to the intended curriculum objectives emphasizing high-order cognitive processes, evidence-based practices, and alternative grouping formats*. The suggested operational indices raise the question of measurement. That is, data along the five OTL indices can be collected through variety of methodological options including teacher self-report and direct observation. Before specific research questions and predictions can be established, it is necessary to review the methodical challenges related to the measurement of OTL.

Measurement Considerations[1]

The measurement of OTL at the enacted curriculum level historically has relied on three methods: direct observation, teacher report, and document analysis. For purposes of the proposed concept of OTL, only the former two methods are applicable. That is, the instructional dimensions of OTL related to time, content, and quality can be operationalized and subsequently documented using (a) *observers* who conduct classroom observations or code videotaped lessons, or (b) *teachers* who self-report on their classroom instruction via annual surveys or daily logs. Third-party observations and teacher surveys are by far the most frequently used methods, each with a unique set of advantages and challenges (Rowan & Correnti, 2009).

Third-party observations are often considered the “gold standard” for classroom research, but the high costs associated with this method limit its large-scale application outside well-funded studies for purposes of documenting OTL. Moreover, the complexity and variability of classroom instruction across the school year (Jackson, 1990; Rogosa et al., 1984) raise the questions of *generalizability* and *representativeness*: How many observations are necessary to generalize to a teacher's entire enacted curriculum? Annual surveys, on the other hand, are relatively inexpensive but rely exclusively on teacher *memory* for the accurate recall of the enacted curriculum. To address these measurement challenges, Rowan and colleagues suggested a third alternative, namely the use of frequently administered teacher logs (see Rowan et al., 2004). Teacher logs are intended to (a) reduce a teacher's response burden by focusing on a discreet set of behaviors, (b) increase accuracy of teacher recall by focusing on a recent time period (e.g., today's lesson), and (c) increase generalizability through frequent (cost-effective) administrations across the school year.

As part of their *Reform Up Close* study, Porter et al. (1993) used a variety of methods to collect data on teachers' enacted curriculum including daily logs, weekly surveys, classroom observations, and questionnaires. The agreement between classroom observations and teacher log data (calculated on each observation pair and averaged over all pairs) along four dimensions—broad content area (A), subskills within broad content area (AB), delivery of content (C), cognitive demand (D)—was .78, .68, .67, and .59, respectively. Porter and colleagues also noted significant correlations between log data and questionnaire data on dimension (A) of .50 to .93 in mathematics and of .61 to .88 in science (see Smithson & Porter, 1994). In 2002, Porter argued that a number of studies investigating the validity of survey data have confirmed that "survey data is [*sic*] excellent for describing quantity—for example, what content is taught and for how long—but not as good for describing quality—for example, how well particular content is taught" (p. 9). For purposes of validating teacher logs in the SII, Camburn and Barnes (2004) discussed the challenges related to reaching (interrater) agreement as one of their validation strategies including rater background, type of instructional content, level of detail (e.g., subskills) associated with content, and frequency of occurrence. Agreement percentages across eight literacy topics between observers and teachers ranged between 37% and 75% (average agreement of 52%) using four levels of emphasis (i.e., primary focus, secondary focus, touched on only briefly, not a focus). The agreement percentages between two observers ranged between 52% and 90% (average agreement of 66%). On the basis of their statistical results, Camburn and Barnes expressed confidence in teacher logs to measure instruction at grosser levels of detail and for activities that occurred more frequently. Rowan and Correnti (2009) eventually concluded that teacher logs are (a) "far more trustworthy" than annual surveys to determine the frequency with which particular content and instructional practices are enacted; and (b) yield "nearly equivalent" data to what would be gathered via trained observers. That being said, classroom observations are presently unrivaled in determining aspects of child-instruction or teacher-child interactions (e.g., Connor et al., 2009; Pianta & Hamre, 2009).

The measurement of the enacted curriculum has attracted much research attention in recent years, as evidenced by two special issues dedicated to "opening up the black box" of classroom instruction: the September 2004 issue of the *Elementary School Journal* and the March 2009 issue of *Educational Researcher*. To situate the appropriateness of teacher logs and annual surveys for measuring OTL, I address three guiding questions originally posed by Douglas (2009) for purposes of examining classroom instruction in the context of OTL: What should we measure in classroom instruction? How can we best analyze data on classroom instruction? At what level should we measure classroom instruction?

The first question challenges researchers to provide a (theoretical and/or empirical) framework for selecting measurement variables of interest and for understanding their relation to the overall construct in question. With respect to OTL, the argument suggested three instructional dimensions at the enacted curriculum for purposes of documenting students' opportunity to learn the intended curriculum. The ICM framework, a review of three distinct research strands related to OTL, and a subsequent instructional dimensions model provided the theoretical and empirical underpinnings for this argument. The answer to "what" should be measured for purposes examining OTL is thus: the degree to which a teacher dedicates instructional time and content coverage to the intended curriculum objectives emphasizing high-order cognitive processes, evidence-based practices, and alternative grouping formats. I further suggested specific operational indices of OTL on the basis of this conceptual definition (see Table 2, p. 51).

The second question points to the nesting of classroom instruction and the importance of variance decomposition models in evaluating the effects of classroom instruction on student achievement. Scheerens and Bosker's (1997) review of the literature indicated that variance in student achievement status (without controlling for prior achievement and SES) can be decomposed as follows: about 15-20% of the variance lies among *schools*; another 15-20% of the variance lies among *classrooms* within schools; and about 60-70% of the variance lies among *students* within classroom within schools. Scheerens and Bosker, however, used an unconditional model (i.e., no independent variables were used to predict student achievement). For their analyses of achievement data, Rowan, Correnti, and Miller (2002) also used a three-level hierarchical linear model but included covariates at each level (i.e., prior achievement, home and social background, social composition of schools). Their results indicated that about 4-16% of the variance in students' reading achievement and about 8-18% of students' mathematics achievement lies among *classrooms* (depending on grade level). Although theses studies support the methodological appropriateness of using multilevel models in the measurement of OTL, which is ultimately a teacher effect, several analysts have challenged the adequacy of covariate adjustment models to model changes in student achievement (Rogosa, 1995; Stoolmiller & Bank, 1995). The evaluation of teacher effects on students' academic *growth* via a gain score as the outcome variable, however, has its own set of unique challenges especially when differences among students on academic growth are rather small (see Rowan et al., 2002). Nonetheless, researchers can select from many options within multilevel modeling that can account for the unique nesting of the enacted curriculum and its relation to student achievement. A cross-classified random effects model (Raudenbush & Bryk, 2002), for example, can account for a situation (common in special education) in which lower-level units are cross-classified by two or more higher-level units (e.g., a students' sources of OTL can come from different teachers nested within different classrooms). In short, multilevel analysis is an invaluable tool for evaluating the effects of OTL on student achievement by portioning true variance from error variance and for modeling interactions across time, students, classrooms, and schools (Douglas, 2009).

The third question is also related to the nested nature of OTL and asks researchers to consider how to locate and sample for OTL. One of the first challenges is to decide the number of measurement occasions for purposes of documenting OTL at the enacted curriculum level. Rowan and Correnti (2009), who used daily teacher logs to measure different aspects of a teacher's enacted curriculum, decomposed variance in time spent on reading/language arts instruction into three levels: time on instruction on a given *day* (Level 1), days nested within *teachers* (Level 2), and teachers nested within *schools* (Level 3). Their results on the basis of about 2,000 teachers, who logged approximately 75,000 days, indicated that approximately 72% of the variance in instructional time lies among *days*, about 23% lies among *teachers* within schools, and about 5% lies among *schools*. In other words, time on instruction can vary significantly from day to day: "the average teacher in the [study] provided students with about 80 minutes of reading/ language arts instruction per day, but the standard deviation of instructional time across days for a given teacher was 45 minutes, with 15% of all days including 0 minutes of reading/language arts instruction!" (Rowan & Correnti, 2009, p. 123). This wide variability of classroom instruction around key instructional dimensions of OTL seems to suggest a fairly large number of measurement occasions for purposes of reliably discriminating among teachers. Given their measurement system, Rowan and Correnti suggested that about 20 logs per year are optimal to reliably discriminate among teachers.

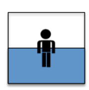
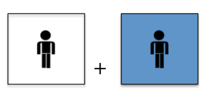
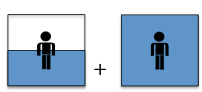
In addition to day-to-day variability, Connor et al. (2009), who used an observational measure, reported that different students nested within the same class may be experiencing different amounts and types of instruction. This issue points to the appropriate measurement level of OTL: Should it be documented at the student level or the classroom level? Most of the teacher-report measures mentioned in the previous literature review were used to collect information on the enacted curriculum at the class level. Given this empirical evidence of significant variation along key instructional dimensions of OTL for students *within* the same class and the theoretical model of the ICM, measurement of OTL restricted to the classroom level does not appear to be sufficient. That is, data on classroom-level OTL cannot necessarily be generalized to individual students and, in the case of students with disabilities, cannot yield information on the extent to which students' had the opportunity to learn their specific intended curriculum (which presumably varies from student to student as well as the overall class).

Croninger and Valli (2009) identified additional challenges related to the variability of instruction, namely the sources and boundaries of (reading) instruction. Results from their 5-year longitudinal study of teaching in schools of poverty indicated that only one third of students experienced no shared instruction. That is, the majority of students received reading instruction from multiple sources in one or more locations. Corninger and Valli noted that "the most prevalent form experienced by students was simultaneous instruction involving an instructional assistant (30%), student teacher (17%), staff developer/resource teachers (15%), and/or in-class help assigned specifically to them (8%)" (p. 105). Moreover, nearly 20% of students received additional reading instruction outside classrooms. Croninger and Valli further noted that many students experienced more reading instruction outside their scheduled reading class than during their scheduled lesson. These findings underscore an important measurement challenge, namely to account for all sources of instruction that contribute to a student's opportunity to learn his or her intended curriculum. This issue is particular relevant for students with disabilities who are likely to share multiple sources of instruction such as general and special education teachers, related services providers, and other instructional personnel.

Table 3 displays a taxonomy of possible instructional sources and scenarios for students with disabilities. The last two scenarios represent *additive instructional scenarios*, which feature multiple teachers who provide students with the opportunity to learn the intended curriculum in separate settings. To accurately represent OTL for these students, it may be necessary to combine OTL data from both sources.

Table 3

Taxonomy of Instructional Sources and Scenarios for Students with Disabilities

Source of Instruction	Instructional Scenario
 **GENED**	Target student receives instruction exclusively from a GENED teacher (e.g., full inclusion class).
 **SPED**	Target student receives instruction exclusively from a SPED teacher (e.g., self-contained class.
 **GENED/SPED**	Target student receives instruction from a GENED and SPED teacher in one class (e.g., co-taught class).
 **GENED + SPED**	Target student receives instruction separately from a GENED teacher and a SPED teacher in two classes (e.g., full inclusion class and pullout class).
 **GENED/SPED + SPED**	Target student receives instruction from a GENED and SPED teacher and additionally from a SPED teacher (e.g., co-taught class and pullout class

Note. GENED = Class instruction by a general education teacher; SPED = Class instruction by a special education teacher.

Based on these considerations, several methodological conclusions can be drawn. First, measurement of OTL via direct observation is not well suited to adequately sample students' opportunity to learn the intended curriculum along the previously suggested

OTL indices. Given the large day-to-day variation in classroom instruction, the number and complexity of OTL indicators, and the potential for multiple instructional sources; the number of classroom observations needed to generalize to OTL across the school year is resource and cost prohibitive. Second, annual surveys also represent a limited measurement option. Considering the specificity of the suggested OTL indices, which require teachers to report instructional minutes and content coverage including cognitive expectations, instructional practices, and grouping formats for specific students; the burden on accurate teacher recall once a year is prohibitive. In sum, the issues of *generalizability* and *reliability* limit the application of classroom observations and annual surveys for measuring students' opportunity to learn the intended curriculum.

Third, a teacher's enacted curriculum provides students with the opportunity to learn the intended curriculum. Teachers therefore represent the objects of measurement. However, students are the referent of OTL, which in the case of multiple instructional sources requires additive considerations for establishing the respective OTL indices. Moreover, the nesting of students in classrooms suggests the use of multilevel models for certain statistical analyses, which also permits researchers to focus on multiple objects of measurement simultaneously. The importance of differentiated instruction for students with disabilities nested within classes further requires measurement of OTL at the class and student level. None of the currently available measurement options such as the SEC and the SII teacher logs are capable of providing this type of information. In addition, neither method accounts for state-specific academic standards or IEP objectives. That is, their curriculum of interest is not congruent with the proposed intended curriculum definition.

Lastly, the ability to reliably discriminate among objects of measurement via repeated measurements depends on three factors: (a) internal consistency of the measure, (b) variance in “true score” measurements over time and across objects of measurement, and (c) the number of measurement occasions (Rowan et al., 2004). Using a single measurement tool will control for measurement reliability on occasions of measurement thus resulting in the following formula: $\alpha = \tau/[\tau + (\sigma^2 /n_j)]$, where α is the ability to discriminate reliably among teachers in patters of cumulative OTL, τ is the amount variance among teachers when this measure is averaged across occasions, σ^2 is the amount of variance within teachers across multiple occasions of measurement, and n_j is the average number of measurement occasions across all teachers. As such, reliability (α) increases as the number of measurement occasions increases. Reliability is further dependent on the amount of variation among teachers’ overall OTL (τ) and on the amount of occasion-to-occasion variance in OTL for each teacher (σ^2). The measure’s internal consistency also impacts occasion variance (σ^2)—as internal consistency decreases, σ^2 increases. Given the large occasion variance in classroom instruction (Fisher et al., 1980; Rowan & Correnti, 2009), the formula underscores the importance of (a) ensuring a reliable measurement instrument and (b) conducting a large enough number of measurement occasions for purposes of reliably discriminating among teachers. The suggested measurement approach to this end is therefore the use of frequently administered teacher logs completed shortly after the lesson in conjunction with criterion-based teacher training and subsequent classrooms observations.

Conclusion

To address the research problem of measuring students' opportunity to learn the intended curriculum, OTL was defined as the degree to which a teacher dedicated instructional time and content coverage to the intended curriculum objectives emphasizing high-order cognitive processes, evidence-based practices, and alternative grouping formats. To ensure that all general and special education teachers who provided OTL for students with disabilities collected OTL data on all five indices frequently across the school year, a teacher self-report approach was adopted based on concurrent teacher logs. These logs were completed concurrently with the implementation of classroom instruction shortly after the lesson had been taught. To allow for the examination of OTL as differentiated opportunity structure, teachers self-reported on several OTL indices at the classroom and student level. Performance-based teacher training and subsequent classroom observations were used to establish and examine the accuracy of teachers' self-reporting practices. The specific research questions and hypotheses on the basis of these conceptual and methodological conclusions are discussed next.

Research Questions and Predictions

To initiate programmatic research based on a conceptually integrated definition of OTL, this study was specifically designed to measure opportunity to learn the intended curriculum for students with disabilities along operationalized OTL indices of the enacted curriculum. To this end, four research questions were addressed:

Question #1**:** *To what degree do students with disabilities have the opportunity to learn the intended curriculum?* To address this question, I examined the degree to which general and special education teachers dedicated instructional time and content coverage to the intended curriculum objectives emphasizing high-order cognitive processes, evidence-based practices, and alternative grouping formats. To this end, I provided descriptive information along several OTL indices. Based on prior research by Kurz et al. (2010), Rowan and Correnti (2009), and Burns and Ysseldyke (2009), I expected the percentage of addressed intended curriculum objectives to be 50% or less and scores from both quality indices to be reflective of emphases on lower-order thinking skills and generic teaching practices.

Question #2*: *To what degree do students with disabilities have a differentiated opportunity to learn the intended curriculum compared to their class? To address this question, I compared the degree to which general and special education teachers dedicated instructional time and content coverage to the intended curriculum objectives emphasizing high-order cognitive processes, evidence-based practices, and alternative grouping formats at the classroom and student level. To this end, I examined differences in class and student means along several OTL indices. Given the findings of Rowan and Correnti (2009), I predicted no statistically significant differences and small effect sizes ($d < .20$) between the class and student means for the various OTL indices.

Question #3: *To what extent is there convergent and predictive validity evidence for the MyiLOGS OTL indices?* To provide initial validity evidence for the OTL measurement tool, I examined convergent validity values between the MyiLOGS OTL indices at the class level and the SEC AI index at the class level. In addition, I compared the predictive validity of both measures using their class-based indices to predict average class achievement on the state achievement test for the Arizona subsample. Given the findings of Kurz et al. (2010) and Smithson and Collares (2007), I predicted evidence of convergent and predictive validity with correlations between the content- and quality-based OTL indices and the AI to exceed the correlations between the time-based OTL indices and the AI.

I was unable to conduct a planned MTMM analyses due to several limitations that resulted from (a) attrition, (b) the number of teacher observations, (c) missing data, and (d) insufficient data provisions by state and university partners. For purposes of reliable validity estimates, the cell sizes for a MTMM matrix should be upwards of 30 cases (Campbell & Fiske, 1958). The initial proposal estimated about 45 cases per cell; yet the final class numbers (Table 4, p. 66) limited the cell size to 20 in MA and 26 in ELA. These numbers were further reduced by a lack of observational data at the classroom level, missing PSG rating data, and insufficient data provisions by study partners linking student data to classrooms. The final cell size fell below 15 cases. I subsequently modified the third research question to address the general intent of the original question, namely to provide initial validity evidence for the OTL measurement tool.

Question #4: *What are the relations between student-based OTL indices and student achievement?* To address this question, the Arizona subsample was used to examine the extent to which student-based OTL indices were predictive of student achievement on the end-of year state test. Given that previous research has supported the relation between time, content, and quality-related OTL indices and student achievement, time, content, and quality-related OTL indices were examined via hierarchical multiple regression analyses. The analyses were conducted with and without controlling for students' prior achievement. Given prior research Kurz et al. (2010) and Smithson and

Collares (2007), I predicted a relation between several student-based OTL indices and student achievement.

I was unable to conduct the planned HLM analyses due to limited data provisions from the state of Pennsylvania and South Carolina including changes in the vertically scaling for both state achievement tests. Irrespective of original intent, both states did not provided individual student scores for all students in participating classrooms. The original power analysis was based on an average of 20 students per classroom and about 30 classrooms in each subject area. Pennsylvania and South Carolina data only included 2 students per classroom. In addition, the previous year's achievement data were no longer on a common scale due to recent test changes in both states. The state of Arizona provided the only complete data set with 16 classes featuring 32 target students. I subsequently modified the fourth research question to address the general intent of the original question, namely to examine the relation between OTL indices and individual student achievement. Given student-based indices of OTL, the averaging of student data could be avoided.

CHAPTER II

METHOD

The conceptual and methodological implications of the proposed definition of OTL necessitated the development of a log-based measure that allowed teachers to regularly report on OTL indicators related to instructional time, content, and quality at the classroom and student level. In the context of a federally funded research grant[2], researchers from Vanderbilt University developed this technology and pilot tested feasibility and usability of the *Instructional Learning Opportunities Guidance System* called MyiLOGS (Kurz, Elliott, & Shrago, 2009) during the 2009-2010 school year. For purposes of this study, general and special education teachers in Arizona, Pennsylvania, and South Carolina were subsequently trained to report on OTL indicators via MyiLOGS for their 8th-grade Mathematics (MA) and English/Language Arts (ELA) classes and two students with disabilities nested within their classes during the 2010-2011 school year.

Participants

The teacher participant sample featured 38 general and special education teachers from seven middle schools in Arizona (*n* = 15 teachers), five middle schools in Pennsylvania (*n* = 12 teachers), and five middle schools in South Carolina (*n* = 11 teachers). To be included in the study, each general and special education teacher had to provide MA and/or ELA instruction to two 8th-grade students with disabilities. In case multiple teachers were involved in the instructional provision for these target students, participation was further contingent on the voluntary consent of all involved teachers. This inclusion criterion was employed to ensure that every teacher who provided target students with the opportunity to learn the subject-specific intended curriculum was participating in the study. The final sample included three co-teaching pairs in Arizona. All three co-teaching pairs were asked to discuss their respective instructional provisions prior to the general education teacher reporting on OTL via MyiLOGS.

The state- and subject-specific breakdowns of schools, teachers, classrooms, and target students are accounted for in Table 4. Several teacher participants logged multiple classrooms within or across subjects, which featured some of the same target students. To highlight this overlap across content areas, Table 4 also lists unique teachers and target students. In South Carolina, two classrooms featured only one target student due to school transfers during the year. In sum, the final subject-specific samples across states were comprised as follows: (a) 19 teachers provided OTL data on 20 MA classes featuring 39 nested target students; and (b) 23 teachers provided OTL data on 26 ELA classes featuring 50 nested target students.

Table 4

Breakdown of Schools, Teachers, Classrooms, and Target Students by State and Subject

	Arizona			**Pennsylvania**			**South Carolina**		
Sample	**MA**	**ELA**	**Unique**	**MA**	**ELA**	**Unique**	**MA**	**ELA**	**Unique**
Schools			7			5			5
Teachers	8	7	15*	5	8	12	6	8	11
Classes	9	7		5	8		6	11	
Target Students	18	14	22	10	16	19	11	20	15

Note. MA = Mathematics; ELA = English/Language Arts.
[a]Includes three special education co-teachers.

All teachers who reported on OTL via MyiLOGS completed a teacher characteristics profile. Table 5 displays teacher characteristics by state including years of experience and professional development hours on state- or district-specific academic standards during the past five years. The teacher sample was predominately female and Caucasian with a majority of teachers holding a graduate degree. With respect to role, the Arizona subsample was exclusively comprised of general education teachers because the three special education co-teachers did not complete a teacher profile.

Table 5

Teacher Participant Characteristics by State

	AZ		PA		SC		Total	
Characteristic	***n***	***(%)***	***n***	***(%)***	***n***	***(%)***	***n***	***(%)***
Gender								
Female	9	*(75)*	11	*(92)*	9	*(82)*	29	*(83)*
Male	3	*(25)*	1	*(8)*	2	*(18)*	6	*(17)*
Ethnicity								
African American	1	*(8)*	0	*(0)*	0	*(0)*	1	*(3)*
Asian American	0	*(0)*	0	*(0)*	0	*(0)*	0	*(0)*
Caucasian	9	*(75)*	12	*(100)*	11	*(100)*	32	*(91)*
Hispanic	2	*(17)*	0	*(0)*	0	*(0)*	2	*(6)*
Other	0	*(0)*	0	*(0)*	0	*(0)*	0	*(0)*
Role								
General Education	12	*(100)*	7	*(58)*	5	*(45)*	24	*(69)*
Special Education	0	*(0)*	5	*(42)*	6	*(55)*	11	*(31)*
Degree								
Bachelor	5	*(42)*	2	*(17)*	6	*(55)*	13	*(37)*
Master	7	*(58)*	10	*(83)*	5	*(46)*	22	*(63)*
Doctorate	0	*(0)*	0	*(0)*	0	*(0)*	0	*(0)*
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Years of Experience	7.6	7.4	10.1	8.4	10.7	8.5	9.4	8.0
PD Hours[a]	79	83	141	168	205	216	140	166

Note. AZ = Arizona; PA = Pennsylvania; South Carolina = SC; PD = Professional Development.
[a]Indicates PD hours on state- and district-specific academic standards during the past five years.

For purposes of establishing the target student sample, state personnel assisted teachers in randomly selecting two students with disabilities nested in each studied classroom. To be eligible for selection, a target student had to have a current IEP that indicated his or her participation in either the regular state assessment or the state's grade-level alternate assessment (i.e., AA-MAS). This selection criterion was used to ensure that all target students were within the legal and legislative framework that mandated their grade-level instruction in the academic standards of the general curriculum. Table 6 displays the target student characteristics by state.

Table 6

Target Student Characteristics by State

Characteristic	AZ		PA		SC		Total	
	n	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*
Gender								
Female	8	*(36)*	10	*(53)*	4	*(27)*	22	*(39)*
Male	14	*(64)*	9	*(47)*	11	*(73)*	34	*(61)*
Ethnicity								
African American	1	*(5)*	6	*(32)*	7	*(47)*	14	*(25)*
Asian American	1	*(5)*	0	*(0)*	1	*(7)*	2	*(4)*
Caucasian	3	*(14)*	12	*(63)*	5	*(33)*	20	*(36)*
Hispanic	16	*(73)*	0	*(0)*	2	*(13)*	18	*(32)*
Other	1	*(5)*	1	*(5)*	0	*(0)*	2	*(4)*
Disability Category[1]								
Intellectual Disability	1	*(5)*	1	*(6)*	2	*(13)*	4	*(7)*
Specific Learning Disability	18	*(82)*	14	*(78)*	12	*(80)*	44	*(80)*
Emotional Disturbance	0	*(0)*	1	*(6)*	1	*(7)*	2	*(4)*
Traumatic Brain Injury	0	*(0)*	2	*(11)*	0	*(0)*	2	*(4)*
Speech/Language	1	*(5)*	0	*(0)*	0	*(0)*	1	*(2)*
Other Health Impairment	1	*(5)*	0	*(0)*	0	*(0)*	1	*(2)*
Multiple Disabilities	1	*(5)*	0	*(0)*	0	*(0)*	1	*(2)*
ELL Status[a]								
No	15	*(79)*	19	*(100)*	11	*(73)*	45	*(85)*
Yes	4	*(21)*	0	*(0)*	4	*(27)*	8	*(15)*
Free/Reduced Lunch[b]								
No	2	*(11)*	10	*(53)*	6	*(40)*	18	*(34)*
Yes	17	*(90)*	9	*(47)*	9	*(60)*	35	*(66)*
IEP Status								
No	0	*(0)*	0	*(0)*	0	*(0)*	0	*(0)*
Yes	22	*(100)*	19	*(100)*	15	*(100)*	56	*(100)*

Note. AZ = Arizona; PA = Pennsylvania; South Carolina = SC; ELL = English Language Learner; IEP = Individualized Education Program.
[a]One missing entry.
[b]Three missing entries.

The target student sample ($N = 56$) was largely comprised of males and students with learning disabilities. The Arizona subsample was predominately Hispanic and the subsamples in Pennsylvania and South Carolina were predominately Caucasian and African American, respectively. The Arizona subsample further featured a very large proportion of students on free/reduced lunch. To further describe the target sample, teachers were asked to rate students' performance levels in the areas of reading, mathematics, motivation, and prosocial behavior via the *Performance Screening Guide* (PSG; Elliott & Gresham, 2008) of the *Social Skills Intervention System* (SSIS; Gresham & Elliott, 2008) and students' academic skills and enablers via the *Academic Competence Evaluation Scales* (ACES; DiPerna & Elliott, 2000).

The criterion-referenced performance descriptors of the PSG feature 5 levels: Level 1 describes a student with serious behavior or skill deficits in need of immediate intervention; Level 2 describes a student with behaviors or skills in need of intervention; Level 3 describes a student possibly at-risk for behavior or academic problems; Level 4 describes a student with well developed behaviors or skills; and Level 5 describes a student with advanced behaviors or skills. The ACES features 5-point rating scales to determine students' academic skills in comparison to their grade-level peers and the frequency with which they exhibit academic enabling behaviors. Raw scores can be transformed to competence levels (i.e., Developing, Competent, or Advanced) and deciles based on a national standardization sample. Table 7 shows the rating results for the target student sample.

Table 7

Target Student Rating Results by State

	AZ			PA			SC			Total		
Rating	***n***	***M***	***SD***	***n***	***M***	***SD***	***n***	***M***	***SD***	***n***	***M***	***SD***
PSG												
Reading	16	2.5	0.9	19	2.6	1.0	15	2.7	0.9	50	2.6	0.9
Mathematics	16	2.4	0.7	19	2.7	0.9	13	2.9	0.8	48	2.7	0.8
Motivation	16	3.2	1.0	19	3.3	0.9	15	3.3	1.1	50	3.3	1.0
Prosocial	16	3.3	0.8	19	3.6	1.0	15	3.7	0.7	50	3.6	0.8
ACES Skills												
Reading	15	19.8	4.8	17	22.1	5.7	15	23.7	7.7	47	21.9	6.2
Mathematics	15	14.4	3.9	13	14.5	4.4	15	17.7	4.6	43	15.6	4.5
Critical Thinking	15	25.9	7.7	18	27.6	7.1	15	29.1	6.7	48	27.5	7.1
Skills Total	15	60.1	15.1	12	64.8	15.2	15	70.5	17.7	42	65.2	16.3
ACES Enablers												
Interpersonal	15	39.9	6.0	18	44.1	6.5	15	39.0	6.1	48	41.2	6.5
Engagement	15	21.2	9.0	18	26.6	7.9	15	27.6	6.6	48	25.2	8.2
Motivation	15	29.7	8.5	18	31.5	10.4	15	32.0	8.1	48	31.1	9.0
Study Skills	15	36.2	8.2	18	37.6	9.3	15	36.6	7.3	48	36.9	8.2
Enablers Total	15	127.0	27.0	18	139.8	29.5	15	135.1	25.0	48	134.3	27.3

Note. PSG = Performance Screening Guide (Elliott & Gresham, 2008); Academic Competence Evaluation Scales (DiPerna & Elliott, 2000).

The mean level ratings via the PSG across all three states indicated that the target student sample generally performed at Level 2 (in need of intervention) in both academic areas and at Level 3 (at-risk for problems) in the "Motivation to Learn" and "Prosocial Behavior" areas. The mean total scores via the ACES further placed students' academic skills across all three states in the Developing range (1st decile nationally) and students' academic enabling behaviors in the Competent range (4th decile nationally). The teachers' low academic ratings of the target student sample were consistent with students' below proficient performance on previous years' state test (see Table 8).

Table 8

Target Student State Test Proficiency Results by State

Proficiency	AZ		PA		SC[a]		Total	
	n	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*
Mathematics								
Below Proficient	21	*(96)*	17	*(90)*	11	*(85)*	49	*(91)*
Proficient	1	*(5)*	2	*(11)*	2	*(15)*	5	*(9)*
English/Language Arts								
Below Proficient	21	*(96)*	18	*(95)*	10	*(77)*	49	*(91)*
Proficient	1	*(5)*	1	*(5)*	3	*(23)*	5	*(9)*

Note. AZ = Arizona; PA = Pennsylvania; South Carolina = SC.
[a]Missing data for two subjects.

All teacher participants were compensated for their time spent on study-related tasks. Each teacher received a $150 honorarium for participation in the MyiLOGS training, $100 per month for using MyiLOGS to report on daily classroom instruction, and $175 for the completion of the SEC at the end of study.

Measures and Materials

All teacher participants completed a total of four measures: MyiLOGS (Kurz, Elliott, & Shrago, 2009), the SEC (Porter & Smithson, 2001), the PSG (Elliott & Gresham, 2008) and the ACES (DiPerna & Elliott, 2000). Teachers also administered their state-specific annual state achievement test used for accountability purposes and an online achievement screener. To answer the first two research questions, MyiLOGS served as the primary measure for determining students' opportunity to learn the intended curriculum. The SEC, ratings scales, and achievement measures provided indices of similar and dissimilar constructs for purposes of the correlational analyses under the third research question. A selection of these indices was further necessary for exploring the relation between OTL and student achievement under the fourth research question. Prior to using MyiLOGS, all participants were required to complete the MyiLOGS training and successfully pass the MyiLOGS performance assessment. In addition, all teachers were observed at least once for reliability purposes. All measures and materials are described next.

OTL Measures

MyiLOGS. This online technology (www.myilogs.com) is designed to assist teachers with the planning and implementation of intended curricula at the class and student level (Kurz, 2011). MyiLOGS was developed on the theoretical and empirical basis of the OTL research literature including the previously discussed curriculum framework of the ICM and the conceptually integrated model of OTL. As such, this educational technology can be used to document all three instructional dimensions of OTL via indicators of instructional time, content coverage, and instructional quality such as cognitive process expectations, instructional practices, and grouping formats (see Table 2, p. 51).

MyiLOGS features the state-specific academic standards of the general curriculum for various subjects and additional customizable skills that allow teachers to add student-specific objectives (e.g., IEP objectives). The tool therefore allows teachers to document the extent to which their classroom instruction covers individualized intended curricula. To this end, MyiLOGS provides teachers with a monthly instructional calendar that includes an expandable sidebar, which lists all intended objectives for a class. Teachers drag-and-drop planned skills that are to be the focus of the lesson onto the respective calendar days and indicate the approximate number of minutes dedicated to each skill. After the lesson, teachers are required to confirm enacted skills, instructional time dedicated to each skill, and any time not available for instruction (due to transitions, class announcements, etc.) at the class level. In addition, two randomly selected days per week require further documentation. On these sample days, teachers report on additional time emphases related to the skills listed on the calendar including cognitive expectations, instructional practices, grouping formats, engagement, goal attainment, and time not available for instruction. This detailed reporting occurs at the class and student level along two two-dimensional matrices and two ratings. Teachers can further review a range of charts and tables that provide detailed information on their enacted curriculum and its relation to the intended curriculum (i.e., subject-specific academic standards and custom objectives). These instructional reports are available for the entire class and individual students. However, this functionality was not available to teachers during the course of this study. Screenshots of the MyiLOGS calendar interface as well as the sample day matrices and ratings are displayed in Figures 5 and 6, respectively.

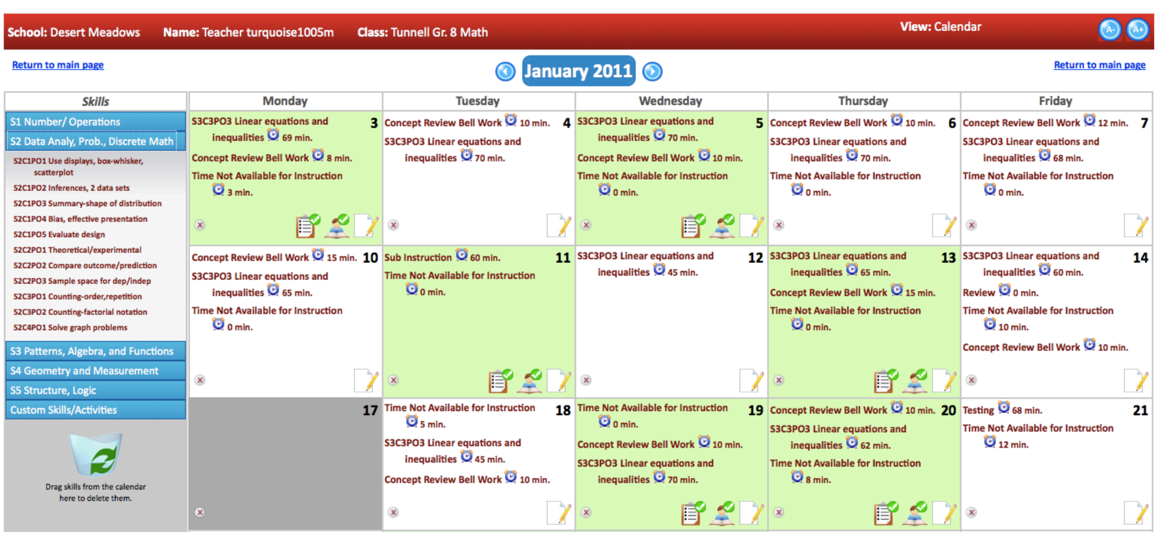


Figure 5. Screenshot of the MyiLOGS calendar interface.

Estimated Time Allocation Across Cognitive Process Dimensions for: Tunnell Gr. 8 Math

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
S3C3PO3 Linear equations and inequalities	5	20	45	0	0	70	70
Concept Review Bell Work	0	5	5	0	0	10	10
Time Not Available for Instruction						0	0
					Update Totals Total:	80	80

Estimated Time Allocation Across Instructional Practices for: Tunnell Gr. 8 Math

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	10	10
Provided Visual Representations	0	0	5	5
Asked Questions	0	5	5	10
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	0	0
Provided Guided Feedback	5	5	0	10
Provided Reinforcement	0	0	10	10
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	35	35
Time Not Available				0
		Update Totals	Calendar Total: 80	80

Engagement Matrix for: Tunnell Gr. 8 Math

Class Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
○ Moderate % of time (50% - 80%)	○ Moderate effort or moderate portion of work completed (50% - 80%)
• High % of time (>80%)	• High effort or substantial portion of work completed (>80%)

Figure 6. MyiLOGS sample day matrices and ratings.

For the first matrix, teachers report on the instructional minutes allocated per skill along five cognitive process expectations for student learning adapted from the revised version of Bloom's taxonomy (see Anderson et al., 2001). For the second matrix, teachers report on the instructional minutes allocated per instructional practice along three grouping formats. Teachers further rate engagement and goal attainment along a 4-point scale. Student engagement and successful work completion are two previously discussed indicators for purposes of determining academic learning time. The definitions for the cognitive process expectations and instructional practices are provided in Tables 9 and 10, respectively. The grouping formats were defined as follows: (a) *Individual*: Instructional action is focused on a single individual; (b) *Small group*: Instructional action is focused on a small groups; (c) *Whole Class*: Instructional action is focused on the whole class.

Table 9

Cognitive Process Expectations for Student Learning and Definitions

Cognitive Process	**Definition**
Attend	Orient toward instructional task and related instructions. ▪ Synonyms include *listen, focus, pay attention*.
Remember[a]	Retrieve relevant knowledge from long-term memory. ▪ Synonyms include *recognize, identify, recall, retrieve*.
Understand[a]	Construct meaning from instructional messages. ▪ Synonyms include *interpret, exemplify, classify, summarize, infer, compare, explain*.
Apply[a]	Carry out or use a procedure in a given situation. ▪ Synonyms include *execute, implement, use*.
Analyze[a]	Break materials into its constituent parts and determine how the parts relate. ▪ Synonyms include *differentiate, organize, integrate, attribute*.
Evaluate[a]	Make judgments based on criteria and standards. ▪ Synonyms include *check, test, critique, judge*.
Create[a]	Put elements together to form a coherent whole or a new structure. ▪ Synonyms include *generate, hypothesize, plan, design, produce*.

[a]This cognitive process and definition is based on the revised Bloom's taxonomy (see Anderson et al., 2001).

Table 10

Instructional Practices and Definitions

Instructional Practice	**Definition**
Provided Direct Instruction[a]	Teacher presents issue, discusses or models a solution approach, and engages students with approach in similar context.
Provided Visual Representations[a]	Teacher uses visual representations to organize information, communicate attributes, and explain relationships.
Asked Questions[a]	Teacher asks questions to engage students and focus attention on important information.
Elicited Think Aloud[a]	Teacher prompts students to think aloud about their approach to solving a problem.
Used Independent Practice	Teacher allows students to work independently to develop and refine knowledge and skills.
Provided Guided Feedback[a]	Teacher provides feedback to students on work quality, missing elements, and observed strengths.
Provided Reinforcement[a]	Teacher provides reinforcement contingent on previously established expectations for effort and/or work performance.
Assessed Student Knowledge[a]	Teacher uses quizzes, tests, student products, or other forms of assessment to determine student knowledge.
Other Instructional Practices	Any other instructional practices not captured by the aforementioned key instructional practices.

[a]This instructional practice has received empirical support across multiple studies.

To minimize teachers' response burden for purposes of this study, the related cognitive processes *Understand* and *Apply* as well as *Create* and *Analyze* were collapsed in the cognitive process matrix (see Figure 6, p. 75). The relation and grouping of these cognitive processes is supported by Webb's DOK levels (see Figure 4, p. 48): (a) the learning expectations under Understand/Apply are mostly limited to routine applications of comprehension and execution linked to familiar skills and concepts; and (b) the learning expectations under Analyze/Evaluate mark a shift toward more complex thinking that requires abstract reasoning, planning, developing, and using of evidence (Webb, 2006). In this study, the cognitive process matrix further included the *Attend* category, which is not part of the revised Bloom's taxonomy (see Anderson et al., 2001). The cognitive expectation of *Attend* allowed teachers to differentiate between the expectation of students (passively) listening to instructional tasks and related instructions and (actively) recalling information such as a fact, definition, term, or simple procedure. This category of cognitive demand has been used previously in the context of special education, especially for students with significant cognitive disabilities (Karvonen, Wakeman, Flower, & Browder, 2007).

The second matrix lists nine instructional practices and three grouping formats. In Table 10, seven instructional practices are marked by a table note to indicate empirical support on the basis of research syntheses and meta-analyses (e.g., Brophy & Good, 1986; Gersten et al., 2009; Marzano, 2000; Swanson, 2000; Vaughn et al., 2000; Walberg, 1986). In addition, grouping formats other than whole class also have received empirical support for improving learning outcomes (see Elbaum et al., 2000). "Other instructional practices" represents a "catch-all" category to allow teachers to report on their entire allocated time per class using the available selection of instructional practices and/or "time not available for instruction." Teachers use the latter category to indicate any non-instructional minutes (e.g., transitions, announcements, fire drills), which together with instructional minutes should add up to the total allocated class time (e.g., 90-minute ELA class).

SEC. This annual online survey (www.seconline.org) is designed to provide information on the alignment between intended, enacted, and assessed curricula (see Martone & Sireci, 2009; Porter, 2002; Roach et al, 2008). The SEC alignment method hereby relies on content translations by teachers (for purposes of the enacted curriculum) and curriculum experts (for purposes of the intended and assessed curriculum) who code a particular curriculum into a content framework that features a comprehensive K-12 list of subject-specific topics. The SEC content frameworks in MA and ELA include 183 and 163 topics, respectively. All content translations occur along a two-dimensional matrix of topics (e.g., multiply fractions) and cognitive demands (e.g., memorize). Teachers, for example, report on their enacted curriculum at the end of the school year by describing different instructional emphases for each topic and any applicable cognitive expectations using a 4-point scale. As such, instructional time is not directly assessed via the SEC. To calculate alignment between two content matrices, the data in each matrix are reduced to cell-by-cell proportions with their sum across all rows and columns equaling 1.0. Table 11 illustrates this methodological convention via two generic content matrices.

Table 11

Generic Content Matrices with Two-Dimensional Emphasis Ratings

Classroom Instruction			**State Standards**		
	Cognitive Demand			Cognitive Demand	
	Category 1	Category 2		Category 1	Category 2
Topic 1	.25	.50	Topic 1	0	.50
Topic 2	.25	0	Topic 2	.50	0

Porter's (2002) alignment index (*AI*) takes both dimensions (i.e., topics and cognitive demands) into consideration when calculating the content overlap between two matrices according to the following formula: $AI = 1 - [(\Sigma|X - Y|)/2]$. The *AI* for the example in Table 11 is therefore .75. The *AI* has served as a proxy for OTL at the classroom level in previous studies (e.g., Kurz et al., 2010). That is, the *AI* can provide information about the extent to which a teacher's enacted curriculum matches the content topics and cognitive expectations expressed in the academic standards of the general curriculum. However, the SEC employs several levels of inference to determine this index. Unlike MyiLOGS, which allows teachers to directly report on instructional time and content coverage allocated to state-specific standards, the SEC relies on (a) expert judgment to translate the state-specific standards into a content matrix and (b) teacher judgment to translate their enacted curricula into a second set of content matrices. Only the subsequent comparison of both matrices ultimately determines the *AI*. Despite the limitations of the *AI* as an OTL proxy, the SEC represents the most efficient measure to gather information about a teacher's 8th-grade enacted curriculum across an entire school year. Appendix A contains the K-12 content surveys for MA and ELA.

Ratings Scales

Performance Screening Guide. The PSG (Elliott & Gresham, 2008) is a paper-and-pencil screening tool designed to describe students' skills against grade-level expectations in four areas: prosocial behavior, motivation to learn, mathematics skills, and reading skills. Table 12 provides the definitions for each area.

Table 12

Performance Screening Guide Areas and Definitions

Performance Area	Definition
Prosocial Behavior	Prosocial behavior is behavior directed toward other people that involves effective communication skills, cooperative acts, self-control in difficult situations, and emphatics or supportive responses to others who experience a problem. For example, children who consistently act in a prosocial manner compromise in conflict situations, invite others to join activities, volunteer to help others, and listen when others are speaking.
Motivation to Learn	Motivation to learn is a state of excitement and activity directed toward learning and completing classroom tasks or activities. For example, children who exhibit motivation to learn show interest, active engagement, and persistence with academic tasks or social interactions. They express satisfaction when learning is successful and renewed effort when it is not as successful as expected.
Mathematics Skills	Math skills involves making use of existing skills and then developing subskills from them in interrelated domains: (1) mathematical process, (2) number operations and relationships, (3) geometry, (4) measurement, (5) statistics and probability, and (6) algebraic relationships. These subskill domains vary in complexity and importance for students in secondary school. In general, students are expected to progress with instruction so they are able to conduct a variety of operations, recognize complex patterns, use measurements to solve problems, and understand basic probability issues.
Readings Skills	The process of reading skills involves making use of existing skills and then developing subskills from them in interrelated domains: (1) meaning of words and phrases in context, (2) understanding text, (3) analyzing text, and (4) evaluating and extending text. These subskill domains vary in complexity and importance for students in secondary school. In general, students are expected to progress with instruction for word use to comprehension of text.

The PSG allows teachers to efficiently rate students' performance in these areas by providing criterion-referenced, behaviorally anchored, multi-level performance descriptors that summarize multiple weeks of teachers' observations and interactions with students. Specifically, teachers are asked to choose one of five performance levels that best describes a student's current level of performance. The skill descriptions vary from level to level according to quality and/or frequency. Figure 7 contains the five performance levels for prosocial behavior. Comparisons are made against the behavioral criteria expressed in each performance level, as opposed to comparing students to each other. Evidence on technical adequacy support reliability of the PSG at the secondary level with test-retest reliabilities between .56 and .73 as well as interobserver reliabilities between .37 and .60 (see Elliott & Gresham, 2007).

Level	Prosocial Behavior
5	Students at this performance level demonstrate most of the following: • excellent skills to communicate and/or cooperate with others • excellent skills to initiate and sustain conversations/interactions with others • excellent self-control and/or a high level of concern for others Students at this performance level generally do not need additional instruction to improve their social skill level, and their current skill level is considered to be high and/or advanced for their age.
4	Students at this performance level demonstrate most of the following: • a general competence when communicating or cooperating with others • adequate skills to initiate and sustain conversations/interactions with others • adequate self-control and/or an appropriate level of concern for others Students at this performance level may benefit from additional instruction to improve their social skills, but their current skill level is considered to be appropriate for their age.
3	Students at this performance level demonstrate most of the following: • occasional difficulty communicating or cooperating with others • occasional difficulty initiating and sustaining conversations/interactions with others • somewhat less-than-expected self-control or concern for others Students at this performance level are often in need of additional instruction to improve their social skills.
2	Students at this performance level demonstrate most of the following: • frequent difficulty communicating or cooperating with others • frequent difficulty initiating and sustaining conversations/interactions with others • limited self-control or little concern for others Students at this performance level are often in clear need of additional instruction to improve their social skills.
1	Students at this performance level demonstrate most of the following: • very limited communication or cooperation skills • extreme difficulty initiating or sustaining conversations/interactions in an age-appropriate manner • poor self-control or little or no concern for others Students at this performance level often need remedial instruction and/or coaching to improve their social skills.

Figure 7. Performance level descriptors of the PSG for prosocial behavior.

ACES. The ACES is a paper-and-pencil rating scale designed to assess students' academic skills and enabling behaviors, which collectively represent a student's academic competence. The enabling behaviors, called academic enablers, are defined as the attitudes and behaviors of students that allow them to benefit from classroom instruction (DiPerna & Elliott, 2002). The academic skills scale features 33 items across three subscales: reading/language arts, mathematics, and critical thinking. The academic enablers scale features 40 items across four subscales: interpersonal skills, engagement, motivation, and study skills. The skills and enablers assessed via the ACES are based on a theoretical model of academic achievement (see DiPerna, Volpe, & Elliott, 2001). Subsequent structural equation modeling analyses based on this model have indicated that prior achievement and interpersonal skills predict motivation, which then predicts study skills and engagement; and the latter skills, in turn, are positively associated with student achievement (DiPerna, Volpe, & Elliott, 2005).

Using a 5-point scale, teachers rate a student's academic skills in comparison with the grade-level expectations at their school (1 = Far Below; 2 = Below; 3 = Grade Level; 4 = Above; 5 = Far Above) as well as how frequently the student exhibits enabling behaviors (1 = Never; 2 = Seldom; 3 = Sometimes; 4 = Often; 5 = Almost Always). Evidence of technical adequacy support reliability of the ACES with test-retest reliabilities of .95 for the academic skills total and .96 for the academic enablers total, internal consistency coefficients at the secondary level of .99 for the academic skills total and .98 for the academic enablers scale total (with all subscales between .94 and .99), as well as interrater reliabilities of .99 for the academic skills total and .61 for the academic enablers total. Validity evidence is based on test content through expert ratings, internal structure through confirmatory factor analysis, as well as relationships with other variables through convergent and discriminant correlations (see DiPerna & Elliott, 2000).

Achievement Measures

Achievement screening tests. The brief achievement screening tests are online multiple-choice assessments for 8th-grade MA and ELA provided by Discovery Education Assessment. Both tests are designed to provide achievement data that are predictive of students' proficiency on the end-of-year summative state test. To this end, university assessment experts and state content expert from all three states reviewed the blueprint of each screener to ensure alignment to each state's content standards and proper balance of items across content domains. The MA test featured 26 items across five areas: (a) Number and Operations; (b) Data Analysis/Probability/Logic; (c) Geometry; (d) Measurement; (e) and Algebra. The ELA test featured 22 items across three areas: (a) Vocabulary; (b) Comprehension; and (c) Interpretation. Based on the current sample, the internal consistency coefficients were .79 and .78 for the MA and ELA tests, respectively. The item difficulty means ranged between .25 and .75 (M = .49) in MA and between .29 and .72 (M = .53) in ELA.

State achievement tests. In three states, paper-and-pencil assessments designed to measure student achievement of state standards were used to provide summative data on the extent to which students have achieved the academic standards of the general curriculum for 8th-grade MA and ELA: (a) the *Arizona Instrument to Measure Standards* (AIMS); (b) the *Pennsylvania System of School Assessment* (PSSA), and South Carolina's *Palmetto Assessment of State Standards* (PASS). [Once available, information on number of items, administration time, alignment, and reliability will be added].

Training Materials

Each teacher participant received professional development training in the use of the online OTL measure MyiLOGS, administration of the brief online achievement screeners, and completion of the ratings scales. On the basis of the MyiLOGS pilot study, the lead author developed a 5-hour professional development training that focused sequentially on four elements. The first introductory element was centered around a video supported *worked example* lasting about 30 minutes, which provided a step-by-step demonstration of how to complete the three essential MyiLOGS tasks (i.e., daily calendar, sampled class details, sampled student details). The second element was a *guided practice* session lasting about 2 hours. During that time, the lead trainer modeled the steps for completing each task followed by teachers practicing these steps with the support of each other and two additional trainers. To establish the definitions of the cognitive process expectations and instructional practices, teachers completed worksheets that asked them to define each category in their own words and provide examples. Subsequent discussion and modeling was used to resolve any questions and disagreements. The third element featured the MyiLOGS *performance assessment* lasting about 1 hour. To ensure teachers had mastered the logging conventions of the technology to accurately represent their instruction (e.g., differentiated instruction, substitute instruction, student absences), teachers had to pass a sequence of performance tests. These tests featured written instructional scenarios that summarized typical lessons along the calendar, class, and student level. Figure 8 displays an example of an instructional scenario. Teachers had to correctly log the instructional scenario via the MyiLOGS software. The answers to the first two scenarios were modeled and discussed by the lead trainer. Subsequent instructional scenarios had to be completed independently by each teacher. Once completed, a trainer reviewed the accuracy of the logged scenario. Teachers had to pass two scenarios with 100% accuracy to be able to continue in the study. A total of five independent instructional scenarios were available to teachers in the allotted training time.

SUBJECT: Mathematics (Gr. 8)
CLASS PERIOD: **60 min**

CALENDAR:

- Analyze and evaluate data interpretations based on ***multiple line graphs, circle graphs, and histograms*** for about 60 minutes. **[Data Analysis and Probability]**
- James was escorted out of the room near the end of the lesson (***time not available for instruction***).

CLASS ENACTED:

- You divided your class into four groups. Each group was given a set of graphs including ***multiple line graphs, circle graphs, and histograms*** with related interpretations/claims. Each **small group** was asked to first **evaluate** the graphs and then **critique** the respective interpretations/claims for about 40 minute during **independent practice**. During that time, you provided **guided feedback** to the different **small groups** for a total of about 10 minutes.
- For the last 20 minutes of the lesson, each group came up to the SMART Board, which displayed the various graphs including ***multiple line graphs, circle graphs, and histograms***, and discussed their appraisal of the claims. This informal discussion [**other instructional practices**] was conducted with the **whole class**. Students were expected to **evaluate** and **analyze** their conclusions based on their classmates' responses.
- The whole class was **highly engaged** and put forth an **excellent effort**.

STUDENT ENACTED:

- **Kayla** participated and completed the same activities as the rest of the class.
- Both **Kayla** and **James** were supported by their special education teacher who provided **guided feedback** during independent group work on an **individual basis** for about 10 minutes per student (in addition to your small group feedback).
- Despite the efforts of the special education teacher, **Kayla's** engagement and effort were only moderate today.
- **James** refused to come in front of the class with his group. The special education teacher tried to talk to him but James became very agitated and had to leave the room. James **missed the last 20 minutes** of the lesson. Overall, his engagement and effort were low today.

Figure 8. Instructional scenario example used in the MyiLOGS performance assessment.

The fourth element was an *independent practice* session lasting about 1 hour. During that time, teachers were allowed to use their teaching materials such as lesson plans and textbooks to retrospectively log the previous month of instruction at the calendar level. For each of their registered classes, teachers were asked to indicate what academic and custom skills were taught and for how long. The final 30 minutes after conclusion of the MyiLOGS training were used to familiarize teachers with the online administration procedures of the brief achievement screeners through the DEA website as well as the completion of the PSG and ACES rating scales.

The following materials were developed for this training: (a) the “MyiLOGS Teacher’s Manual Part 1,” which provided teachers with step-by-step instructions for completing the three main MyiLOGS tasks (i.e., daily calendar, sampled class details, sampled student details) as well as detailed answers to frequently asked questions; (b) the “MyiLOGS Teacher’s Manual Part 2,” which provided teachers with the first five instructional scenarios and their respective answer keys; (c) worksheets on the cognitive process expectations and instructional practices; (d) handouts of the agenda, presentation slides, the introductory worked example, a “cheat sheet” of important MyiLOGS conventions, and the performance assessment scenarios; (e) administration instructions for the brief achievement screeners; and (f) a 9-item professional development survey. Appendix B contains all of the aforementioned materials of the teacher training package.

To ensure accurate use of the SEC, the lead author worked with the director of the Measures of the Enacted Curriculum Project at the Wisconsin Center for Education Research to develop a training video that reviewed the online completion procedures and logging conventions of the SEC. The 30-minute video also reviewed the similarities and differences of the cognitive process expectations between the SEC and MyiLOGS.

Observation Materials

To estimate the extent to which teachers were using MyiLOGS reliably, each teacher participant was observed at least once during his or her logging period. In addition, a subset of three teachers per state was randomly chosen for two additional observation sessions to determine the stability of the reliability estimates. To this end, the lead author developed an observation form that mirrored the two two-dimensional matrices displayed in Figure 6. Trained observers used this form to code the dominant cognitive expectation for student learning and instructional practice observed during a 1-minute interval. A vibrating timer on a fixed interval was used to indicate the 1-minute recording mark. Appendix C contains the observation protocol and observation form. Interobserver agreement (IOA) was collected on 30% of all observation sessions across states. IOA percentages are reported in the Results section.

Procedures

The schedule and duration of all major study tasks are summarized in the Gantt chart (Figure 9).

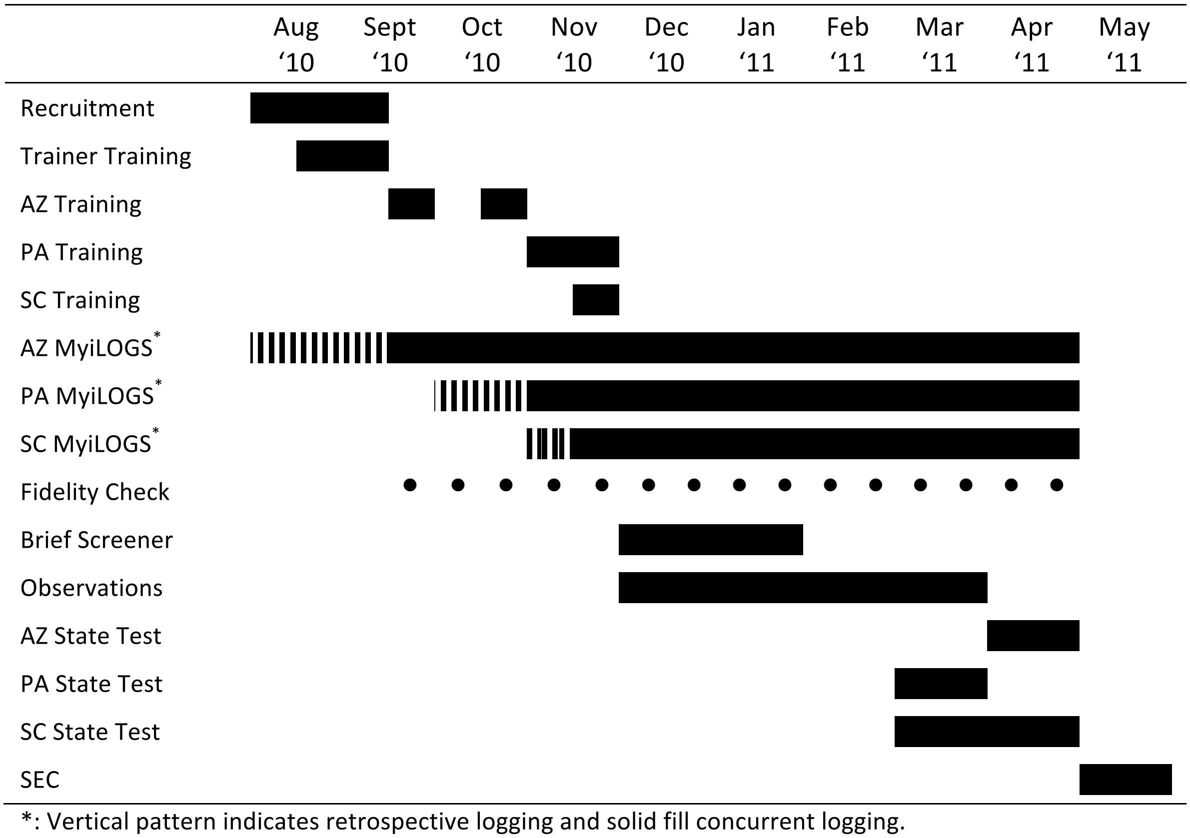


Figure 9. Schedule and duration of major study tasks.

State personnel in each state began the recruitment process at the beginning of the 2010-2011 school year. During the recruitment months of August and early September, the lead author trained two senior research professors and one doctoral graduate student in the use of MyiLOGS, its logging conventions, and the respective instructional scenarios for purposes of the professional development training. All three individuals had prior experience with conducting teacher workshops. In addition, both the lead author and graduate student had teaching experience as special education teachers.

Teacher Training

In late September and late October, the lead author and one trained senior research professor, conducted the two Arizona teacher trainings. A total of 11 and 5 general and special education teachers attended the first and second trainings, respectively. For purposes of reporting OTL, all teacher participants were asked to log their daily classroom instruction at the calendar level (i.e., instructional time, content coverage) and twice a week in greater detail at the classroom and student level (i.e., instructional time, content coverage, cognitive expectations, instructional practices, grouping formats, engagement, goal attainment). In co-taught classes, the general education teacher was designated as the main reporter for purposes of MyiLOGS (see Appendix B). That is, both co-teachers were asked to confer about their shared instruction, especially on any instructional differentiations that may have been implement by the special education teacher. The use of MyiLOGS for planning purposes was optional. Teachers were asked to log their instruction shortly after having taught the lesson. To support teachers in their ongoing logging efforts, MyiLOGS provided several visual cues and reminders each week (see Appendix B). General website user statistics are reported in the Results section.

All teacher participants could be trained to criterion (i.e., passed two performance tests with 100% accuracy) and thus were able to continue with the study. During the independent practice session, the majority of teachers were able to retrospectively log the calendar level back to the beginning of the school year. Subsequently, teachers were given a four-week window to complete any outstanding retrospective logging tasks as well as the PSG and ACES rating scales. The monthly compensation was contingent on timely completion of MyiLOGS, which was monitored remotely by the lead author through bi-weekly procedural fidelity checks (see Figure 9). To pass a fidelity check, each class had to have two weeks of daily logged skills and times as well as completed class and student details (see Results section). Teacher participants who passed both fidelity checks during a four-week period were able to withdraw the monthly $100 compensation from a debit card that could be loaded remotely by university personnel. The required logging period for all participants was four full months after the teacher training with the option to continue through the month of April 2011.

In Pennsylvania, a trained senior research professor and doctoral graduate student conducted several smaller trainings during the month of November 2010. A total of 12 general and special education teachers were trained to criterion. The procedures followed were the same as in Arizona. However, the retrospective logging for Pennsylvania teachers was limited to one month prior to the training. Similarly, the lead author and one trained senior research professor and doctoral graduate student conducted a large training in South Carolina in late November 2010. Out of 16 attendees, 13 general and special education teachers could be trained to criterion in the allotted time. As in Pennsylvania, teachers' retrospective calendar-based logging was limited to one month.

Across states, a total of 41 general and special education teachers entered the study upon training. During the course of the study, one teacher in Arizona and one teacher in South Carolina dropped out of the study. One additional teacher from South Carolina had to be removed for purposes of data analysis due to logging two subject areas per class. Table 4 reflects the final participant numbers. Lastly, all participants decided to continue their instructional logging through April, which resulted in data collection periods ranging between five to eight months depending on start date.

Observer Training and Data Collection

During the months of December 2010 and January 2011, the lead author trained university and state personnel in the observation procedures and conducted IOA sessions in all three states. For training purposes, the lead author reviewed the MyiLOGS definitions and conventions (see Appendix B) as well as the observation protocol (see Appendix C) and subsequently conducted training sessions in actual classrooms. Observers had to obtain an overall agreement percentage of 80% or higher on two consecutive 30-minute sessions. Across states, a total of six individuals were trained to criterion.

For observation purposes, all classrooms observers (a) prerecorded the skills listed on the MyiLOGS calendar for the given day; (b) started the 1-minute interval with the bell or at the lesson's designated start time; (c) made a tally in both matrices according to the cognitive expectation and instructional practice that occupied the majority of the time during a 1-minute interval (by skill and grouping format); and (d) kept a frequency count of discreet events such brief praise statements. At the conclusion of the observation, the observer was allowed to make time adjustments to reflect the summative duration of discreet events as well as the MyiLOGS convention of equal emphasis. The latter convention requires teachers to divide instructional minutes equally according to emphasis. For example, a teacher who allowed students to work independently for 10 minutes but concurrently provided students with individual guided feedback throughout the entire time could not log 10 minutes under each practice. Instead, the teacher must divide the instructional minutes accordingly (i.e., 5 minutes per practice). This convention constrains teachers to the allocated class time—the more skills and/or practices that are addressed, the less instructional time can be dedicated to each one. Accordingly, observers were allowed to make tally adjustment immediately following the observation.

For agreement purposes, cell-by-cell agreement was calculated for each matrix based on cell estimates within a 3-minute range or less. That is, two observer estimates of direct instruction at the whole class level of 20 minutes and 23 minutes respectively were counted as an agreement. Likewise, teacher and observer estimates of the Pythagorean Theorem at the Remember level of 4 minutes and 0 minutes respectively were counted as a disagreement. For each matrix, interrater agreement was calculated as the total number of agreements divided by the sum of agreements and disagreements. In addition, a combined interrater agreement percentage was calculated as the total number of agreements across both matrices divided by the sum of agreements and disagreements across both matrices. That latter index was used in establishing the training criterion (at or above 80%) and retraining criterion (below 80%) for observers. Agreement percentages between observers as well as teachers and observers are reported in the Results section.

Achievement Screening Test Administration

During the months of December 2010 and January 2011, teacher participants administered the online achievement tests to all consented target students and other students in the respective class. Concurrently, trained university and state personnel continued teacher observations through early March 2011. Beginning in mid-March 2011, the state testing windows opened up lasting through the end of April 2011 (see Figure 9, p. 89).

SEC Administration

The study concluded with the administration of the SEC in early May. All teacher participants were asked to report on their annual enacted curriculum via the SEC for all classes logged via MyiLOGS. To this end, all teachers reviewed a 30-minute training video focused on the SEC coding conventions, a comparison between the cognitive process used in the SEC and MyiLOGS, and the SEC alignment reports. Teacher received $175 contingent on reviewing the training video and completing the SEC for one class. Participants who reported on two classes received an additional $75.

MyiLOGS Scoring Procedures

In the context of the discussed OTL measure, the previously suggested operational indices (see Table 2, p. 51) were calculated as follows. First, the Instructional Time (IT) index was specified according to instructional time spent on state-specific academic standards and instructional time spent on custom objectives. Second, the IT indices were calculated based on average minutes per day and as average percentages of allocated class time. The latter convention was used to allow for comparability between classes that differed in allocated class time. Third, time indices for non-instructional time collected via MyiLOGS were calculated separately. Fourth, the Content Coverage (CC) index was determined as previously described (i.e., percentage of addressed academic standards). Fifth, all indices related to instructional time and content coverage were calculated on the basis of calendar days and sample days with the former representing the largest set of measurement points. The three quality indices related to Cognitive Processes (CP), Instructional Practices (IP), and Grouping Formats (GF) were calculated on the basis of sample days only. Sixth, Engagement and Goal Attainment/Effort were two additional indices based on sample days. Lastly, all calendar-based indices reflected OTL at the class level, whereas indices based on sample days reflected OTL at the class and student level.

With respect to the differential weighting of instructional quality indicators, a weight of 1 was applied to all lower-order thinking skills, generic instructional practices, and whole class instruction for CP, IP, and GF scores, respectively. The weight of 2 was applied to all high-order thinking skills, empirically supported practices, and individual/small group instruction for CP, IP, and GF scores, respectively. As such, all cognitive expectations, instructional practices, and grouping formats received credit; yet those presumed to contribute more to enhance the quality of OTL received a greater weight. The CP, IP, and GF scores thus ranged between 1.00 and 2.00. A CP, IP, and GF score of 1.00 indicates an exclusive focus on lower-order thinking skills (i.e., attend, remember), generic instructional practices (i.e., independent practice, other instructional practices), and whole class instruction, respectively. A CP, IP, and GF score of 2.00, on the other hand, indicates an exclusive focus on higher-order thinking skills (i.e., understand/apply, analyze/evaluate, create), generic instructional practices (i.e., direct instruction, visual representations, questions, think aloud, guided feedback, reinforcement, assessment), and individual/small group instruction, respectively. The teacher ratings for class and student engagement were based on a four-point scale: “Not engaged (0%)” = 0; “Low % of time (<50%)” = 1; “Moderate % of time (50%-80%)” = 2; “High % of time (>80%)” = 3. The class and student ratings for goal attainment/effort were also based on a four-point scale: “No effort or product observed (0%)” = 0; “Low effort or limited portion of work completed (<50%)” = 1; “Moderate effort or moderate portion of work completed (50%-80%)” = 2; “High effort or substantial portion of work completed (>80%)” = 3. Tables 13 and 14 list all calendar day based and sample day based OTL indices and their respective operational definitions.

Table 13

Calendar Day OTL Indices and Operational Definitions

Calendar Day Index	**Definition**
Instructional Time on Standards (Min/Day)	Average amount of instructional minutes dedicated to the state-specific academic standards per day.
Instructional Time on Standards (%)	Average percentage of allocated class time used for instruction on the state-specific academic standards per day.
Instructional Time on Custom (Min/Day)	Average amount of instructional minutes dedicated to custom objectives per day.
Instructional Time on Custom (%)	Average percentage of allocated class time used for instruction on the custom objectives per day.
Non-Instructional Time (Min/Day)	Average amount of non-instructional minutes per day.
Non-Instructional Time (%)	Average percentage of allocated class time not used for instruction.
Content Coverage (%)	Percentage of state-specific academic standards addressed.

Table 14

Sample Day OTL Indices and Operational Definitions

Sample Day Index	Definition
Instructional Time on Standards (Min/Day)	Average amount of instructional minutes dedicated to the state-specific academic standards per day.
Instructional Time on Standards (%)	Average percentage of allocated class time used for instruction on the state-specific academic standards per day.
Instructional Time on Custom (Min/Day)	Average amount of instructional minutes dedicated to custom objectives per day.
Instructional Time on Custom (%)	Average percentage of allocated class time used for instruction on the custom objectives per day.
Non-Instructional Time (Min/Day)	Average amount of non-instructional minutes per day.
Non-Instructional Time (%)	Average percentage of allocated class time not used for instruction.
Content Coverage (%)	Percentage of state-specific academic standards addressed.
Cognitive Process Score	Sum of differentially weighted percentages of instructional time dedicated to each cognitive process expectation (*Attend* and *Remember* x1; *Understand/Apply*, *Analyze/Evaluate*, and *Create* x2).
Instructional Practice Score	Sum of differentially weighted percentages of instructional time dedicated to each instructional practice (*Used Independent Practice* and *Other Instructional Practices* x1; *Provided Direct Instruction*, *Provided Visual Representation*, *Asked Question*, *Elicited Think Aloud*, *Provided Guided Feedback*, and *Assessed Student Knowledge* x2).
Grouping Format Score	Sum of differentially weighted percentages of instructional time dedicated to each grouping format (*Whole Class* x1; *Individual* and *Small Group* x2)
Engagement	Average score based on “Not engaged (0%)” = 0; “Low % of time (<50%)” = 1; “Moderate % of time (50%-80%)” = 2; “High % of time (>80%)” = 3.
Goal Attainment/Effort	Average score based on No effort or product observed (0%) = 0; Low effort or limited portion of work completed (<50%) = 1; Moderate effort or moderate portion of work completed (50%-80%) = 2; High effort or substantial portion of work completed (>80%) = 3.

Data Analyses, Expected Outcomes, and Criteria for Evaluating Outcomes

The main purpose of this study was to determine the extent to which students with disabilities have the opportunity to learn the intended curriculum as measured by instructional indicators of the enacted curriculum. To this end, I proposed four research questions focused on describing OTL and exploring its relation with other constructs.

To answer the first two research questions, it was necessary to obtain a reliable description of the degree to which general and special education teachers dedicated instructional time and content coverage to the academic standards of the general curriculum objectives as well as custom objectives emphasizing higher-order cognitive processes, evidence-based practices, and alternative grouping formats at the student and classroom level. Based on the OTL indices available via MyiLOGS (see Tables 13, p. 97 and 14, p. 98), the first research question was answered based on descriptive data using calendar-based OTL indices related to instructional time and content coverage as well as OTL indices based on sample days related to cognitive processes, instructional practices, grouping formats, engagement, and goal/attainment effort. The former two calendar-based indices are preferable to the respective indices based on sample days due to the larger number of data points. Given that the resulting descriptive data set will be the first of its kind, prior research can only be used to expect a relatively low OTL index for content coverage (< .50) and quality scores to be reflective of emphases on lower-order thinking skills and generic teaching practices (< 1.5).

To answer the second research question regarding OTL as a differentiated opportunity structure, I compared the means and standard deviations of the seven OTL indices based on sample days between the classroom and student levels. Dependent t-tests were used to carry out tests of statistical significance. To determine the magnitude of the difference, effect sizes were also calculated. Based on prior research, no statistically significant differences between the classroom and student levels were expected.

To answer the third research question, I examined convergent validity values between the MyiLOGS OTL indices at the class level and the SEC AI index at the class level. In addition, I compared the predictive validity of both measures using their class-based indices to predict average class achievement on the state achievement test for the Arizona subsample. Based on prior research, I predicted evidence of convergent and predictive validity with correlations between the content- and quality-based OTL indices and the AI to exceed the correlations between the time-based OTL indices and the AI.

To answer the fourth research question, the Arizona subsample was used to examine the extent to which student-based OTL indices were predictive of student achievement on the end-of year state test. Given that previous research has supported the relation between time, content, and quality-related OTL indices and student achievement, time, content, and quality-related OTL indices were examined via hierarchical multiple regression analyses. The analyses were conducted with and without controlling for students' prior achievement. Based on prior research, I predicted a relation between several student-based OTL indices and student achievement.

CHAPTER III

RESULTS

Data Quality

I collected evidence along three steps of the training and data collection process to ensure that teachers recorded their daily classroom instruction reliably and with fidelity and to estimate the extent to which teachers' log data represented a valid account of their classroom instruction. Specially, I used (a) survey responses following teacher training; (b) bi-weekly procedural fidelity data and website user statistics across 30 weeks of instructional logging; and (c) agreement percentages between teachers and trained classroom observers. In addition, all teachers had to log two instructional scenarios of the performance assessment with 100% accuracy to be a participant in the study (see Method section, p. 85-86).

Teacher Training

Immediately following the 5-hour teacher training, all attending teachers completed a post-training survey using their anonymous identification names. The survey featured nine questions with a 6-point scale: *Strongly Disagree* = 1; *Disagree* = 2; *Somewhat Disagree* = 3; *Somewhat Agree* = 4; *Agree* = 5; *Strongly Agree* = 6. Table 15 lists all survey questions and Table 16 displays the survey results by state.

Table 15

Teacher Training Survey Questions

Question Number	Question Stem
1	Professional development related to the content standards is important for promoting effective instruction.
2	Comprehensive, high-quality coverage of the content standards is an important part of effective instruction.
3	The MyiLOGS training was helpful for understanding how to use the system.
4	The MyiLOGS training scenarios were helpful for understanding how to use the system.
5	Overall, I think the trainers were well prepared.
6	Overall, I think the training time was sufficient for understanding how to use the system.
7	Based on the training, I am prepared to use the system reliably.
8	An online version of this training (e.g., webinar) could have been equally effective.
9	I think MyiLOGS can support my comprehensive, high-quality coverage of the content standards

Table 16

Teacher Training Survey Results by State

Question Number	AZ			PA			SC			Total		
	n	*M*	*(SD)*	*n*	*M*	*(SD)*	*n*	*M*	*(SD)*	*n*	*M*	*(SD)*
1	15	5.9	(0.3)	11	5.7	(0.5)	15	5.7	(0.5)	41	5.8	(0.4)
2	15	5.9	(0.4)	11	5.8	(0.4)	15	5.7	(0.5)	41	5.8	(0.4)
3	15	5.8	(0.4)	11	6.0	(0)	15	5.9	(0.3)	41	5.9	(0.3)
4	15	5.9	(0.4)	11	6.0	(0)	15	5.7	(0.6)	41	5.9	(0.4)
5	15	5.6	(0.6)	11	6.0	(0)	15	6.0	(0)	41	5.9	(0.4)
6	15	5.7	(0.5)	11	5.8	(0.4)	15	5.4	(0.5)	41	5.7	(0.5)
7	15	5.7	(0.5)	11	5.6	(0.5)	15	5.3	(0.5)	41	5.5	(0.5)
8	15	3.7	(1.8)	11	3.3	(1.6)	14	2.5	(0.9)	40	3.2	(1.5)
9	15	5.6	(0.5)	11	5.4	(0.8)	14	5.7	(0.5)	40	5.6	(0.6)

Note. AZ = Arizona; PA = Pennsylvania; South Carolina = SC.

Based on the survey results, teachers experienced consistent training across states both in terms of trainer preparation and perceived ability to use the system reliably post training. In addition, teachers rated the training and the training scenarios of the performance assessment as helpful for understanding how to use the system. In addition, teachers rated the allotted training time (i.e., 4.5 hours for MyiLOGS) as sufficient for understanding how to use the system.

Procedural Fidelity and Website Usage Statics

For purposes of reporting OTL, all participants were asked to log their daily classroom instruction at the calendar level (i.e., instructional time, content coverage) and twice a week in greater detail at the classroom and student level (i.e., instructional time, content coverage, cognitive expectations, instructional practices, grouping formats, engagement, goal attainment/effort). Teachers' procedural fidelity (PF) based on completed calendar days and detailed sample days was monitored on a bi-weekly basis. Each check was scored dichotomously as either complete or incomplete. Missing calendar and/or sample day information was identified in a follow-up email along with a prompt to complete the missing information before the next check. Across states, a total of 15 PF checks were completed during 30 weeks of instructional logging. Across all checks, the completion rate ranged between 75% and 100% of classrooms. On average, 92% of classrooms were logged without any missing calendar or sample day information. Upon prompting, all teachers completed their missing data prior to the next PF check. The final instructional data set was 100% complete for all participating teachers.

All teachers were asked to report on their enacted curriculum concurrently with their daily instructional planning and implementation efforts. Although teachers were not required to log their instruction on a daily basis, the training materials recommended two to three logging times per week to minimize the burden on teacher recall. To determine the extent to which teachers followed this recommendation, the website was used to keep track of teachers' average number of log-ins per week (excluding Winter break) as well as their active log-in time per week. On average, participants logged into MyiLOGS 2.4 times per week (*SD* = 0.6) and clocked about 5.9 minutes per week (*SD* = 1.4) of active log-in time.

Classroom Observations

Each teacher was observed at least once to estimate the extent to which teachers' log data represented a valid account of their classroom instruction. To this end, agreement percentages between teachers and independent observers were calculated on the basis of sample day details at the class level related to five cognitive process expectations per standard/objective and nine instructional practices per three grouping formats. Teachers and observers used the same matrix format to report on sample day details (see Appendix C). In addition, three teachers per state were selected randomly to receive two additional observations. Due to teacher attrition, South Carolina only featured two teachers with additional observations. Lastly, IOA was collected on 31% of all observation sessions between two trained observers. Table 17 shows the agreement percentages based on cognitive processes, instructional practices, and overall agreement. Across sessions, agreement between two independent observers for cognitive processes per standard/objective ranged between 67% and 100% with an average of 93%. Across sessions, agreement for instructional practices per grouping format ranged between 89% and 100% with an average of 98%. Overall agreement between teachers and observers across sessions ranged between 85% and 100% with an average of 97%.

Table 17

Percentage Agreement between Two Independent Observers

IOA Session	Cognitive Processes	Instructional Practices	Overall Agreement
1	100	96	**98**
2	100	96	**97**
3	100	100	**100**
4	100	100	**100**
5	88	100	**95**
6	82	100	**95**
7	100	100	**100**
8	100	100	**100**
9	100	96	**97**
10	100	100	**100**
11	100	100	**100**
12	100	100	**100**
13	91	100	**97**
14	67	100	**94**
15	100	96	**98**
16	67	89	**85**
M (SD)	93 (12)	98 (3)	**97 (4)**

Tables 18, 19, and 20 show the agreement percentages between teachers and observers based on cognitive processes, instructional practices, and overall agreement for teachers in Arizona, Pennsylvania, and South Carolina, respectively. Across states, agreement for cognitive processes per standard/objective ranged between 27% and 100% with an average of 63%. Across states, agreement for instructional practices per grouping format ranged between 64% and 100% with an average of 82%. Overall agreement across states ranged between 55% and 100% with an average of 77%.

Table 18

Percentage Agreement between Teachers and Independent Observers in Arizona

Teacher Identification	Cognitive Processes	Instructional Practices	Overall Agreement
goldenrod1038[a]	65	90	**84**
gray1037	50	86	**79**
orange1022	33	86	**76**
orchid1021	38	82	**66**
purple1018	62	75	**69**
red1017	50	75	**71**
silver1011	27	71	**59**
skyblue1010	45	79	**69**
snow1009[a]	48	74	**69**
turquoise1005	64	79	**74**
white1002	73	75	**74**
yellow1001[a]	41	80	**70**
M (SD)	50 (14)	79 (6)	**72 (6)**

[a]Percentages for this teacher are averaged across three observations.

Table 19

Percentage Agreement between Teachers and Independent Observers in Pennsylvania

Teacher Identification	Cognitive Processes	Instructional Practices	Overall Agreement
silver1511	88	86	**86**
skyblue1510	68	75	**71**
snow1509	31	86	**55**
tan1508	100	100	**100**
teal1507	100	100	**100**
thistle1506	100	93	**94**
tomato1505	50	82	**76**
turquoise1504	36	71	**62**
violet1503[a]	86	90	**88**
wheat1502	67	79	**76**
white1501[a]	71	82	**79**
yellow1500[a]	82	94	**90**
M (SD)	73 (24)	87 (9)	**81 (14)**

[a]Percentages for this teacher are averaged across three observations.

Table 20

Percentage Agreements between Teachers and Independent Observers in South Carolina

Teacher Identification	Cognitive Processes	Instructional Practices	Overall Agreement
royalblue3016	75	89	**84**
seagreen3014	64	82	**77**
skyblue3010	64	64	**64**
snow3009	36	79	**67**
teal3007	67	82	**79**
thistle3006[a]	59	72	**68**
turquoise3004	86	64	**73**
violet3003	50	82	**76**
wheat3002	64	86	**79**
white3001	100	89	**91**
yellow3000[a]	79	88	**84**
M (SD)	68 (17)	80 (9)	**77 (8)**

[a]Percentages for this teacher are averaged across three observations.

In each state, agreement percentages for cognitive processes per standard/objective were consistently lower than agreement percentages for instructional practices per grouping format. In addition, the agreement percentages for cognitive processes per standard/objective were also more variable than agreement percentages for instructional practices per grouping format.

Question 1: To What Degree Do Students With Disabilities Have The Opportunity To Learn The Intended Curriculum?

Teachers in each state reported on time and content indicators of OTL at the class level based on daily calendar days. On two random days per week, teachers also reported on additional quality indicators at the class and student level. To answer the first research question, OTL is described at the class level on the basis of calendar-based indices for time and content (see Table 13, p. 97) and on the basis of sample days for quality related indices (see Table 14, p. 98). With respect to the time dimension of OTL, teachers reported on three time-based indices: (a) instructional time on state-specific standards (*Time on Standards*), (b) instructional time on custom skills/activities (*Time on Custom*), and (c) non-instructional time (*Non-Instructional Time*). These class-specific time indices were calculated based on average minutes per day and as average percentages of allocated class time per day. With respect to the content dimension of OTL, teachers reported on the specific academic standards they covered during the course of the study. The calculated content-based index is the percentage of content standards addressed (*Content Coverage*). With respect to OTL indices related to instructional quality, teachers reported on time emphases along different cognitive processes, instructional practices, and grouping formats. These quality indices were calculated on the basis of summary scores (see Table 14, p. 98) and as total minute allocations and percentages for the different cognitive processes, instructional practices, and grouping formats. In addition, teachers rated class engagement and class goal attainment/effort.

Time and Content Indices

For the 2010-2011 school year, all three states required 180 school days to be used for instruction. Across states, teachers logged between 85 and 178 school days via the calendar, which represented between 47% and 99% of the school year. On average, teachers logged calendar-based OTL indices for about 151 school days, or 84% of the school year. Across states, teachers' allocated class time (i.e., scheduled class length) ranged between 25 and 150 minutes with an average of 65 minutes per class. Table 21 lists all calendar-based OTL indices for the entire sample.

Table 21

Calendar-Based Class OTL Indices for Entire Sample

OTL Index	*n*	*M*	*(SD)*
Logged School Days	**46**	**151**	**(18)**
Instructional Time on Standards (Min/Day)	46	44	(23)
Instructional Time on Standards (%)	46	67	(18)
Instructional Time on Custom (Min/Day)	46	18	(11)
Instructional Time on Custom (%)	46	27	(17)
Non-Instructional Time (Min/Day)	46	3	(3)
Non-Instructional Time (%)	46	5	(4)
Number of Standards	**46**	**53**	**(28)**
Content Coverage of Standards (%)	46	68	(22)

Allocated class time was used to calculate all percentage-based indices. On average, teachers spent about 68% of allocated class time on teaching the state-specific standards per day. About 27% of allocated class time was spent on teaching custom skills/activities and an additional 5% was not available for instruction. The total across all percentage-based indices accounted for about 99% of allocated class time. Occasionally, the sum across percentage-based indices did not equal 100% due to time changes at the class or school level. That is, some teachers had the flexibility to shorten or extend their class periods by a few minutes on a given day. In addition, the assignment of "half-days" due to inclement weather conditions or other administrative reasons effectively shortened all applicable class periods. The general curriculum featured an average of 53 academic standards, of which teachers' were able to address approximately 36 (about 68%) during their respective login period. Lastly, a review of the custom skills/activities indicated that the sample of students with disabilities did not receive additional IEP objectives beyond the academic standards of the general curriculum. Upon review, only one objective out of

554 was specifically identified as an IEP objective (logged by a special education teacher) related to fluency and comprehension.

Table 22 shows the calendar-based OTL indices broken down for each state by subject area.

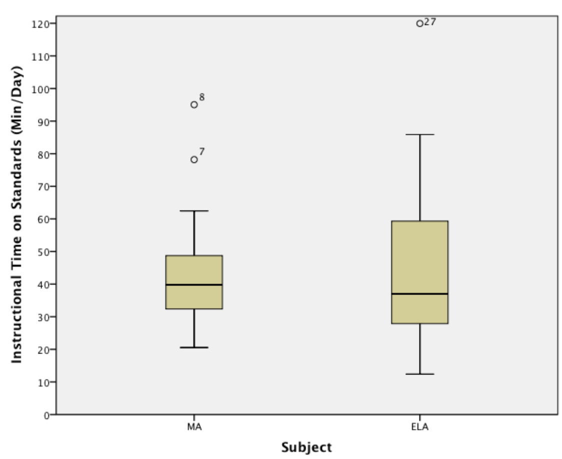
Table 22

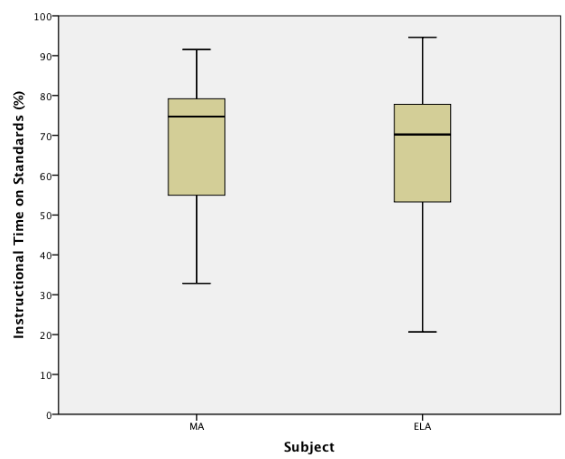
Calendar-Based Class OTL Indices By Subject Area

OTL Index	MA			ELA		
	n	***M***	***SD***	***n***	***M***	***SD***
Arizona						
Logged School Days	**9**	**163**	**(5)**	**7**	**165**	**(7)**
Instructional Time on Standards (Min/Day)	9	52	(22)	7	71	(29)
Instructional Time on Standards (%)	9	73	(11)	7	72	(14)
Instructional Time on Custom (Min/Day)	9	17	(9)	7	24	(9)
Instructional Time on Custom (%)	9	25	(16)	7	27	(11)
Non-Instructional Time (Min/Day)	9	5	(4)	7	4	(4)
Non-Instructional Time (%)	9	6	(5)	7	3	(3)
Number of Standards	**9**	**61**	**(0)**	**7**	**115**	**(0)**
Content Coverage of Standards (%)	9	67	(11)	7	54	(16)
Pennsylvania						
Logged School Days	**5**	**142**	**(7)**	**8**	**128**	**(23)**
Instructional Time on Standards (Min/Day)	5	44	(11)	8	33	(14)
Instructional Time on Standards (%)	5	79	(13)	8	64	(14)
Instructional Time on Custom (Min/Day)	5	12	(12)	8	11	(5)
Instructional Time on Custom (%)	5	18	(15)	8	24	(14)
Non-Instructional Time (Min/Day)	5	2	(1)	8	4	(2)
Non-Instructional Time (%)	5	2	(2)	8	8	(6)
Number of Standards	**5**	**41**	**(0)**	**8**	**32**	**(0)**
Content Coverage of Standards (%)	5	69	(24)	8	87	(13)
South Carolina						
Logged School Days	**6**	**156**	**(11)**	**11**	**149**	**(13)**
Instructional Time on Standards (Min/Day)	6	30	(10)	11	37	(18)
Instructional Time on Standards (%)	6	55	(18)	11	63	(25)
Instructional Time on Custom (Min/Day)	6	23	(12)	11	18	(14)
Instructional Time on Custom (%)	6	38	(17)	11	31	(23)
Non-Instructional Time (Min/Day)	6	1	(1)	11	3	(3)
Non-Instructional Time (%)	6	2	(1)	11	4	(4)
Number of Standards	**6**	**33**	**(0)**	**11**	**40**	**(0)**
Content Coverage of Standards (%)	6	63	(29)	11	66	(25)
Across States						
Logged School Days	**20**	**156**	**(12)**	**26**	**147**	**(21)**
Instructional Time on Standards (Min/Day)	20	43	(19)	26	45	(25)
Instructional Time on Standards (%)	20	69	(16)	26	66	(19)
Instructional Time on Custom (Min/Day)	20	17	(11)	26	18	(11)
Instructional Time on Custom (%)	20	27	(17)	26	28	(17)
Non-Instructional Time (Min/Day)	20	3	(3)	26	3	(3)
Non-Instructional Time (%)	20	4	(4)	26	5	(5)
Number of Standards	**20**	**48**	**(13)**	**26**	**58**	**(36)**
Content Coverage of Standards (%)	20	66	(20)	26	69	(23)

Note. MA = Mathematics; ELA = English/Language Arts.

In Arizona, the allocated class time for MA ranged between 46 and 120 minutes with an average of 71 minutes. For ELA, the allocated class time ranged between 57 and 150 minutes with an average of 97 minutes. In Pennsylvania, the allocated class time for MA ranged between 39 and 82 minutes with an average of 57 minutes. For ELA, the allocated class time ranged between 39 and 82 minutes with an average of 50 minutes. In South Carolina, the allocated class time for MA ranged between 30 and 70 minutes with an average of 57 minutes. For ELA, the allocated class time ranged between 25 and 70 minutes with an average of 57 minutes. Across states, the percentage-based indices for MA and ELA were similar with 69% and 66% for *Time on Standards*, 27% and 28% for *Time on Custom*, 4% and 5% for *Non-Instructional Time*, as well as 66% and 69% for *Content Coverage*, respectively. Figures 10 display the boxplots for all seven OTL indices by subject area across states.





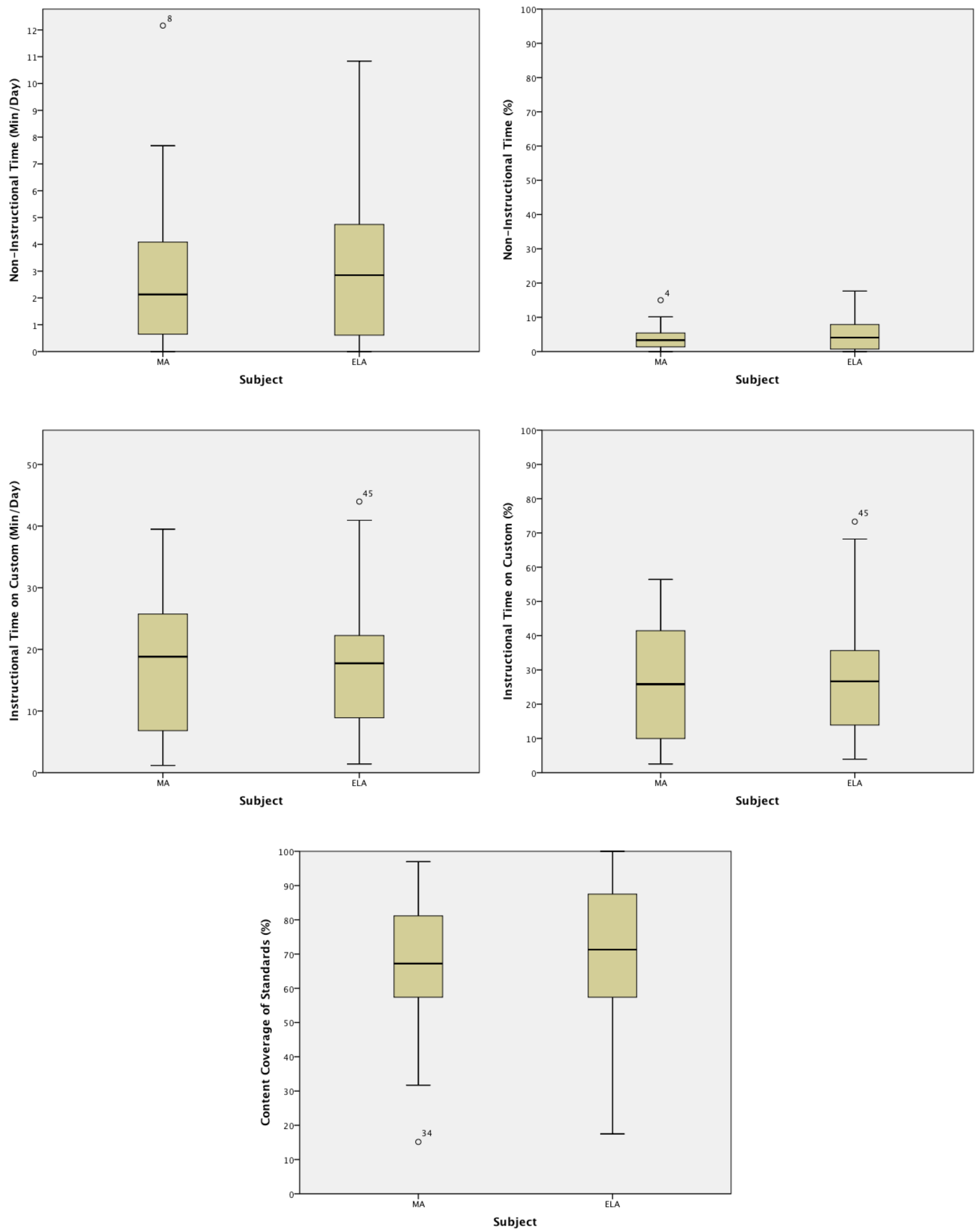


Figure 10. Boxplots of time and content related OTL indices by subject area.

Given the similarity of OTL indices for MA and ELA, Table 23 details the same OTL indices by classroom type—general education and special education—across states.

Table 23

Calendar-Based Class OTL Indices By Class Type

OTL Index	GENED (*n* = 29)		SPED (*n* = 17)				
	M	*SD*	*M*	*SD*	*df*	*t*	*ES*
Logged School Days	**155**	**17**	**142**	**17**	44	2.49*	0.76
Instructional Time on Standards (Min/Day)	50	23	34	16	44	2.60*	0.83
Instructional Time on Standards (%)	71	13	61	23	44	1.94	0.55
Instructional Time on Custom (Min/Day)	17	10	18	14	44	-0.13	-0.03
Instructional Time on Custom (%)	26	14	30	22	44	-0.81	-0.23
Non-Instructional Time (Min/Day)	3	3	3	3	44	-0.07	-0.02
Non-Instructional Time (%)	4	4	6	5	44	-1.14	-0.33
Number of Standards	**63**	**32**	**37**	**4**	44	3.42*	1.17
Content Coverage of Standards (%)	74	19	59	24	44	2.35*	0.69

Note. GENED = General education class; SPED = Special education class.

For this sample (N = 46), the observed mean differences in calendar-based OTL indices indicate that students in special education classrooms experienced less instructional time on standards and less coverage of the state-specific standards. The respective mean differences for *Time on Standards* and *Content Coverage* between general and special education classroom are statistically significant ($p < .05$) with an effect size of $d = .83$ and $d = .69$, respectively.

Quality Indices

OTL indices related to instructional quality were collected based on two random days per week at the class and student level. On sample days, teachers completed additional information beyond the calendar related to cognitive processes, instructional practices, grouping formats, class engagement, and goal attainment/effort. On average, teachers logged quality-related OTL indices for about 43 school days, or 24% of the school year. To complement the aforementioned calendar-based indices for time and content, Table 24 presents three quality-related summary indices—Cognitive Process Score, Instructional Practice Score, Grouping Format Score—each with a score range between 1.00 to 2.00 (see Table 14, p. 98) for each subject area by state. In addition, Table 24 provides a rating score for perceived class engagement and goal attainment/effort with a score range between 0 and 3.

Table 24

Sample-Day Based Class OTL Quality Indices By Subject Area

	MA			ELA		
	n	***M***	***SD***	***n***	***M***	***SD***
Arizona						
Logged Sample Days	**9**	**51**	**8**	**7**	**50**	**4**
Cognitive Process Score	9	1.69	0.16	7	1.82	0.10
Instructional Practice Score	9	1.67	0.08	7	1.57	0.11
Grouping Format Score	9	1.27	0.18	7	1.12	0.07
Engagement	9	2.60	0.30	7	2.63	0.27
Goal Attainment/Effort	9	2.59	0.29	7	2.60	0.29
Pennsylvania						
Logged Sample Days	**5**	**40**	**5**	**8**	**37**	**5**
Cognitive Process Score	5	1.71	0.17	8	1.79	0.13
Instructional Practice Score	5	1.70	0.09	8	1.69	0.18
Grouping Format Score	5	1.33	0.16	8	1.14	0.12
Engagement	5	2.42	0.22	8	2.71	0.19
Goal Attainment/Effort	5	2.36	0.28	8	2.69	0.21
South Carolina						
Logged Sample Days	**6**	**41**	**6**	**11**	**39**	**13**
Cognitive Process Score	6	1.67	0.13	11	1.74	0.11
Instructional Practice Score	6	1.68	0.18	11	1.49	0.25
Grouping Format Score	6	1.24	0.20	11	1.36	0.34
Engagement	6	2.52	0.32	11	2.43	0.40
Goal Attainment/Effort	6	2.50	0.31	11	2.43	0.40
Across States						
Logged Sample Days	**20**	**45**	**8**	**26**	**41**	**10**
Cognitive Process Score	20	1.69	0.14	26	1.78	0.11
Instructional Practice Score	20	1.68	0.12	26	1.57	0.21
Grouping Format Score	20	1.28	0.18	26	1.23	0.26
Engagement	20	2.53	0.28	26	2.57	0.33
Goal Attainment/Effort	20	2.50	0.29	26	2.56	0.33

Note. MA = Mathematics; ELA = English/Language Arts.

Across states, the summary indices indicate a greater emphasis of high-order thinking skills in ELA than in MA and a greater emphasis of evidence-based practices and *Individual* and *Small Group* grouping formats in MA than in ELA. To examine these trends in greater detail, Tables 25, 26, and 27 provide the respective time emphasis for the specific cognitive processes, instructional practices, and grouping formats in total minutes per logging period, as well as a percentage of total time.

Table 25

Sample-Day Based Class OTL Details on Cognitive Processes By Subject Area

	MA			ELA		
	n	***M (SD)***	***M (SD)***	***n***	***M (SD)***	***M/ (SD)***
Arizona						
Cognitive Process						
Attend	9	215 (125)	8% (7%)	7	314 (187)	8% (7%)
Remember	9	762 (376)	24% (10%)	7	512 (531)	10% (7%)
Understand/Apply	9	1674 (871)	47% (11%)	7	1983 (768)	43% (12%)
Analyze/Evaluate	9	705 (608)	18% (11%)	7	1216 (503)	25% (7%)
Create	9	118 (78)	4% (2%)	7	642 (334)	14% (6%)
Pennsylvania						
Cognitive Process						
Attend	5	111 (90)	6% (7%)	8	92 (98)	5% (4%)
Remember	5	520 (542)	23% (18%)	8	297 (327)	16% (11%)
Understand/Apply	5	1042 (413)	49% (11%)	8	764 (280)	48% (17%)
Analyze/Evaluate	5	404 (233)	18% (6%)	8	270 (124)	18% (9%)
Create	5	86 (77)	4% (3%)	8	233 (265)	13% (16%)
South Carolina						
Cognitive Process						
Attend	6	353 (226)	16% (8%)	11	292 (164)	16% (8%)
Remember	6	343 (192)	17% (8%)	11	241 (213)	10% (7%)
Understand/Apply	6	1092 (489)	52% (15%)	11	881 (294)	46% (15%)
Analyze/Evaluate	6	281 (322)	13% (15%)	11	372 (500)	13% (12%)
Create	6	36 (60)	2% (3%)	11	306 (255)	15% (13%)
Across States						
Cognitive Process						
Attend	20	230 (174)	10% (8%)	26	236 (178)	10% (8%)
Remember	20	576 (407)	21% (12%)	26	331 (359)	12% (8%)
Understand/Apply	20	1341 (717)	49% (12%)	26	1142 (687)	46% (14%)
Analyze/Evaluate	20	503 (481)	17% (11%)	26	568 (573)	18% (11%)
Create	20	85 (78)	3% (3%)	26	374 (318)	14% (12%)

Note. MA = Mathematics; ELA = English/Language Arts.

Table 26

Sample-Day Based Class OTL Details on Instructional Practices By Subject Area

	MA			ELA		
	n	*M (SD)*	*M (SD)*	*n*	*M (SD)*	*M (SD)*
Arizona						
Instructional Practice						
Provided Direct Instruction	9	639 (367)	19% (9%)	7	639 (303)	14% (5%)
Provided Visual Representations	9	284 (179)	8% (3%)	7	223 (133)	5% (2%)
Asked Questions	9	259 (136)	8% (5%)	7	262 (165)	6% (3%)
Elicited Think Aloud	9	118 (68)	4% (3%)	7	207 (160)	4% (3%)
Used Independent Practice	9	774 (265)	23% (3%)	7	1139 (407)	25% (8%)
Provided Guided Feedback	9	232 (181)	6% (3%)	7	299 (161)	7% (3%)
Provided Reinforcement	9	115 (89)	3% (2%)	7	175 (139)	4% (2%)
Assessed Student Knowledge	9	679 (385)	19% (7%)	7	895 (343)	19% (3%)
Other Instructional Practices	9	373 (339)	10% (9%)	7	848 (477)	17% (9%)
Pennsylvania						
Instructional Practice						
Provided Direct Instruction	5	304 (93)	15% (3%)	8	208 (143)	13% (6%)
Provided Visual Representations	5	189 (142)	8% (3%)	8	115 (88)	7% (5%)
Asked Questions	5	260 (169)	12% (9%)	8	247 (199)	14% (7%)
Elicited Think Aloud	5	155 (60)	8% (3%)	8	117 (189)	5% (5%)
Used Independent Practice	5	553 (259)	26% (8%)	8	372 (278)	25% (20%)
Provided Guided Feedback	5	183 (106)	8% (2%)	8	180 (206)	10% (12%)
Provided Reinforcement	5	67 (48)	3% (2%)	8	49 (61)	2% (2%)
Assessed Student Knowledge	5	389 (409)	17% (14%)	8	290 (156)	19% (12%)
Other Instructional Practices	5	62 (91)	4% (5%)	8	84 (99)	6% (7%)
South Carolina						
Instructional Practice						
Provided Direct Instruction	6	537 (317)	24% (12%)	11	451 (317)	20% (10%)
Provided Visual Representations	6	160 (107)	7% (4%)	11	60 (76)	3% (3%)
Asked Questions	6	134 (39)	6% (1%)	11	143 (128)	6% (4%)
Elicited Think Aloud	6	55 (52)	3% (2%)	11	105 (113)	4% (4%)
Used Independent Practice	6	477 (281)	22% (9%)	11	793 (567)	39% (19%)
Provided Guided Feedback	6	165 (122)	10% (10%)	11	141 (100)	7% (7%)
Provided Reinforcement	6	24 (20)	1% (1%)	11	68 (59)	3% (2%)
Assessed Student Knowledge	6	347 (300)	17% (14%)	11	114 (103)	5% (5%)
Other Instructional Practices	6	228 (326)	10% (13%)	11	230 (330)	13% (20%)
Across States						
Instructional Practice						
Provided Direct Instruction	20	525 (322)	19% (9%)	26	427 (310)	16% (8%)
Provided Visual Representations	20	223 (155)	8% (3%)	26	121 (116)	5% (4%)
Asked Questions	20	222 (133)	9% (6%)	26	207 (165)	8% (6%)
Elicited Think Aloud	20	108 (70)	4% (3%)	26	136 (152)	5% (4%)
Used Independent Practice	20	630 (289)	23% (6%)	26	757 (528)	31% (18%)
Provided Guided Feedback	20	199 (145)	8% (6%)	26	195 (163)	8% (8%)
Provided Reinforcement	20	76 (74)	3% (2%)	26	91 (99)	3% (2%)
Assessed Student Knowledge	20	507 (383)	18% (11%)	26	379 (384)	13% (10%)
Other Instructional Practices	20	252 (308)	8% (9%)	26	352 (446)	12% (15%)

Note. MA = Mathematics; ELA = English/Language Arts.

Table 27

Sample-Day Based Class OTL Details on Grouping Formats By Subject Area

	MA			ELA		
	n	***M (SD)***	***M (SD)***	***n***	***M (SD)***	***M (SD)***
Arizona						
Grouping Format						
Individual	9	471 (425)	17% (15%)	7	243 (142)	5% (3%)
Small Group	9	351 (172)	11% (5%)	7	362 (303)	7% (5%)
Whole Class	9	2651 (1619)	73% (18%)	7	4084 (1243)	88% (7%)
Pennsylvania						
Grouping Format						
Individual	5	360 (366)	16% (13%)	8	126 (116)	7% (6%)
Small Group	5	357 (225)	17% (15%)	8	124 (155)	6% (7%)
Whole Class	5	1445 (764)	67% (16%)	8	1411 (554)	87% (12%)
South Carolina						
Grouping Format						
Individual	6	447 (479)	20% (19%)	11	508 (469)	32% (31%)
Small Group	6	86 (126)	4% (5%)	11	54 (73)	4% (6%)
Whole Class	6	1595 (610)	76% (20%)	11	1542 (1301)	64% (34%)
Across States						
Grouping Format						
Individual	20	436 (409)	18% (15%)	26	319 (355)	17% (24%)
Small Group	20	273 (208)	10% (9%)	26	159 (218)	6% (6%)
Whole Class	20	2033 (1287)	72% (18%)	26	2187 (1587)	77% (26%)

Note. MA = Mathematics; ELA = English/Language Arts.

Across states, the cognitive process emphases displayed in Table 25 indicate that the most emphasized cognitive processes are *Understand/Apply*. In this sample, teachers emphasized the *Remember* category to a greater extent in MA than in ELA, and the *Create* category to greater extent in ELA than in MA. With respect to instructional practices, the results in Table 26 show that *Independent Practice* represented the most commonly emphasized instructional practice among the available choices and across both subject areas. Moreover, *Direct Instruction* and *Assessed Student Knowledge* followed

Independent Practice as the second and third order of emphasis across subject areas. Lastly, data in Table 27 indicate that *Whole Class* was the most commonly emphasized grouping format across subject areas. Conversely, *Small Group* represented the least commonly emphasized grouping format across subjects. Considering potential difference between general and special education classrooms, Table 28 summarizes data for all quality-related OTL indices by class type.

Table 28

Sample-Day Based Class OTL Quality Indices By Class Type

OTL Index	**GENED (n = 29)**		**SPED (n = 17)**				
	M	***SD***	***M***	***SD***	***df***	***t***	***ES***
Across States							
Logged Sample Days	**47**	**9**	**37**	**6**	**44**	**3.98***	**1.27**
Cognitive Process Score	1.77	0.14	1.68	0.11	44	2.41*	0.75
Instructional Practice Score	1.64	0.13	1.59	0.25	44	0.77	0.22
Grouping Format Score	1.19	0.17	1.36	0.27	44	-2.70*	-0.78
Engagement	2.60	0.28	2.47	0.34	44	1.38	0.41
Goal Attainment/Effort	2.58	0.28	2.46	0.35	44	1.27	0.37

Note. *p <.05*;* GENED = General education class; SPED = Special education class; ES = Effect size measure *d*.

For this sample (N = 46 classes), the observed mean differences in sample-day based OTL quality indices indicate that students in special education classrooms experienced a greater emphasis of lower order thinking skills and grouping formats other than whole class than students in students in general education classrooms. The observed mean differences for the *Cognitive Process Score* and the *Grouping Format Score* between general and special education classrooms are statistically significant (p < .05) with an effect size of d = .75 and d = -.78, respectively. Table 29 provides further details on the sample-day based quality indices for general and special education.

Table 29

Sample-Day Based Class OTL Details on Cognitive Processes, Instructional Practices, and Grouping Formats By Class Type

	GENED			SPED		
	n	***M (SD)***	***M (SD)***	***n***	***M (SD)***	***M (SD)***
Across States						
Cognitive Process						
Attend	29	213 (161)	7% (6%)	17	270 (194)	15% (8%)
Remember	29	477 (406)	15% (11%)	17	370 (379)	17% (12%)
Understand/Apply	29	1436 (766)	46% (13%)	17	873 (371)	50% (14%)
Analyze/Evaluate	29	751 (561)	22% (10%)	17	178 (141)	10% (8%)
Create	29	306 (294)	10% (10%)	17	150 (237)	8% (13%)
Instructional Practice						
Provided Direct Instruction	29	525 (310)	17% (7%)	17	375 (311)	19% (11%)
Provided Visual Rep	29	189 (145)	6% (4%)	17	124 (130)	6% (5%)
Asked Questions	29	236 (129)	8% (5%)	17	175 (179)	8% (7%)
Elicited Think Aloud	29	140 (111)	5% (3%)	17	97 (141)	4% (5%)
Used Independent Practice	29	839 (476)	27% (13%)	17	466 (238)	28% (17%)
Provided Guided Feedback	29	214 (149)	7% (3%)	17	168 (162)	10% (11%)
Provided Reinforcement	29	109 (98)	3% (2%)	17	43 (50)	2% (2%)
Assessed Student Knowledge	29	580 (408)	18% (10%)	17	186 (145)	11% (9%)
Other Instructional Practices	29	364 (419)	9% (9%)	17	213 (329)	12% (18%)
Grouping Format						
Individual	29	280 (325)	10% (12%)	17	523 (424)	30% (25%)
Small Group	29	261 (239)	9% (9%)	17	118 (145)	6% (6%)
Whole Class	29	2065 (1506)	81% (17%)	17	1205 (734)	64% (27%)

Note. GENED = General education class; SPED = Special education class.

A comparison of the summary data in Table 29 indicates a greater emphasis of *Attend* in special education classrooms with $t(44) = -3.59$ ($p < 0.5$) and an effect size of $d = -1.06$. In addition, students in general education classroom experienced a greater instructional emphasis on *Analyze/Evaluate* with $t(44) = 4.01$ ($p < .05$) and an effect size of $d = 1.26$. With respect to instructional practices, students in general education classroom experienced a greater emphasis on *Assessed Student Knowledge* with $t(44) =$

2.43 (p < 05) and an effect size of $d = 0.76$. Lastly, *Individual* grouping formats were emphasized to greater extent in special education classrooms with $t(44)$ -3.66 ($p < .01$) and an effect size of $d = -1.01$, while *Whole Class* instruction was more common in general education classrooms with $t(44) = 2.66$ (p <.05) and an effect size of $d = 0.77$.

In summary, the collected OTL indices did not confirm the initial hypothesis based on prior research, which suggested relatively low *Content Coverage* (< 50%) as well as low quality-related indices (< 1.50). Across subject areas and classroom types, teachers reported having covered about 68% of state-specific academic standards during about 151 log days. Students in special education classrooms experienced lower standards coverage (about 59%) than students in general education classrooms (about 74%) with a medium effect size of $d = .69$. With respect to OTL indices related to instructional quality, the observed mean differences for the *Cognitive Process Score* and the *Grouping Format Score* between general and special education classroom were statistically significant with medium effect sizes of $d = .75$ and $d = -.78$, respectively. Moreover, students in special education classrooms experienced less instructional time on standards per day in their respective classes (about 61%) than students in general education classrooms (about 71%) with a medium effect size of $d = .55$. Additional instructional differences include a greater emphasis on *Attend* and lower emphasis on *Analyze/Evaluate* in special education classrooms with larger effect sizes of $d = -1.06$ and $d = 1.26$, respectively.

Question 2: To What Degree Do Students With Disabilities Have A Differentiated Opportunity To Learn The Intended Curriculum Compared To Their Class?

To examine the extent to which teachers provided a differentiated opportunity structure for students with disabilities compared to their peers in the same class, teachers were asked to report on sample-day details at the class and student level. The time, content, and quality related OTL indices collected via sample days were described in Table 14 (p. 98). On average, teachers logged about 43 sample days, or 24% of the school year. Table 30 provides the class and respective student means and standard deviations for all seven time, content, and quality related indices. In addition, dependent t-test results and Cohen's *d* effect sizes are provided to facilitate a comparison of theses indices at the class and student level.

Across states, the results of these analyses indicate statistically significant differences along five of the seven OTL indices. In terms of effect sizes above .20, the results across the combined state data indicate three major differences in OTL. First, compared to the overall class, students with disabilities in this sample experienced less instructional time on state-specific standards with $t(88) = 5.89$ ($p < .001$) and an effect size of $d = .21$. Second, compared to the overall class, students with disabilities experienced more time not available for instruction with $t(88) = -4.68$ ($p < .001$) and an effect size of $d = -.49$. Third, compared to the overall class, students with disabilities experienced less coverage of the state-specific content standards with $t(88) = 5.91$($p < .001$) and an effect size of $d = .22$. The effect sizes for the three summary scores related to instructional quality did not exceed .10.

Table 30

Differences in Class and Student Key OTL Indices By State

	Class		Student				
	M	***SD***	***M***	***SD***	***df***	***t***	***ES***
Arizona (*n* = 32)							
Instructional Time on Standards (Min/Day)	**56**	23	**48**	17	31	4.71***	.37
Instructional Time on Custom (Min/Day)	**24**	13	**22**	13	31	2.10*	.13
Non-Instructional Time (Min/Day)	**5**	5	**15**	15	31	-4.71***	-.60
Content Coverage of Standards (%)	**40**	12	**32**	11	31	5.08***	.64
Cognitive Process Score	**1.75**	0.15	**1.73**	0.16	31	5.05***	.08
Instructional Practice Score	**1.63**	0.10	**1.61**	0.12	31	3.09***	.18
Grouping Format Score	**1.21**	0.16	**1.21**	0.18	31	-0.51	-.02
Pennsylvania (*n* = 26)							
Instructional Time on Standards (Min/Day)	**35**	15	**34**	16	25	2.57*	.05
Instructional Time on Custom (Min/Day)	**12**	7	**13**	8	25	-0.73	-.03
Non-Instructional Time (Min/Day)	**3**	3	**4**	3	25	-0.83	-.14
Content Coverage of Standards (%)	**52**	16	**51**	16	25	2.24*	.05
Cognitive Process Score	**1.76**	0.14	**1.75**	0.15	25	0.51	.02
Instructional Practice Score	**1.70**	0.15	**1.71**	0.14	25	-1.94	-.07
Grouping Format Score	**1.21**	0.16	**1.24**	0.16	25	-1.17	-.18
South Carolina (*n* = 31)							
Instructional Time on Standards (Min/Day)	**31**	16	**27**	14	30	4.38***	.24
Instructional Time on Custom (Min/Day)	**21**	13	**21**	14	30	-0.46	-.03
Non-Instructional Time (Min/Day)	**5**	5	**8**	9	30	-2.05*	-.46
Content Coverage of Standards (%)	**41**	20	**38**	20	30	4.42***	.13
Cognitive Process Score	**1.71**	0.12	**1.70**	0.12	30	2.03*	.07
Instructional Practice Score	**1.55**	0.24	**1.53**	0.25	30	1.79	.06
Grouping Format Score	**1.35**	0.29	**1.35**	0.30	30	-0.76	-.02
Across States (*N* = 89)							
Instructional Time on Standards (Min/Day)	**41**	22	**37**	18	88	5.89***	.21
Instructional Time on Custom (Min/Day)	**19**	12	**19**	13	88	0.84	.03
Non-Instructional Time (Min/Day)	**5**	5	**10**	12	88	-4.68***	-.49
Content Coverage of Standards (%)	**43**	17	**40**	18	88	5.91***	.22
Cognitive Process Score	**1.74**	0.14	**1.73**	0.14	88	3.73***	.07
Instructional Practice Score	**1.62**	0.18	**1.61**	0.19	88	2.28*	.05
Grouping Format Score	**1.26**	0.22	**1.27**	0.23	88	-1.44	-.05

Note. $^{*}p < .05$; $^{***}p < .001$; ES = Effect size measure *d*.

An examination of individual state data highlights that the previously noted differences related to *Time on Standards*, *Non-Instructional Time*, and *Content Coverage* are not representative of Pennsylvania. None of the statistically significant differences in Pennsylvania exceeded an effect size above .20.

Table 31 allows for a comparison of the differentiated opportunity structure by classroom type. A comparison of the three, previously examined OTL indices—*Time on Standards*, *Non-Instructional Time*, and *Content Coverage*—with effect sizes above .20 indicates varying OTL gaps between the class and student level by classroom type. In general education classrooms, the gap for instructional time on standards between class and target students (.24) was wider compared to the gap in special education classrooms between class and target students (.18). In addition, the gap for content coverage between class and target students was greater in general education classrooms (.31) than in special education classrooms between class and target students (.08). The previously noted difference in time not available for instruction for the combined sample was no longer statically significant for the special education sample. However, the effect size indicated that the gap for *Non-Instructional Time* between class and target students was smaller in general education classrooms (-.20) than in special education classrooms (-.38).

Table 31

Differences in Class and Student Key OTL Indices By Class Type

	Class		Student				
	M	*SD*	*M*	*SD*	*df*	*t*	*ES*
General Education (*n* = 55)							
Instructional Time on Standards (Min/Day)	**47**	12	**41**	17	54	4.77***	.24
Instructional Time on Custom (Min/Day)	**21**	12	**20**	12	54	2.18*	.09
Non-Instructional Time (Min/Day)	**4**	4	**10**	13	54	-4.58***	-.20
Content Coverage of Standards (%)	**47**	15	**42**	17	54	5.36***	.31
Cognitive Process Score	**1.77**	0.14	**1.76**	0.15	54	3.89***	.05
Instructional Practice Score	**1.64**	0.13	**1.63**	0.14	54	2.32*	.08
Grouping Format Score	**1.19**	0.17	**1.21**	0.18	54	-1.70	-.11
Special Education (*n* = 34)							
Instructional Time on Standards (Min/Day)	**32**	18	**29**	17	33	3.90***	.18
Instructional Time on Custom (Min/Day)	**17**	13	**18**	14	33	-0.77	-.05
Non-Instructional Time (Min/Day)	**6**	5	**8**	8	33	-1.68	-.38
Content Coverage of Standards (%)	**38**	18	**36**	19	33	3.98***	.08
Cognitive Process Score	**1.68**	0.11	**1.67**	0.12	33	1.81	.09
Instructional Practice Score	**1.59**	0.25	**1.59**	0.26	33	0.92	.03
Grouping Format Score	**1.36**	0.26	**1.36**	0.28	33	0.52	.01

Note. $^{*}p < .05$; $^{***}p < .001$; ES = Effect size measure *d*.

Question 3: To What Extent Is There Convergent and Predictive Validity Evidence for the MyiLOGS OTL Indices?

To provide initial validity evidence for the OTL measurement tool, I examined convergent validity values between the MyiLOGS OTL indices at the class level and the SEC AI index at the class level. In addition, I compared the predictive validity of both measures using their class-based indices to predict average class achievement on the state achievement for the state of Arizona—the only state that provided class-specific achievement data for students in participating classrooms.

Convergent Validity

It was hypothesized that the SEC AI index, which quantifies alignment based on a match of topic and cognitive demand between teacher instruction and state standards, should correlate differentially with the various OTL indices from MyiLOGS. Given that SEC does not account for instructional time, the correlations between the content- and quality-based OTL indices and the AI were hypothesized to exceed the correlations between the time-based OTL indices and the AI. In addition, the correlations between both measures were hypothesized to range between .15 and .30. The results of the alignment analyses by state are listed in Table 32. The AI averages ranged between .14 and .16 with an average of .16 across states.

Table 32

Average SEC Alignment Index By State

		AI	
	n	***M***	***(SD)***
Arizona	16	**0.20**	(0.04)
Pennsylvania	13	**0.14**	(0.05)
South Carolina	17	**0.16**	(0.04)
Across States	46	**0.16**	(0.05)

Note. AI = Alignment Index.

The difference in alignment between classroom instruction and state content standards for general and special education classrooms was statistically not significant ($p > .05$) with a medium effect size of $d = .44$ (see Table 33). On average, alignment was lower in special education classrooms (.15) than in general education classrooms (.17).

Table 33

Difference in Average SEC Alignment By Class Type

	GENED (*n* = 29)		**SPED (*n* = 17)**				
	M	***SD***	***M***	***SD***	***df***	***t***	***ES***
Alignment Index	**0.17**	0.05	**0.15**	0.04	44	1.43	.44

Note. GENED = General education class; SPED = Special education class; ES = Effect size measure *d*.

The correlations between class-based OTL indices from MyiLOGS and the SEC AI are displayed in Table 34. None of the correlations were statistically significant ($p > .05$). Consequently, the displayed correlations cannot be interpreted in the context of the aforementioned hypotheses.

Table 34

Correlations between Key Class OTL Indices and SEC Alignment Index

MyiLOGS Indices	Alignment Index
Instructional Time on Standards (Min/Day)	.14
Instructional Time on Standards (%)	.14
Instructional Time on Custom (Min/Day)	-.08
Non-Instructional Time (Min/Day)	.13
Non-Instructional Time (%)	.12
Content Coverage of Standards (%)	-.02
Cognitive Process Score	-.08
Instructional Practice Score	-.07
Grouping Format Score	-.12

Note. N = 46. All correlations statistically non-significant with $p > .05$.

To allow for a visual analysis of the hypothesized relations, I examined scatterplots for the SEC AI and three OTL indices: *Time on Standards (Min/Day)*, *Content Coverage (%)*, and the *Cognitive Process Score*. As previously noted, the relation Figure 11 displays two scatterplots for the relation between the SEC AI and the OTL index related to *Time on Standards* featuring linear and quadratic fit lines. Similarly, Figures 12 and 13 display scatterplots for the relations between the SEC AI and OTL indices related to *Content Coverage* and the *Cognitive Process Score*, respectively.

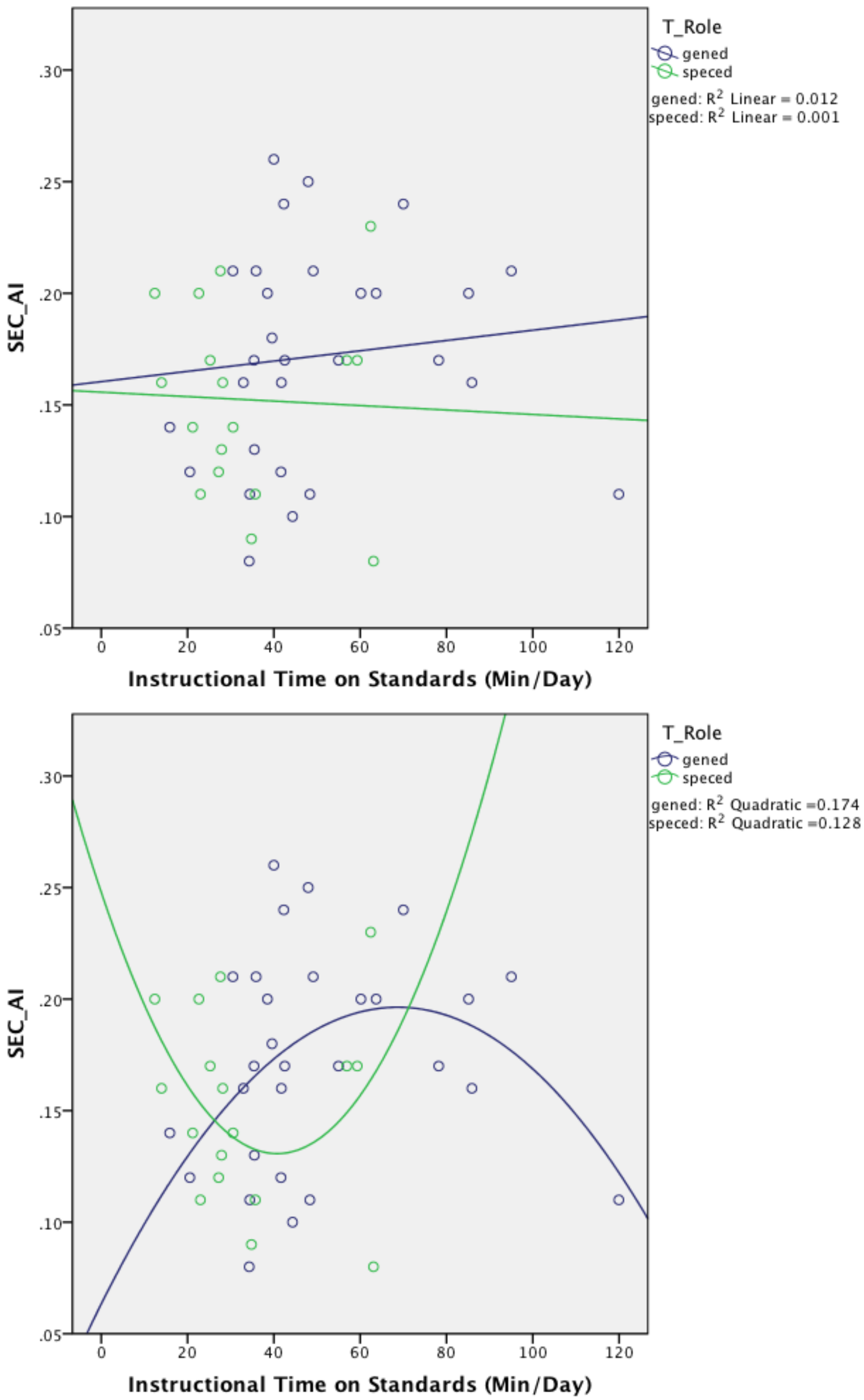


Figure 11. Scattterplots for SEC AI and Instructional Time on Standards.

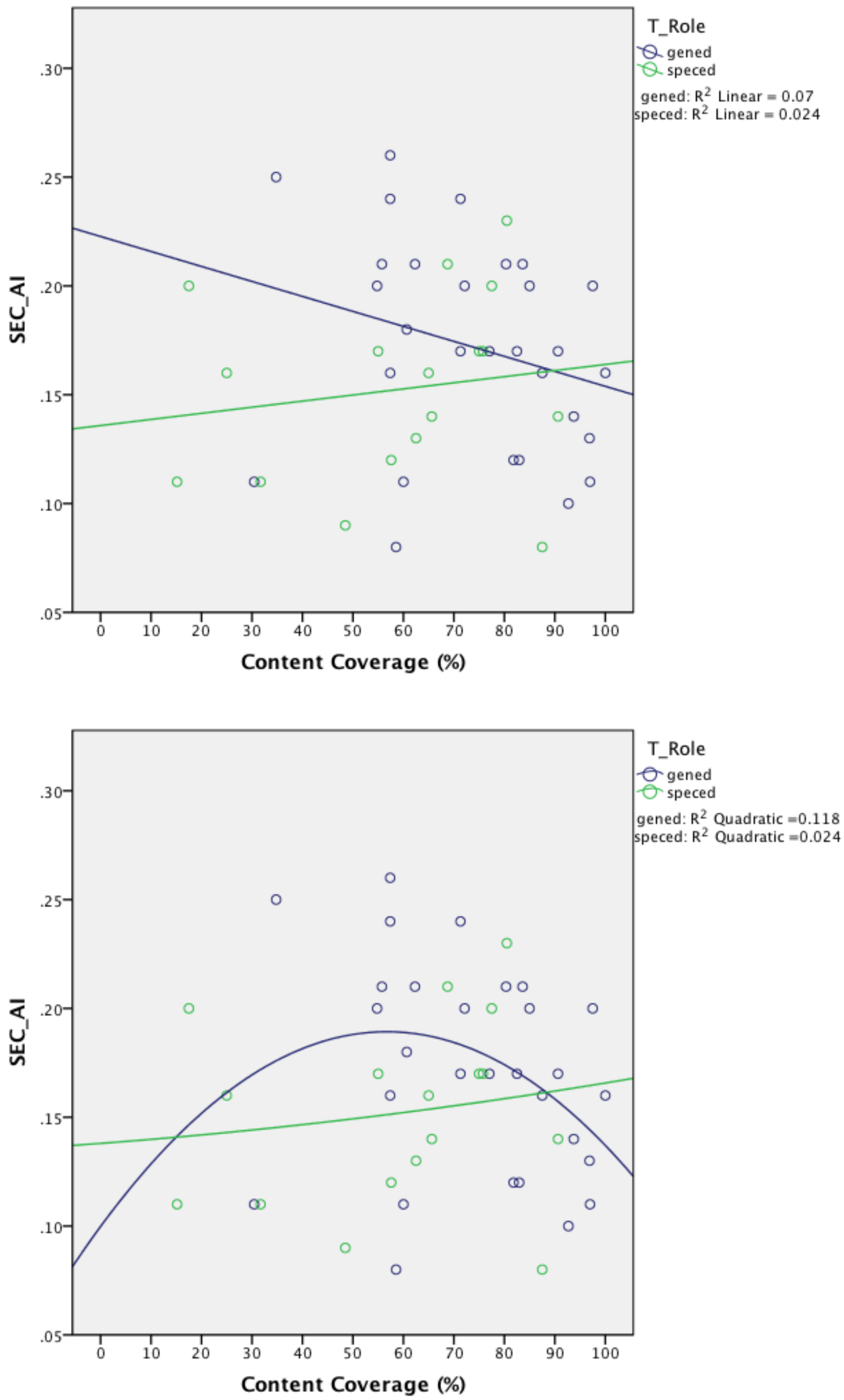
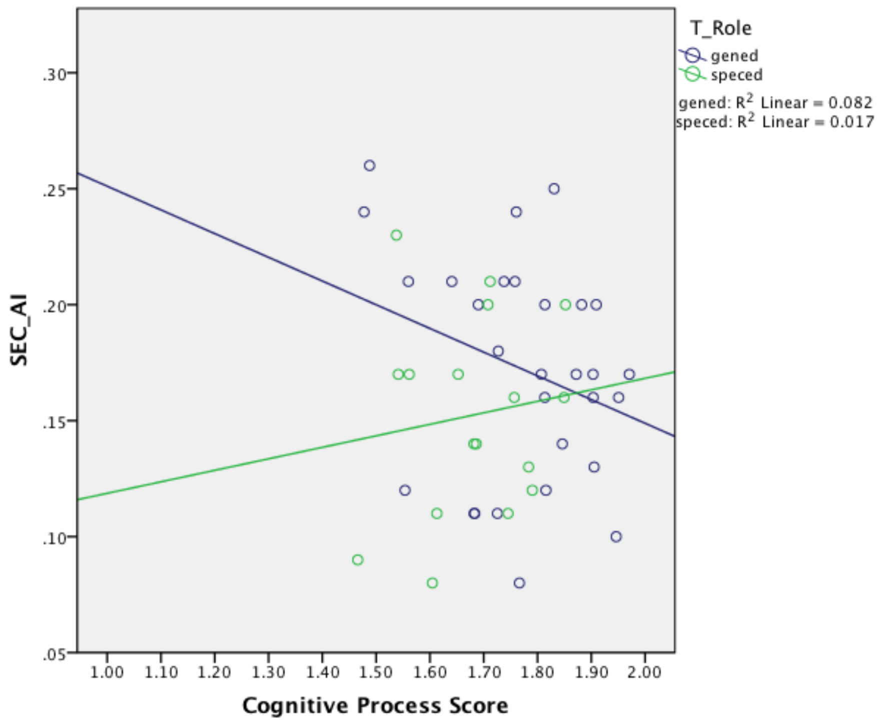


Figure 12. Scattterplots for SEC AI and Content Coverage.



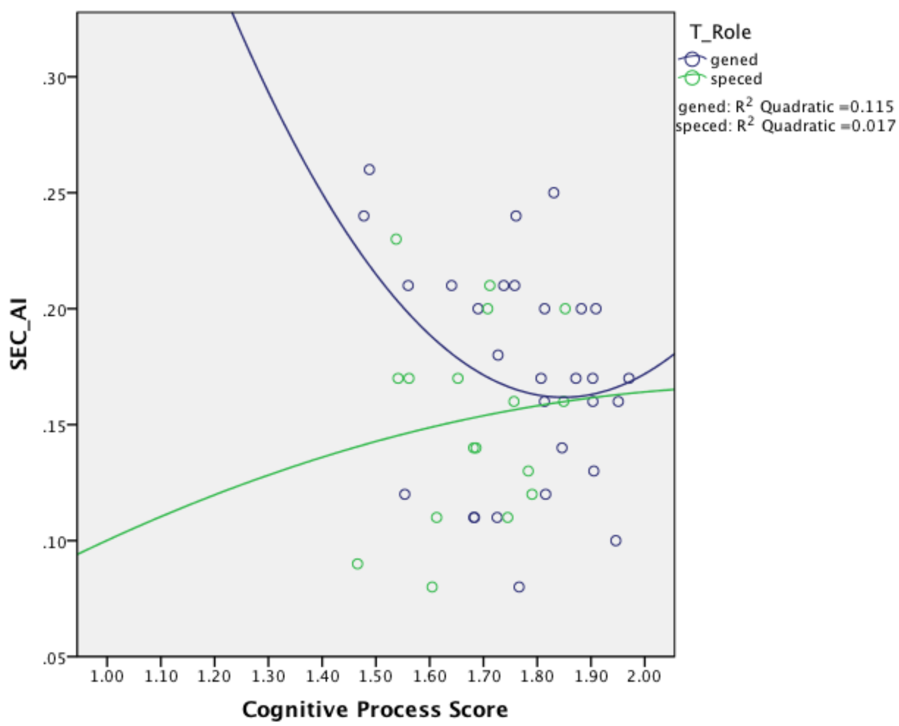


Figure 13. Scattterplots for SEC AI and the Cognitive Process Score.

None of the scatterplots in Figure 11, 12, and 13 display a clear relation between the SEC AI and the respective OTL indices. Based on these results, the two measurement tools provide indices that do not appear to be related. The extent to which the class-based SEC AI and MyiLOGS OTL indices are related to class achievement on the 2010-2011 state test are examined next.

Predictive Validity

For the Arizona subsample, state personnel provided class averages of the 2010-2011 AIMS state test for each class logged by a participating teacher. The Arizona subsample featured a total of 16 classes, which consisted exclusively of general education classrooms (three of which featured a general and special education co-teaching pair). The correlations between the SEC AI and time, content, and quality-related OTL indices are shown in Table 35.

Table 35

Correlations between SEC and MyiLOGS OTL Indices and Class Achievement Averages

Index	2010-2011 Average Class Achievement
SEC Alignment Index	-.53*
Instructional Time on Standards (Min/Day)	.56*
Instructional Time on Standards (%)	.06
Instructional Time on Custom (Min/Day)	.49
Non-Instructional Time (Min/Day)	-.04
Non-Instructional Time (%)	-.32
Content Coverage of Standards (%)	-.30
Cognitive Process Score	.64**
Instructional Practice Score	-.34
Grouping Format Score	-.71**

Note. N = 16. $^{*}p < .05$; $^{**}p < .01$.

First, the bivariate correlation between the SEC AI and class achievement was statistically significant with $r = -.53$. As such, the AI accounted for about 28% of the variance in average class achievement. For this sample, the negative relation indicates that a higher AI corresponded with a lower average class achievement. With respect to the MyiLOGS measurement tool, one time-based and two quality-related OTL indices were related to average class achievement. Second, the bivariate correlation between the *Time on Standards* and class achievement was statistically significant with $r = .56$. As such, the *Time on Standards* index accounted for about 31% of the variance in average class achievement. For this sample, the positive relation indicates that more instructional time dedicated to the state-specific standards was associated with higher average class achievement. Third, the bivariate correlation between the *Cognitive Process Score* and class achievement was statistically significant with $r = .64$. As such, the AI accounted for about 41% of the variance in average class achievement. For this sample, the positive relation indicates that a greater emphasis of higher-order cognitive processes was associated with higher average class achievement. Fourth, the bivariate correlation between the *Grouping Format Score* and class achievement was statistically significant with $r = -.71$. As such, the AI accounted for about 50% of the variance in average class achievement. For this sample, the negative relation indicates that a greater emphasis of individual and small group formats was associated with lower average class achievement.

Based on the current result, the hypothesis of convergent validity between the SEC AI and MyiLOGS OTL indices could not be corroborated. Visual analysis of scatterplots of several indices did not support a relation between the SEC AI and MyiLOGS OTL indices. With respect to predictive validity, only two indices—*Time on*

Standards and the *Cognitive Process Score*—were positively related to average class achievement.

Question 4: What Are the Relations Between Student-Based OTL Indices and Student Achievement?

The Arizona subsample was used to examine the extent to which student-based OTL indices were predictive of student achievement on the end-of year state test. Given that previous research has supported the relation between time, content, and quality-related OTL indices and student achievement, the following OTL indices were entered into the model: (a) *Time on Standards (Min/Day)*; (b) *Time on Custom (Min/Day)*; (c) *Non-Instructional Time (Min/Day)*, (d) *Content Coverage (%)*; (e) *Cognitive Process Score*; (f) *Instructional Practice Score*; and (g) *Grouping Format Score*. The time, content, and quality-related OTL indices were each entered as a set. Any non-significant predictors were removed prior to the next step. The order for the respective steps was based on prior research. Table 36 displays the summary results for all three steps including the final model. The only student-based time index that showed a statistically significant relation with student achievement was *Time on Custom* (i.e., average amounts of minutes dedicated to custom skills/activities per day) with R^2 = .24.

Table 36

Hierarchical Regression Analysis Summary for Student-Based OTL Indices Predicting Student Achievement

Variable	*B*	*SEB*	*β*	R^2	ΔR^2
Step 1				**.25**	
Time on Standards (Min/Day)	-0.01	0.52	0.00		
Time on Custom (Min/Day)	1.76	0.64	0.50*		
Non-Instructional Time (Min/Day)	0.11	0.56	0.04		
Step 2				**.25**	**.00**
Time on Custom (Min/Day)	1.72	0.58	0.49*		
Content Coverage (%)	-0.13	0.70	-0.03		
Step 3				**.26**	**.01**
Time on Custom (Min/Day)	1.39	0.77	0.40		
Cognitive Process Score	36.58	67.88	0.12		
Instructional Practice Score	-39.46	75.93	-0.10		
Grouping Format Score	4.34	53.03	0.02		
Final Model				**.24**	
Time on Custom (Min/Day)	1.74	0.56	0.49*		

Note. $p < .05$.

Table 37 displays the summary results for the same student-based OTL indices predicting student achievement controlling for prior achievement for all three steps including the final model. The results indicate that none of the student-based OTL indices exhibited a statistically significant relation with student achievement controlling for students' prior achievement, which accounted for $R^2 = .62$.

Table 37

Hierarchical Regression Analysis Summary for Student-Based OTL Indices Predicting Student Achievement Controlling for Prior Achievement

Variable	*B*	*SEB*	*β*	R^2	ΔR^2
Step 1				**.62**	**.62**
Prior Achievement	0.76	0.11	0.79^*		
Step 2				**.64**	**.02**
Prior Achievement	0.70	0.13	0.73^*		
Time on Standards (Min/Day)	0.00	0.37	0.00		
Time on Custom (Min/Day)	0.46	0.51	0.13		
Non-Instructional Time (Min/Day)	0.20	0.40	0.06		
Step 3				**.63**	**-.01**
Prior Achievement	0.79	0.11	0.83^*		
Content Coverage (%)	0.54	0.50	0.13		
Step 4				**.63**	**.00**
Prior Achievement	0.78	0.14	0.81^*		
Cognitive Process Score	9.17	42.17	0.03		
Instructional Practice Score	36.75	55.37	0.09		
Grouping Format Score	2.26	37.30	0.01		
Final Model				**.62**	
Prior Achievement	0.76	0.11	0.79^*		

Note. $p < .05$.

To provide additional information on the student-based quality indices, Table 38 shows the summary results for three models of student-based OTL quality indices based on the various cognitive processes, instructional practices, grouping formats and their respective relations to student achievement.

Table 38

Hierarchical Regression Analysis Summary for Student-Based OTL Quality Indices Predicting Student Achievement

Variable	*B*	*SEB*	*β*	R^2
Model 1				**.25**
Attend	0.07	0.07	0.21	
Remember	-0.02	0.03	-0.12	
Understand/Apply	0.02	0.02	0.35	
Analyze/Evaluate	0.00	0.03	0.03	
Create	0.03	0.04	0.20	
Model 2				**.53**
Provided Direct Instruction	0.04	0.03	0.25	
Provided Visual Representations	0.04	0.10	0.12	
Asked Questions	-0.40	0.22	-1.02	
Elicited Think Aloud	0.63	0.28	1.24*	
Used Independent Practice	0.23	0.07	1.46*	
Provided Guided Feedback	0.03	0.10	0.09	
Provided Reinforcement	-0.43	0.21	-0.82	
Assessed Student Knowledge	-0.05	0.04	-0.34	
Other Instructional Practices	-0.08	0.04	-0.63	
Model 3				**.19**
Individual	0.03	0.03	0.22	
Small Group	-0.02	0.05	-0.09	
Whole Class	0.02	0.01	0.53*	

Note. $p < .05$.

This exploratory analysis indicates a statistically significant relation with student achievement for two instructional practices, *Elicited Think Aloud* and *Used Independent Practice*, and the *Whole Class* grouping format.

CHAPTER IV

DISCUSSION

Restatement of the Problem

This study was designed to develop an OTL measurement tool for the purpose of quantifying the extent to which students with disabilities have the opportunity to learn the intended curriculum as measured by instructional indicators of the enacted curriculum. To this end, I provided a conceptual synthesis of OTL on the basis of theoretical and empirical research related to OTL. The concept was redefined as the degree to which a teacher dedicates instructional time and content coverage to the intended curriculum objectives emphasizing high-order cognitive processes, evidenced-based practices, and alternative grouping formats. As such, the refined conceptualization of OTL addressed three key instructional dimensions of OTL identified in the research literature: time, content, and quality. Upon a review of the methodological approaches for measuring OTL, I embedded operationally defined OTL indices along each dimension into a structured online teacher log called MyiLOGS. The development of this teacher self-report measure advanced traditional teacher logging approaches—exemplified by the works of Burstein (1989), Porter (2002), as well as Rowan and colleagues (Rowan et al., 2004)—by embedding teacher logs into teachers' ongoing daily instructional practice. In combination with a sampling approach related to gathering additional details on aspects of instructional quality, the newly developed *concurrent* teacher log OTL measure permitted the establishment of a heretofore unavailable record of continuous teacher self-report data across the school year on OTL indices at both the class and student level.

The study was thus designed to provide the first comprehensive assessment of instruction for students with disabilities yielding data about their instructional access to the general curriculum and instructional equality compared to their class peers. The research problem further extends into the context of test-based accountability, whenever test score inferences are drawn about the adequate provision of instruction. To this end, I addressed four research questions: (a) To what extent do students with disabilities have the opportunity to learn the intended curriculum? (b) To what extent do students with disabilities have a differentiated opportunity to learn the intended curriculum? (c) To what extent is there convergent and predictive validity evidence for the MyiLOGS OTL indices? (d) What are the relations between student-based OTL indices and student achievement? Each question is discussed below along with the respective findings.

Research Questions, Predictions, and Findings

Question 1: To What Degree Do Students With Disabilities Have The Opportunity To Learn The Intended Curriculum?

To answer the first research question, I provided descriptive statistics on the time, content, and quality indices of the OTL measure. For this question, OTL was described at the class level on the basis of calendar-based indices for time and content; and on the basis of sample days for quality related indices. With respect to time, teachers reported on three time-based indices: (a) instructional time on state-specific standards (*Time on Standards*), (b) instructional time on custom skills/activities (*Time on Custom*), and (c) non-instructional time (*Non-Instructional Time*). With respect to content, teachers reported on the specific academic standards they covered during the course of the study. The calculated content-based index is the percentage of content standards addressed (*Content Coverage*). With respect to instructional quality, teachers reported on time emphases along different cognitive processes, instructional practices, and grouping formats. In addition, teachers rated class engagement and class goal attainment/effort. All OTL indices used to address the first question were based on the class level. This represents the traditional view of OTL, which treats the teacher's instructional provision of the enacted curriculum as universal and undifferentiated.

Based on website user statistics, teachers applied the concurrent logging approach as instructed, logging their daily classroom instruction, on average, 2.4 times a week covering, on average, about 151 school days, or 84% of the school year. Three major categories were implicit in the data set: (a) state (i.e., Arizona, Pennsylvania, and South Carolina); (b) subject (i.e., MA and ELA); and (c) class type (i.e., general education class and special education class). Arizona represented a unique sample, because all class types in this subsample were general education classrooms. As such, Arizona represents the full inclusion model, whereas the other two states featured a mix of full-inclusion general education classrooms and special education classroom. However, given the inclusion of all target students in the regular state assessment, the instructional provision of the general curriculum standards was fully warranted for both class types across states. That is, all students in the respective classes should have had the opportunity to learn the academic standards of the general curriculum (which were subsequently assessed via the respective state test) and any other IEP mandated objectives. With the exception of Arizona, no other state prescribed any of the OTL indices. At the time of the study, the state of Arizona mandated teachers cover 100% of the general curriculum standards.

With respect to basic time and content frameworks, teachers within and between states demonstrated a great deal of variation both in terms of allocated class time and the number of academic standards for each subject area. Across states and subject areas, the allocated class time ranged between 25 and 150 minutes and the number of academic standards ranged between 32 and 115. Variability in time extended further including for teachers of the same subject in the same state: (a) allocated class time in MA ranged between 46-120 minutes, 39-82 minutes, and 30-70 minutes in Arizona, Pennsylvania, and South Carolina, respectively; and (b) allocated class time in ELA ranged between 57-150 minutes, 39-82 minutes, and 25-70 minutes in Arizona, Pennsylvania, and South Carolina, respectively. Within these basic frameworks of allocated class time and number of content standards, teachers further varied in the extent to which they dedicated instructional time to the content standards and different custom skills, as well as the extent to which allocated time was non-instructional (e.g., transitions, announcements). Irrespective of the large standard deviations, the average percentage-based indices across states were similar for MA and ELA with 69% and 66% for *Time on Standards*, 27% and 28% for *Time on Custom*, 4% and 5% for *Non-Instructional Time*, as well as 66% and 69% for *Content Coverage*, respectively.

The extent to which the observed variation and values were a function of class type was also examined by considering general and special education classes across states separately. The range in allocated class time remained wide for both class types with 39-

150 minutes in general education classes (range = 111 minutes) and 25-82 minutes in special education classes (range = 57 minutes). The variation around the percentage-based time and content indices was greater for special education classrooms than general education classroom. On average, the percentage of instructional time dedicated to the standards was greater in general education classrooms (71%) than in special education classrooms (61%). On the other hand, the average percentage of instructional time dedicated to custom skills (e.g., IEP objectives) was greater in special education classrooms (30%) than in general education classrooms. The average percentage of non-instructional time was similar in both class types. Lastly, the average percentage of content coverage was greater in general education classrooms (74%) than in special education classrooms (54%). The differences in percentage-based indices for *Time on Standards* and *Content Coverage* further exhibited medium effect sizes.

Assuming that academic achievement is higher in general education classrooms, the findings that general education teachers were able to (a) dedicate more instructional time to teaching the academic standards and (b) cover more content standards were not surprising. However, students in this study's special education classrooms nonetheless participated in the same regular state assessments as their general education peers, which should have necessitated the same academic expectations for both subgroups irrespective of instructional setting. In fact, it seems reasonable to suggest that students' placement in special education due to disability-related academic difficulties should result in even greater time and content emphasis on the academic standards of the general curriculum precisely because of their disability-related academic challenges (e.g., attention difficulties, memory issues, behavioral challenges). The present results for this sample, however, do not support the notion of *equal* OTL for students with disabilities based on class type.

With respect to OTL indices for instructional quality, data were collected on two random days per week. That is, teachers completed additional information on cognitive processes, instructional practices, grouping formats, class engagement, and goal attainment/effort. Specifically, teachers logged quality-related OTL indices for an average of about 43 school days, or 24% of the school year. Based on summary data across states, subject-specific differences in OTL indices were noted along the *Cognitive Process*, *Instructional Practice*, and *Grouping Format* scores. These summary indices indicated a greater emphasis of high-order thinking skills in ELA than in MA, a greater emphasis of evidence-based practices in MA than in ELA, and a greater emphasis of alternative grouping formats in MA than in ELA. None of these general trends, however, represented statistically significant differences based on this sample.

Subsequent descriptions of total time allocations across the different cognitive process, instructional practices, and grouping formats indicated the following. Across states, the most emphasized cognitive processes were *Understand/Apply*. The *Remember* process was more prevalent in MA than in ELA, and the *Create* process more prevalent in ELA than in MA. Both findings appear reasonable given the large number of memorizable MA facts and the ability for ELA teachers to utilize the *Create* process during composition tasks. With respect to instructional practices, *Independent Practice* represented the most commonly emphasized practice among available choice across both subject areas. Moreover, *Direct Instruction* and *Assessed Student Knowledge* followed *Independent Practice* as the second and third order of emphasis across subject areas.

Lastly, *Whole Class* was the most commonly emphasized grouping format across subject areas. Conversely, *Small Group* represented the least commonly emphasized grouping format across subjects.

In the context of class type, differences in quality-related OTL scores were statistically significant for both the *Cognitive Process* and the *Grouping Format* scores with large effect sizes. That is, students in general education classrooms experienced a greater emphasis of high-order cognitive processes and a greater emphasis of whole class instruction than students in special education classrooms. An examination of the total time allocations indicated that the major difference in cognitive processes between both class types was largely due to a greater emphasis of *Attend* in special education classrooms with a large effect size and a greater emphasis of *Analyze/Evaluate* in general education also with a large effect size. With respect to instructional practices, students in general education classroom experienced a greater emphasis on *Assessed Student Knowledge* with a large effect size. In addition, it should be noted that *Independent Practice* remained the most emphasized instructional practice in both classroom settings. Not surprisingly, the major difference in grouping formats between both class types was due to a significantly greater emphasis of *Individual* grouping formats in special education classrooms and a significantly greater emphasis of *Whole Class* grouping formats in general education classrooms.

In summary, these initial OTL results by subject area and class type did not confirm the predictions of low content coverage or quality scores reflective of emphases on lower-order thinking skills and generic teaching practices. In fact, in each instance, the respective OTL indices exceeded the predicted values irrespective of subject area and class type. However, the initial predictions were largely based on the results of alignment studies, which used alignment as a proxy for OTL. The results of the Kurz et al. (2010) alignment study, for example, indicated low alignment (less than 20%) between teachers' instruction and the respective state standards. However, the alignment index of the SEC combines content coverage (i.e., topics) and cognitive demand into one single index, which can explain why the separate content coverage and cognitive process indices of MyiLOGS differed from the SEC's AI.

Question 2: To What Degree Do Students With Disabilities Have A Differentiated Opportunity To Learn The Intended Curriculum Compared To Their Class?

Treating OTL as an undifferentiated opportunity structure represents a major assumption of using class-based OTL indices (Kurz, 2011; Rowan et al., 2004). That is, teachers' instructional provisions at the class level may differ for individual students nested within their class. To date, no published reports of research exist that compare OTL at the class and student level for the same teacher. Given that the study's target student sample was exclusively comprised of students with disabilities, the possibility of a differentiated instruction due to instructional provisions aimed at addressing disability-related characteristics and/or IEP objectives was particularly pertinent.

To examine the extent to which teachers provided a differentiated opportunity structure for students with disabilities compared to their peers in the same class, teachers were asked to report on sample-day details at the class and student level. On average, teachers logged about 43 sample days, or 24% of the school year. A comparison of the class-based and student-based OTL indices across subject areas and states indicated five statistically significant differences, three of which yielded effect sizes above .20. Compared to the overall class, students with disabilities experienced less *Time on Standards*, more *Non-Instructional Time*, and less *Content Coverage* than their classmates. Statistically significant difference for two OTL indices related to instructional quality, the *Cognitive Process Score* and the *Instructional Practice Score*, were also found. However, the effect sizes for both indices were very small. Theses results were based on summary data across states, subject areas, and class types.

Looking at individual states, the results based on the Pennsylvania subsample differed from the remaining two states. In Pennsylvania, only two indices, *Time on Standards* and *Content Coverage*, showed statistically significant differences between the class and student level; however, the magnitude of the difference was very small. The largest differences were found in the Arizona subsample, where six of the seven OTL indices showed statistically significant differences between the class and student level. In terms of effect size, the results indicated medium effect sizes for *Time on Standards*, *Non-Instructional Time*, and *Content Coverage*. The fact that the Arizona subsample was comprised exclusively of general education classes presents a possible explanation for the larger effect sizes. That is, the Arizona subsample represented the full inclusion model, where students with disabilities are included in a class of general education peers who are likely to perform at higher academic levels. Consequently, teachers may be able to provide more instructional time on standards-based instruction to students who are academically ready to benefit, namely the majority of classmates without disabilities. However, it should be noted that students with disabilities did not receive significantly different time allocations to *Time on Custom* skills/activities compared to their overall class; a category reserved for any academic objectives or activities that are not part of the general curriculum standards. In fact, a review of the 554 custom skills/activities logged in all 46 classrooms indicated that only 1 custom skill/activity was tagged as an IEP objective related to reading fluency. Furthermore, over 50% of custom skills logged were based on summary activities that either practiced or reviewed standards-related instruction such as “Bell Work” or “Review,” as well as technology-based activities such as Study Island or ALEKS®.

The issue of *Non-Instructional Time* also warrants additional consideration. With the exception of the Pennsylvania subsample, target students (with disabilities) experienced more *Non-Instructional Time* than their classmates. The *Non-Instructional Time* index is intended to reflect any teacher-reported minutes of allocated class time that could not be used for instruction (either on general curriculum standards or custom skills/ activities). However, teachers were not asked to identify the types of non-instructional activities such as transitions, school announcements, and so on. The magnitude of the difference between the class and student level was the largest in the Arizona subsample, where teachers provided data on OTL for target students (with disabilities) and the overall class (largely without disabilities). The reasons why these students with disabilities experienced more *Non-Instructional Time* than their classmates, however, remain unclear (e.g., behavioral challenges, absences, related services provisions).

A comparison of the differentiated opportunity structure by classroom type indicated that in special education classes the differences in OTL indices between the class and student level were statistically significant, albeit with very small effect sizes for *Time on Standards* and *Content Coverage*. In contrast, six of the seven OTL indices in general education classrooms showed statistically significant differences with a range of small and medium effect sizes. Specifically, the magnitude of the difference for *Time on Standards*, *Non-Instructional Time*, and *Content Coverage* yielded effect sizes above .20. A comparison of the findings by class type thus indicated that the differences in OTL indices were largely a function of class type. The gap in OTL for *Instructional Time* between the class and student level was larger in general education classes (.24) than in special education class (.18). Moreover, the gap in OTL for Content Coverage was comparatively small (.08) between the class and student level in special education classes compared to general education classes (.31).

In summary, the findings support the contention that OTL is a differentiated opportunity structure, which differs at the class and student level. However, it should be noted that in this study the student level was comprised of students with disabilities of low academic performance. Second, the differences in OTL indices were largely related to class type, with general education classes yielding the largest OTL gaps for students with disabilities. That is, students with disabilities in this study who were taught in general education classes experienced (a) less instructional time on state-specific standards than their classmates; (b) more non-instructional time than their classmates; and (c) less content coverage of the states-specific standards than their classmates. These results extend the findings of the previous research question, which already indicated unequal OTL *between* different class types. The findings of this question provided further evidence of unequal OTL *within* class types.

Question 3: To What Extent Is There Convergent and Predictive Validity Evidence for the MyiLOGS OTL Indices?

To provide initial validity evidence for the OTL measurement tool, I examined convergent validity values between the MyiLOGS OTL indices at the class level and the SEC AI index at the class level. In addition, I compared the predictive validity of both measures using their class-based indices to predict average class achievement on the state achievement for the state of Arizona—the only state that provided class-specific achievement data for students in participating classrooms. The SEC AI was previously identified as an OTL proxy (e.g., Kurz et al., 2010; Porter, 2002). The AI quantifies alignment based on overlap between an enacted curriculum matrix (established teacher self-report) and a general curriculum matrix (established by content experts on the basis of state-specific standards) at the intersection of topic and cognitive demand. Low alignment can thus be function of misalignment among topics covered, cognitive demands emphasized, or both.

The results of the alignment analyses indicated that the AI averages ranged between .14 and .16 across states. The differences in AIs by class type were not statistically significant. With respect to convergent validity, none of the correlations between MyiLOGS OTL indices and the AI were statistically significant. Given the hypothesized relations between content and quality-related OTL indices and the AI in the range of .10 and .30, the analyses suffered from low power and were thus subject to Type II errors. In short, the present results could not be used to determine convergent validity between the MyiLOGS OTL indices and the AI.

For purposes of predictive validity, Arizona Department of Education personnel provided class averages of the 2010-2011 state test for each class logged by participating teachers. The unit of analysis was kept at the class level due to the SEC being a class-level alignment index. Given the small sample size (N = 16), these analyses also suffered from low power and were thus subject to Type II errors. Despite low power, the results indicated several statistically significant correlations with medium effect sizes above .50. For the Arizona subsample, the SEC AI was negatively correlated with class achievement with $r = -.52$ ($p < .05$). This finding is surprising given prior research findings, which have supported a positive relation between the AI and student achievement (e.g., Kurz et al., 2010; Smithson & Collares, 2007). An important difference between this subsample and samples in other predictive studies such as the ones in Kurz et al. (2010) is the sample's sensitization to their daily instructional practices. That is, teachers in this study reviewed their daily instruction several times a week for up to eight months prior to taking the SEC's annual survey. However, the extent to which this sensitization increased or decreased the accuracy with which teachers were completing the SEC's annual survey is unclear.

Three class-based OTL indices showed statistically significant relations with class achievement: *Time on Standards*, the *Cognitive Process Score*, and the *Grouping Format Score*. First, the average amount of minutes per day dedicated to the state-specific standards had a positive relation with class achievement with a medium effect size. Second, a greater emphasis on high-order thinking skills correlated positively with class achievement also with a medium effect size. Third, a greater emphasis on small group and individual grouping formats correlated negatively with class achievement with a medium negative effect size. The latter finding is also surprising given prior research indicating a positive relation between achievement and grouping formats other than whole class (e.g., Elbaum et al., 2000). In addition, this finding cannot be attributed to class type—the prevalence of alternative grouping formats in special education classroom, which may further coincide with lower academic achievement—because the Arizona subsample was entirely comprised of general education classrooms.

In summary, the current analyses could not be used to substantiate convergent validity between the SEC AI and the MyiLOGS OTL indices. To do so, further research, properly powered to detect the hypothesized relations, is needed. With respect to the predictive validity of two class-based OTL indices—*Time on Standards* and the *Cognitive Process Score*—evidence was found to support their relation to class achievement.

Question 4: What Are the Relations Between Student-Based OTL Indices and Student Achievement?

Based on the available data, I examined the relation between student-based OTL indices and individual student achievement for the Arizona subsample (N = 32). To this end, I applied several multiple regression models predicting current student achievement and three sets of time, content, and quality-related OTL indices. Without controlling for prior achievement, instructional time on custom skill/activities (*Time on Custom*) was the only student-based OTL index that exhibited a positive relation with student achievement accounting for about 24% of the variance. This finding is surprising in the context of a non-significant finding for *Time on Standards*. That is, one would expect that more instructional time on the state-specific standards be related to higher achievement based on an assessment that covers those standards—rather than an index related to instructional time on objectives/activities outside the standards. However, as noted previously, many teachers logged review activities and technology-based elements of their lesson under *Time on Custom*. As such, it is very likely that *Time on Custom* reflected *additional* time on standards-based instruction rather than instructional time unrelated to the general curriculum standards.

None of the student-based OTL indices in the various models were significant predictors above and beyond students' prior achievement. An exploratory analysis using three models of student-based OTL quality indices for the various cognitive processes, instructional practices, and grouping formats indicated a statistically significant relation with student achievement for two instructional practices, *Elicited Think Aloud* and *Used Independent Practice*, as well as the *Whole Class* grouping format.

Major Findings and Prior Research

Prior to summarizing the major findings of this study, it is important to situate these findings in the context of overall data quality. The evidence collected to support the quality of this data set substantiated the following: (a) teachers can be trained to criterion within 4-hour to report reliably on various OTL indices based on instructional scenarios at the class and student level; (b) teachers can be supported to maintain high procedural fidelity logging various OTL indices at the class and student level across the duration of a school year; and (c) teachers' concurrent log data provided a valid account of their classroom instruction based on agreement percentages between teachers and independent observers. It should be noted, however, that the teacher-observer agreement percentages were calculated on a fine grain level requiring agreement within a 3-min range between teachers and observers based on minutes observed according to (a) cognitive processes per standard/objective and (b) instructional practices per grouping format. As such, any misalignment in observed minutes due to differences in observed allocated time, non-instructional minutes, and so on negatively affected the cell-by-cell agreement. The results of the classroom observations indicated that two independent observers were able to achieve high agreements across both observation categories and that teachers and observers generally had lower agreements for cognitive processes than instructional practices. In the context of prior validity research where teacher logs were used (Camburn & Barnes, 2004), the agreement percentage between observers ranged between 52% and 90% with an average agreement of 66%. In the current study, the overall agreement percentages between observers ranged between 67% and 100% with an average agreement of 93%. Camburn and Barnes further reported agreement percentages between teachers and observers, which ranged between 37% and 75% with an average agreement of 52%. In current study, the overall agreement percentages between teachers and observers ranged between 55% and 100% with an average agreement of 77%. Although differences in the observation system do not permit a direct comparison of the agreement percentages, the current findings do support the conclusion that the collected teacher self-report data provided a valid account of their classroom instruction.

The major findings of the study are threefold: (a) students' opportunity to learn the intended curriculum is highly variable even within the same state and subject; (b) opportunity to learn the intended curriculum for students with disabilities presents itself as differentiated opportunity structure that differs from the overall class; and (c) initial evidence for the predictive validity of several class-based OTL indices as measured by MyiLOGS has been substantiated. The majority of findings of this study are unique, because no investigator has previously reported a study where OTL data were continuously collected and analyzed along all three instructional dimensions—time, content, and quality—at the class and student level for a large portion of the school year. As such, no prior published research could be found to place the current findings into context. The first major finding underscored the considerable amount of variation that exists in OT, both between class types (general education classes vs. special education classes) and within class types (class vs. student). In addition, the descriptive data set provided a first snapshot of OTL data based on a limited three-state sample. As such, these initial data suggest that teachers spent about two-thirds of their allocated class time on teaching the academic standards of the general curriculum, another fourth on custom skills/activities, and about one twentieth not available for instruction. In addition, teachers covered approximately two-thirds of the academic standards based on an average of about 151 school days. Moreover, teachers of this sample generally emphasized *Understand/Apply* expectations as well as *Independent Practice* during their instruction. An examination of class-based OTL indices by class type further indicated a greater emphasis on higher-order thinking skills in general education classrooms than in special education classrooms. Lastly, the large variability in OTL underscores the value of the applied methodology for purposes of establishing generalizability. That is, measurement of OTL via tools such as MyiLOGS allows for large-scale data collection across an entire school year, which can generate a far greater number of data points than alternatives such as direct observation.

A second major finding of this study was that OTL is a differentiated opportunity structure for students with disabilities. That is, teachers' OTL provision differed for the class and individual students nested within the class. Comparisons in the context of class type indicated that differences in OTL between the class and student level were most pronounced in general education classrooms. Based on this sample's general education classrooms, students with disabilities experienced less *Time on Standards*, more *Non-Instructional Time*, and less *Content Coverage* than their classmates. These findings do not support a commonly held assumption in OTL research, namely that class-based OTL indices are sufficient for describing OTL for all students nested within that class. At least for students with disabilities, OTL appears to be a differentiated opportunity structure. Moreover, the instructional differences do not indicate equal or equitable OTL provisions for students with disabilities. Given their disability-related characteristics, students with disabilities may need at least as much OTL, if not more, than their peers without disabilities. However, the current findings suggest the exact opposite.

The final major finding is related to evidence of predictive validity for three class-based OTL indices: *Time on Standards*, the *Cognitive Process Score,* and the *Grouping Format Score*. In addition, student-based OTL indices such as *Time on Custom* as well as time emphases related to two instructional practices and a grouping format were related to student achievement. Given the sample size, these finding are promising yet require replication with a larger sample for further corroboration. The current findings based on student-specific OTL indices when controlling for prior achievement, however, did not substantiate a statistically significant relation between these student-based OTL indices and individual student achievement.

Limitations

In general, the study's results were based on a relatively small volunteer sample across states, subject areas, and class types. As such, these initial OTL results lack generalizability. In addition, the missing achievement data from the states of Pennsylvania and South Carolina significantly limited the predictive findings related to student achievement.

The study findings are also subject to limitations due to several unconfirmed assumptions and methodological challenges. With respect to assumptions, the following ones remain unconfirmed: (a) the state tests used for determining the relation between OTL and achievement were aligned with the state-specific standards and exhibited instructional sensitivity; and (b) the intended curriculum for students with disabilities was congruent with the general curriculum standards applicable to students without disabilities. A violation of the first assumption related to alignment could have led to underestimation of the relation between the various OTL indices and student achievement. Given that most OTL indices in this study were based on the state-specific general curriculum standards, a strong relation between these indices and achievement cannot be expected, if the respective state tests are not well aligned with the standards used to determine OTL. In addition, we have no evidence of instructional sensitivity for the respective state tests. That is, the extent to which the state assessments were sensitive to differences in instruction remains unclear. Low instructional sensitivity could result in test scores that cannot fully reflect differences in OTL. Consequently, the presumed relation between OTL and achievement could be underestimated.

A violation of the second assumption could limit the extent to which the findings' conclusion are related to students' opportunity to learn the *intended curriculum*. As discussed in the Introduction, the intended curriculum for students with disabilities is dually determined by both the general curriculum and additional IEP objectives. The current conclusion based on students' opportunity to learn the intended curriculum assumes that teachers accurately logged all applicable IEP objectives. Based on the current results, it appears that students' intended curriculum overlapped entirely with the general curriculum standards. Given that students in the participating states were expected to have standards-based IEPs this assumption is logical, but was never directly confirmed through an actual review of the target students' IEPs. The findings therefore may underrepresent students' intended curricula. In other words, the current findings may be a more accurate description of students' opportunity to learn the *general curriculum*.

A final limitation stems for two methodological challenges related to the observation system. Given the possibility that a teacher can address all cognitive processes and instructional practices in one lesson, the observation protocol allowed any categories that were neither reported by the teacher nor observed by the observer to be counted as an agreement. This convention may have contributed to inflated agreement percentages in certain cases. A second methodological challenge of the observation system was the varying cell sizes by which agreement percentages were calculated. Depending on the number of standards/objectives per lesson, the possible number of agreements/disagreements varied from teacher to teacher. This prevented the application of alternative agreement statistics such a Kappa, which could have accounted for chance agreement.

Implications for Practice and Future Research

A major implication for both practice and research lies in the development of the applied OTL measurement tool, MyiLOGS, which was used successfully to collect data on a range of OTL indices related to time, content, and quality. Specifically, I provided evidence to support the feasibility, usability, and promise of MyiLOGS and its training and follow-up procedures for measuring OTL at class and student level. As such, large-scale research on OTL including normative studies as well as subgroup-specific investigations can be launched.

Secondly, the findings raise concerns that students with disabilities may not receive adequate OTL along several instructional dimensions. These concerns are particularly applicable to students with disabilities nested in general education classrooms. Additional OTL research is necessary to determine the OTL provision for students with disabilities in various instructional settings, especially given their federally mandated access to the general curriculum and their inclusion in test-based accountability. The current findings provide some evidence for the so-called "OTL gap" (Abedi et al., 2009), which has been suggested to exist for certain student subgroups. That is, certain students may receive less OTL than others as a function of belonging to a certain subgroup (e.g., students with disabilities, ELL). In this study, students with disabilities taught in general education classrooms experienced significantly less OTL along all three OTL dimensions on a daily basis. More large-scale research is needed to determine the extent to which these “gaps” are systemic and “why” these gaps are occurring. Currently, we do not know why these students with disabilities received less instructional time and content coverage of the academic standards and why they experienced more non-instructional time than their classmates. Moreover, the extent to which additional instructional scenarios affect the provision of OTL remains unclear. That is, this study only examined two scenarios, namely the subject-specific content delivery in either a general education classroom or a special education classroom. So-called *additive scenarios* delineated earlier (Table 3) such as full inclusion plus additional pullout sessions were not examined in this study. Lastly, additional research is needed on the OTL dimension related to quality. The selection of quality indices in this study was limited and could be refined through additional instructional practices, a set of practices specific to certain subject areas and grade spans, as well as other important quality aspects such as technology usage.

A second implication for practice lies in the remediation of potential OTL gaps through the development of teacher-level interventions. The findings of this study have demonstrated feasibility, usability, and promise of using an online technology such as MyiLOGS for purposes of concurrent teacher logging of OTL indices at the class and student level. Therefore, the collected data can be used to provide teachers with ongoing feedback about aspects of their classroom instruction. Given the established effects of self-recording and self-monitoring on behavior change (Gresham & Elliott, 1991; Elliott & Gresham, 2008), the recording and review of one’s personal OTL data have the potential to induce change—especially if considered in the context of instructional coaching. The evaluation of various teacher interventions affecting malleable factors of instruction such as instructional time on standards, non-instructional time, and content coverage seems to be an important area for future research. In addition, a tool like MyiLOGS provides a unique opportunity for multiple teachers to collaborate on shared instructional provisions for certain classes or students. That is, collaboration, coordination, and communication could occur based on instructional data collected on an ongoing basis throughout the school year. Future research on the formative aspects of OTL, especially in conjunction with student outcomes data, appears to be particularly salient, because it would allow teachers to use data on instructional inputs, processes, and outcomes for informing instruction.

A third implication for practice concerns the validity of test score interpretations used to determine student achievement as a consequence of instruction. Given the evidence that OTL is a differentiated opportunity structure, student achievement data are confounded by varying "dosages" of OTL related to intended and ultimately assessed curricula. That is, a student's poor test performance can be due to, or in spite of, having had the opportunity to learn the intended and hence assessed curriculum. If test score inferences go beyond what students know and are able to do and include interpretations that seek to attribute student achievement to adequate or effective instruction, then additional evidence to support the validity of those interpretations is recommended. Specifically, the use of student-level OTL indicators collected via self-report tools such as MyiLOGS could be used to ascertain more directly and validly the instructional provisions of teachers. However, the methodology used in this study was applied outside a high-stakes context by a volunteer sample that received monetary compensation for participation. The extent to which high-stakes, for example, may corrupt self-report data and/or decrease the agreement between teachers and observers remains to be examined.

Conclusion

This study was designed to develop an OTL measurement tool that teachers could use to reliably capture OTL data on instructional time, content, and quality at the enacted curriculum level both for the overall class and individual students. As such, the main research goal was the quantification of students' opportunity to learn the intended curriculum for individuals with disabilities. The applied methodology underlying MyiLOGS was an extension of teacher logs via an online technology that provided teachers a self-report structure for logging key OTL indices concurrent with their daily instruction. The study rationales were grounded in compliance with federal legislation mandating students' access to the general curriculum as well as concerns for the validity of certain test score inferences. In addition, several research studies related to special education and students with disabilities have provided findings suggesting limited use of allocated time for instruction, low exposure to standards-aligned content, and inconsistent use of evidence-based practices.

Based on the study's three-state sample at the eight-grade level, the results provided evidence that MyiLOGS could be used effectively by teachers to collect OTL data, which substantiated that students with disabilities in this sample received less instructional time and content coverage related to the state-specific standards compared to their classmates, while also experiencing more non-instructional time than their peers. The latter finding can be further qualified by stating that these "OTL gaps" were most pronounced for students with disabilities in general education classrooms. The current results thus support the hypothesis that OTL is a differentiated opportunity structure for students with disabilities. The results of this study further provided an initial data set delineating OTL for MA and ELA teachers at the eight-grade level, which established that teachers in this study spent about two-thirds of their allocated class time on instructing the standards, about one fourth on custom skills/activities, and about one twentieth not available for instruction. In addition, teachers covered approximately two-thirds of the academic standards during an average of about 151 school days.

These findings, among others, led to the following conclusions: (a) teachers can be trained to report reliably on various OTL indices that provide a valid account of classroom instruction as supported by third party observations; (b) the applied online technology based on a concurrent teacher log model, MyiLOGS, offered teachers a feasible and usable way for collecting OTL data at the class and student level on an ongoing basis across the school year; (c) the resulting system shows promise for a large-scale collection of OTL data; (d) future OTL research is needed to confirm OTL as a differentiated opportunity structure for additional subgroups (e.g., ELL students) and to establish further validity evidence for the collected indices; and (e) additional studies focused on the evaluation of teacher-level interventions are needed to address malleable aspects of OTL.

The concept of OTL has intrigued researchers for decades and its relevance in the context of test-based accountability and the equitable delivery of educational opportunities has been noted frequently (e.g., Darling-Hammond, 1993; Guiton & Burstein, 1993; Hall, Jaeger, Kearney, & Wiley, 1985; Wang, 1998; Kurz, 2011).

However, as acknowledged in many of these studies, researchers have struggled to operationalize the concept and develop a measurement system that allows teachers to provide ongoing information on aspects of instruction related to time, content, and quality at the class and student level. This study established the theoretical, empirical, and methodological groundwork for further, systematic and large-scale investigations of OTL. Many important questions regarding OTL and the instructional lives of teachers and their students can now be examined more efficiently and reliably. Moreover, future studies of OTL and the potential development of teacher interventions based on the application of tools like MyiLOGS are expected to contribute to the enhancement of instruction for all students.

FOOTNOTES

[1]This section is an adapted excerpt from a previously published chapter. Please refer to original source for citation purposes:

> Kurz, A. (2011). Access to what should be taught and will be tested: Students' opportunity to learn the intended curriculum. In S. N. Elliott, R. J. Kettler, P. A. Beddow, & A. Kurz (Eds.), *The handbook of accessible achievement tests for all students: Bridging the gaps between research, practice, and policy*. New York: Springer.

[2]The Modified Alternate Assessment Participation Screening (MAAPS) project addresses federal regulations, which note that participation in alternate assessments based on modified achievement standards (AA-MAS) is, in part, dependent on a student's failure to reach grade-level proficiency despite access to "appropriate instruction" (U.S. Department of Education, 2007). In the context of MAAPS, the concept of OTL is used to circumscribe appropriate instruction and its measurement is intended to support IEP teams in a data-driven placement decision.

APPENDICES

Appendix A: SEC Content Surveys

Council of Chief State School Officers
Wisconsin Center for Education Research

SURVEYS OF ENACTED CURRICULUM©

Survey Of Instructional Content
Teacher Survey
Grades K-12
Mathematics

The following pages request information regarding topic coverage and your expectations for students in the target mathematics class **for the most recent school year (current year if reporting after March 1st).** The content matrix that follows contains lists of discrete topics associated with mathematics instruction. The categories and the level of specificity are intended to gather information about content across a wide variety of programs. It is not intended to reflect any recommended or prescribed content for the grade level and may or may not be reflective of your local curriculum.

Please read the instructions on the next two pages carefully before proceeding.

Expectations for Students in Mathematics

Memorize Facts/Definitions/ Formulas

- Recite basic mathematics facts
- Recall mathematics terms and definitions
- Recall formulas and computational procedures

Perform Procedures

- Use numbers to count, order, or denote
- Do computational procedures or algorithms
- Follow procedures or instructions
- Solve equations, formula, androutine word problems
- Organize or display data
- Read or produce graphs and tables
- Execute geometric constructions

Demonstrate Understanding of Mathematical Ideas

- Communicate mathematical ideas
- Use representations to model mathematical ideas
- Explain findings and results from data analysis strategies
- Develop and explain relationships between concepts
- Show or explain relationships between models, diagrams, and/or other representations

Conjecture/Generalize/Prove

- Determine the truth of a mathematical pattern or proposition
- Write formal or informal proofs
- Recognize, generate, or create patterns
- Find a mathematical rule to generate a pattern or number sequence
- Make and investigate mathematical conjectures
- Identify faulty arguments or misrepresentations of data
- Reason inductively or deductively

Solve Non-Routine Problems/ Make Connections

- Apply and adapt a variety of appropriate strategies to solve non-routine problems
- Apply mathematics in contexts outside of mathematics
- Analyze data and recognize patterns
- Synthesize content and ideas from several sources

Response Codes
Time on Topic

0 = None
(Not covered)
1 = Slight coverage
(Less than one class/lesson)
2 = Moderate coverage
(One to five classes/lessons)
3 = Sustained coverage
(More than five classes/lessons)

Response Codes
Expectations for Students

0 = No emphasis
(Not a performance goal for this topic)
1 = Slight emphasis
(Less than 25% of time on this topic)
2 = Moderate emphasis
(25% to 33% of time on this topic)
3 = Sustained emphasis
(More than 33% of time on this topic)

Time on Topic		Grades K-12 Mathematics Topics	Expectations for Students in Mathematics				
<none>	1	**Number Sense/Properties/Relationships**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	101	Place value	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	102	Whole numbers and integers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	103	Operations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	104	Fractions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	105	Decimals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	106	Percents	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	107	Ratios and proportions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	108	Patterns	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	109	Real and/or rational numbers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	110	Exponents and scientific notation	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	111	Factors, multiples, and divisibility	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	112	Odd/even/prime/composite/square numbers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	113	Estimation	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	114	Number comparisons (e.g., order, magnitude, relative size, inverse, opposites, equivalent forms, scale, or number line)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	115	Order of operations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	116	Computational algorithms	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	117	Relationships between operations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	118	Number theory (e.g., base-ten and non-base-ten systems)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	119	Mathematical properties (e.g., distr. property)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	2	**Operations**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	201	Add/subtract whole numbers and integers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	202	Multiply whole numbers and integers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	203	Divide whole numbers and integers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	204	Combinations of operations on whole numbers or integers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	205	Equivalent and non-equivalent fractions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	206	Add/subtract fractions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	207	Multiply fractions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	208	Divide fractions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	209	Combinations of operations on fractions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	210	Ratio and proportion	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	211	Representations of fractions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	212	Equivalence of decimals, fractions, and percents	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	213	Add/subtract decimals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	214	Multiply decimals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	215	Divide decimals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	216	Combinations of operations on decimals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	217	Computing with percents	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	218	Computing with exponents and radicals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③

Time on Topic		Grades K-12 Mathematics Topics	Expectations for Students in Mathematics				
<none>	3	**Measurement**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	301	Use of measuring instruments	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	302	Theory (e.g., arbitrary, standard units, and unit size)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	303	Conversions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	304	Metric (SI) system	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	305	Length and perimeter	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	306	Area and volume	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	307	Surface area	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	308	Direction, location, and navigation	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	309	Angles	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	310	Circles (e.g., *pi* , radius, and area)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	311	Mass (weight)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	312	Time and temperature	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	313	Money	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	314	Derived measures (e.g., rate and speed)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	315	Calendar	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	316	Accuracy and precision	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	4	**Consumer Applications**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	401	Simple interest	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	402	Compound interest	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	403	Rates (e.g., discount and commission)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	404	Spreadsheets	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	5	**Basic Algebra**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	501	Absolute value	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	502	Use of variables	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	503	Evaluation of formulas, expressions, and equations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	504	One-step equations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	505	Coordinate planes	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	506	Patterns	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	507	Multi-step equations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	508	Inequalities	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	509	Linear and non-linear relations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	510	Rate of change/slope/line	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	511	Operations on polynomials	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	512	Factoring	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	513	Square roots and radicals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	514	Operations on radicals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	515	Rational expressions	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	516	Multiple representations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③

Time on Topic		***Grades K-12 Mathematics Topics***	***Expectations for Students in Mathematics***				
<none>	6	**Advanced Algebra**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	601	Quadratic equations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	602	Systems of equations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	603	Systems of inequalities	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	604	Compound inequalities	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	605	Matrices and determinants	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	606	Conic sections	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	607	Rational, negative exponents, or radicals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	608	Rules for exponents	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	609	Complex numbers	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	610	Binomial theorem	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	611	Factor/remainder theorem	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	612	Field properties of real number system	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	613	Multiple representations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	7	**Geometric Concepts**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	701	Basic terminology	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	702	Points, lines, rays, segments, and vectors	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	703	Patterns	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	704	Congruence	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	705	Similarity	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	706	Parallels	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	707	Triangles	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	708	Quadrilaterals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	709	Circles	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	710	Angles	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	711	Polygons	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	712	Polyhedra	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	713	Models	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	714	3-D Relationships	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	715	Symmetry	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	716	Transformations (e.g., flips or turns)	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	717	Pythagorean Theorem	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③

Time on Topic		*Grades K-12 Mathematics Topics*	*Expectations for Students in Mathematics*				
<none>	8	**Advanced Geometry**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	801	Logic, reasoning, and proofs	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	802	Loci	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	803	Spheres, cones, and cylinders	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	804	Coordinate Geometry	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	805	Vectors	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	806	Analytic Geometry	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	807	Non-Euclidean Geometry	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	808	Topology	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	9	**Data Displays**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	901	Summarize data in a table or graph	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	902	Bar graphs and histograms	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	903	Pie charts and circle graphs	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	904	Pictographs	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	905	Line graphs	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	906	Stem and leaf plots	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	907	Scatter plots	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	908	Box plots	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	909	Line plots	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	910	Classification and Venn diagrams	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	911	Tree diagrams	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	10	**Statistics**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	1001	Mean, median, and mode	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1002	Variability, standard deviation, and range	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1003	Line of best fit	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1004	Quartiles and percentiles	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1005	Bivariate distribution	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1006	Confidence intervals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1007	Correlation	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1008	Hypothesis testing	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1009	Chi-square	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1010	Data transformation	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1011	Central Limit Theorem	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③

Time on Topic		Grades K-12 Mathematics Topics	Expectations for Students in Mathematics				
<none>	**11**	**Probability**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	1101	Simple probability	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1102	Compound probability	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1103	Conditional probability	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1104	Empirical probability	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1105	Sampling and sample spaces	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1106	Independent vs. dependent events	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1107	Expected value	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1108	Binomial distribution	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1109	Normal curve	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	**12**	**Analysis**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	1201	Sequences and series	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1202	Limits	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1203	Continuity	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1204	Rates of change	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1205	Maxima, minima, and range	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1206	Differentiation	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1207	Integration	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	**13**	**Trigonometry**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	1301	Basic ratios	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1302	Radian measure	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1303	Right-triangle trigonometry	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1304	Law of Sines and Cosines	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1305	Identities	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1306	Trigonometric equations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1307	Polar coordinates	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1308	Periodicity	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1309	Amplitude	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③

Time on Topic		*Grades K-12 Mathematics Topics*	*Expectations for Students in Mathematics*				
<none>	14	**Special Topics**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	1401	Sets	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1402	Logic	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1403	Mathematical induction	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1404	Linear programming	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1405	Networks	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1406	Iteration and recursion	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1407	Permutation combinations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1408	Simulations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1409	Fractals	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	15	**Functions**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	1501	Notation	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1502	Relations	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1503	Linear	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1504	Quadratic	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1505	Polynomial	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1506	Rational	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1507	Logarithmic	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1508	Exponential	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1509	Trigonometric and circular	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1510	Inverse	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1511	Composition	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
<none>	16	**Instructional Technology**	**Memorize Facts/ Definitions/ Formulas**	**Perform Procedures**	**Demonstrate Understanding of Mathematical Ideas**	**Conjecture/ Generalize/ Prove**	**Solve Non-Routine Problems/Make Connections**
⓪ ① ② ③	1601	Use of calculators	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1602	Use of graphing calculators	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1603	Use of computers and the internet	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1604	Computer programming	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③
⓪ ① ② ③	1605	Use of spreadsheets	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③	⓪ ① ② ③

Thank you for your participation in this survey.

Council of Chief State School Officers
Wisconsin Center for Education Research
Learning Point Associates

SURVEYS OF ENACTED CURRICULUM©

Survey Of Instructional Content
Teacher Survey
Grades K-12
English, Language Arts, and Reading

The following pages request information regarding topic coverage and your expectations for students in the target English, language arts, and reading class for **the most recent school year (current year if reporting after March 1st)**. The content matrix that follows contains lists of discrete topics associated with English, language arts, and reading instruction. The categories and the level of specificity are intended to gather information about content across a wide variety of programs. It is not intended to reflect any recommended or prescribed content for the grade level and may or may not be reflective of your local curriculum.

Please read the instructions on the next two pages carefully before proceeding.

Expectations for Students in English, Language Arts, and Reading

Memorize/Recall
Provide facts, terms, definitions, conventions
Describe
Locate literal answers in text
Identify relevant information
Reproduce sounds or words

Perform Procedures/Explain
Follow instructions
Give examples
Summarize
Identify purpose, main ideas, organizational patterns
Check consistency
Gather Information

Generate/Create/Demonstrate
Dramatize
Express new ideas (or express ideas in new ways)
Create/develop connections among text, self, world
Integrate with other topics and subjects
Develop reasonable alternatives
Order, group, outline, organize ideas
Recognize relationships

Analyze/Investigate
Categorize, schematize information
Distinguish fact and opinion
Make inferences, draw conclusions
Predict probable consequences
Compare and contrast
Identify with another's point of view

Evaluate
Determine relevance, coherence, internal consistency, logic
Test conclusions, hypotheses
Critique
Assess adequacy, appropriateness, credibility
Synthesize content and ideas from several sources
Generalize

Response Codes
Time on Topic

0 = None
(Not covered)
1 = Slight coverage
(Less than one class/lesson)
2 = Moderate coverage
(One to five classes/lessons)
3 = Sustained coverage
(More than five classes/lessons)

Response Codes
Expectations for Students

0 = No emphasis
(Not a performance goal for this topic)
1 = Slight emphasis
(Less than 25% of time on this topic)
2 = Moderate emphasis
(25% to 33% of time on this topic)
3 = Sustained emphasis
(More than 33% of time on this topic)

Time on Topic		Reading					Expectations for Students in English/Language Arts/Reading
<none>	1	**Phonemic awareness**	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	101	Phoneme isolation (e.g., the distinct sounds /c/, /a/, and /t/)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	102	Phoneme blending (e.g., c/a/t=cat)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	103	Phoneme segmentation	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	104	Onset-rime	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	105	Sound patterns	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	106	Rhyme recognition	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	107	Phoneme deletion, substitution, and addition	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	108	Identification of syllables	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
<none>	2	**Phonics**	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	201	Alphabetic principle (includes alphabet recognition and order)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	202	Consonants	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	203	Consonant blends	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	204	Consonant digraphs (e.g., ch, sh, th, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	205	Diphthongs (e.g., oi, ou, ow, oy [as in "boy"], etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	206	R-controlled vowels (e.g., farm, torn, turn, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	207	Patterns within words	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	208	Vowel letters (a, e, i, o, u, y)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	209	Vowel phonemes (15 sounds)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	210	Sound and symbol relationships	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	211	Blending sounds	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
<none>	3	**Vocabulary**	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	301	Compound words and contractions	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	302	Inflectional forms (e.g., -s, -ed, and -ing)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	303	Suffixes, prefixes, and root words	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	304	Word definitions (including new vocabulary)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	305	Word origins	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	306	Synonyms, antonyms, and homonyms	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	307	Word or phrase meaning from context	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	308	Denotation and connotation	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	309	Analogies	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	310	Sight words	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	311	Use of references	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
<none>	4	**Text and print features**	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	401	Book handling	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	402	Directionality; sequence of text	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	403	Parts of a book (e.g., cover, title, front, and back)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	404	Letter, word, and sentence distinctions	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	405	Structural elements (e.g., index, glossary, table of contents, subtitles, and headings)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	406	Graphical elements (e.g., graphs, charts, images, illustrations)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	407	Technical elements (e.g., bullets, instructions, forms, sidebars)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	408	Electronic elements (e.g., hypertext links, animations,etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	409	Environmental print, i.e., prints or symbols found in students' everyday environment	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③

Time on Topic **Reading** **(continued)** ***Expectations for Students in English/ Language Arts/Reading***

Time on Topic	#	Topic	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
<none>	5	**Fluency**	**Memorize/ Recall**	**Perform Procedures/ Explain**	**Generate/ Create/ Demonstrate**	**Analyze/ Investigate**	**Evaluate**
⓪①②③	501	Prosody (e.g., phrasing, intonation, and inflection)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	502	Automaticity of words and phrases (e.g., sight and decodable words)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	503	Speed and pace	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	504	Accuracy	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	505	Independent reading (e.g., repeated/silent reading for fluency)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
<none>	6	**Comprehension**	**Memorize/ Recall**	**Perform Procedures/ Explain**	**Generate/ Create/ Demonstrate**	**Analyze/ Investigate**	**Evaluate**
⓪①②③	601	Word meaning from context	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	602	Phrase	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	603	Sentence	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	604	Paragraph	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	605	Main idea(s), key concepts, and sequences of events	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	606	Descriptive elements (e.g., detail, color, and condition)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	607	Narrative elements (e.g., events, characters, setting, and plot)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	608	Persuasive elements (e.g., propaganda, advertisement, and emotional appeal)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	609	Expository or informational elements (e.g., explanation, lists, and organizational patterns such as description, cause-effect, and compare-contrast)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	610	Technical elements (e.g., bullets, instruction, form, sidebars)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	611	Electronic elements (e.g., hypertext links, animations, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	612	Strategies (e.g., activating prior knowledge, questioning; making connections, predictions; inference, imagery, summarization, re-telling)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	613	Self-correction strategies (e.g., monitoring, cueing systems, and fix-up)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	614	Metacognitive processes (i.e., reflecting about one's thinking)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	615	Interpret maps, graphs, and charts	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	616	Test-taking strategies	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
<none>	7	**Critical Reasoning**	**Memorize/ Recall**	**Perform Procedures/ Explain**	**Generate/ Create/ Demonstrate**	**Analyze/ Investigate**	**Evaluate**
⓪①②③	701	Fact and opinion	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	702	Appealing to authority, reason, or emotion	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	703	Validity and significance of assertion or argument	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	704	Relationships among purpose, organization, format, and meaning in text	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	705	Author's assumptions or bias	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	706	Comparison of topic, theme, treatment, scope, or organization across texts	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	707	Inductive/deductive approaches (e.g., making inferences and drawing conclusions from texts)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	708	Logical reasoning in text (e.g., implications, authors' rationale, development of argument, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	709	Textual evidence and/or use of references to support position	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	710	Drawing meaning from allegory and myth	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	711	Distinguishing real from fantastical events in literature	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③

Time on Topic **Reading (continued)** ***Expectations for Students in English/Language Arts/Reading***

<none>	8	**Author's Craft**	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	801	Theme/thesis	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	802	Purpose (e.g., to inform, perform, critique, or appreciate)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	803	Characteristics of genres and forms	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	804	Point of view (e.g., first or third person, multiple perspectives, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	805	Literary devices (e.g., analogy, simile, metaphor, hyperbole, flashbacks, structure, and archetypes)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	806	Literary analysis (e.g. symbolism, voice, style, tone, and mood)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	807	Influence of time and place on authors and texts (e.g., historical era or culture)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	808	Aesthetic aspects of text (e.g. dramatic or poetic elements)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③

Time on Topic **Writing** ***Expectations for Students in English/Language Arts/Reading***

<none>	9	**Writing Processes**	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	901	Printing, cursive writing, and penmanship	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	902	Pre-writing (e.g., essential questions, topic selection, brainstorming, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	903	Drafting and revising	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	904	Editing for conventions (e.g., usage, spelling, and structure)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	905	Manuscript conventions (e.g., indenting, margins, citations, references, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	906	Final draft and publishing	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	907	Use of technology (e.g., word processing, multimedia, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
<none>	10	**Elements of Presentation (Verbal and Written)**	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	1001	Purpose, audience, and context	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1002	Main ideas	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1003	Organization	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1004	Word choice	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1005	Support and elaboration	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1006	Style, voice, technique, and use of figurative language	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1007	Writing Conventions (e.g., capitalization, punctuation, indentation, citation, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1008	Transitional Devices	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
<none>	11	**Writing Applications**	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	1101	Narrative (e.g., stories, fiction, and plays)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1102	Poetry	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1103	Expository (e.g., report, theme, essay, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1104	Critical/evaluative (e.g., review)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1105	Expressive (e.g., journals or reflections)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1106	Persuasive (e.g., editorial, advertisement, or argumentative)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1107	Procedural (e.g., instructions, brochure, lab report, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1108	Technical (e.g., manuals, specifications, research report, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1109	Real world applications of writing (e.g., resumes, letters to editor, note taking, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③

Time on Topic Language Study

Expectations for Students in English/Language Arts/Reading

<none>	12	Language Study	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	1201	Syllabication	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1202	Spelling	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1203	Capitalization and punctuation	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1204	Signs and symbols (e.g., semiotics)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1205	Syntax and sentence structure	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1206	Grammatical analysis	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1207	Standard and non-standard language usage	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1208	Linguistic knowledge (including dialects and diverse forms)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1209	History of language	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1210	Relationships of language forms, contexts, and purposes (e.g., rhetoric and semantics)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1211	Effects of race, gender, or ethnicity on language & language use	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③

Time on Topic Oral Communication

Expectations for Students in English/Language Arts/Reading

<none>	13	Listening and Viewing	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	1301	Listening	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1302	Viewing	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1303	Nonverbal communication	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1304	Consideration of others' ideas	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1305	Similarities/differences among print, graphic, and nonprint communications	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1306	Literal and connotative meanings	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1307	Diction, tone, syntax, convention, or rhetorical structure in speech	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1308	Media-supported communication	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③

<none>	14	Speaking and Presenting	Memorize/ Recall	Perform Procedures/ Explain	Generate/ Create/ Demonstrate	Analyze/ Investigate	Evaluate
⓪①②③	1401	Public speaking and oral presentation	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1402	Diction, tone, syntax, conventions, and rhetorical structure in speech	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1403	Demonstrating confidence	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1404	Effective nonverbal skills (e.g., gesture, eye contac, etc.)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1405	Knowledge of situational and cultural norms for expression	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1406	Conversation and discussion (e.g., Socratic seminars, literature circles, and peer discussion)	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1407	Debate and structure of argument	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1408	Dramatics, creative interpretation	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1409	Media-supported communication	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1410	Selecting presentation format	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③
⓪①②③	1411	Interviewing	⓪①②③	⓪①②③	⓪①②③	⓪①②③	⓪①②③

NOTE: On this page, please mark only the amount of time you use any of these sources of textual material, using the same codes as the prior pages. There is no need to code expectations for students.

Time on Topic		**Instructional Sources**
<none>	15	**Forms of Text**
⓪①②③	1501	Myths, tales, fables, or epics
⓪①②③	1502	Short stories
⓪①②③	1503	Novels (including chapter books)
⓪①②③	1504	Picture books
⓪①②③	1505	Drama
⓪①②③	1506	Poetry
⓪①②③	1507	Public documents
⓪①②③	1508	Consumer, technical, and business writing (e.g., manuals, how-to texts, ads, memos)
⓪①②③	1509	Newspaper or magazine articles
⓪①②③	1510	Speeches
⓪①②③	1511	Essays
⓪①②③	1512	Criticism and commentary
⓪①②③	1513	Historical accounts
⓪①②③	1514	Biography and autobiography
⓪①②③	1515	Content area materials
<none>	16	**Genre** (fiction or non-fiction)
⓪①②③	1601	Traditional literature
⓪①②③	1602	Contemporary literature
⓪①②③	1603	Multicultural literature
<none>	17	**Sources of Text**
⓪①②③	1701	Basal readers
⓪①②③	1702	Anthologies
⓪①②③	1703	"Leveled" books
⓪①②③	1704	Textbooks
⓪①②③	1705	Children's trade books
⓪①②③	1706	Young adult trade books
⓪①②③	1707	Other supplementary texts
⓪①②③	1708	Periodicals
⓪①②③	1709	Non-print media
<none>	18	**Choice**
⓪①②③	1801	Teacher assigned
⓪①②③	1802	Class or group choice
⓪①②③	1803	Individual student choice

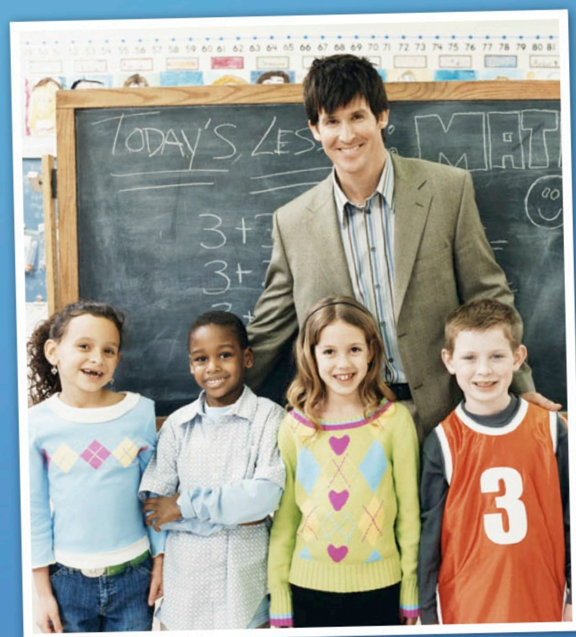
END OF SURVEY

Thank you for your participation!

Appendix B: MyiLOGS Training Materials

My iLOGS™

instructional LEARNING OPPORTUNITIES GUIDANCE SYSTEM



TEACHER'S MANUAL

Part 1:
Set-up, Instructions, & FAQ

INSTRUCTIONS FOR MYILOGS:

I. Go to: http://myilogs.com/

II. Login:

1. Enter your username.
2. Enter your password.
3. Click on "**Log in**".

III. Initial Set-up:

1. Start by completing the "**Teacher Profile**".

Your last login was on Tuesday, September 21st, 2010 at 09:32:14 AM.

Welcome, Demo AZ Teacher!

From here, you can plan classes using the calendar links below, create and edit classes using the Manage Classes link, or logout.

- Calendars
  - Gr 6 MA Class DEMO
  - Gr 7 MA Class DEMO
  - New Kurz Gr 7 Math Class DEMO
  - New Kurz Gr 8 Math Class DEMO
  - Training Kurz Gr 8 Reading
  - Gr 8 Math Class
- Manage Classes
- Edit Teacher Profile
- Logout

2. After you completed the "**Teacher Profile**", you will see green highlighting.

- Manage Classes
- Edit Teacher Profile
- Logout

3. To create the class that you will log via MyiLOGS, click on "**Manage Classes**".

4. Write class name (e.g., Kurz Gr 8 Math) and select **grade**, **subject**, and **teacher role**. Then click on "**Save Changes**".

ID	Class Name	Grade	Subject	Teacher Role	Actions				
197	Lemons Gr 8 Reading DEMO	8	RE	Sp. Ed. Teacher	populate	reports	print lessons	class profile	delete
202	NEW Kurz Gr 8 Math DEMO	8	MA	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
275	NEW Kurz Gr 8 Reading	8	RE	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
105	OLD Kurz Gr 8 Math DEMO	8	MA	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
106	OLD Kurz Gr 8 Reading DEMO	8	RE	Sp. Ed. Teacher	populate	reports	print lessons	class profile	delete
279	Scenarios Kurz	8	MA	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
204	TRAINING Kurz Gr 8 Math	8	MA	Sp. Ed. Teacher	populate	reports	print lessons	class profile	delete
NEW		K	RE						

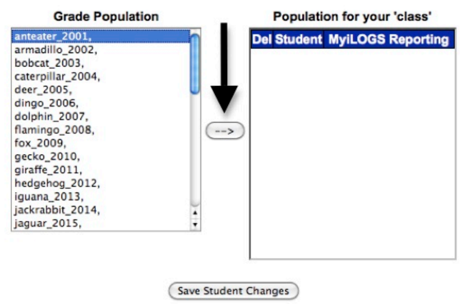
Save Changes

5. To load students into your class, click on "**populate**".

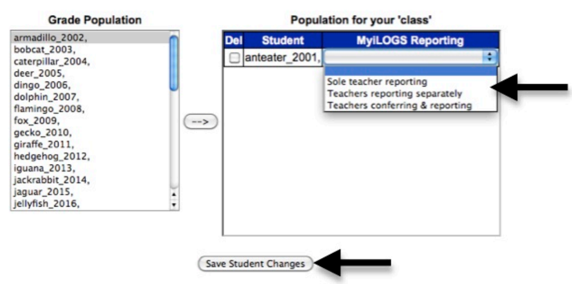
ID	Class Name	Grade	Subject	Teacher Role	Actions				
197	Lemons Gr 8 Reading DEMO	8	RE	Sp. Ed. Teacher	populate	reports	print lessons	class profile	delete
202	NEW Kurz Gr 8 Math DEMO	8	MA	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
275	NEW Kurz Gr 8 Reading	8	RE	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
105	OLD Kurz Gr 8 Math DEMO	8	MA	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
106	OLD Kurz Gr 8 Reading DEMO	8	RE	Sp. Ed. Teacher	populate	reports	print lessons	class profile	delete
279	Scenarios Kurz	8	MA	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
204	TRAINING Kurz Gr 8 Math	8	MA	Sp.	populate	reports	print lessons	class profile	delete
NEW		K	RE						

Save Changes

6. Select target students from the list on the left and then click on the arrow key in the middle to move students.



7. Select how the MyiLOGS reporting is done for each target student. Please refer to the **MyiLOGS Reporting Scenarios** (in your training materials folder) to make the proper choice and then click on "**Save Changes**".



8. Complete the "**Class Profile**" for each applicable class. After you completed the "**Class Profile**", you will see green highlighting.

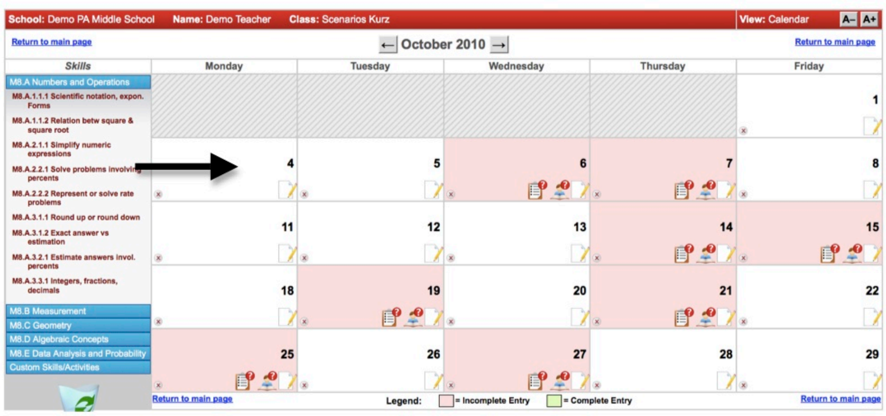
ID	Class Name	Grade	Subject	Teacher Role	Actions				
197	Lemons Gr 8 Reading DEMO	8	RE	Sp. Ed. Teacher	populate	reports	print lessons	class profile	delete
202	NEW Kurz Gr 8 Math DEMO	8	MA	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
275	NEW Kurz Gr 8 Reading	8	RE	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
105	OLD Kurz Gr 8 Math DEMO	8	MA	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
106	OLD Kurz Gr 8 Reading DEMO	8	RE	Sp. Ed. Teacher	populate	reports	print lessons	class profile	delete
279	Scenarios Kurz	8	MA	Gen. Ed. Teacher	populate	reports	print lessons	class profile	delete
204	TRAINING Kurz Gr 8 Math	8	MA	Sp. Ed. Teacher	populate	reports	print lessons	class profile	delete
NEW		K	RE						

Save Changes

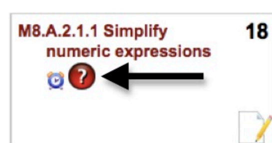
IV. CALENDAR

1. The calendar is used on a **daily basis** to report what skill(s) were covered and for how long. Many teachers use the calendar to plan their instruction ahead of time. If you do so, be sure to review your plans **after** you taught the lesson and make any necessary changes. The calendar ultimately reflects what was taught.

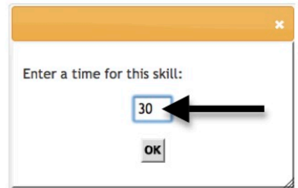
2. To use the calendar, simply drag and drop the skill(s) onto the calendar.



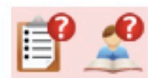
3. After you dropped a skill, you will see a red question mark.



4. Click on the question mark and enter the approximate instructional minutes for this skill. Add custom skills and/or "**Time not available for instruction**", if necessary. Be sure that the sum of all calendar minutes equals the scheduled length of your class period.

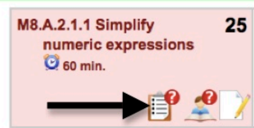


5. Certain days on the calendar also feature these two icons. Those days require more detailed information on your class and target students (see **Section V**).

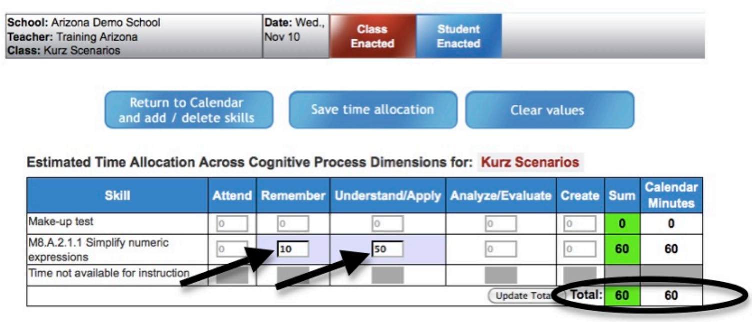


V. DETAILS: CLASS ENACTED

1. To report more detailed information on what was taught at the classroom level, click on the **class details icon**.



2. For the **Cognitive Process Dimensions** matrix, distribute your allocated time (e.g., 60 minutes) from the calendar across the cognitive processes that you expected from your students for each skill. Be sure that the **matrix total** equals the **calendar total**. Look for the green highlighting. Then click "**Save time allocation**".



3. For the **Instructional Practices** matrix, distribute your allocated time (e.g., 60 minutes) from the calendar across any applicable **key instructional practices** (e.g., Provided explicit instruction) and their **instructional context** (e.g., Whole Class). Any of your other instructional practices not listed in the matrix are reported under "Other instructional practices". Be sure that the **matrix total** equals the **calendar total**. Look for the green highlighting. Then click "**Save time allocation**".

Estimated Time Allocation Across Instructional Practices for: Scenarios Kurz

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	20	20
Provided Visual Representations	0	0	10	10
Asked Questions	0	0	0	0
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	25	25
Provided Guided Feedback	0	0	0	0
Provided Reinforcement	5	0	0	5
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				0
		Update Totals	Calendar Total: 60	60

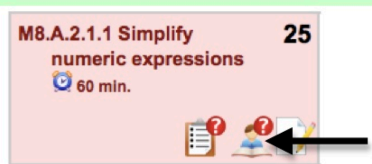
4. At the very bottom, you see the **Engagement** matrix. Indicate average class engagement and goal attainment. Then click "**Save time allocation**".

Engagement Matrix for: TRAINING Kurz Gr 8 Math

Class Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
◉ Moderate % of time (50% - 80%)	◉ Moderate effort or moderate portion of work completed (50% - 80%)
○ High % of time (>80%)	○ High effort or substantial portion of work completed (>80%)

VI. DETAILS: STUDENT ENACTED

1. To report more detailed information on what was taught at the student level, click on the **student details icon**.



2. Select the **target student** for whom you want to report more details.

--- select a student ---
--- select a student ---
√ Fulsom, James
√ Palko, Kayla

Estimated Time Allocation Across Cogniti… ns for: (not selected yet)

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
Make-up test	0	0	0	0	0	0	0
M8.A.2.1.1 Simplify numeric expressions	0	10	50	0	0	60	60
					Update Totals Total:	60	60

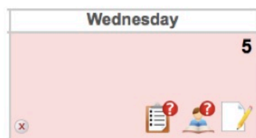
3. Complete the **Cognitive Process Dimensions** matrix and the **Instructional Practices** matrix as described under **Section V**. Please note that any saved class values appear as a default for each student. Use "**Clear values**", if you want to delete all pre-loaded values.

4. Complete the **Engagement** matrix as described under **Section V**.

5. Don't forget to click **"Save time allocation"** after each step.

VII. Color Coding

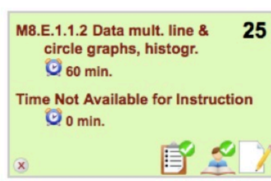
1. Days that require detailed information are colored in red.



2. After you complete the details for your class, the **class icon** will receive a green check mark.

3. After you complete the details for **all** your target students, the **student icon** will receive a green check mark.

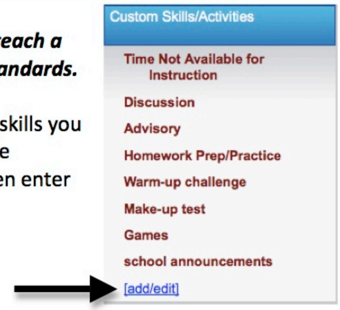
4. Once you have completed class details **and** student details for all your target students, the color for that day will change to green.



VIII. Any questions?

1. No problem! We'd love to assist you with any problems you may encounter while using MyiLOGS!
   - **Alexander Kurz**
     - **EMAIL:** alexander.kurz@vanderbilt.edu **PHONE:** 615-322-1192
   - **Jackie Shargo**
     - **EMAIL:** jackie.shrago@vanderbilt.edu **PHONE:** 615-343-3852

IX. FAQ:

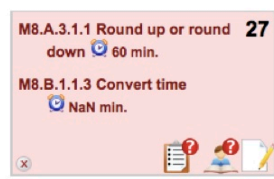


- **Q1: *"My students are below grade level. I teach a lot of basic skills that are <u>not</u> part of the standards. How can I account for that?"***
- **A1:** No problem. You can enter any custom skills you wish under "**<u>Custom Skills/Activities</u>**" on the Calendar page. Just click **"<u>add/edit</u>"** and then enter additional skills.

- **Q2: *"What do I put on the calendar when the class is taking a test for the entire class period?"***
- **A2:** Please add "**<u>Testing</u>**" as a custom skill and drag & drop it on the appropriate calendar day. See **Q1** on creating custom skills! Under the details, indicate what cognitive processes were implicated in the test. Typically, tests are at the understand/apply level. For purposes of the instructional practices matrix, choose "**<u>Assessed Student Knowledge</u>**".

- **Q3: *"I sometimes differentiate my instruction for certain students. How can I enter different skills at the class vs. student level?"***
- **A3:** Skills that are only applicable to individual students have to be entered at the calendar level. Since the calendar reflects the class level, assign the skill "**0 minutes**" on the calendar. Once you get to the target student under "**Student Enacted**", assign the proper minutes to the skill. Be sure to make any necessary subtractions from time allocations to skills that are no longer applicable!

- In this example, the general education teacher taught rounding to the entire class for 60 minutes. For the last 15 minutes, however, the special education teacher worked with James on converting time in the back of the class. "**Convert time**" was thus assigned "**0 minutes**" on the calendar.



- This is how the instructional details were logged under **Class Enacted**. Students were asked to apply rounding for 60 minutes as whole class.

Estimated Time Allocation Across Cognitive Process Dimensions for: Kurz Scenarios

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.A.3.1.1 Round up or round down	0	0	60	0	0	60	60
M8.B.1.1.3 Convert time	0	0	0	0	0	0	0
Time Not Available for Instruction						0	0
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Kurz Scenarios

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	0	0
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	0	0
Provided Guided Feedback	0	0	0	0
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	60	60
Time Not Available				0
			Update Totals Calendar Total: 60	60

Engagement Matrix for: Kurz Scenarios

Class Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
○ Moderate % of time (50% - 80%)	○ Moderate effort or moderate portion of work completed (50% - 80%)
◉ High % of time (>80%)	◉ High effort or substantial portion of work completed (>80%)

- Below is the differentiated instructional scenario for James under **Student Enacted**. Since he spent the last 15 minutes working on converting time with his special education teacher on an individual basis, adjustments had to be made in both matrices.

√ Fulsom, James

Estimated Time Allocation Across Cognitive Process Dimensions for: Fulsom, James

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.A.3.1.1 Round up or round down	0	[illegible]	45	0	0	45	60
M8.B.1.1.3 Convert time	0	0	15		0	15	0
Time Not Available for Instruction						0	0
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Fulsom, James

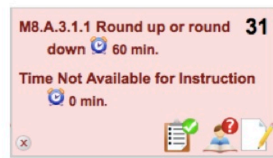
Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	0	0
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	0	0
Provided Guided Feedback	0	0	0	0
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	15	0	45	[illegible]
Time Not Available				0
			Update Totals Calendar Total: 60	60

Engagement Matrix for: Fulsom, James

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
◉ Moderate % of time (50% - 80%)	◉ Moderate effort or moderate portion of work completed (50% - 80%)
○ High % of time (>80%)	○ High effort or substantial portion of work completed (>80%)

- **Q4: *"One of my target students was absent. How do I indicate that?"***
- **A4:** A student absence indicates "**Time not available for instruction**" at the individual student level. "**Time not available for instruction**" thus needs to be assigned "**0 minutes**" on the calendar. Once you get to the target student under "**Student Enacted**", clear all values and indicate "**Time not available for instruction**" for the entire period (e.g., 60 minutes) under both matrices.

- In this example, James was absent during the entire 60-minutes math class. All three matrices had to be adjusted from the class level.



√ Fulsom, James

Estimated Time Allocation Across Cognitive Process Dimensions for: Fulsom, James

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.A.3.1.1 Round up or round down	0	0	0	0	0	0	60
Time Not Available for Instruction						60	0
					Update Totals	Total: 60	60

Estimated Time Allocation Across Instructional Practices for: Fulsom, James

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	0	0
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	0	0
Provided Guided Feedback	0	0	0	0
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				60
		Update Totals	Calendar Total: 60	60

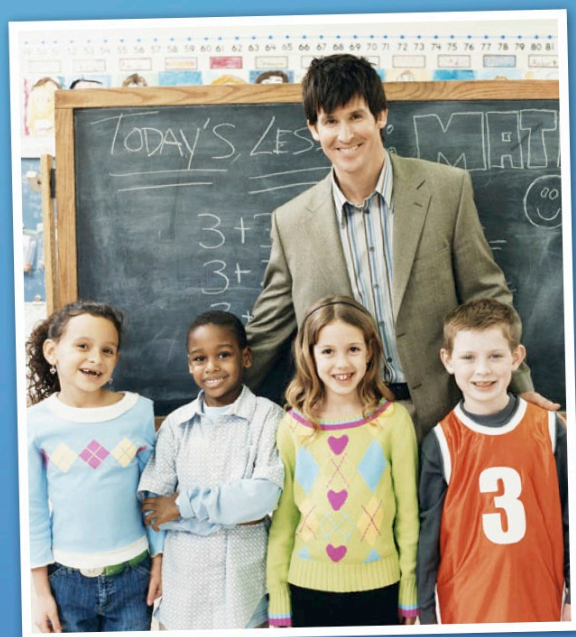
Engagement Matrix for: Fulsom, James

Student Engagement	Learning Goal Attainment
(●) Not Engaged (0%)	(●) No effort or product observed (0%)
( ) Low % of time (<50%)	( ) Low effort or limited portion of work completed (<50%)
( ) Moderate % of time (50% - 80%)	( ) Moderate effort or moderate portion of work completed (50% - 80%)
( ) High % of time (>80%)	( ) High effort or substantial portion of work completed (>80%)

- **Q5: *"I'm going to be on Fall break. How do we indicate that school was not in session?"***
- **A5:** Please click the small "x" button in the lower left corner. Clicking this button will gray out the day and exclude any entered data from the report calculations. Data will not be erased. Simply click the button again, in case you grayed out a day by mistake.

My iLOGS™

instructional LEARNING OPPORTUNITIES GUIDANCE SYSTEM



TEACHER'S MANUAL

Part 2:
Training Scenarios & Answer Keys

MyiLOGS Instructional LEARNING OPPORTUNITIES GUIDANCE SYSTEM

MYILOGS TRAINING SCENARIO 1 (PRACTICE)

I. Log in with Username "**training_az**" and Password "**training**".
II. Select the "**[Yourlastname] Scenarios**" class on the main page.
III. Read the scenario below carefully.
IV. On the calendar, find an available day with class and student details. ⇨
V. Enter the scenario using the **Calendar** and **Details**.

SUBJECT: Mathematics (Gr. 8)
CLASS PERIOD: **60 min**

CALENDAR:
- ***Round up or round down*** for about 60 minutes. **[Numbers and Operations]**

CLASS ENACTED:
- For review, you **asked questions** of the **whole class**. Students were expected to **recall** basic rules for ***rounding up or rounding down*** for about 10 minutes.
- For the remaining 50 minutes, the **whole class** engaged in **independent practice** by working through several ***rounding*** problems in their textbook. During that time, you provided **guided feedback** to the **whole class** for about 5 minutes. Students were expected to **attend** to directions for about 5 minutes and **apply** appropriate rounding conventions to the assigned textbook problems for about 45 minutes.
- The whole class was **highly engaged** and put forth an **excellent effort**.

STUDENT ENACTED:
- **Kayla** participated and completed the same activities as the rest of the class. She was highly engaged and put forth an excellent effort.
- **James** participated and completed the same activities as the rest of the class. His engagement and effort, however, were very low today.

SCENARIO 1 (PRACTICE) – ANSWER KEY

M8.A.3.1.1 Round up or round down 60 min. **7**

Estimated Time Allocation Across Cognitive Process Dimensions for: Kurz Scenarios

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.A.3.1.1 Round up or round down	5	10	45	0	0	0	60
Time not available for instruction							
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Kurz Scenarios

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	10	10
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	45	45
Provided Guided Feedback	0	0	5	5
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Kurz Scenarios

Class Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
○ Moderate % of time (50% - 80%)	○ Moderate effort or moderate portion of work completed (50% - 80%)
◉ High % of time (>80%)	◉ High effort or substantial portion of work completed (>80%)

Calendar & Class: ____

Estimated Time Allocation Across Cognitive Process Dimensions for: Palko, Kayla

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.A.3.1.1 Round up or round down	5	10	45	0	0	60	60
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Palko, Kayla

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	10	10
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	45	45
Provided Guided Feedback	0	0	5	5
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Palko, Kayla

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%) ○ Low % of time (<50%) ○ Moderate % of time (50% - 80%) ◉ High % of time (>80%)	○ No effort or product observed (0%) ○ Low effort or limited portion of work completed (<50%) ○ Moderate effort or moderate portion of work completed (50% - 80%) ◉ High effort or substantial portion of work completed (>80%)

Kayla: ____

Estimated Time Allocation Across Cognitive Process Dimensions for: Fulsom, James

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.A.3.1.1 Round up or round down	5	10	45	0	0	60	60
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Fulsom, James

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	10	10
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	45	45
Provided Guided Feedback	0	0	5	5
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Fulsom, James

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%) ◉ Low % of time (<50%) ○ Moderate % of time (50% - 80%) ○ High % of time (>80%)	○ No effort or product observed (0%) ◉ Low effort or limited portion of work completed (<50%) ○ Moderate effort or moderate portion of work completed (50% - 80%) ○ High effort or substantial portion of work completed (>80%)

James: ____

MYiLOGS TRAINING SCENARIO 2 (PRACTICE)

I. Log in with Username "**training_az**" and Password "**training**".
II. Select the "**[Yourlastname] Scenarios**" class on the main page.
III. Read the scenario below carefully.
IV. On the calendar, find an available day with class and student details. ⇨
V. Enter the scenario using the **Calendar** and **Details**.

SUBJECT: Mathematics (Gr. 8)
CLASS PERIOD: **60 min**

CALENDAR:

- ***Simplify numeric expressions*** for about 60 minutes. **[Numbers and Operations]**
- James showed up 10 minutes late (***time not available for instruction***).

CLASS ENACTED:

- For review, you **asked questions** of the **whole class**. Students were expected to **recognize** some of the basic rules for ***simplifying numeric expressions*** (e.g., order of operations) for about 10 minutes.
- For the remaining 50 minutes, you **modeled and discussed** several problems and their solutions on the board for the **whole class**. During that time, you provided **guided feedback** to the **whole class** (about 10 minutes) and some **positive reinforcement** to **individual students** (about 5 minutes). Students were expected to **attend** to your models and explanations (about 20 minutes) and **recognize** what strategy you just applied (about 30 minutes).
- Overall, the class was **highly engaged** and completed **all required work**.

STUDENT ENACTED:

- **Kayla** participated and completed the same activities as the rest of the class. Her engagement and effort were moderate today.
- **James** showed up 10 minutes late and thus missed the review. Otherwise, he participated and completed the same activities as the rest of the class. His engagement and effort were low today.

SCENARIO 2 (PRACTICE) – ANSWER KEY

M8.A.2.1.1 Simplify numeric expressions 60 min. 9

Time Not Available for Instruction 0 min.

Estimated Time Allocation Across Cognitive Process Dimensions for: Kurz Scenarios

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.A.2.1.1 Simplify numeric expressions	20	40	0	0	0	60	60
Time Not Available for Instruction						0	0
					Update Totals	Total: 60	60

Estimated Time Allocation Across Instructional Practices for: Kurz Scenarios

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	35	35
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	10	10
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	0	0
Provided Guided Feedback	0	0	10	10
Provided Reinforcement	5	0	0	5
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Kurz Scenarios

Class Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
○ Moderate % of time (50% - 80%)	○ Moderate effort or moderate portion of work completed (50% - 80%)
◉ High % of time (>80%)	◉ High effort or substantial portion of work completed (>80%)

Calendar & Class: ____

Estimated Time Allocation Across Cognitive Process Dimensions for: Palko, Kayla

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.A.2.1.1 Simplify numeric expressions	20	40	0	0	0	60	60
Time Not Available for Instruction						0	0
					Update Totals	Total: 60	60

Estimated Time Allocation Across Instructional Practices for: Palko, Kayla

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	35	35
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	10	10
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	0	0
Provided Guided Feedback	0	0	10	10
Provided Reinforcement	5	0	0	5
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Palko, Kayla

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
◉ Moderate % of time (50% - 80%)	◉ Moderate effort or moderate portion of work completed (50% - 80%)
○ High % of time (>80%)	○ High effort or substantial portion of work completed (>80%)

Kayla: ____

Estimated Time Allocation Across Cognitive Process Dimensions for: Fulsom, James

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.A.2.1.1 Simplify numeric expressions	20	30	0	0	0	50	60
Time Not Available for Instruction						10	0
					Update Totals	Total: 60	60

Estimated Time Allocation Across Instructional Practices for: Fulsom, James

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	35	35
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	0	0
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	0	0
Provided Guided Feedback	0	0	10	10
Provided Reinforcement	5	0	0	5
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				10
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Fulsom, James

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
◉ Low % of time (<50%)	◉ Low effort or limited portion of work completed (<50%)
○ Moderate % of time (50% - 80%)	○ Moderate effort or moderate portion of work completed (50% - 80%)
○ High % of time (>80%)	○ High effort or substantial portion of work completed (>80%)

James: ____

MyiLOGS Training Scenario 3 (Pretest)

I. Log in with Username "**training_az**" and Password "**training**".
II. Select the "**[Yourlastname] Scenarios**" class on the main page.
III. Read the scenario below carefully.
IV. On the calendar, find an available day with class and student details. ⇨
V. Enter the scenario using the **Calendar** and **Details**.

SUBJECT: Mathematics (Gr. 8)
CLASS PERIOD: **60 min**

CALENDAR:

- ***Simplify numeric expressions*** for about 60 minutes. **[Numbers and Operations]**
- James worked with his special education teacher on a ***make-up test*** (***custom skill***).

CLASS ENACTED:

- For review, you **asked questions** of the **whole class**. Students were expected to **recognize** some of the basic rules for ***simplifying numeric expressions*** (e.g., order of operations) for about 10 minutes.
- You then passed out a problem worksheet to the **whole class** for **independent practice**, which lasted about 30 minutes. During that time, you had to occasionally stop to provide some **guided feedback** to the **whole class** (about 5 minutes). Throughout the entire 30 minutes, students were expected to **apply** the proper procedures for ***simplifying numeric expressions***.
- For the last 20 minutes, you engaged **individual students** in a **think aloud**. Students were expected to **explain** their approach for solving numeric expressions.
- Overall, the class was **highly engaged** and completed **all required work**.

STDENT ENACTED:

- **Kayla** participated and completed the same activities as the rest of the class. For the beginning review, however, her special education teacher worked with her **individually asking questions** (about 5 minutes) and **providing direct instruction** (about 5 minutes). Her engagement and effort were very high as well.
- **James** participated in the review and worked on his worksheet just as everyone else. For the last 20 minutes, however, James was **assessed** via a **make-up test** in the back. The special education teacher mentioned the test was a simple **recall exercise**. His engagement and effort appeared to be high today.

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SCENARIO 3 (PRETEST) – ANSWER KEY

Make-up test 0 min. **13**

M8.A.2.1.1 Simplify numeric expressions 60 min.

Estimated Time Allocation Across Cognitive Process Dimensions for: Kurz Scenarios

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
Make-up test	0	0	0	0	0	0	0
M8.A.2.1.1 Simplify numeric expressions	0	10	50	0	0	60	60
Time not available for instruction							
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Kurz Scenarios

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	10	10
Elicited Think Aloud	20	0	0	20
Used Independent Practice	0	0	25	25
Provided Guided Feedback	0	0	5	5
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Kurz Scenarios

Class Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
○ Moderate % of time (50% - 80%)	○ Moderate effort or moderate portion of work completed (50% - 80%)
◉ High % of time (>80%)	◉ High effort or substantial portion of work completed (>80%)

Calendar & Class: ____

Estimated Time Allocation Across Cognitive Process Dimensions for: Palko, Kayla

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
Make-up test	0	0	0	0	0	0	0
M8.A.2.1.1 Simplify numeric expressions	0	10	50	0	0	60	60
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Palko, Kayla

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	5	0	0	5
Provided Visual Representations	0	0	0	0
Asked Questions	5	0	0	5
Elicited Think Aloud	20	0	0	20
Used Independent Practice	0	0	25	25
Provided Guided Feedback	0	0	5	5
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Palko, Kayla

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
○ Moderate % of time (50% - 80%)	○ Moderate effort or moderate portion of work completed (50% - 80%)
● High % of time (>80%)	● High effort or substantial portion of work completed (>80%)

Kayla: ____

Estimated Time Allocation Across Cognitive Process Dimensions for: Fulsom, James

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
Make-up test	0	20	0	0	0	20	0
M8.A.2.1.1 Simplify numeric expressions	0	10	30	0	0	40	60
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Fulsom, James

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	10	10
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	25	25
Provided Guided Feedback	0	0	5	5
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	20	0	0	20
Other Instructional Practices	0	0	0	0
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Fulsom, James

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
○ Moderate % of time (50% - 80%)	○ Moderate effort or moderate portion of work completed (50% - 80%)
● High % of time (>80%)	● High effort or substantial portion of work completed (>80%)

James: ____

MyiLOGS Training Scenario 4 (Test 1)

I. Log in with Username "**training_az**" and Password "**training**".
II. Select the "**[TeacherID] Scenarios**" class on the main page.
III. Read the scenario below carefully.
IV. On the calendar, find an available day with class and student details. ⇨
V. Enter the scenario using the **Calendar** and **Details**.

SUBJECT: Mathematics (Gr. 8)
CLASS PERIOD: **60 min**

CALENDAR:

- ***Time not available for instruction*** for about 5 minutes due to school announcements.
- ***Continue patterns*** for about 35 minutes. **[Algebraic Concepts]**
- ***Find missing elements*** for about 20 minutes. **[Algebraic Concepts]**

CLASS ENACTED:

- For review, you **asked questions** of the **whole class**. Students were expected to **identify** several previously learned strategies for recognizing and ***continuing patterns*** for about 5 minutes.
- For about 30 minutes, you asked the **whole class** to engage in **independent practice**. During that time, you **modeled step-by-step approaches** for identifying and ***continuing patterns*** to the **whole class** for about 10 minutes. Throughout independent practice, students were expected to **apply** previously learned strategies.
- For the last 20 minutes, you wrote several patterns with ***missing elements*** on the board. You asked students to come up and **think aloud** about how to find ***missing elements***. The **whole class** and **individual students** were **equally involved** with about 10 minutes each. For the think aloud, you expected students to **explain** their approach for finding the missing elements.
- Overall, the class was **highly engaged** and completed **all required work**.

STUDENT ENACTED:

- **Kayla** participated and completed the same activities as the rest of the class. She was highly engaged today and showed outstanding effort.
- **James** showed up **10 minutes late** and thus **missed announcements and the review**. Otherwise, he participated in the same activities as the rest of the class. He was **highly engaged** throughout the entire class period, but he struggled to complete his work. He completed a bit **more than half of his work**.

SCENARIO 4 (TEST 1) – ANSWER KEY

M8.D.1.1.1 Continue pattern **15**
35 min.
M8.D.1.1.2 Find missing elements
20 min.
Time Not Available for Instruction
5 min.

Estimated Time Allocation Across Cognitive Process Dimensions for: Kurz Scenarios

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.D.1.1.1 Continue pattern	0	5	30	0	0	35	35
M8.D.1.1.2 Find missing elements	0	0	20	0	0	20	20
Time Not Available for Instruction						0	5
					Update Totals	Total: 60	60

Estimated Time Allocation Across Instructional Practices for: Kurz Scenarios

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	10	10
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	5	5
Elicited Think Aloud	10	0	10	20
Used Independent Practice	0	0	20	20
Provided Guided Feedback	0	0	0	0
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				5
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Kurz Scenarios

Class Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
○ Moderate % of time (50% - 80%)	○ Moderate effort or moderate portion of work completed (50% - 80%)
◉ High % of time (>80%)	◉ High effort or substantial portion of work completed (>80%)

Calendar & Class: ____

Estimated Time Allocation Across Cognitive Process Dimensions for: Palko, Kayla

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.D.1.1.1 Continue pattern	0	5	30	0	0	35	35
M8.D.1.1.2 Find missing elements	0	0	20	0	0	20	20
Time Not Available for Instruction						5	5
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Palko, Kayla

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	10	10
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	5	5
Elicited Think Aloud	10	0	10	20
Used Independent Practice	0	0	20	20
Provided Guided Feedback	0	0	0	0
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				5
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Palko, Kayla

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%) ○ Low % of time (<50%) ○ Moderate % of time (50% - 80%) ◉ High % of time (>80%)	○ No effort or product observed (0%) ○ Low effort or limited portion of work completed (<50%) ○ Moderate effort or moderate portion of work completed (50% - 80%) ◉ High effort or substantial portion of work completed (>80%)

Kayla: ____

Estimated Time Allocation Across Cognitive Process Dimensions for: Fulsom, James

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
M8.D.1.1.1 Continue pattern	0	0	30	0	0	30	35
M8.D.1.1.2 Find missing elements	0	0	20	0	0	20	20
Time Not Available for Instruction						10	5
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Fulsom, James

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	10	10
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	0	0
Elicited Think Aloud	10	0	10	20
Used Independent Practice	0	0	20	20
Provided Guided Feedback	0	0	0	0
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				10
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Fulsom, James

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%) ○ Low % of time (<50%) ○ Moderate % of time (50% - 80%) ◉ High % of time (>80%)	○ No effort or product observed (0%) ○ Low effort or limited portion of work completed (<50%) ◉ Moderate effort or moderate portion of work completed (50% - 80%) ○ High effort or substantial portion of work completed (>80%)

James: ____

MYiLOGS TRAINING SCENARIO 5 (TEST 2)

I. Log in with Username "**training_az**" and Password "**training**".
II. Select the "**[Yourlastname] Scenarios**" class on the main page.
III. Read the scenario below carefully.
IV. On the calendar, find an available day with class and student details. ⇨
V. Enter the scenario using the **Calendar** and **Details**.

SUBJECT: Mathematics (Gr. 8)
CLASS PERIOD: **60 min**

CALENDAR:

- ***Warm-up challenge*** for about 10 minutes (***custom skill***).
- ***Stem-leaf and box-whisker plot*** for about 50 minutes. **[Data Analysis and Probability]**
- James did not show up for the entire lesson (***time not available for instruction***).

CLASS ENACTED:

- For the ***warm-up challenge*** [**other instructional practices**], you engaged the **whole class** in a simple "**remember** the facts" game based on previously learned math facts for about 10 minutes.
- For the main lesson, you displayed several **visual examples** of ***stem-leaf and box-whisker plots*** to explain the **whole class** how each **graph represented and organized information** for about 10 minutes. Students were expected to **attend** to the visual representations.
- For the next 40 minutes, you allowed **small groups** to work on ***box-whisker plots*** using number lines via **independent practice**. For this task, students were expected to **carry out** a set of procedures. However, almost everybody had a hard time finding the upper and lower median. So during that time, you provided **guided feedback** to each **small group** (about 10 minutes), **individual students** (about 5 minutes) and the **whole class** (about 5 minutes).
- Class engagement and effort were **moderate** today.

STUDENT ENACTED:

- **Kayla** participated and completed the same activities as the rest of the class. Her engagement and effort were excellent today.
- **James** was absent for the entire lesson.

SCENARIO 5 (TEST 2) – ANSWER KEY

Warm-up challenge 10 min. **22**

M8.E.1.1.3 Data stem-leaf or box-whisker plots 50 min.

Time Not Available for Instruction 0 min.

Estimated Time Allocation Across Cognitive Process Dimensions for: Kurz Scenarios

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
Warm Up Challenge	0	10	0	0	0	10	10
M8.E.1.1.3 Data stem-leaf or box-whisker plots	10	0	40	0	0	50	50
Time Not Available for Instruction						0	0
					Update Totals Total:	60	60

Estimated Time Allocation Across Instructional Practices for: Kurz Scenarios

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	10	10
Asked Questions	0	0	0	0
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	20	0	20
Provided Guided Feedback	5	10	5	20
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	10	10
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Kurz Scenarios

Class Engagement	Learning Goal Attainment
○ Not Engaged (0%)	○ No effort or product observed (0%)
○ Low % of time (<50%)	○ Low effort or limited portion of work completed (<50%)
◉ Moderate % of time (50% - 80%)	◉ Moderate effort or moderate portion of work completed (50% - 80%)
○ High % of time (>80%)	○ High effort or substantial portion of work completed (>80%)

Calendar & Class: ____

MyiLOGS Instructional LEARNING OPPORTUNITIES GUIDANCE SYSTEM

Estimated Time Allocation Across Cognitive Process Dimensions for: Palko, Kayla

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
Warm Up Challenge	0	10	0	0	0	10	10
M8.E.1.1.3 Data stem-leaf or box-whisker plots	10	0	40	0	0	50	50
Time Not Available for Instruction						0	0
				Update Totals		Total: 60	60

Estimated Time Allocation Across Instructional Practices for: Palko, Kayla

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	10	10
Asked Questions	0	0	0	0
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	20	0	20
Provided Guided Feedback	5	10	5	20
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	10	10
Time Not Available				0
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Palko, Kayla

Student Engagement	Learning Goal Attainment
○ Not Engaged (0%) ○ Low % of time (<50%) ○ Moderate % of time (50% - 80%) ◉ High % of time (>80%)	○ No effort or product observed (0%) ○ Low effort or limited portion of work completed (<50%) ○ Moderate effort or moderate portion of work completed (50% - 80%) ◉ High effort or substantial portion of work completed (>80%)

Kayla: ____

Estimated Time Allocation Across Cognitive Process Dimensions for: Fulsom, James

Skill	Attend	Remember	Understand/Apply	Analyze/Evaluate	Create	Sum	Calendar Minutes
Warm Up Challenge	0	0	0	0	0	0	10
M8.E.1.1.3 Data stem-leaf or box-whisker plots	0	0	0	0	0	0	50
Time Not Available for Instruction						60	0
				Update Totals		Total: 60	60

Estimated Time Allocation Across Instructional Practices for: Fulsom, James

Teacher Actions	Individual	Small Group	Whole Class	Sum
Provided Direct Instruction	0	0	0	0
Provided Visual Representations	0	0	0	0
Asked Questions	0	0	0	0
Elicited Think Aloud	0	0	0	0
Used Independent Practice	0	0	0	0
Provided Guided Feedback	0	0	0	0
Provided Reinforcement	0	0	0	0
Assessed Student Knowledge	0	0	0	0
Other Instructional Practices	0	0	0	0
Time Not Available				60
		Update Totals	Calendar Total: 60	60

Engagement Matrix for: Fulsom, James

Student Engagement	Learning Goal Attainment
◉ Not Engaged (0%) ○ Low % of time (<50%) ○ Moderate % of time (50% - 80%) ○ High % of time (>80%)	◉ No effort or product observed (0%) ○ Low effort or limited portion of work completed (<50%) ○ Moderate effort or moderate portion of work completed (50% - 80%) ○ High effort or substantial portion of work completed (>80%)

James: ____

Appendix C: MyiLOGS Observation Protocol and Form

MyiLOGS Observation Protocol

Training/Follow-up:

1. Kurz will train all observers on the use of the observation form and its respective recording conventions.
2. Kurz will conduct classroom observations with all observers until category-based agreement of **80% or higher for 2 consecutive 30-min sessions** is reached.
3. Kurz will conduct classroom observations with all trained observers to collect **IOA on 20% of all observations sessions**. Category-based IOA has to be **at or above 80%**. Steps 1-2 will have to be repeated for below criterion IOA.

Sampling:

1. Each participant will be observed **once**.
2. In each state, **3 participants** will be randomly sampled to receive **2 additional observations** for a total of 3 observations.

Procedure:

1. Prior to the observation, the observer will record the skill(s) to be taught during the lesson on the observation form. It is best to record the skills indicated on the MyiLOGS calendar the morning of the observation and then **verify** those skills with the teacher upon entering the classroom.
2. For the actual observation, the observer will use a vibrating timer set at FI 1-min.
3. Every time the timer vibrates, the observer will record the **student expectation** and **teacher action** that occupied the **majority of time** during the 1-min interval.
4. For **discreet teacher actions** (e.g., "Asked Questions," "Provided Reinforcement"), it is further necessary to keep a **frequency count**. This will allow the observer to make subsequent adjustments to address equal emphasis, if necessary. See recording conventions.
5. After the observation, the observer will **inform the teacher** of the exact number of minutes that were recorded for purposes of the observation. Depending on the exact start and end time of the observation, the recorded minutes may slightly deviate from the usual allocated minutes.

Recording Conventions:

1. To ensure that teachers and observers account for the same number of minutes, the observer will inform the teacher of the total number of minutes that were recorded.
2. After the recording process is completed, it may be necessary to adjust time allocations for certain teacher actions that were equally emphasized but did not receive equal minute allocations (due to one action consistently occupying the majority of time during the 1-min interval).
    a. For example, a teacher may allow the entire class to engage in *independent practice* for 10 minutes, while he or she is providing *individual guided feedback* throughout the entire 10 minutes. The interval-based recording convention will require the observer to record *individual guided feedback* as occupying the entire 10 minutes, despite the fact that *independent practice* occurred throughout the entire 10 minutes. Adjustments of observed time allocations may thus be necessary to ensure consistency with the MyiLOGS logging convention that requires teachers to indicate equal emphasize among instructional practice by dividing time allocations accordingly.

Agreement:

1. Minute-based agreement by available options in each matrix (± 2 minutes).
2. Category-based agreement by available options in each matrix.

Teacher ID:	Date:	Class:	Time:

① Record in 1-min intervals. ② Use tally marks (||||) to record the **student expectation** and **teacher action** that occupied the **majority of time** during the 1-min interval.

Skills	Attend Listen, focus, pay attention	Remember Recognize, identify, recall	Understand/Apply Interpret, exemplify, classify, summarize, infer, compare, explain / Execute, implement, use	Analyze/Evaluate Differentiate, organize, integrate, attribute / Check, test, critique, judge	Create Generate, hypothesize, plan, design, produce	Comments
Time not available for instruction						

Teacher Actions	Individual Action is focused on single individuals	Small Group Action is focused on small groups	Whole Class Action is focused on entire class	Comments
Provided Direct Instruction Teacher presents issue, discusses or models a solution approach, and engages students with approach in similar context.				
Provided Visual Representations Teacher uses visual representations to organize information, communicate attributes, and explain relationships.				
Asked Questions Teacher asks questions to engage students and focus attention on important information.				
Elicited Think Aloud Teacher prompts students to think aloud about their approach to solving a problem.				
Used Independent Practice Teacher allows students to work independently to develop and refine knowledge and skills.				
Provided Guided Feedback Teacher provides feedback to students on work quality, missing elements, and observed strengths.				
Provided Reinforcement Teacher provides reinforcement contingent on previously established expectations for effort and/or work performance.				
Assessed Student Knowledge Teacher uses quizzes, tests, student products, or other forms of assessment to determine student knowledge.				
Other Instructional Practices Any instructional practices not captured by the aforementioned key instructional practices. You can use the class notes to leave additional details.				
Time not available for instruction				

Summative Class Engagement	○ 0% ○ <50% ○ 50%-80% ○ >80%	Summative Goal Attainment	○ 0% ○ <50% ○ 50%-80% ○ >80%

Kurz / MyiLOGS Observation Form v2.0

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