The **Galileo**® Pre-K Online Educational Management System

by
Sarah M. Callahan, Ph.D.
John Richard Bergan, Ph.D.
Jason K. Feld, Ph.D.
Michelle C. Larson, M.P.H.
Christine G. Burnham, Ph.D.
and John Robert Bergan, Ph.D.

ATI
Assessment Technology Incorporated

Technical Manual: The Galileo® Pre-K Online Educational Management System

By Sarah M. Callahan, Ph.D., John Richard Bergan, Ph.D., Jason K. Feld, Ph.D.,
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I. Introduction

Galileo® Pre-K Online from Assessment Technology Incorporated (ATI) provides early childhood educators and other stakeholders a complete and fully integrated assessment, curriculum, and reporting system that links assessment, planning, individualization and program progress. This technical manual provides an overview of the theoretical background and research underlying the ongoing development of Galileo Pre-K Online including the recently revised Galileo G3 assessment scales for infancy through five years and the Galileo Pre-K Online Curriculum. This document also describes the technical and psychometric properties of Galileo Pre-K Online and the G3 assessment scales. The remainder of this section provides a brief overview of Galileo Pre-K Online and standards-based education in early childhood. Section 2 describes the Galileo approach to assessment. Section 3 describes how Galileo uses standards-aligned path-referenced scales based on Item Response Theory (IRT) to support users in measuring children's development and in the process documenting standards mastery. Section 4 describes the Galileo assessment scales, the alignment of the scale content with federal and state standards, and the research evidence supporting the validity of the content comprising the scales. Section 5 provides detailed information regarding psychometric analyses of the Galileo G3 assessment scales for infancy through five years.

A. Brief Overview of Galileo Pre-K Online

Galileo Pre-K Online is a web-based application implementing patented technology to provide rapid access to assessment and curriculum information to guide children's learning from infancy through age 5. Galileo Pre-K Online is a companion application to Galileo K-12 Online, which provides information to guide learning from kindergarten through high school. It is well known that the first 5 years of life constitute a period of extremely rapid cognitive, physical, and emotional development. The linking of Galileo Pre-K Online to Galileo K-12 Online makes it possible to provide continuous information on children's development from the important early years of life through high school and to use that information to inform policy and practice to ensure that children enter school ready to learn and that they continue to progress as they move toward college and career paths.

As one of the first online tools of its kind, Galileo Pre-K has been successfully implemented for over a decade by thousands of early childhood teachers serving several hundred thousand children representing ages infancy through 5. Over the years, Galileo has been used extensively in an array of early learning settings across the country including Head Start, Early Head Start, Even Start, Smart Start, proprietary child care centers, family child care homes, public school preschool, and special education preschool programs. Galileo K-12 Online has been used in a wide array of public and private schools including public and private charter schools. Moreover, the K-12 application has also been used by many thousands of educators and many millions of children.

Galileo Pre-K Online provides early childhood educators and other stakeholders a complete, fully integrated, standards-aligned assessment, curriculum, and reporting system. The principal distinguishing features of the system include:

- a standards-based approach to early childhood education;
- developmental level scores based on IRT making it possible to measure growth in a wide range of competency domains;

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- empirically validated developmental progressions used in planning learning opportunities to promote school readiness;
- patented *Scale Builder* technology supporting rapid development of new scales to accommodate standards diversity and continuous changes in standards;
- the comprehensive early childhood Galileo® Pre-K Online Curriculum providing an empirically based scope and sequence for multiple developmental domains that is grounded in development and learning theory;
- model curriculum lesson plans and activities for the classroom and the home for children from diverse backgrounds including computer-based *Storyteller* language and literacy activities and instruction;
- support for continuous assessment to guide learning continuously throughout the program year;
- a multi-method approach to assessment providing information from direct observation, work samples, parent interviews, and authentic technology-based *Storyteller* assessment; and
- a continuous research program supporting adaptation to rapid changes in educational goals and instructional processes associated with continuing changes in technology and advances in the scientific knowledge base.

B. Early Childhood Standards-Based Education and IRT

The defining features of the standards-based approach include standards reflecting valued educational goals, assessments designed to measure progress toward the achievement of standards, and curriculum and instruction aligned to standards and designed to promote standards mastery. Standards may reflect national standards, state standards, and local standards. In the years ahead, the Common Core State Standards and new science standards can be expected to play an increasingly large role in the development of standards for students of all ages including the early childhood years.

The standards-based approach was originally implemented in elementary and secondary education. Federal policies such as the No Child Left Behind Act (No Child Left Behind, 2002) and more recent initiatives such as Race to the Top (RTTT) have encouraged standards-based education reform involving the Common Core State Standards and new science standards. States have adopted state education standards for elementary and secondary students and have initiated statewide assessments that provide data on student progress for use in accountability initiatives.

Increasingly, the standards-based approach to education is also being applied in early childhood education. The recent federal RTTT Early Learning Challenge Initiative provides funding for states to build statewide systems of high-quality early childhood programs implementing standards-based curriculum and assessment. The federal government and many states have already established standards for early childhood education programs. Many states are also in the process of developing early childhood programs. These programs are linked historically to the Head Start program established over forty years ago. The principal purpose of Head Start from its inception was to ensure that children entered school ready to learn. The principal goal of standards based initiatives in early childhood education is to evaluate and improve the school readiness of children entering kindergarten.

A fundamental question addressed in the standards-based movement in early childhood education and in elementary and secondary education is the extent to which learning is

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improving over time. This is the point at which IRT becomes important (e.g., Kolen & Brennan, 2004). Statewide tests necessarily vary from one year to the next. Yet, if progress is to be measured, test scores must be placed on a common scale from one year to the next. IRT is used in statewide assessment programs to place assessment scores on a common scale so that progress can be measured over time. It is used for the same purpose in Galileo®. IRT technology dominates psychometric analyses in statewide testing initiatives. Yet, IRT is not yet a widespread feature of early childhood assessment tools. Galileo is one of only a few tools that use IRT techniques to provide a measure of progress towards standards mastery and school readiness.

II. Galileo Approach to Assessment

A. Multi-Method Approach to Assessment

Galileo provides an easy-to-use, authentic multi-method approach to assessment that assists educators to meet local, state, and federal requirements. The multi-method approach allows for assessment through observation in the child's learning environment, one-on-one observation, work samples, parent input, and direct *Storyteller* assessment. This broad range of formats accommodates the ways children from diverse backgrounds express their competencies and helps provide a meaningful portrait of each child's development. Galileo enables the teacher to record capabilities that are learned. Capabilities that are not marked as learned are assumed to be ones that have not yet been acquired.

Assessment in early childhood necessarily occurs in a variety of ways. The most fundamental of these is direct observation. In order for assessments to support learning and development, they must be closely aligned with what children are learning. To achieve this close alignment, teachers often assess children by observing them during an instructional activity (Shepard, Kagan, & Wurtz, 1998). In addition to direct observation, teachers may use work samples to assess development. Educational software may also play a role in the assessment process. Finally, in some cases, formal one-on-one assessment may be carried out to document learning outcomes for young children (Shepard, Kagan, & Wurtz, 1998). Galileo® enables the teacher to document the data source used in making a judgment regarding each capability regardless of whether it has been learned or not learned. For example, a teacher may record that a recently administered diagnostic test revealed that a child had not yet acquired a certain capability. Likewise, the teacher might indicate that a work sample revealed that the child possessed another capability.

Although the need for multiple methods of assessment has been recognized for some time, traditional assessment methodology does not easily accommodate multiple modes of gathering information on children's learning and development. In particular, assessment technology for integrating information gathered from diverse sources has been lacking. As described previously, Galileo makes it possible to document multiple data sources providing information on children's learning. For example, the system allows the user to document learning observed in a formal assessment as well as learning directly observed in the classroom setting. Galileo can integrate these two forms of assessment into one overall picture of the child's development or treat them separately. The ability to integrate multiple methods of assessment allows the teacher to take account of multiple sources of information in assessing children's development. The ability to separate formal assessment from other sources of assessment information makes it possible to establish the extent of congruence between findings obtained through formal assessment and findings obtained through direct observation.

Information of this kind can be useful when policy makers use observational data to document learning outcomes.

B. Advantages of Observational Assessment of Ability

Although the Galileo® scales are designed to accommodate a variety of methods of assessment, observational assessment plays a key role. Observational assessment has been a hallmark of early childhood education since the beginning of the 20th century and the observational approach has been widely advocated by professionals in early childhood education (e.g., NAEYC, 1991; Shepard, Kagan, & Wurtz, 1998).

Observational assessment represents an alternative to formal ability testing and has advantages over ability testing in many circumstances. First, observational assessment can provide important information about development, which cannot easily be obtained through a formal ability test. For example, in assessing the development of literacy, one might wish to determine whether a child listens attentively to stories, whether the child can make up a story with a beginning, a middle, and end, and whether the child attempts to write stories initially by scribbling and gradually later on by forming letters and words. These kinds of capabilities are best assessed by observing the child's actions in the natural learning environment. For instance, in a formal testing situation it would be very difficult to determine whether a child tended to listen attentively to stories. At best, one might be able to observe the child's reaction to a single very short story. Time limitations invariably associated with testing would not allow for the extended observation needed to get a full picture of the child's attentive behavior.

A second advantage of observational assessment is that it takes place in the child's learning environment. To the extent that an observer is able to estimate ability accurately, he or she can target learning opportunities and observations at any given time toward capabilities that are appropriate for the developmental level of the child. In conducting observations, the skilled observer will avoid learning environments that subject children to activities that are too easy and may be boring. Likewise, the skilled observer will shun environments involving activities that are too difficult and may be frustrating for the child. It is particularly important to avoid developmentally inappropriate experiences that may lead to boredom or frustration with young children.

A third benefit to the observational approach is that assessment is conducted on many occasions over an extended time period. One of the significant limitations of ability testing is that it is conducted within a highly restricted time span. As a result, it is generally not possible to assess all of the capabilities that one might wish to assess. Moreover, it generally isn't feasible to observe patterns of behavior that may be manifested only across time. Young children are well known for the inconsistency of their behavior. They may exhibit a capability in one set of circumstances and not in another. To get an accurate picture of their capabilities, it is often necessary to observe children's reactions on repeated occasions. For example, a young child who has the ability to count small groups of objects may not show that capability in a testing situation because he or she simply does not wish to count at the time the examiner is attempting to elicit counting behavior.

A fourth advantage of the observational approach is that it can place assessment in the service of teaching and learning (Shepard, Kagan, & Wurtz, 1998). When a teacher observes a child's behavior and has a sound understanding of the underlying developmental processes associated with that behavior, the teacher is able to use the information obtained through assessment to plan learning opportunities to promote further development.

C. Training to Support Reliable Observational Assessment

Although the benefits of observational assessment are sufficiently substantial to warrant widespread endorsement of the approach among early childhood professionals, observational assessment does pose significant challenges when the intended use is to measure children's abilities. Current approaches to observational assessment have been heavily influenced by work in behavioral psychology. Observational assessment has been a mainstay in applied behavioral research and practice for many decades (e.g. Baer, Wolf, & Risley, 1968; Hartmann, 1982; Shapiro & Kratochwill, 1988; Sheridan, Kratochwill, & Bergan, 1996). Over the years behavioral researchers have developed an elaborate technology for conducting observations in ways that provide evidence of the reliability of those observations.

ATI offers teachers and other program staff professional development and training designed to help ensure high inter-rater reliability as well as training in the basics of the application. This training will increase the consistency of the observational data and improve the quality of the reports used to monitor child development. The ideal approach to ensuring high inter-rater reliability can be labor intensive, so there is a need to strike a balance between what is practical with regard to implementation and what is necessary for a credible outcome.

For this reason, ATI offers a two-tiered approach to teacher certification in inter-rater reliability. ATI training for Tier 1 inter-rater reliability certification is available online as part of the Galileo® Basics and Inter-Rater Reliability Training self-study training offering. This training offering jump starts program implementation by enabling staff to quickly develop the knowledge and skills required to reliably conduct observational assessments within Galileo Pre-K Online. The Tier 1 certification process ensures that the observers recording the data have a clear understanding of precisely what skills and behaviors are being evaluated. Borrowing from best industry practices in education, Tier 1 training includes activities that encourage the participant to *unpack the standards* and to carefully evaluate each indicator on the observational scale to gain a detailed understanding the skills and behaviors that comprise the instrument being used in the evaluation of a child's capabilities. Teachers work through the training online at their own pace and then take an online test to verify learning. The online test contains a series of questions in which a target skill from the scale is presented along with a description of child behavior relevant to the skill. The participant is asked to use the knowledge gained from unpacking the standards to indicate whether the described behavior may be considered to be an indication that the child has mastered the skill.

Once teachers have achieved Tier 1 certification for each scale, the program or school may desire to design and implement a Tier 2 certification initiative. ATI can provide assistance to the program or school desiring to implement a Tier 2 initiative. Tier 2 certification provided by the program or school offers enhanced ecological validity by evaluating inter-rater reliability in a real classroom context. ATI recommends that participants work as observers in teams of two (typically a teacher and a teacher's aide) and simultaneously independently rate the same child on the same scale. ATI further suggests that if the two raters agree on over 80 percent of the skills, they be awarded Tier 2 certification for the scale. Programs implementing a Tier 2 certification initiative obtain additional valuable information related to the reliable use of the assessment within their own program.

D. Benefits of Galileo Pathfinder

Although any observational assessment initiative can benefit significantly from the knowledge base accumulated through behavioral research, there are unique issues related to

the observational assessment of children's abilities that call for a new look at the technology of observation. Behavioral research is typically concerned with the observation of one or a small number of independent behaviors on repeated occasions. Reliable observations reflecting acceptable levels of measurement error are generally achieved by carefully defining each of the behaviors to be observed, providing examples of the behaviors, and practice in observing them. Evidence of reliability is established by having two or more observers assess the same behaviors. The level of agreement is then computed for each observed behavior using an appropriate statistical technique. Within the behavioral approach, each of the observed behaviors is treated as an independent entity. The idea that large sets of behaviors may be indicators of an underlying ability is totally absent from the behavioral perspective (e.g., Bergan, 1990; Messick, 1989; Shepard, 1991). Understandably, behavioral observational technology does not include sensitizing observers to the relationships of specific behaviors to an underlying ability.

The observational assessment of ability is by definition an assessment of ability, not simply the observation of isolated skills. The fundamental judgment to be made is a judgment about ability. The purpose for assessing specific capabilities in the observational assessment of ability is the same as that for any ability test, namely to arrive at a reliable estimate of ability. In order to achieve this purpose, observers need to understand the relationship between specific observed capabilities and the underlying ability being assessed. Observations of specific capabilities should occur within the context of an overall knowledge of the ability being measured. Moreover, such observations should stimulate inferences about overall ability. For example, a teacher observing children's math capabilities would almost certainly be aware that the capability to add two relatively large numbers suggests greater math ability than the capability to count a small group of objects. Observers profit from professional development and training assisting them to use this kind of information in making overall judgments of ability and in making observations regarding specific behaviors known to be indicators of ability.

Galileo® Pre-K Online includes a feature called *Pathfinder*, which is designed to assist observers to initiate their assessments by focusing on overall ability rather than on isolated skills. *Pathfinder* uses item difficulty and discrimination parameters derived using IRT techniques to obtain a baseline estimate of performance on each capability in a scale from a user (teacher) estimate of a child's overall ability. The initial baseline values subsequently may be modified based on direct observation, which typically occurs over an extended time span. *Pathfinder* has a number of benefits. First, it provides an instantaneous picture of the child's ability including the things that the child is likely to have learned as well as the things that the child will be ready to learn in the future. This broad picture of ability assists the teacher to see relationships among skills rather than looking at them in isolation. As a result, the teacher can plan learning experiences for the child based on what the child is likely to be ready to learn. A second important benefit is that the use of *Pathfinder* minimizes the likelihood that the child will be exposed to tasks that are either too easy, or too difficult.

There is a substantial body of research indicating that teachers are often excellent judges of the overall abilities of the children in their charge (e.g., Begeny et al., 2008; Coladarci, 1986; Demarary & Elliot, 1998). Thus, in many cases, it is reasonable to expect that they will be able to use *Pathfinder* to produce an initial baseline that provides a good picture of the child's current developmental level. Nonetheless, there will be instances in which additional information is required before an initial informed judgment could be made. There are a variety of ways that teachers can get the information needed for effective use of *Pathfinder*. Parent input or information from other teachers may be useful in formulating an initial baseline estimate. Informal observation of selected skills may also be useful.

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Although the *Pathfinder* approach has many benefits, there may be circumstances in which observation of individual skills is preferred in determining a child's developmental level. For example, if there is no need to get an initial baseline to guide instructional planning, a teacher might elect to schedule a series of observations of individual skills to determine the child's developmental level. In using this approach, it is important for the teacher to be particularly aware of the need to avoid subjecting the child to boredom or frustration. At the same time, the teacher must eventually make a judgment regarding all of the capabilities in the scale in order to get an accurate picture of the child's developmental level.

E. Dynamic Approach to Assessment

Psychometric tradition supports a long and complex development process producing assessment instruments typically used for many years with little or no change. In today's changing world, the usefulness of this static approach to assessment is likely to become increasingly limited. Not surprisingly, there is increasing recognition of the value of dynamic approaches to assessment, which allow assessment instruments to be continuously modified in order to meet changing educational needs. For example, the Galileo® scales were initially developed to meet established guidelines for assessment in Head Start, but have been revised several times in response to changing standards.

Dynamic assessment imposes a number of requirements with respect to the development of assessment instruments. First, to accommodate the need for continuous change, it must be possible to alter the content of assessment tools quickly. Galileo addresses this requirement through a software tool called *Scale Builder*. *Scale Builder* assists the user to create new scales, translate scales into other languages, and modify existing scales. Scales generated in *Scale Builder* are immediately available in Galileo Pre-K Online, which makes it possible for teachers to use them as soon as they are created to record observations of children's development electronically.

The second requirement imposed by dynamic assessment is to frequently update the psychometric properties of assessment instruments. This requirement occurs not only because of the continuing need to modify the content of assessment, but also because of changes in psychometric properties, which may occur over time because of changes in the characteristics of the children being assessed. IRT techniques are used in the Galileo system to establish the psychometric properties of the scales. Data on the psychometric properties of the scales in Galileo will be presented later in this document. Periodically, new analyses are undertaken to accommodate the need to update item parameter estimates.

The third requirement associated with dynamic assessment is to link newly added capabilities to an existing scale psychometrically. This is especially useful when there is a need to make scores administered prior to the change comparable to scores attained after the change. IRT provides a particularly useful approach for addressing this requirement. IRT can be used to link properties of newly created items in a scale to the previously established properties of existing items. IRT models can generate estimates of ability from any set of items reflecting the underlying ability being assessed (e.g., Lord, 1980). Thus, under the assumptions of IRT, ability estimates obtained prior to the addition of new items should be comparable to estimates obtained following the addition of new items. In this way, the statistical models that provide the theoretical foundation for the scales used in Galileo support the construction of dynamic models of development that can accommodate the rapid social and technological change that is the hallmark of the age in which we live.

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III. Measuring Ability and Documenting Learning Outcomes

A. Scale Construction

Scale construction in the Galileo® system is influenced strongly by federal and state standards. The widespread adoption of standards-based education has been accompanied by the development of state standards as well as federal standards designed to guide learning in early childhood education. The proliferation of standards across the nation has led to heavy reliance on mapping documents, which link skills represented on an assessment instrument to state and/or federal standards. While mapping is useful, excessive reliance on mapping can lead to questionable links between measured skills and standards. An alternative approach is to produce assessment scales designed to be aligned specifically to state standards. When this approach is used, IRT can be applied when necessary to place assessments aligned to different standards on a common scale. This is the approach that ATI uses. ATI has constructed scales aligned to standards for use in 33 states and continues to extend these scales to additional states. ATI also continually revises scales to accommodate advances in the scientific knowledge base and changes in state and federal assessment guidelines. The current Galileo G3 assessment scales for birth through 5 years represent recent revisions to previously existing Galileo assessment scales completed in partnership with federal, state, and private childcare and early childhood programs throughout the nation.

Scale construction in Galileo is influenced by a developmental perspective on learning. The construction of a scale is based on a research-based model of the structure of knowledge in the developmental areas targeted for assessment. This model provides part of the foundation for a theory of measurement linking the mastery of capabilities or tasks to increases in ability. For a given developmental area (e.g., early math), the model specifies a set of subordinate knowledge areas (e.g., counting and comparing, identifying numerals, adding, subtracting). Within each knowledge area, the model specifies a set of ordered capabilities or tasks reflecting a developmental progression. For example, the capabilities associated with adding include adding one to a small group, indicating that a small group has more after some have been added, and adding two small groups together. These capabilities can be aligned to a wide variety of standards including federal, state, and local standards. There is no requirement that the model specify all of the knowledge areas in the developmental area of interest. Nor is it necessary for the model to detail all of the capabilities falling within a particular knowledge area. Indeed, to attempt to construct an exhaustive model of the developmental areas of interest in education would be an impossible task. The IRT models that ATI employs enable a child's ability to be estimated from any set of capabilities that reflect that ability. These models will be described further in the following section.

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B. IRT and the Developmental Level Score

In the context of the research-based model of the structure of knowledge described previously, Galileo® uses statistical models and techniques based in IRT to provide a Developmental Level (DL) score. The DL score is an estimate of a child's ability that is linked to the mastery of standards aligned capabilities. This link enables the reporting of child learning outcomes in terms of what the child is capable of doing. For example, a teacher could report to parents that the student has mastered the capability of adding one to a small group.

IRT models treat the responses to items or tasks on an assessment as observable manifestations of an unobservable (latent) trait or ability. The DL score indicates an individual's position on a path of development (i.e., a continuous latent-ability scale). Since the latent trait is not directly observable, IRT models assume that ability can be estimated from any set of capabilities reflecting the trait in question (e.g., Lord, 1980). This means it is possible to infer the kinds of things that a child is capable of doing based on a limited number of observations of what he or she has done. The result is a substantial increase in the amount of information available about children's learning that can be derived from assessment.

As ability increases throughout development, children are able to perform progressively more difficult tasks. In generating an estimate of ability, IRT models consider not only the observed responses to the tasks on an assessment, but also the characteristics of the tasks themselves such as difficulty. IRT places ability and task difficulty on the same scale. This feature provides many advantages. One advantage is that the ordering of tasks forming a developmental progression can be empirically validated using IRT and factor analysis techniques. Another advantage involves the link between ability and instruction. The fact that ability and difficulty are measured on the same scale provides the basis for an interpretation of ability in terms of the tasks that the child is likely to be able to perform now and the tasks that he or she will be able to perform as development progresses. We have used the term path-referenced assessment to refer to this interpretation of the ability score (Bergan, 1981, 1985).

Galileo is designed to support a path-referenced approach to assessment. Path-referenced assessment is useful in many ways in educational settings. Path-referenced assessment supports a developmental conception of ability that facilitates the use of assessment information to guide instruction. When we know a child's developmental level as summarized by the DL score, we know the kinds of things that the child has already learned and the things that the child is ready to learn now and in the future. This information provides the basis for planning learning opportunities that are appropriate to the child's needs and interests.

Path-referenced assessment is also useful in documenting program outcomes because the DL score measures progress in terms of position on a continuous developmental ability scale. In addition, it is possible to link DL scores across age levels to assess progress over an extended time span. In documenting program outcomes, it is often desirable to summarize findings for communication to other audiences. For example, as part of accountability initiatives, child learning outcomes are typically communicated to policy makers and the public. A major reporting challenge in this context is to communicate findings related to child learning outcomes in ways that can be easily understood; however, it is also critical to ensure that these findings are not likely to be misunderstood or to lead to harmful unintended consequences. One approach to the communication problem involves the use of achievement levels. A second involves the use of developmental milestones. The following sections describe how Galileo supports both of these approaches along with the advantages and limitations of each approach.

C. Establishing Achievement Levels

Achievement levels are established by setting cut points on the ability continuum. For example, the ability continuum for a particular scale, say language and literacy, could be segmented into three levels, a beginning level, an intermediate level, and an advanced level. Three questions must be addressed in setting achievement levels. The first is how many levels to set. The second is where to put the cut points used as boundaries for the levels, and the third is what to call the levels. Galileo® provides the flexibility to set as many levels as may be desired, to vary the cut points used as level boundaries, and to choose whatever names the user desires for the levels. When settings related to these three questions have been entered, the system automatically incorporates the settings into reports summarizing children's accomplishments.

The simplest approach to take with respect to the number of levels is to divide the ability continuum into two levels (e.g., pass and fail). However, it is often advantageous to segment the continuum into more than two levels. There is necessarily a loss in information when the ability continuum is cut into segments. Having more than two levels reduces the amount of lost information. Many levels are also better than two levels at reflecting the range of achievement likely to be found in early childhood classrooms. However, when there are only two levels, you only need one number to communicate results (e.g., the percentage of children who are above the pass-fail cut point). From the standpoint of communicating results to the public and to policy makers, it is better to have one number than more than one number. This would seem to argue in favor of a single performance standard. However, even when only one performance standard is reported, it is still useful to have multiple achievement levels available. Cronbach, Bradburn, and Horvitz (1994) in a report prepared for the state of California recommend reporting the percent above cut points as opposed to percents at various proficiency levels. This facilitates reporting using one performance standard selected from among multiple available standards. For example, a newspaper publication might report that 70 percent of the children in a particular program scored at or above a particular level of development. The availability of multiple levels accommodates cases in which the use of one achievement level would reveal minimal accomplishment whereas two or three would reveal substantial accomplishment.

The process of setting cut points for performance standards and naming those cut points standards can be a controversial task (Lissitz & Bourque, 1995). Performance standards are inherently subjective (Cizek, 2001). For example, to say that 60 percent of the children in a program are performing at an advanced level in literacy requires a subjective judgment as to what is meant by advanced. When assessment is carried out for accountability purposes, there are invariably consequences for meeting or not meeting a performance standard. The combination of inherent subjectivity and consequences related to accountability is a breeding ground for controversy. There are procedures that can be used to assess the validity and reliability of performance standards (Cizek, 1996; Messick, 1995; Yen, 1997). Galileo includes a number of features that can support research initiatives aimed at establishing the validity and reliability of performance standards. For example, the flexibility to set any number of cut points and give them any desired names makes it easy to conduct research on a variety of options before arriving at a final approach to standard setting.

D. Establishing Developmental Milestones

Developmental milestones are established by selecting critical capabilities in developmental areas that reflect valued educational goals. For example, in the literacy area, one might choose the ability to create a simple story with a beginning, middle, and end as a

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developmental milestone. Galileo® makes it possible to select any set of capabilities in any developmental area for which scales have been established as developmental milestones. The system is capable of printing reports indicating the proportion of children who have learned the capabilities assessed by milestones.

In establishing milestones, it is necessary to ensure that there is consensus as to the importance of the capabilities selected. The selection of a capability as a milestone underscores the educational importance of that capability. Not surprisingly, when a capability has been designated as a milestone, teachers may be strongly motivated to provide learning opportunities that will promote the development of that capability. In order to justify the special emphasis likely to be given to milestones, it is essential that the milestones selected be ones of recognized importance.

E. Monitoring and Evaluating Learning Outcomes

Galileo contains various reports that can be used to monitor and evaluate learning outcomes. These reports are designed to accommodate varying levels of aggregation. For example, reports can be generated that aggregate child learning outcomes across several agencies or school districts. It is also possible to aggregate across all centers or schools within an agency or school district. The user can also generate reports for classes within a center or school. In addition, it is possible to generate individual reports for one or more children. Galileo report filters also make it possible to analyze assessment data in the context of child demographic, programmatic, curricula, and staff variables. Reports include *Development Profile Reports*, *Development Milestones Reports*, *Development Summary Reports*, *Achievement Reports*, *Progress Reports*, and *Outcomes Analysis Reports* to name a few. Galileo also provides management reports including *Data Source Reports, History Reports*, *Inactive/Active Children Reports*, and *Child Information Reports*, to name a few. Examples of several types of reports are presented in the following sections.

i. Development Profile Reports

The *Development Profile Reports* document learning of all of the capabilities in a scale for a given developmental area. One of the principal uses of the *Development Profile Reports* is to plan learning opportunities to promote learning. The *Development Profile Reports* include information on what a child has learned and on the capabilities that a child is ready to learn or will be ready to learn soon or later. A teacher can use this information to plan learning opportunities to promote the child's learning.

Individual Development Profile

Center: 1481 Center
Class: FISCHER

Observation Period: 8/15/2012 to 6/6/2013

Child: Matthew DIAZ
Scale: 3-5 years: G3 Early Math

COUNTING AND COMPARING

Readiness	Capability
Learned	1) Uses one-to-one correspondence when counting objects.
Learned	2) Counts to find how many are in a group up to 5.
Learned	3) Counts forward from a number > 1 to find how many are in a group.
Learned	4) Counts to find how many are in a group up to 10.
Learned	5) Counts to find out how many are in a group greater than 10.
Learned	6) Counts backward to find how many are left.
Learned	7) Writes numerals to indicate 6 or less objects.
Ready Later	8) Writes numerals to indicate between 7 and 10 objects.
Ready Later	9) Writes numerals to indicate between 11 and 20 objects.
Ready Soon	10) Answers questions about two sets of items using comparison terminology (e.g., more, less, greater than, fewer than, equal to).
Ready Now	11) Separates a group into two sets and identifies the number of items in both sets.

ii. Development Milestones Reports

The *Development Milestones Reports* document the learning of selected capabilities in a given developmental area. The *Development Milestones Reports* can be used to guide learning. For example, a teacher might share a *Development Milestones Report* with a parent during a planning session to promote learning in the home environment. The *Development Milestones Reports* can also be used as part of an accountability initiative to communicate learning outcomes to the public and other audiences such as state legislators.

iii. Development Summary Reports

The *Development Summary Reports* give a series of four scores that summarize a child's development. Three of the scores are norm-referenced scores (i.e., a percentile rank, a normalized standard score, and a normal curve equivalent score). Norm-referenced scores are widely used in educational programs and give a child's position in a norm group. For example, the percentile rank indicates the percentage of children in the norm group at or below a particular score. Norm-referenced scores may be useful in those instances in which a management decision is informed by knowledge of where the child stands in a norm group. In some cases, norm-referenced scores may be used to assist in planning learning opportunities. For example, as part of a planning initiative a teacher may wish to know the extent to which a child has made progress relative to his or her peers. The fourth score in the *Development Summary Report* is the DL score. As described previously, this score is an IRT scale score that indicates the child's position in a path of development. The DL score can be used to assist in the planning of learning opportunities and in documenting learning outcomes. For example, the DL score is used along with other information to compute the probability that a child will be able to perform each of the capabilities in a developmental scale. For ease of interpretation, these probability estimates are converted to readiness levels that can be used to guide the planning of learning opportunities for children. The DL score also provides the foundation for setting achievement levels defining standards of performance.

Individual Development Summary Report – Confidential Screen Shot

Individual Development Summary

Agency: ATI Prek Demo Agency

Center: 1481 Center

Class: FISCHER

Report Date: 6/6/2013

Child & Scale	Observation Date (Age)	DL Score	Percentile	Standard Score	Norm Curve Equivalent
ZAMORA, Lesley (DOB: 12/10/2008)					
3-5 years: G3 Nature and Science	4/12/2013 (4 yr 4 mo)	458	0.22	-0.79	33.36

iv. Achievement Reports

The *Achievement Reports* indicate the proportion of children who have reached each of a set of achievement levels established for the reports. As described previously, achievement levels are established by setting cut points along the distribution of DL scores. Achievement levels are frequently used to establish performance standards used in high-stakes testing programs. However, they may also be used to summarize children's accomplishments. For example, achievement levels could be used with parents to plan learning opportunities for their children.

Achievement Report

Scale: 3-5 years: G3 Nature and Science (56 goals in scale)

Observation Period: 8/1/2012 to 6/6/2013

Beginning (0-18)	29
Intermediate (19-36)	184
Advanced (37-56)	119
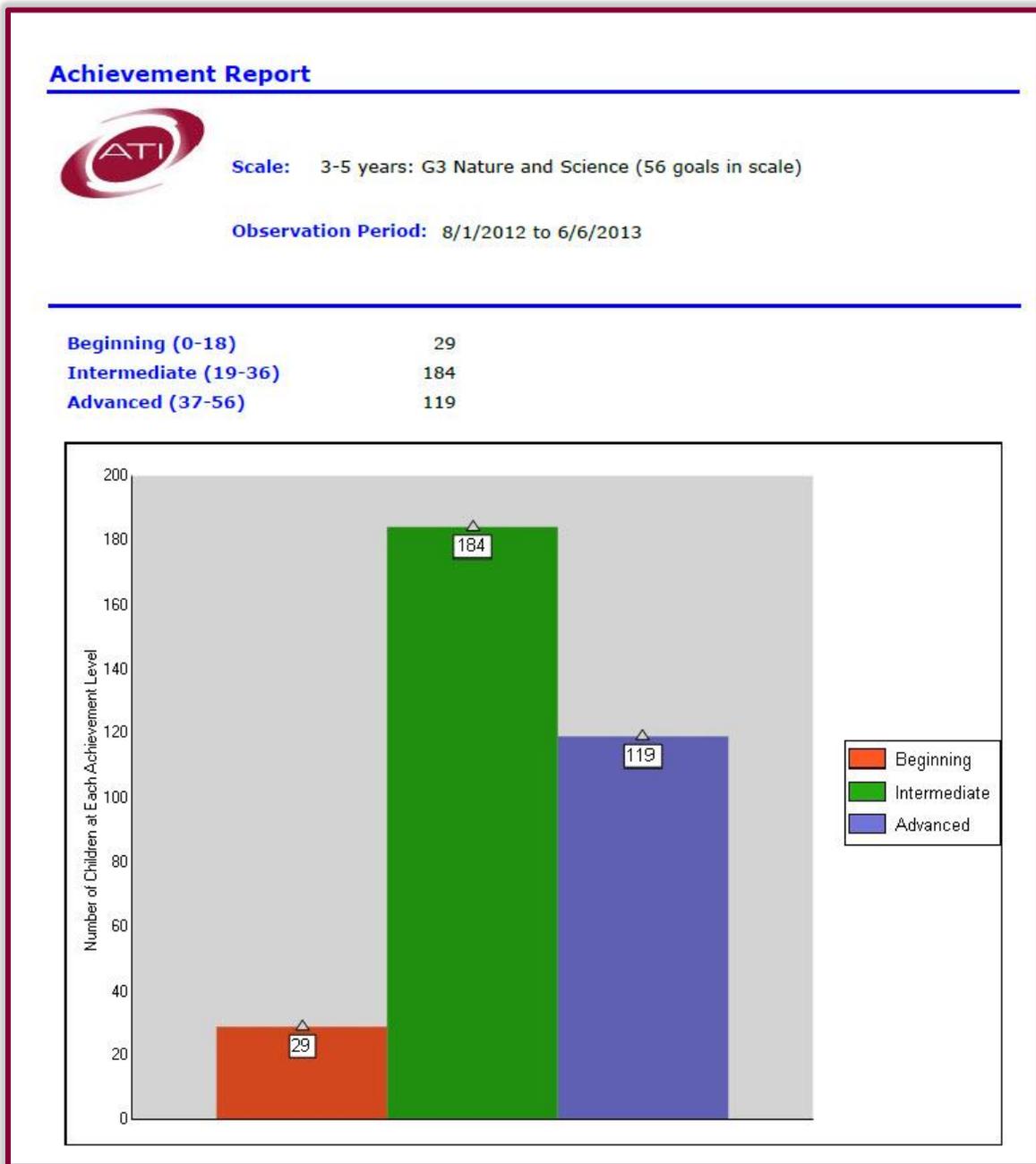
v. *Progress Reports*

The *Progress Reports* are indicators of the change that has occurred in children's development from an initial observation period to a subsequent observation period. In Galileo[®], *Progress Reports* are constructed by assessing children's achievement levels at two points in time. *Progress Reports* are easy to interpret. They can be used to summarize children's accomplishments for parents and other public audiences. However, *Progress Reports* have limitations that are important to keep in mind. Of particular importance is the fact that it is generally not useful to compare children's progress in one group with children's progress in

another group. Comparison requires converting the representation of progress to a gain score. When gain scores are used to compare groups with differing initial scores, the group whose initial score is furthest from the average has a built in advantage (Linn, 1981). For this reason, adjustment is necessary when group comparisons are required.

Individual Progress Report – Confidential Screen Shot
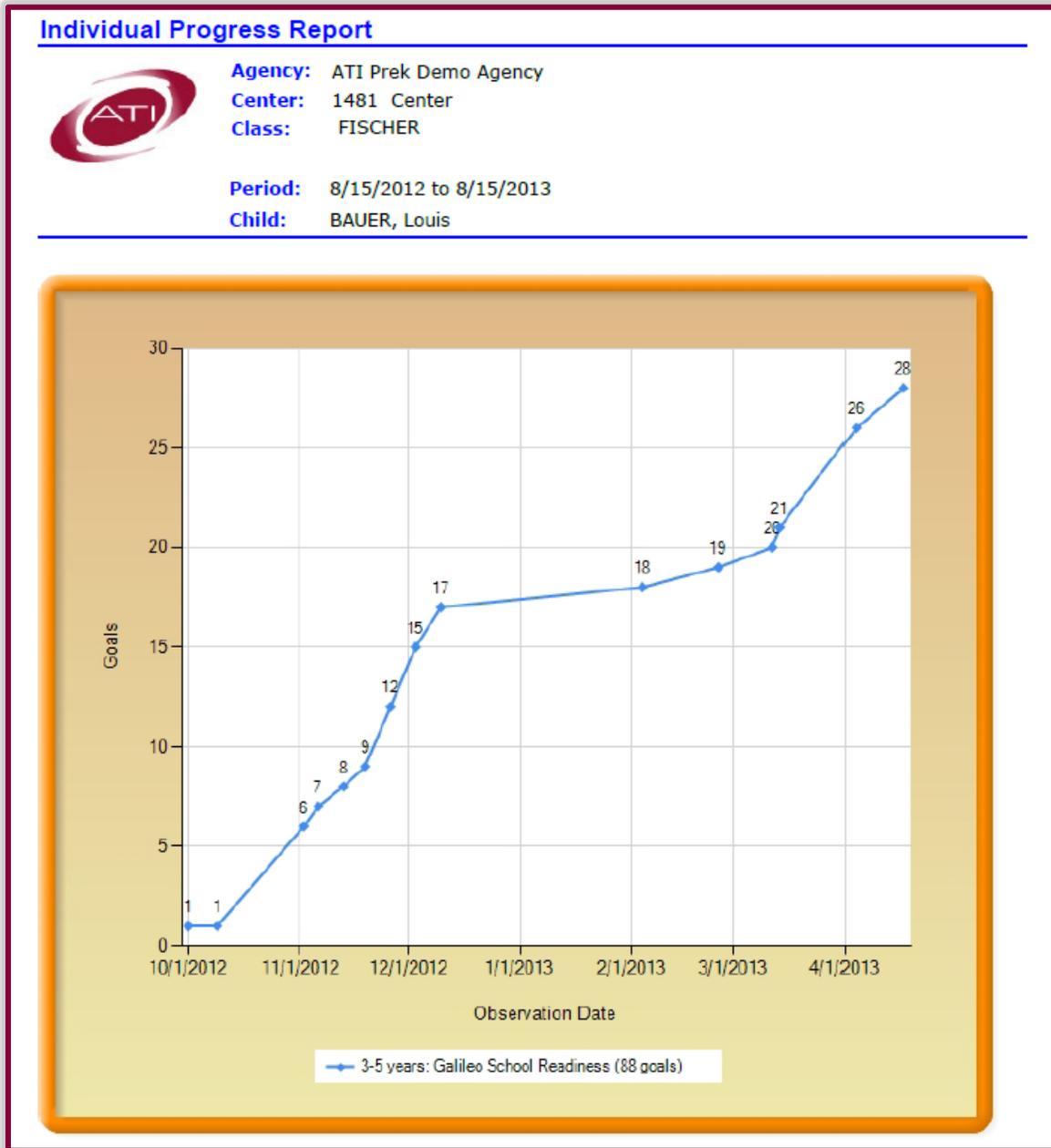
vi. Outcomes Analysis Reports

The *Outcomes Analysis Reports* provides a comprehensive summary of child progress across multiple time periods in terms of Developmental Level scores and achievement levels. Users can display one or more scales at a time and aggregate data across centers and/or

classes. Drill downs provide access to reports for individual children. Many programs use this report to track child progress and achievement and to provide data that can satisfy Head Start reporting requirements.

Outcomes Analysis Report – Confidential Screen Shot
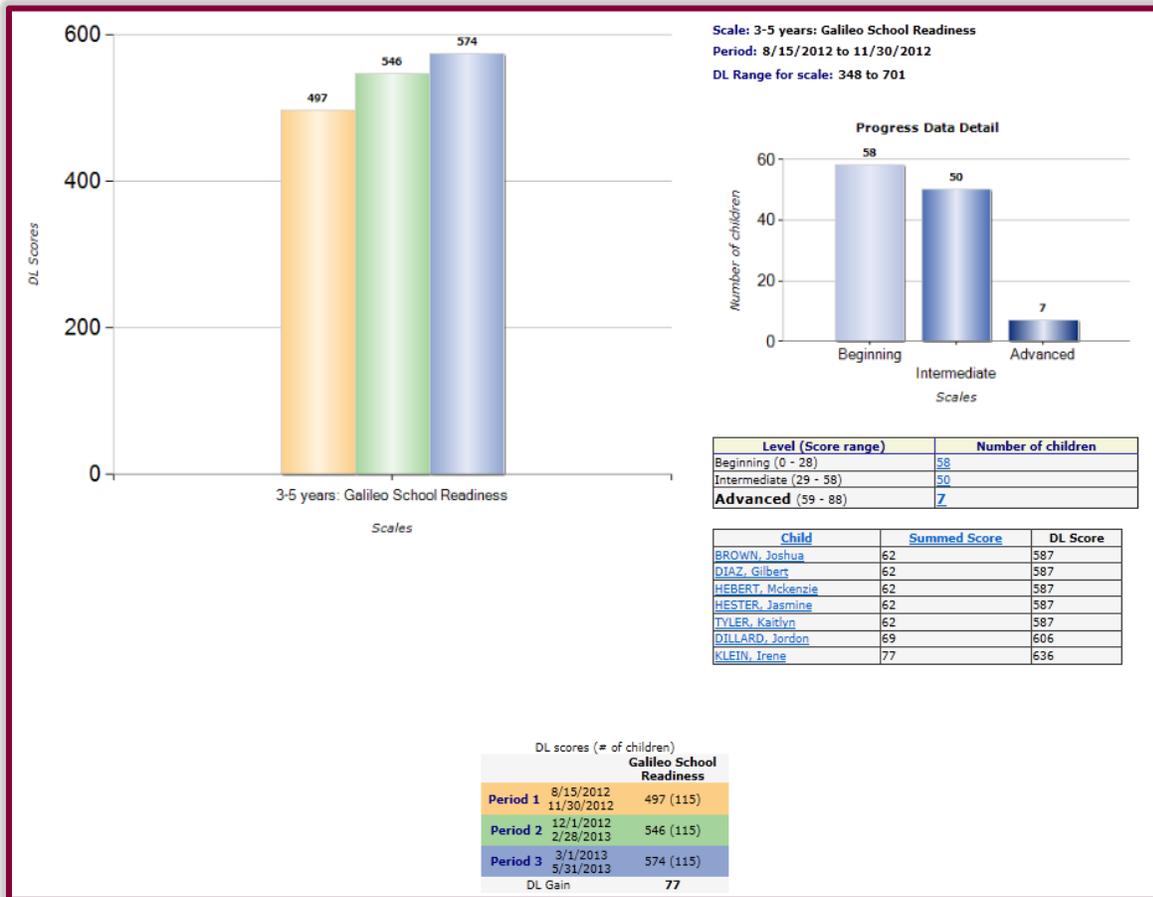
IV. Validity of **Galileo**® G3 Assessment Scales

As part of the development and evaluation of an assessment tool, it is important to address the validity of the tool (i.e., whether it measures what it purports to measure). In the measurement tradition, content validity has often been addressed by having content experts judge the extent to which test content is representative of the knowledge domain that the test is intended to measure. However, Messick (1989) noted that these expert judgments are independent of the responses that examinees actually make to the items on the test. Messick (1989) argued convincingly that the examination of the validity of the content of an assessment scale must include consideration of the manner in which examinees respond to scale content. In other words, he claimed that content validity is inextricably bound to whether the content of a scale is a representative sample of a broader knowledge domain that the scale is intended to measure (i.e., construct validity). Therefore, this section considers two inter-related aspects of validity: content validity and construct validity.

A. Evaluating Validity

Evaluating validity involves examining a number of issues related to whether the assessment tool adequately measures the relevant aspects of the targeted skills or abilities (e.g., Nunnally & Bernstein, 1994). One issue has to do with the extent to which items on a test adequately measure the underlying capabilities that they are intended to measure. For example, does a multiple-choice item designed to assess a simple addition skill accurately reflect children's learning of that skill? Since the principal source of data recorded in Galileo® is direct observation of children's capabilities in their learning environments, there are no test items per se. Consequently, the issue of whether or not an item adequately reflects an underlying capability is not a relevant concern.

Another issue relates to whether a test score adequately reflects children's learning as it is displayed in the learning environment. For example, will children adequately display their learning in a formal assessment situation? Assessing children's accomplishments based on direct observation in the child's learning environment obviates this concern. However, within Galileo, users can record developmental accomplishments based on information from a variety of data sources. For some data sources, the question of the relationship between test performance and performance in the learning environment may arise. For example, a teacher may base her judgment that a child has acquired a particular capability in whole or in part on the performance of the child on a test. In this case, the teacher's judgment provides an additional source of evidence beyond the child's test performance. When the teacher asserts that the child has mastered the capability in question, he or she implicitly supports the assumption that test performance adequately reflects the capability of the child displayed in the learning environment. This assumption can be examined empirically by assessing the congruence between test performance and observed performance. For example, test performance might reveal children's mastery of one or more simple counting skills. Observation in turn might reveal their mastery of other math capabilities such as relatively complex addition skills. Examination of the difficulty and discrimination parameters derived using IRT for each of these capabilities would reveal the extent to which performance on the counting items was consistent with performance related to other capabilities on the scale.

A third issue has to do with the extent to which the content of a scale is a representative sample of a broader knowledge domain that the scale is intended to measure. Often it is assumed that the content of the scale should be composed of a random sample of capabilities reflecting the broader knowledge domain. The purpose of imposing this criterion is to justify generalization from the sample to performance in the larger domain (e.g., Messick, 1989). The criterion of random selection is often impossible to realize. As a result, the test developer is left with the problem of arguing that items not chosen at random are nonetheless like the ones that would have been selected if a random procedure were feasible.

Galileo takes a different approach to this issue by empirically examining children's performance of the capabilities in the scales using models based in IRT and latent trait theory. As indicated previously, the scales included in Galileo are designed to support a developmental approach to assessment reflecting the assumptions of latent trait theory. Each of the scales is composed of one or more knowledge areas and a set of capabilities sequenced by difficulty within each of the knowledge areas. Each of the scales is assumed to measure a child's latent ability with respect to a particular developmental area. Latent ability cannot be observed directly. It must be inferred from performance on a sample of capabilities reflecting the ability in question. The inference does not require a random sample of capabilities. Any sample of capabilities reflecting the ability will do. There will generally be many more capabilities reflecting a given

ability than the ones assessed. Moreover, the full domain of potential capabilities reflecting a given ability may not be known. However, given an estimate of ability and estimates of item parameters such as difficulty and discrimination, it is possible to make inferences about a child's performance of capabilities that have not been directly assessed.

B. Identifying Content for Assessment

Given that IRT enables the use of any set of capabilities to assess a child's latent ability in a particular developmental area, the selection of content for the Galileo® scales has been guided by other constraints. The first constraint is that the content of the scales should reflect the instructional goals of the educational programs using Galileo Pre-K Online. These goals can be expected to vary, which is one reason why the system supports a dynamic approach to assessment in which existing scales may be modified and new scales developed to meet instructional goals. For example, the Galileo scales have been modified a number of times in response to updates of state and federal instructional goals.

The second constraint involves the identification of developmental progressions within knowledge areas. In order to develop scales to assess children's development (as well as to develop the Galileo Pre-K Online Curriculum), a blueprint is developed that outlines key competencies that form developmental progressions. This blueprint is shaped by many sources. One important source is the research literature on children's learning and development. The last several decades have produced an abundance of new knowledge about children's development. For example, the rapid development of cognitive science following the publication of Newell and Simon's (1972) classic work on human problem-solving has significantly advanced our knowledge about children's cognitive functioning. This information is useful in the formation of hypotheses that can be examined empirically with the large samples of children in programs using the Galileo system. However, there are still large gaps in our knowledge of developmental progressions in many areas of development. Moreover, much remains to be learned about how children acquire new capabilities in the course of development. In those instances in which research is not available to guide hypothesis formation, hypotheses must be based on other sources. These include the collective experience of educators and parents, current curricular goals and practices, and societal values.

The G3 assessment scales contain sets of scales appropriate for several age ranges: birth to 8-months-old, 8- to 18-months-old, 18- to 24-months-old, 2- to 3-years-old, and 3- through 5-years-old. For each age range, the Galileo G3 assessment scales are organized into domains of knowledge that cover a variety of aspects of development including the essential domains of school readiness such as: 1) physical development and health, 2) social and emotional development, 3) approaches to learning, 4) language and literacy development, and 5) cognitive development. Within each scale, each domain is comprised of a set of knowledge areas and each knowledge area is expressed as a set of capabilities. The ordering of the capabilities within each scale can be empirically validated using IRT techniques on an ongoing basis using current populations of children.

The remainder of this section describes the organization of the Galileo G3 assessment scales and knowledge areas in the context of a review of current knowledge of critical developmental areas for children's growth. The aim is to briefly outline the rationale for including particular content in the Galileo assessment scales. The full set of knowledge areas and capabilities contained within each of the Galileo G3 assessment scales for birth through 5 years is presented in Section 5 along with detailed information about the psychometric properties of each scale and each capability.

i. Physical Development and Health

Many health and social problems affecting adults have their origins in the behaviors and habits that are developed in early childhood. Essential health knowledge and skills should be taught in the early educational years to influence attitudes and behaviors for a healthy and safe life in the future. Research demonstrates that even very young children are ready to learn about food, nutrition, exercise and health (Singleton, Achterberg, & Shannon, 1992). Knowledge of nutrition, health, and safety, when combined with self-help skills of feeding, grooming, dressing and toileting, and natural physical development helps to give a child autonomy and independence.

The capabilities within the knowledge areas in the Galileo® *G3 Physical Development and Health Scale* for 3- through 5-year-olds are designed to not only teach concepts, but to actively engage children in practicing them. Comprehensive school health education commencing at the preschool level and extending through high school is necessary to promote the development of health knowledge, health-related skills, and positive attitudes toward health in our society. Furthermore, healthy children in an educational setting are able to focus on and actively engage in learning experiences across the board in any subject area.

The ability to move and control objects is the means by which we can explore our surroundings, increase sensory information, and thereby gain understanding of the world in which we live. Perceptual-motor development is inextricably linked to cognitive development. Recent brain research examining ways in which motor and cognitive development are intertwined suggests that the cerebellum is important not only for motor functions, but also for cognitive functions (Diamond, 2000).

Young children have a strong drive to gain autonomy. Learning to feed, dress, and groom themselves is a source of great pride. For example, they may learn to use Velcro fasteners or to button or zipper their clothing. They may also take a more active role in feeding themselves by using utensils and drinking from a cup. They are also eager to show their independence by washing their hands and brushing their teeth.

The Galileo *G3 Physical Development and Health Scale* for 3- through 5-year-olds contains the following knowledge areas: *Obtaining Nutrition*; *Practicing Hygiene*; *Exercising*; *Dressing*; *Toileting*; *Understanding of Health and Safety Practices*; *Developing Gross Motor Control and Balance*; *Developing Gross Motor Coordination*; *Developing Fine Motor Dexterity and Control;* and *Developing Hand-Eye Coordination*.

1. Obtaining Nutrition

Research tells us that developmentally appropriate materials related to classroom nutrition education can be effectively implemented with children as young as 3 through 5 years of age. The nutrition education activities used in instruction should be tailored to children's cognitive abilities and muscular developmental levels, and teach skills for lifelong decision-making (Morrison, 2001). The capabilities related to eating and nutrition in the Galileo *Physical Development and Health Scale* are written to be both practical and hands-on in nature, progressing from proficiency in food handling to the specific knowledge of healthy food choices.

2. Practicing Hygiene

When children learn early the importance of personal hygiene practices such as brushing their teeth or washing their hands properly, they are not only immediately healthier, but have also begun to establish lifelong hygiene habits. Initially children require assistance with these skills and modeling is important. As they progress they are able to do them on their own, though they may still need frequent reminding. Besides being important in a social context, the acquisition of hygiene skills is key to avoiding illness and disease.

3. Exercising

Few people would argue against the notion that regular physical activity has consequential health benefits. Among children aged 3- to 4-years-old, those who were less active tended to remain less active after the age of 3 years than most of their peers (Pate et al., 1996). In recent years, school physical education requirements have been recommended for children in preschool programs as well as children in the elementary school (Center for Disease Control, 1997). In February 2002, the National Association for Sport and Physical Education adopted their first physical activity guidelines for toddlers and preschoolers. These guidelines are designed to promote appropriate levels of physical activity. The addition of exercise to the preschool classroom should be carefully planned to include appropriate activities for children of different ages (Barret, 1992). The capabilities in the Galileo® *Physical Development and Health Scale* are designed to meet young children's needs for regular physical activity, while helping to instill the value of exercise for lifelong health. The goals reflected in the Galileo *Physical Development and Health Scale* are designed to encourage children not only to participate in exercise activities and outdoor games, but also to talk about the ways in which exercise keeps us healthy. This connects enjoyment with physical exercise and a healthy purpose.

4. Dressing and Toileting

The self-help capabilities contained in the knowledge areas of *Dressing* and *Toileting* reflect goals that promote the kind of independence necessary to function effectively in educational environments. As children acquire skills that enable them to function independently, they become more confident in their ability to interact effectively in educational settings.

Most children become ready for dressing skills as their fine motor skills improve, hence the progression of capabilities from unfastening clothing to fastening clothing, and from assisted tasks to unassisted tasks. In the preschool years, children are also developing decision-making and problem-solving skills that enable them to realize, for example, that when it is cold you should put on a coat. The goals in the *Dressing* knowledge area track a child's progress in the motor skills required to dress themselves and correctly put on their shoes.

Children need to be allowed opportunities to practice self-help skills of toileting at any moment throughout their day. Most children have learned to stay dry during the day by the age of 3. However, children are still perfecting their toileting skills beyond this age. Tasks such as indicating the need to use the toilet in time and staying dry between bathroom trips take more time, patience, and reinforcement from adults, as well as more independence on the part of the child. Eventually, children will assume responsibility for initiating a trip to the bathroom.

5. Understanding of Health and Safety Practices

As children grow and become more independent, it is important to teach them to make the right decisions and to have safe habits. In 2009, more than 9,000 children died from preventable injuries in the United States and many more were seriously injured leaving them with morbidities which may last a lifetime (Centers for Disease Control, 2012). Even with the most diligent adult supervision and childproofing in our schools and homes, children may encounter unprotected hazards at any time. For this reason a child must learn to utilize teachers and other adults as helpful resources, recognize and avoid dangerous situations, and follow rules to protect themselves from harm. The differing goals within this knowledge area enable children to learn with guidance the safety skills to make the right decisions in different situations.

6. Developing Gross Motor Control and Balance

Perceptual-motor activity is related to the ways we think as well as to the ways we play. For example, movement and coordination skills gained in childhood are prerequisites to effective participation in sports and games which in turn provide a lifetime of physical activity. Physical activity is an essential ingredient of a healthy lifestyle and is associated with an extended life span and reducing the risk of a variety of diseases. Promoting motor skill confidence and competence in early childhood helps to ensure healthy development and the likeliness of future participation in physical activity (National Association for Sports and Physical Education, 2012).

Gross motor movements use the entire body or large portions of the body. Capabilities related to balance extend from moving around obstacles to controlled movement along an alignment, such as a chalk-line or balance beam. Ultimately, the child is able to use these balance skills while stationary by balancing the entire body on one foot. Early basic locomotion capabilities included in this knowledge area progress from walking forward and backward to jumping forward and backward to pedaling, hopping, and climbing. Later capabilities, which require integration of rhythm with movement, include skipping and galloping.

7. Developing Gross Motor Coordination

Motor movements are readily observed. As a consequence, it is not surprising that early developmental theorists extensively documented perceptual-motor development. Coordinated movement requires the ability to use visual and perceptual information to plan and guide motions. Gross motor goals in this area include such capabilities as throwing and kicking a ball with increasing degrees of accuracy. Further development is marked by the ability to catch a ball in outstretched arms and later to catch with flexibility in the arms and with greater accuracy. As visual perception and motor coordination are refined, the child is able to dribble a ball first with two hands and then with one hand.

8. Developing Fine Motor Dexterity and Control

Fine motor skills that involve small body movements of the hands and fingers develop more slowly than gross motor skills, which involve large body movements. The energy needed to perform gross motor tasks is endless in preschoolers. However, the delicate fine motor tasks of holding and manipulating small objects takes patience, a trait uncharacteristic of children this age. The central nervous system is still in the process of maturing to enable complex messages to travel from the brain to the preschool child's fingers. During the preschool years these skills will improve rapidly in most children. As these skills are linked to other domains of knowledge

such as early writing and creative arts, it is important to track a child's development of fine motor control and identify potential areas of need early on.

9. Developing Hand-Eye Coordination

This knowledge area involves goals in which the eyes and hands develop skills together for accuracy in placement, direction, and spatial-awareness. Capabilities related to hand-eye coordination include initial skills such as copying simple geometric shapes and familiar letters from provided samples and later skills such as drawing shapes and recognizable objects without samples. Ultimately, a mind-body connection is achieved when children use drawing implements to translate thoughts into meaningful marks on paper to represent objects or events. The development of hand-eye coordination, necessary for writing and drawing, is one of the most important prerequisites for school readiness. Fine motor skills are essential to a successful classroom experience in early elementary school years and the importance of assessing and mastering such skills should not be dismissed at the preschool level.

ii. *Physical Development and Health for Infants and Toddlers*

Infancy through toddlerhood is a time when a child is rapidly changing physically as well as developing lifelong muscle control and coordination. Therefore, it is important to monitor a child's developmental progress. The Galileo® *G3 Physical Development and Health* assessment scales for infants through toddlers provide developmentally appropriate age based opportunities to document a child's development in four major areas: *Gross Motor Development*; *Fine Motor Development*; *Self-Help*; and *Health*. These four areas are included in each of the age range scales as they are primary to a child's physical development and health and contribute substantially to a child's success in other areas of learning as well.

1. Gross Motor Development

Gross Motor Development is broken into two distinct areas: *Demonstrates Healthy Physical Development*; and *Demonstrates Balance, Control and Coordination*. Development in these areas enables a child to participate in classroom activities independently and provides the physical control necessary to fulfill many activities of daily living.

2. Fine Motor Development

Fine Motor Development is also broken into two areas: *Demonstrates Healthy Perceptual-Motor Development*; and *Demonstrates Perceptual-Motor Strength, Control and Coordination*. These skills will lead to a child's ability to complete important activities of daily living as well as fine motor tasks such as writing and reading which will be essential to a child's success in school.

3. Self-Help

Self-Help also includes two areas: *Participates in Self-Care*; and *Participates in Basic Health and Safety Routines*. The capabilities in this knowledge area relate to eating, dressing and toileting. Long term success in school and in life depends on a child's ability to perform basic health, hygiene and safety practices independently.

4. Health

Health is divided into four areas: *Shows Characteristics of Good Nutritional Health*; *Demonstrates Auditory Skills That Support Healthy Development*; *Shows Characteristics of Good Oral Health*; and *Shows Basic Physical Needs Are Met*. Within this knowledge area capabilities are documented that relate to a child's physical health which is strongly correlated to a child's success in school (Morrison, 2001).

iii. Social and Emotional Development

Social development involves the acquisition of capabilities that promote effective interactions with others and that assist individuals to regulate their own behavior. Social development plays an important role in children's success in school, peer acceptance, ability to communicate with others, and understanding of cultural diversity (Bierman, et al., 2008) (Fantuzzo, et al., 2007) (Hemmeter, Ostrosky, & Fox, 2006). Promoting social development has been a fundamental outcome goal of early childhood programs for decades. The Galileo® *G3 Social and Emotional Development Scale* includes knowledge areas related to: *Learning About Self*; *Learning Cooperation*; *Resolving Conflicts*; *Discovering Independence in Daily Activities;* and *Building Social Relationships*.

1. Learning About Self and Discovering Independence in Daily Activities

The preschool years mark an important transition in the development of a child from total dependence on adults to participating in activities with assistance, to sustained independence (Morrison, 2001). Growing independence can be seen in a young child as they prepare for classroom activities, transition through the daily routine and engage in self-help skills such as calming/soothing activities. Vital steps along this process of development include developing a sense of self, learning to identify the self as an individual, and talking about preferences, accomplishments, and emotions. Research shows that a child who demonstrates strong emotional skills may have increased success in school and form more satisfying relationships throughout life (Hansen & Zambo, 2007).

Research has also shown evidence of a relationship between academic achievement and self-esteem, but no clear indication as to the causal direction of that relationship (Shavelson & Carey, 1981). It seems most likely that self-esteem and achievement operate hand-in-hand with increased esteem causing improved confidence, initiative and curiosity, which in turn makes if more likely that the child will be successful thereby further enhancing esteem.

2. Learning Cooperation

Young children learn important prosocial skills such as cooperation through interaction with other children in a preschool setting. Preschool is a valuable time for a child to learn how to appropriately interact within a group such as the class through practicing following rules and routines in the classroom and making transitions between activities. A child will also practice working with adults and other children one on one and in small groups. The development of learning cooperation can be observed through classroom activities and play opportunities (Ashiabi, 2007).

3. Resolving Conflicts

The ability to resolve conflicts is vital to a child's personal success in multiple aspects of their childhood and adult life. A recent investigation found that the frequency of positive and negative peer interactions observed in childcare between the ages of 24 and 54 months predicted the children's peer competence as third graders in terms of individual social skills, dyadic friendships, and peer-group acceptance (National Institute of Child Health and Human Development Early Child Care Research Network, 2008). Preschool offers opportunities for children to build these skills in a supportive environment. The Galileo® *G3 Social and Emotional Development Scale* allows programs to track a child's progress along a continuum of development related to resolving conflicts. This developmental path begins with the child resolving conflicts with adult assistance and progresses to the child suggesting strategies for resolution, compromising and using passive strategies to manage escalating conflicts.

4. Building Social Relationships

The ability of a preschool age child to build successful social relationships is strongly correlated with school readiness and, in turn, school success (Hemmeter, Ostrosky, & Fox, 2006). Research indicates that many teachers rate the importance of social and emotional success above academic success during preschool (Ashiabi, 2007). A child demonstrating poor social and emotional competency in these important years should be identified as early as possible to provide appropriate intervention. Through the use of the Galileo *G3 Social and Emotional Development Scale* a program will have a valuable tool for identifying children at risk of poor social and emotional competency.

Social understanding involves the ability to make inferences about the behavior or feelings of another individual. For example, at an early age children know that a child who is crying may have been hurt. They may also be able to infer how a child feels based on facial expression. The ability to infer the feelings of another is an essential component of being able to respond to others appropriately. Social understanding also involves understanding oneself. An important aspect of self-understanding is self-esteem. Enhancement of self-esteem has been a major focus of early childhood intervention programs for years. It has been viewed both as an important factor in academic achievement and a meaningful objective in its own right.

iv. Social and Emotional Development for Infants and Toddlers

As one of the five essential domains included in the Head Start Framework, the Galileo G3 assessment scales for infants and toddlers each include a scale for social and emotional development. Infants and toddlers are highly reliant on others around them, so this is an essential time for the development of social and emotional skills. Everyone an infant or toddler interacts with including caregivers, family members, and other children provides a multitude of opportunities to learn in all domains. Infants are completely dependent on others in the beginning and become more independent as time goes; however, social and emotional development is important throughout a young child's life.

The Galileo *G3 Social and Emotional Development* scales for children ages birth to 3 years follow the progression a child makes through three broad knowledge areas: *Trust and Emotional Security*, *Self-Regulation*, and *Self-Concept*. Each of these knowledge areas is further subdivided into more specific knowledge areas.

1. Trust and Emotional Security

Trust and Emotional Security are important for a young child. This knowledge area contains subdivisions for *Experiencing and Developing Secure Relationships* and *Responding to the Environment*. As a child learns to trust others and their environment, they create space and a safety net for their independent exploration.

2. Self-Regulation

The *Self-Regulation* knowledge area contains three subdivisions: *Emotional Regulation*, *Behavioral Regulation*, and *Social Problem-Solving*. Very young children learn to regulate their emotions and behavior through testing their boundaries and interpreting the feedback. Integration of this knowledge and their interactions with others provide opportunities to develop social problem solving skills which will be important throughout their life with respect to their interpersonal interactions.

3. Self-Concept

A major milestone in the development of a young child is the emergence of self-awareness and a sense of self in relationship to others. Indicators for these important aspects of development are present in the *Self-Concept* knowledge area which is further broken down into *Self Awareness and Connectedness to Others* and *Sense of Competence and Confidence*. As a child comes to appreciate their individuality, they can then more fruitfully connect with others. This child can also move forward into a more independent role supported by a strong sense of self-confidence.

v. Approaches to Learning

Approaches to Learning refers to the motivation and behavioral aspects associated with the way a child approaches learning (McDermott, Rikoon, Waterman, & Fantuzzo, 2012). *Approaches to Learning* is a key domain contained in the Head Start Development and Early Learning Framework (US Department of Health and Human Services, 2010), the National Education Goals (National Education Goals Panel, 2000) and most state early learning standards. While *Approaches to Learning* is a new addition to the bank of research in early learning it is often considered one of the most critical domains. A child's progress within *Approaches to Learning* may directly affect their mastery of the content in all other areas of learning. Because of the wide scope of development children experience during their preschool years the child's individual approach to gaining knowledge may directly impact their learning outcomes across multiple domains throughout their lifetime. Aspects of a child's approach to learning may be related to inborn predispositions and experiences in early life (National Education Goals Panel, 2000).

Since *Approaches to Learning* plays a significant role in a child's developmental path it is important to recognize areas of need in this area at an early age so that additional support can be provided as needed. This can be done most effectively by using a psychometrically sound and developmentally appropriate assessment tool such as Galileo® Online (Bulotsky-Shearer, Fernandez, Dominguez, & Rouse, 2011). The Galileo *G3 Approaches to Learning Scale* for 3- through 5-year-olds measures the child's progress in representative knowledge areas including *Taking Initiative and Exhibiting Curiosity*, *Developing Creativity and Inventiveness*, *Goal Setting and Planning*, and *Learning Cooperation*.

1. Taking Initiative and Exhibiting Curiosity

Taking initiative can be defined as the ability to create and follow through on plans. Taking initiative directly relates to a child's ability to explore their learning environment by selecting appropriate purposeful activities. If a child is demonstrating curiosity he or she is actively engaged in learning. He or she may express this by exploring, asking questions, participating in a variety of activities or experimenting with a variety of materials and objects in the classroom. This creates a foundation for learning throughout classroom interest areas and in a variety of classroom lessons.

2. Developing Creativity and Inventiveness

Children are active learners who often benefit greatly from learning opportunities involving self-directed experimentation (Poddiakov, 2011). When children are able to formulate their own understandings based on self-directed experimentation they are moving toward abstract thinking and the ability to generalize information from one situation to the next (National Education Goals Panel, 2000). As a child finds solutions to simple problems, corrects mistakes, and experiments in new ways, he or she is building abilities related to maintaining concentration as well as abilities related to persistence. These abilities are important life skills that develop at an early age yet serve us throughout our lives.

3. Goal Setting and Planning

Planning and achievement of predetermined goals may provide the motivation for persistence and support positive self-esteem (Szente, 2007). These capabilities may play a vital role in a child's achievement in school. The *Goal Setting and Planning* knowledge area houses capabilities related to setting goals prior to beginning an activity, verbalizing goals, indicating when a task has been completed, and revising a plan when needed to accomplish the predetermined goals.

4. Learning Cooperation

The ability to work well with others is a crucial skill for children to develop during their preschool years. It supports a cooperative, interactive learning environment where children can practice problem solving, communication and social skills. Research indicates that group learning experiences may support a greater depth of learning as children can learn from each other (Ramani, 2012). The Galileo® G3 assessment scale for *Learning Cooperation* assesses cooperative behaviors such as sharing, taking turns, helping others and working directly with a partner.

5. Precursor Capabilities for Infants and Toddlers

The Galileo G3 *Approaches to Learning* scales for infants and toddlers provide assessment tools to monitor the child's progress in mastering precursor skills to those included in the G3 *Approaches to Learning Scale* for 3- through 5-year-olds including capabilities in knowledge areas related to *Eagerness and Curiosity*, *Persistence*, and *Creativity and Inventiveness*.

When a child demonstrates eagerness and curiosity he or she is actively engaging in experiences to further their knowledge base. As a baby this may look like babbling or exploring objects by banging them on the floor. As a toddler this might become imitating adults as a way

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of practicing new activities or exploring their environment independently. In each of these examples the child is self-motivated to learn about their world through purposeful actions. As the child moves into elementary school and beyond these habits of mind will serve to help them achieve their full potential. Similarly, an individual's ability to persist through the challenges in completing a task builds on capabilities which begin to emerge early in infancy. It is important for a child to lay this groundwork in their early years. Creativity and inventiveness refers to a child's ability to creatively approach the world and promote independent thinking. Many of the capabilities demonstrated in the *Creativity and Inventiveness* knowledge area support problem solving activities which are tied to the Galileo® *G3 Cognitive and General Knowledge* scales for infants and toddlers.

vi. Language

There exists a large body of research on language and language development. One major focus of language research has been the correspondence between the sounds of language and the visual symbols used to represent those sounds. Similarly, the development of the awareness of this correspondence (i.e., phonological awareness) has been a particularly active area of research on language development. Extensive evidence exists indicating the importance of phonological awareness for the development of reading skills (National Research Council, 1999). Additional research has documented the importance of combining decoding skills with the acquisition of other language skills providing meaning with respect to what has been read (e.g., Connor, Piasta, Fishman, Glasney, Schatschneider, Crowe, Underwood, & Morrison, 2009). The scientific knowledge base related to the psychological processes that influence the development of language and literacy skills have guided the construction of the language and literacy scales in the Galileo system. The Galileo *G3 Language Scale* knowledge areas include *Listening and Understanding*, *Speaking and Communicating*, and *Appreciating Literature*.

1. Listening and Understanding

The capabilities contained within the *Listening and Understanding* knowledge area reflect the influence of current cognitive perspectives on language development. The development of grammatical structures is assessed. Likewise, vocabulary development, which is known to be important to the development of literacy skills, is assessed. In addition, capabilities related to the understanding of objects and actions in space and time are measured. The *Listening and Understanding* knowledge area is divided into two areas: Stories, Songs, Poems, and Directions; and Receptive Vocabulary. Listening to stories, poems, or songs provides a vehicle for children to learn to derive meaning and enjoyment from the printed word. At an early age children learn to listen to stories. They may signify their enjoyment by listening attentively and by asking to have a story read to them. Children may demonstrate their comprehension abilities by asking questions or making comments about a story. They also often demonstrate recall by retelling a familiar story in their own words.

Listening to directions is, of course, critical to the safety and well-being of children. Children must demonstrate the ability to follow a simple direction in order to participate fully and safely in classroom activities. As development progresses, children will learn to follow a small set of step-by-step directions. This skill expands the kinds of activities that children are able to experience.

Listening to and understanding verbal communications is one of the critical steps in achieving linguistic fluency. Young children develop a receptive vocabulary, that is, classes of

words that they understand, although they may not yet be able to use them in their own speech. Vocabulary development is known to correlate highly with later reading skill.

2. Speaking and Communicating

Conversation and conversational interaction impact a child's language capability and may even affect the rules of language. For example, there was a time when the word impact was a noun. Now, as we have seen in the preceding sentence, it can also be a verb. Social influences on linguistic rules affect the way language is used in different cultures and social classes. In addition, early childhood educators have linked language development to literacy development.

The *Speaking and Communicating* knowledge area represents the next step a child takes in achieving oral proficiency in language. Children "learn the pragmatics of their language, that is, how to use language appropriately and effectively in social contexts" (National Research Council, 1999). This knowledge area is divided into three subsets: Self-expression, Conversation, and Expressive Vocabulary. During the preschool years, children refine their self-expression skills. Children demonstrate and refine the ability to share information, to request help, and to convey their feelings, needs and opinions. The focus in the area of conversation is on growth in the use of language in a social context. Children develop their abilities to take turns, to develop a topic, and to change their tone and inflection to communicate meaning (National Research Council, 1999).

The focus in the area of expressive vocabulary is on developmental changes in the use of language expressions. For example, at an early age children express themselves in two- and three-word utterances reflecting a subject and an action. Later, they will use words to describe the qualities and locations of objects. As development advances, they will use possessive forms, tenses, and pronouns in compound sentences.

3. Appreciating Literature- Storytelling

One way that children demonstrate their understanding of a story structure is by telling stories that they construct. Initially, children may require assistance to tell a story with a beginning, middle and end. Later, they will be able to tell a complete story without assistance.

vii. Literacy

In the early part of the 20th century, the term reading had a different connotation for educators than it does today when the concept of reading is strongly tied to the concept of literacy. The tying of reading to literacy has been accompanied by a change in educational goals as well as significant changes in assumptions about children's learning. With the advent of the No Child Left Behind, legislation issues pertaining to early literacy have taken on more profound social implications, as some groups of students are at greater risk of being left behind due to difficulties in language and literacy. For example, it has been documented that students who are living below the poverty line move more slowly through the increasingly complex stages of literacy development than their peers who are living above the poverty line so that, by the end of first grade, 87 percent of the students living above the poverty line were at the early word reading level or higher, whereas only 30 percent of their peers who were living below the poverty line had achieved the same status (Kaplan, 2005). The implications of such discrepancies are accentuated by the Matthew effect which states that poor reading skills impede learning in other academic areas (Stanovich, 1986). The Galileo[®] *G3 Literacy Scale*

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provides the necessary tools to monitor literacy development in preschool in order to identify children in need of remediation.

The skills presented in the Galileo® *G3 Literacy Scale* are particularly important for ensuring early success in reading (National Research Council, 1999). Children need to have many opportunities to acquire phonological awareness skills during the course of a program year. While language skills develop naturally when children are around other speakers (or signers, for that matter), literacy skills, which take the concrete spoken word and represent it with an abstract symbol (letters), require more advanced cognitive development and direct instruction. For this reason, we can expect that children will demonstrate learning of these skills later in their preschool careers.

The Galileo *G3 Literacy Scale* outlines developmental progressions in seven knowledge areas, *Recognizing Sounds – Phonological Awareness*, *Increasing Book Knowledge and Appreciation – Story Reasoning*, *Expanding Book Knowledge and Appreciation – Interest in Books*, *Developing Print Awareness and Concepts*, *Building Early Reading Skills*, *Building Early Writing Skills*, and *Developing Alphabet Knowledge*.

      1. Phonological Awareness

The term phonological awareness refers to a person's knowledge about the sound structure of spoken language. It is sometimes used interchangeably with the term phonemic awareness. Phonemic awareness, however, is a more advanced form of phonological awareness. It is the understanding that speech can be broken down even further into phonemes, the smallest units of sound in a language (National Research Council, 1999).

Research shows that children's phonological awareness is strongly related to reading achievement (Storch & Whitehurst, 2002). A meta-analysis involving over 700 studies has shown that instruction aimed at enhancing phonological awareness increases early reading skills (Bus & van IJzendoorn, 1997). Programs combining phonological instruction and letter training were more effective than those implementing phonological instruction alone. The study by Bus and van IJzendoom also found that preschool children profit more from phonological training than kindergarten or elementary school children. This finding supports an early start for phonological instruction.

Children demonstrate phonological awareness by perceiving and producing rhymes, by dividing words into syllables and smaller components such as phonemes, and by putting syllables and phonemes back together to form words (National Research Council, 1999). The National Research Council's recommendations outline categories of instruction reflected in the Galileo G3 *Literacy* knowledge area related to *Recognizing Sounds – Phonological Awareness*. There are many appropriate activities that help build phonological awareness in young preschoolers and phonemic awareness in older children. Rhyming songs, syllable-clapping, and grouping objects according to initial sounds draw children's attention to the sounds of speech (National Research Council, 1999). These activities allow them to distinguish between vowel sounds, to distinguish beginning and ending consonant sounds, to recognize matching and dissimilar sounds, and to pronounce two syllable words clearly.

Two aspects of phonological awareness instruction have assumed preeminence in the field: rhyming and segmentation/blending. Rhyming is one element of spoken language to which children seem particularly attracted. They often notice rhymes and enjoy rhyming songs and poems (National Research Council, 1999). Researchers have also identified segmentation

and blending of phonemes as key skills in the development and assessment of phonemic awareness (Busink, 1997) (Muter, Hulme, Snowling, & Taylor, 1997). Segmentation is also a foundational skill in emergent literacy because the understanding that the letters of the alphabet correspond to the units of sound represented by phonemes is key to understanding the logic of the alphabetic principle (National Research Council, 1999).

2. Book Knowledge and Appreciation

The *Book Knowledge and Appreciation* knowledge area is divided into two subsets: *Story Reasoning*, and *Interest in Books*. Reading stories with children and engaging them in discussion of characters and events has been shown to help them learn how narratives are constructed, remember what has been read, and derive meaning from stories (Karweit & Wasik, 1996).

Reasoning about stories requires children to go a step beyond the explicit details of the story. Often, the child must consider the available information and make an educated guess as to what will happen in the story or why something happened in the story. One of the child's early reasoning accomplishments is to use picture cues to tell what is happening in a story. Later, he or she will make guesses about why things happened in a story. Eventually, the child will be able to relate what has happened in a story to his or her own life experiences.

A child's interest in books is a major first step toward reading. Babies play with and chew their favorite books. "Toddlers start recognizing favorite books by their cover, pretend to read books, and understand that books are handled in certain ways" (National Research Council, 1999). By the time children are four years old, they begin to understand that it is the print that is read in stories.

3. Print Awareness and Concepts

Print awareness generally refers to a child's understanding that print is a way to get information and knowledge. Print concepts refer to the conventions that govern written language. For example, spaces separate words, English text runs left to right and from top to bottom, and a period signals the end of a sentence.

"Skills such as print concepts or the ability to 'read' environmental print do not appear to have independent predictive associations with later reading; rather, their predictive relations with later reading appear to reflect the development of other emergent literacy skills such as letter knowledge and phonological sensitivity" (Lonigan, Burgess, & Anthony, 2000). Skills related to the understanding of print concepts are easily introduced at the preschool level. Story reading sessions with children provide an effective means of teaching these concepts in a relevant and interesting context (Arnold & Whitehurst, 1994).

4. Early Reading and Early Writing

The capabilities assessed in the *Early Reading* and *Early Writing* knowledge areas draw heavily from those acquired in the preceding knowledge areas. That is, early reading and early writing draw on phonological processing abilities, and print knowledge (Lonigan, Burgess, & Anthony, 2000). Research has shown that children typically master writing by first learning to make letters. Once they have learned to make letters, they can progress to stringing letters together to form appropriate sounds and ultimately words. Once the child is able to write words, he or she can move on to writing phrases and sentences using correct punctuation.

5. Alphabet Knowledge

Letter knowledge is considered to be an emergent aspect of literacy that is independent of phonological awareness, environmental print, and decoding (Lonigan, Burgess, & Anthony, 2000). This skill, when combined with strong phonological skills, allows a child to take those first steps toward decoding and eventually reading.

viii. Language and Literacy for Infants and Toddlers

In the context of infants and toddlers, the domains of language and literacy have been combined as part of the Galileo® G3 *Language, Communication, Reading and Writing* assessment scales for birth through 3 year olds. The capabilities included in these scales are precursors crucial to the successful development of language and literacy throughout the course of a child's education and adult life (Missal, et al., 2007). The opportunity to track a child's progress in development of early language, communication, reading and writing skills beginning from infancy provides an important tool to ensure that developmentally appropriate learning opportunities are provided and areas of potential need are identified early on.

The capabilities on the Galileo *G3 Language, Communication, Reading and Writing* scales for infants through toddlers are fully integrated across the scales for different age ranges as well as with the Galileo G3 assessment scales for *Language* and *Literacy* for 3- through 5-year-olds. As a child develops, the scales can be used continuously to monitor ways in which the child demonstrates both speech and language skills and early reading and writing. The infant and toddler scales are each composed of four knowledge areas: *Listening and Understanding*, *Communicating and Speaking*, *Early Reading and Print Awareness*, and *Early Writing*.

1. Listening and Understanding

Children learn many of the basic skills necessary to produce speech and understand language at a very early age. In fact, some researchers suggest this learning begins as early as in the womb (Films Media Group, 2010). Infants and babies learn by watching and listening to the familiar adults around them. This early learning is illustrated through the purposeful observation infants make of the adults around them, watching their faces and the movement of their lips in addition to hearing the sounds and rhythm of their language. As development progresses, a child will babble in tones and rhythm similar to their familiar language, then progress to using one word utterances, two word sentences, and finally complex communications (Films Media Group, 2010). While verbal language and speech skills are still developing a child will already demonstrate understanding of language through body language, by completing tasks based on verbal directions, and much more. Documenting non-verbal capabilities that illustrate language understanding helps to provide additional information about a child's path to speech and language skill development (Films Media Group, 2007). Therefore, many non-verbal skills are included in the Galileo *G3 Language, Communication, Reading and Writing* scales for infants through toddlers in the knowledge areas for *Listening and Understanding*, and *Communicating and Speaking*.

2. Communicating and Speaking

The development of language skills requires both physical development for speech and cognitive development for language. The child must develop the physical control to form words and the cognitive understanding of language to produce meaningful communication.

Development of early reading and writing skills also involve both physical and cognitive development. A child must develop the fine motor skills to correctly handle books and use writing tools as well as the cognitive maturity to interpret what they are reading and the ability to write with meaning. Children will not all demonstrate these capabilities at the same rate or at the same ages (Films Media Group, 2007).

3. Early Reading, Print Awareness, and Early Writing

The development of early reading, print awareness, and early writing skills progresses in tandem with the development of language skills. Infants and very young children will demonstrate an interest in reading long before they are able to interpret written language. This interest is demonstration through the capabilities related to exploring books and discussing stories that appear in the Galileo® *G3 Language, Communication, Reading, and Writing* scales for infants and toddlers. Early writing skills are also documented in the Galileo *G3 Language, Communication, Reading, and Writing* assessment scales for infants through toddlers through capabilities reflecting the development of the fine motor skills necessary to hold and control a writing instrument in addition to demonstrations of creativity and communication through dramatic play.

ix. Early Math

As one of the three Rs, mathematics has occupied a primary place in education for generations. The growing fear today is that individuals with marginal math skills will be rapidly left behind. Research indicates that children who begin building their mathematic capabilities before entering kindergarten may be more successful throughout their educational careers (Methe, Hintze, & Floyd, 2008). This reality has been a major motivating force behind reform in mathematics education.

The capabilities related to mathematics present on the Galileo G3 birth through 3 years scales and the Galileo *G3 Early Math* scales for 3 through 5 years were chosen to create a continuous progression. Each scale overlaps the next to provide a clear path for tracking the mathematic development of young children from infancy through entering kindergarten. The capabilities included on these scales build on the inherent desire and ability of young children to engage in mathematical thinking and learning (Clements, Samara, & DiBiase, 2004) (Gelman, 2006).

The National Council of Teachers of Mathematics (NCTM) has played a major role reforming mathematics education. The Council has developed curriculum and evaluation standards for school-aged children that have had a significant impact on instruction in the nation's schools (National Council of Teachers of Mathematics, 2000). The work of the Council has also had a significant impact on preschool curriculum development. The standards for preschool through grade two include topics such as understanding numbers and operations, computation fluency, patterns, relations and functions, algebra, geometric shapes and relationships, spatial relationships, and measurement (National Council of Teachers of Mathematics, 2000). These topics are among those known to be appropriate for promoting the math development of young children (Methe, Hintze, & Floyd, 2008).

The work of the Council has had a significant influence on the kinds of mathematical learning opportunities provided through the Galileo *G3 Early Math* scales for 3 through 5 years. The mathematical content covered in the scales is designed to evaluate a child's understanding of mathematics concepts, particularly as they apply to problems encountered in day-to-day life.

The Galileo *G3 Early Math Scale* for 3- through 5-year-olds includes the following knowledge areas: *Counting and Comparing*; *Identifying Numerals*; *Adding*; *Subtracting*; *Understanding Fractions*; *Sorting*; *Ordering*; *Comprehending Spatial Concepts*; *Learning About Shapes*; *Noticing Patterns*; and *Measuring*.

1. Counting and Comparing

Children begin to lay the foundation for counting and other mathematical skills early in infancy as they develop spatial awareness and understand the basic properties of physical objects (Fletcher & Pine, 2009). Indicators of these early stages of mathematical development are found on in the Galileo® G3 birth to 3 years scales which serve as a platform for assessing the early steps along the pathway to mathematical development.

Mathematical literacy requires that children understand that mathematics is more than just a set of rules for solving abstract problems. Instead, math provides a language for representing real-life problems and a set of tools that can be applied to solving those problems. The NCTM standards encourage the use of word problems, verbal discussion of mathematical ideas, and journals as means to develop understanding of the language of mathematics. The Galileo *G3 Early Math Scale* for 3 through 5 years encourages communication involving the use of written numerals to convey quantity.

2. Identifying Numerals

The concepts and skills related to number and operations are foundational to other mathematical topics (Clements, Samara, & DiBiase, 2004). During the preschool years, children strengthen their sense of number, moving from the initial development of basic counting techniques to a complex understanding of the size of numbers, number relationships, patterns, operations, and place value (National Council of Teachers of Mathematics, 2000). The Galileo *G3 Early Math Scale* for 3 through 5 years includes goals to specifically measure this progression of learning. Assessing children's mathematical development regularly throughout their preschool years is one of the most important steps which can be taken to improve children's mathematical achievement (Clements, Samara, & DiBiase, 2004). Early identification of children at risk in mathematics will provide the opportunity for intervention that may significantly improve a child's academic performance long-term (Methe, Hintze, & Floyd, 2008). There is evidence that development of number and operation skills in the preschool years may increase mathematical achievement throughout a child's educational career, in some cases reaching as far as grade ten (Floyd, Hojnoski, & Key, 2006).

3. Adding, Subtracting, and Understanding Fractions

As children grow beyond exploring their physical world in infancy their mathematical capabilities expand from recognizing discrete objects, to counting objects, to using manipulatives and performing basic problem solving. The skills of counting forward and backward are building blocks to learn addition, subtraction, multiplication, division and other advanced mathematics (Patel & Canobi, 2010). The Galileo *G3 Early Math Scale* for 3 through 5 years assesses mathematical development by directly assessing a child's ability to count using a one-to-one correspondence, to use written numbers, and to add, subtract and understand fractions.

4. Sorting and Ordering

Geometry offers children an alternate experience with mathematics. As children become familiar with shape, structure, and location, and develop spatial reasoning skills, they lay the foundation for understanding not only their spatial world but also topics in mathematics, art, science, and social studies (National Council of Teachers of Mathematics, 2000). Building on these strengths fosters enthusiasm for mathematics and provides a context in which to develop number and other mathematics concepts. The Galileo® *G3 Early Math Scale* for 3 through 5 years has five knowledge areas related to development of geometry skills: *Sorting and Ordering*; *Comprehending Spatial Concepts*; *Learning About Shapes*; *Noticing Patterns*; and *Measuring*.

These knowledge areas address the section of the NCTM standards which calls for children to "Analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships" (National Council of Teachers of Mathematics, 2000). In terms of sorting, children are initially expected to be able to match objects to an example. Then, they are expected to sort diverse objects by various physical criteria such as size and shape. Sorting, classifying, and ordering facilitate work with patterns, geometric shapes, and data (National Council of Teachers of Mathematics, 2000).

5. Comprehending Spatial Concepts

The *Comprehending Spatial Concepts* knowledge area addresses a child's ability to specify locations and describe spatial relationships. The Galileo *G3 Early Math Scale* assesses a child's ability to understand object directionality concepts (e.g., right, left, up, down), object position concepts (e.g., under, top, bottom, inside, behind), and object order concepts (e.g., first, last, second, next, before). The Galileo scales thus meet the NCTM (2000) standards which expect children to be able to describe, name, and interpret relative positions in space, and apply ideas about relative position; to describe, name and interpret direction and distance in navigating space; and to find and name locations with simple relationships (National Council of Teachers of Mathematics, 2000).

6. Learning About Shapes

A child's initial encounter with geometry involves simple shapes. The NCTM curriculum standards state that geometry in pre-kindergarten through second grade begins with describing and naming shapes. Young children begin by using their own vocabulary to describe objects, and gradually incorporate conventional terminology into their descriptions of objects. Using terminology to focus attention helps to lay the foundation for more formal geometry in later grades (National Council of Teachers of Mathematics, 2000). Thus, the Galileo *G3 Early Math* scales for 3 through 5 years evaluate a child's ability to identify familiar shapes such a circle or square by name, and later, to be able to place a shape into a form board. When simple shapes can be recognized and reproduced, the child will learn to manipulate shapes mentally. For example, the child may be able to tell how a shape would look if it were turned. The ability to visualize changes in shapes is not only important in the development of skills in geometry, but also in many more advanced forms of mathematics. Children also learn about geometric properties by combining or cutting apart shapes to form new shapes (National Council of Teachers of Mathematics, 2000), a skill addressed in this knowledge area.

7. Noticing Patterns

During preschool children will begin to apply their observations of movement, visual and auditory experiences to noticing patterns. They will then be able to repeat movement, visual and auditory patterns. Once a child has mastered repeating an existing pattern he or she will be able to apply the concept to extending a number series and creating a visual pattern.

8. Measuring

During their preschool years children also begin using measurement and measurement terminology. The NCTM has adopted the following standards related to measurement for pre-kindergarten through second grade: "Understand measurable attributes of objects and the units, systems and processes of measurement" and "Apply appropriate techniques, tools and formulas to determine measurement" (National Council of Teachers of Mathematics, 2000). The Galileo® *G3 Early Math* scales for 3 through 5 years assess these standards with goals related to the use of non-standard and familiar measuring devices to measure volume, area and length.

x. *Cognition and General Knowledge in Infants and Toddlers*

Cognition and General Knowledge is the domain included in the Galileo G3 assessment scales for infants through toddlers which includes the precursors for early mathematics, logic and reasoning, and science. While the child's capacity for skill demonstration will increase over time as his or her cognitive abilities expand, it is important not to overlook developmental progress of foundational skills by infants and toddlers. A child will move through many stages of cognitive development from infancy through age 3 much of which will revolve around their understanding of objects, self and the relationship between themselves and their environment. The Galileo *G3 Cognitive Development and General Knowledge* scales for birth through 3 years follow the typical cognitive development pathway and provide a tool for documenting a child's progress in three knowledge areas: *Exploration and Discovery*, *Concept Development and Memory*, and *Problem-Solving and Creative Expression*.

1. Exploration and Discovery

Early childhood is filled with exploration and discovery which provides rich, experiential opportunities for learning about the world. For example, a baby mouthing an object or banging it repeatedly on the floor is learning basic concepts about the object which will later allow him or her understand more advanced concepts such as cause and effect. Because the learning process is intrinsically a continuum of more advanced concepts layering upon more basic concepts a child must be provided with learning experiences which are developmentally appropriate based on what they have already learned (Films Media Group, 1995). Through the use of the Galileo G3 *Cognitive Development and General Knowledge* assessment scales teachers are supported in doing just that.

2. Concept Development

Successful concept development and memory relate to a child's ability to retain information, recognize familiar objects, routines and actions, and develop new skills. Many of the capabilities included in this knowledge area form the building blocks for later social studies concepts as they relate to a child's ability to be a part of the classroom community, to communicate with others and to develop a sense of self within the group.

3. Problem-Solving and Creative Expression

Problem-solving is one of the more important life skills a child can develop. This skill will benefit the child throughout their life. The capacity for abstract thinking required for effective problem-solving, this higher level of thinking develops over time building on basic knowledge of objects and processes. When a child begins to illustrate problem-solving capabilities and creative expression it is important that he or she be encouraged to continue building these skills with appropriate classroom activities. By using the Galileo® G3 *Cognitive Development and General Knowledge* scales for birth through age 3 the early indicators of problem-solving behavior and creative expression can be identified so that support can be provided for continued development in these areas.

xi. Science

As science is interwoven with our everyday lives, it is vital that children develop a positive association with science and an interest in scientific exploration at an early age (American Association for the Advancement of Science [AAAS], 2009). Children should enter kindergarten knowing that science is for everyone (National Academy Press, 1996) and that science is a fun and exciting exploration of our natural world (AAAS, 2009). Learning science, like mathematics, poses unique challenges as it requires the integration of both domain specific content knowledge as well as the development of problem solving skills and other abstract capabilities (Li & Klahr, 2006).

The concept of scientific literacy emphasizes the importance of developing these skills for application throughout our lives. Scientific literacy is "the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs and economic productivity" (National Academy Press, 1996). Observation, classification, and prediction are all fundamental to scientific literacy. The National Science Education Standards (NSES) proposed by the National Research Council present a vision of scientific inquiry in which children are able to actively combine comprehension of the facts of science with the scientific process to develop their understanding (National Academy Press, 1996).

Scientific literacy includes specific types of abilities which develop over a lifetime, with baseline skills developing in early infancy. When infants begin to explore their world utilizing their five senses, they are laying the foundation for observing, gathering information and predicting outcomes. The Galileo G3 scale capabilities related to nature and science in each age category were selected to provide an accurate gauge of a child's progress along the path to developing scientific literacy. The Galileo *G3 Nature and Science Scale* for 3 through 5 years continues to support the acquisition of scientific skills including classification, observation, and prediction, as well as the application of those skills in the child's everyday life to enhance understanding of plant/animal processes and physical phenomena. This scale reflects the view that science education should be made available to all young children and overwhelmingly emphasizes the view that young children should be "gaining experience with natural and social phenomena and…enjoying science" (AAAS, 2009).

The knowledge areas included in The Galileo *G3 Nature and Science Scale* for 3 through 5 years are: *Using Senses and Scientific Devices to Learn*; *Observing and Describing Living Things*; *Observing and Describing Physical Phenomena*; *Classifying Living Things*; *Classifying Physical Phenomena*; *Predictions About Living Things*; *Predicting Physical*

Phenomena; *Gathering and Presenting Data*; *Explaining Events and Outcomes*; and *Questioning and Developing Hypotheses*.

1. Using Senses and Scientific Devices to Learn

The NSES recognizes that the ability to employ simple equipment and tools to gather data and extend the senses is one of the fundamental abilities necessary to scientific inquiry (AAAS, 2009). Children learn to use these simple devices to make their observations more precise and perhaps to reveal things that would not otherwise be observed.

2. Observing and Describing Living Things and Physical Phenomena

The Galileo® *G3 Nature and Science Scale* for 3 through 5 years combines the abilities of observation and communication. Observation is the most basic of all scientific skills. As young children observe their world it is important that they are encouraged to communicate their experience to other. The American Association for the Advancement of Science states that telling others "what they see, what they think and what it makes them wonder" is essential for young science learners. While accuracy is not expected at a preschool age, children should be encouraged to talk about what they observe and compare observations with others (AAAS, 2009).

3. Classifying Living Things and Physical Phenomena

Classification is a way to form concepts, which provide the theoretical basis for interpreting what we observe. Preschool children are capable of reasoning about subtle and abstract concepts, and use concepts to expand knowledge through inductive inferences (Gelman, 1999). Classification then serves as a means to expand both a child's perception of an object and his or her understanding of it.

Within the *G3 Nature and Science Scale*, classification is divided into two areas of focus: *Classifying Living Things* and *Classifying Physical Phenomena. Classifying Living Things* focuses on the categorization of plants, animals, and animal behavior. *Classifying Physical Phenomena* focuses on categorizing objects according to their state (e.g., liquid, solid, gas) and their physical composition. Objects are also classified according to living vs. non-living and natural vs. man-made.

Classification helps children establish the different kinds of investigations they might use depending on the questions they are trying to ask. Investigations include describing objects, events, and organisms as well as classifying them (National Academy Press, 1996).

4. Predictions About Living Things and Physical Phenomena

The ability to make reasonable predictions based on evidence obtained through observation lays the foundation for hypothesis formation and theory building, which is fundamental to science. Predictions also allow people to anticipate potential consequences of actions in everyday life situations.

Within the *G3 Nature and Science Scale*, prediction is divided into two areas of focus: *Predictions About Living Things* and *Predicting Physical Phenomena. Predictions About Living Things* assesses a child's ability to comprehend a life cycle sequence, simple animal behaviors, and the effects of human activity and weather on wildlife and plants. *Predicting Physical*

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Phenomena assesses a child's understanding of the effect that force, temperature, and momentum may have upon an object. Children can make relatively complex predictions regarding physical phenomena.

5. Gathering and Presenting Data and Explaining Events and Outcomes

The *Gathering and Presenting Data* and *Explaining Events and Outcomes* knowledge areas address the NSES goal of developing the abilities necessary for the understanding and implementation of scientific inquiry.

Children should pose questions to investigate, organize their responses, and create representations of their data. Graphs are among the most widely used tools for displaying and communicating data. Young children can learn about graphing by creating "real" graphs to compare groups of objects. For example, a child might compare the number of blocks of different color by arranging blocks of each color in a row on the floor. At a more advanced level, the child will be able to construct a picture graph, eventually being able to explain a graphic display. The Galileo® *G3 Nature and Science Scale* assesses a child's capacity to explain the information presented on a graph, to create a frequency graph of objects, and to create graphs of real objects in order to make comparisons between groups.

Gathering and presenting data verbally or through drawing encourages children to search for patterns and order in their work. In order to gather this evidence, children must draw upon their abilities to observe and classify an object or event. As their abilities develop, children will eventually be able to generalize their finding to similar situations and form hypotheses.

6. Questioning and Developing Hypotheses

The *Questioning and Developing Hypotheses* knowledge area also addresses the development of abilities related to scientific inquiry.

When engaging in scientific inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others. Children often begin to demonstrate their understanding of objects by naming objects based on their functions and placing them in familiar categories based on functionality (Nelson, Holt, & Egan, 2004).

To meet the final goal of understanding and implementing scientific inquiry, children must take the step of asking "Why?" and "How?" They must also be encouraged to formulate an explanation. Correct or not, creating one or more explanations for an event fosters a curiosity and active engagement in science. Children will identify their assumptions, use critical and logical thinking, and consider alternative explanations. In this way, students actively develop their understanding of science by combining scientific knowledge with reasoning and thinking skills (National Academy Press, 1996).

xii. Creative Arts

Most children enjoy art activities. From scribbling to drawing with crayons to finger painting to sculpting, art gives children the opportunity to explore their feelings and experiment with forms and materials. Through their art, young children use symbols that have primary and universal meaning. Like true artists, they seem to possess an innate sense of design and

composition. Their charming, honest expressions are a way of experiencing and understanding their world.

Enjoyment is not the only thing children gain from their experiences with art. Art, including music, movement, and visual arts, can be broadly useful to a child's education. Children's drawing, including their early scribbling, has been linked to many aspects of development, including social and emotional as well as cognitive functioning. The significance of the artistic intelligence domain in human development has been well acknowledged in the field of educational psychology (Gardner, 1995). In fact, research has shown a positive crossover relationship between the benefits of art and other academic areas of learning such as language acquisition, reading, writing, math, and science (Lorenzo-Lasa & Ideishi, 2007) (Gromko J. E., 2005).

The capabilities in the Galileo® *G3 Creative Arts Scale* for 3- through 5-year-olds reflect a balance between process and product, protecting against the overemphasis on process art experiences found in many preschools (Kindler, 1996). The scale contains goals relating to process such as tools, care of art materials, selecting a variety of materials, recombining art materials, and describing the steps in their art process as well as goals related to specific milestones that should be represented in art products and goals related to the interpretation of finished products. The knowledge areas included in the Galileo *G3 Creative Arts Scale* include: *Enjoying Music and Movement*; *Creating Visual Arts*; and *Participating in Dramatic Play*.

1. Enjoying Music and Movement

There is evidence that musical experiences have a positive influence on children's overall development. Music is often a catalyst for creativity, imagination, self-expression, social interaction, and socialization throughout childhood. In recent years, there has been considerable interest in the role that music may play in stimulating cognitive development. Studies have established that musical training, such as keyboard lessons and song bell instruction, conducted with preschool age children over a three year period resulted in an improvement in spatial-temporal capabilities, which are cognitive functions required for abstract reasoning in mathematics (Gromko & Poorman, 1998) (Rauscher, et al., 1997). Likewise, research with preschool children has demonstrated that providing dance experiences can improve skills involving counting and language.

Galileo's distinct musical activities are easily made part of the daily happenings in the preschool room. These musical activities can be used as a vehicle to teach in many other content areas and reinforce additional goals related to other Galileo G3 assessment scales. Music and movement activities such as finger plays and action songs are a means to teach basic counting skills, color names, knowledge related to nature and science, and social skills.

Gross and fine motor skills are also influenced through music. Many preschool musical activities call for movements involving the entire body. Repetition of such activities may increase the accuracy, speed, timing, and coordination of large muscle groups. Finger plays emphasize the development of precise control of the smaller muscles of the arms and hands.

2. Creating Visual Art

Art activities allow children to experiment with new ways of thinking and doing as well as encourage them to stretch their limits and develop their minds, bodies, and emotions. Children use art as a way to understand their experiences as well as to construct imaginary roles (Dyson,

1990). The sense of achievement gained from producing a work of art augments cognitive and personality factors in tandem with a child's positive self-concept (Coughlin, et al., 2000). Participation in art activities and the resulting increased positive self-concept can enhance children's motivation and enthusiasm for learning. Visual art also provides an open release for sensibilities and emotions. Moreover, physical motor development is enhanced through the use of small muscles, hand-eye coordination, and dexterity as children draw, paint, manipulate, glue, or work with collage materials. These findings suggest that not only should art be integrated into the early childhood curriculum, but that it probably should be given more emphasis than is commonly the case in most programs today.

3. Participating in Dramatic Play

The *Dramatic Play* component of the Galileo® *G3 Creative Arts Scale* captures a developmental progression of skills that can be seen to emerge through observations of children at play. These skills occupy an important role in development beyond the realm of play. Research shows that play promotes young children's general development, supporting play-based curricula in programs for children under age five (Bergan, 2001). For example, cognitive development (reasoning, creativity and problem-solving), language acquisition, literacy development, and social and emotional development may all be enhanced through activities involving play. Piaget (1962) saw play as integral to the growth of intelligence and accomplished through interaction with the environment occurring during the preoperational stage. Pretend play also has been linked with cognitive development in the areas of creativity and problem-solving (Katz, 2008) as well as the stimulation of brain development (Rushton, Juola-Rushton, & Larkin, 2010).

A child gains an understanding of his or her environment through interacting with it in pretend play (Morrison, 2001). Young children learn through their play experiences because they do not yet have the life experiences required to be able to conceptualize abstract knowledge. They need to concretely experience new knowledge and skills to internalize and remember new knowledge or concepts. Through play, children are encouraged to think abstractly as words represent ideas in their mind and the oral description of the pretend setting exists in their imagination. Furthermore, fantasy and creativity used in dramatic play are the starting points that promote and encourage divergent ways of thinking and reasoning. Children practice flexibility and creativity when substituting things for objects they don't have (e.g., a chair becomes the driver's seat of a school bus).

xiii. Logic and Reasoning

Any educator, parent, or researcher will confirm that children strive to solve problems, and in fact that children often generate problems just to have the opportunity to reason and solve them. When a child reasons through a situation he or she is learning how to learn as well as learning about the world around them. These capabilities will contribute to the development of many important life skills and, in the case of the preschool age child, increase school readiness (Greenwood, Walker, Carta, & Higgins, 2006). A child's approaches to learning, including learning style, competencies, perceptions, and expectations of the outcomes of learning, help determine what is learned and how. Those learning experiences in turn affect the child's future efforts to learn (Gale Group, 2001).

The Galileo *G3 Logic and Reasoning Scale* for 3- through 5-year-olds assesses a child's progression along the path of developing critical skills related to logic and reasoning with capabilities broken out into knowledge areas including *Using Symbols in Pretend Play*,

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Reasoning and Problem Solving, Sorting and Classifying, Examining Cause and Effect, and *Solving Puzzles.*

1. Using Symbols in Pretend Play

Pretend play allows children rich opportunities to participate in a range of activities, learn from and learn with their classmates, and express themselves in a safe environment (Morrison, 2001). Decades of research has shown that encouraging dramatic play in the preschool classroom is an important part of supporting children's development (Furman, 2000). While a teacher may play a proactive role in dramatic play by providing props, themes and a dedicated area of the classroom for dramatic play, it is important for children to guide the scenes. As a child organizes a self-chosen scene for the child and his or her classmates to act out and creatively brings materials in to the play, he or she is gaining valuable interpersonal skills. He or she is also gaining knowledge about the world including the ability to differentiate reality from make-believe. The dramatic play area of the classroom can be a place where a child practices reasoning through problems with the assistance of classmates and the supervision of the teacher.

2. Reasoning and Problem-Solving

Children are problem-solvers by nature. Although problem solving and reasoning always have been a cornerstone of modern education, the importance of these capabilities is just being fully realized. Since problem-solving skills are vital to school success, it is important to measure the child's progress to ensure that any need for intervention is identified in a timely fashion (Greenwood, Walker, Carta, & Higgins, 2006).

The capabilities represented in the *Reasoning and Problem-Solving* knowledge area reflect learners' problem-solving methods and evaluation. Children initially need help and assistance from peers and adults to decide what problem-solving method to use. As children develop, they begin to be able to choose problem-solving methods on their own. Then, they become more effective problem-solvers who are capable of generating a problem-solving method, applying it, and, most importantly, developing an alternative solution if the first is not successful.

Novice learners use memorization skills, recall prior knowledge, and manipulate the pieces of the problem in attempts to solve the problem (National Research Council, 2000). In preschoolers these behaviors manifest themselves when children use materials or reorganize objects (e.g., blocks) to solve problems. More expert learners will display a more elaborate understanding of the problem as they start to organize their ideas around the larger principles underlying the problem and pose alternatives (National Research Council, 2000). As preschoolers' problem-solving and reasoning capabilities grow, they begin to be able to describe cause and effect relationships and apply strategies from one experience to another. They also begin to develop metacognitive strategies.

3. Sorting and Classifying

In order to learn and grow, children must learn to classify objects and events, sort those objects and events into some kind of meaningful structure, and ultimately, describe those objects and experiences. Children begin by sorting objects as like or unlike based on physical properties such as size and color, and develop the ability to classify objects based on function. As a child's skills develop, he or she will also begin to be able to say why they sorted as they

did. As development progresses further, the child will be able to sort more conceptually (e.g., sort events based on season) and to sort new experiences in terms of prior knowledge (e.g., how the rules at their grandmother's house are different than mommy's rules). As a child questions, sorts, and describes, he or she builds their knowledge of the world around them.

4. Examining Cause and Effect

As a child observes and interacts with the world around them he or she builds an awareness of the impact of their actions. Through repeated observation a child will be able to generalize the effects of an action to make predictions and verbalize the cause of an effect.

5. Solving Puzzles

Puzzles provide a child with the chance to apply their critical thinking and problem-solving skills to a sometimes very difficult task. A child will often use trial and error and planned sequential steps to complete a puzzle. Solving puzzles can also include working with patterns and picture sequences, helping the child develop additional logic and reasoning skills.

xiv. Social Studies

Social studies is a broad domain that incorporates the knowledge areas essential to becoming a good citizen (National Council for the Social Studies, 2008). While a preschool aged child is not ready to fully understand their role as a citizen, the child is at an important developmental stage to begin laying the foundation for later understanding of the complexities inherent in the ever changing field of social studies. As a field, social studies include the study of history, economics, geography, political science, sociology, anthropology, archaeology and psychology. The capabilities measured in the Galileo® *G3 Social Studies Scale* for 3 through 5 years are the precursors to a child's success in these subjects later in their educational career. The Galileo *G3 Social Studies Scale* for 3 through 5 years incorporates seven knowledge areas: *Discovering Family*; *Participating in the Classroom Community*; *Exploring the Greater Community*; *Looking at Spatial Representation and Map Skills*; *Examining the Environment*; *Conserving Resources; Talking about the Past, Present and Future*; and *Respecting Diversity*.

1. Discovering Family

A child's family has a significant impact on their development across all knowledge areas. When a child's family is engaged in the child's learning the child is healthier and happier and development progresses (Head Start, 2011). When a child's family participates in the child's learning the child is able to explore their family structure and individuals within their family. Learning about family is one of the initial ways a child learns about his or her place in the world and begins the path to self-discovery. These early skills contribute to the child's ability to experience being a part of their family. The Galileo *G3 Social Studies Scale* for 3 through 5 years assesses a child's ability to share personal family stories and traditions, identify family relationships and tell about each family member's role in the household.

2. Participating in the Classroom Community

A child's ability to actively participate within the classroom community improves their learning outcomes and school readiness (McDermott, Rikoon, Waterman, & Fantuzzo, 2012). A child who lacks the social and emotional skills to work with others and/or independently may be at risk of not achieving their full academic potential (Schultz, Richardson, Barber, & Wilcox,

2011). Through the use of the Galileo® assessment scales a child may be identified as being at risk before entering kindergarten, allowing for early intervention which may greatly improve the child's long-term academic progress.

The Galileo *G3 Social Studies Scale* for 3 through 5 years includes capabilities related to cooperative behaviors, making independent choices, understanding consequences, problem solving and following through. As a child progresses along this developmental path he or she is learning how to participate as a productive member of a group which is a building block supporting successful citizenship skills.

3. Exploring the Greater Community

Preschool aged children must come to appreciate not only their role in the family and in their class, but also their relationship to the town or city and country in which they live. Understanding this larger community sets the stage for a future understanding of community resources, laws and societal structure.

The Galileo *G3 Social Studies Scale* for 3 through 5 years includes capabilities that assess a child's ability to describe the roles of community workers and community resources, identify major landmarks, talk about basic traffic rules and identify the United States flag. With these skills, a child will move forward deepening his or her understanding of what it means to be a part of a city, state, country, and finally, a global community.

4. Looking at Spatial Representation and Map Skills and Examining the Environment

Understanding spatial representations and mapping are important life skills. In addition, building a strong foundation in these areas facilitates a child's success in later social studies courses such as geography. Often children are able to interpret and produce basic spatial representations and maps between the ages of three and five years (Koerber & Sodian, 2008). For this reason, the Galileo *G3 Social Studies Scale* for 3 through 5 years provides an assessment tool to track the development of early mapping and navigation skills as well as the development of the ability to use appropriate vocabulary related to location, direction and distance. This scale also assesses a child's ability to identify common locations within their environment and the natural environment including manmade structures such as roads or buildings as well as plants, trees, and animals. Building an awareness of their environment may also improve sensory and emotional development in young children (Witt & Kimple, 2008).

5. Conserving Resources

Conservation of natural resources is an increasingly important aspect of being a good citizen. A child must begin to develop good habits such as recycling and disposing of trash responsibly at an early age. The Galileo *G3 Social Studies Scale* for 3 through 5 years includes capabilities related to recycling, placing trash appropriately in the garbage can, and discussing the importance of doing so.

6. Talking About the Past, Present, and Future

A child's first attempt to link their experiences to the passing of time generally involves daily events (Burtin & Edge, 1985). Along with changes in the environment such as the sunrise and sunset, breakfast time, lunchtime, naptime, dinnertime and bedtime are major daily events

that help the child to understand time. As a child's knowledge of time grows, he or she notes that certain events occur only on certain days. Concepts such as tomorrow and yesterday soon follow. By the age of five, or for some much earlier, children are able to create a sequence of events representing their experiences in chronological order using representations such as pictures or other media (Koerber & Sodian, 2008).

The Galileo® *G3 Social Studies Scale* for 3 through 5 years assesses a child's ability to use words to refer to time and times of day, to identify events that might occur in the future or have occurred in the past, to identify the time an activity might take place, and to distinguish between morning, afternoon, or evening activities.

7. Respecting Diversity

As our population becomes increasingly diverse with people of different races and abilities, it is important that children develop a positive attitude about diversity at an early age (Perlman, Kankesan, & Zhang, 2010). The preschool classroom is an ideal location for a child to explore and learn to appreciate differences amongst people. The Galileo *G3 Social Studies Scale* for 3 through 5 years includes key capabilities related to respecting and recognizing differences in people related to gender, abilities, cultures, and family structures.

xv. English Language Acquisition

In the year 2000, the Department of Health and Human Services reported that 18 percent of Head Start children spoke a language other than English at home; by 2009 this number had jumped to 26 percent (Hulsey, et al., 2011). These statistics are representative of a nationwide trend which is bringing more dual language learners into the preschool classroom each year. Working with these children and families poses a challenge to programs as teachers and administrators strive to provide them with culturally sensitive and appropriate learning activities that will allow them to build English proficiency while maintaining their home language.

It is very important for dual language learners to reach developmental milestones in preschool to ensure they begin kindergarten ready to continue their education in English. Children entering kindergarten who are behind their classmates in cognitive development and knowledge are at a high risk for lower academic achievement throughout their education, and often have higher grade-repetition and drop-out rates (Farver, Lonigan, & Eppe, 2009). The Galileo *G3 English Language Acquisition Scale* allows programs to track a child's English language acquisition along a developmental continuum including the following knowledge areas: *Comprehending Spoken Language for English Learners*, *Speaking for English Learners*, and *Participating in Literature for English Learners*. When a program is able to identify potential areas of need in a child's English language acquisition, early intervention can be provided which may significantly improve the child's outcomes.

It is important for programs to utilize this scale to track a dual language learning child's English language skills while continuing to use the other Galileo G3 assessment scales to track development in other domains. It is also important for programs to note that if a child demonstrates skills that appear on other Galileo G3 assessment scales in their home language, this should be considered an appropriate demonstration of these skills as children are often able to directly translate their skills from their home language to English once their English language acquisition has progressed (Farver, Lonigan, & Eppe, 2009). If a teacher or program staff marks a capability as learned which was demonstrated in the child's home language, an anecdotal

note may be entered to illustrate that the capability was demonstrated in a language other than English.

1. Comprehending Spoken Language for English Learners

A dual language learning child will begin by observing others engaging in English speaking activities and then progress to participate in English language activities non-verbally such as participating in finger plays without speaking or waving hello and goodbye. The child will then progress to being able to follow directions given in English. Within this path of developing comprehension skills it is important to note that the child actively participating and responding non-verbally is an appropriate demonstration of English language understanding. Often responding non-verbally is a precursor to English language speaking skills (Worthington, et al., 2011).

2. Speaking for English Learners

A dual language learning child will begin speaking English using one word sentences, and finally move to expressing thoughts and emotions. The path a child takes in developing their English communication skills will be somewhat dependent on the mastery of their home language and the similarities between the grammar and lexicon in the home language and that of English (Worthington, et al., 2011).

3. Participating in Literature for English Learners

Early literacy is identified as one of the primary skills necessary for school success (Farver, Lonigan, & Eppe, 2009). Since 50 percent of dual language learners are read to in a language other than English at home (Hulsey, et al., 2011) and are not exposed to written English language at home, it is common for a dual language learning child to fall behind their native English speaking peers in building English literacy skills. Therefore, it is important for programs to encourage dual language learning children to participate actively in English literature activities in the classroom. While a child is interacting during story time using gestures and/or verbal skills he or she is laying a foundation for learning to read in English.

xvi. School Readiness

Research shows that the social, physical, and cognitive environments that a child is exposed to in the first years of life have a lasting impact on a child's long-term academic achievement (Furlong & Quirk, 2011). To help programs target these valued educational goals, ATI has created a Galileo® *School Readiness Scale* for ages 3 through 5.

The Galileo *School Readiness Scale* is a reporting tool that focuses on capabilities from the essential areas of learning and development reflected in the Galileo G3 assessment scales. The Galileo *School Readiness Scale* for 3 through 5 years is made up of 88 capabilities that are automatically linked to the skills articulated in the Galileo G3 assessment scales. This scale was designed to create a seamless path through kindergarten by targeting a continuum of capabilities that directly link the Galileo *School Readiness Scale* to the Common Core Kindergarten Standards.

In choosing which capabilities to include on the Galileo *School Readiness Scale*, ATI analyzed the specific goals in the Head Start Child Development and Early Learning Framework, various state early learning standards, and Common Core Kindergarten Standards.

Those capabilities that were common among the Framework and standards were identified as the essential performance objectives for preschool-age children transitioning into kindergarten.

The Galileo® *School Readiness Scale* is organized into five knowledge areas: *Cognition and General Knowledge*, *Language and Literacy*, *Approaches to Learning*, *Social and Emotional Development*, and *Physical Development and Health.* These areas align to the domains and domain elements outlined in the Head Start Child Development and Learning Framework.

Because the Galileo G3 assessment scales include additional domains that are not included in the Head Start Child Development and Learning Framework multiple Galileo G3 assessment scales were combined in the Galileo *School Readiness Scale* for 3- through 5-year-olds. Selected capabilities from the Galileo *G3 Early Math*, *G3 Logic and Reasoning*, *G3 Nature and Science*, and *G3 Social Studies* scales for 3- through 5-year-olds are part of the cognition and general knowledge area of the Galileo *School Readiness Scale*. Similarly, selected capabilities from the Galileo *G3 Language* and *Literacy* scales are part of the language and literacy area of the Galileo *School Readiness Scale*. Selected capabilities from the Galileo *G3 Approaches to Learning* and *G3 Creative Arts* scales are part of the approaches to learning area of the Galileo *School Readiness Scale* and selected capabilities from the Galileo *G3 Social and Emotional Development Scale* are part of the social and emotional development knowledge area. Finally, capabilities from the Galileo *G3 Physical Development and Health Scale* are part of the *Physical Development and Health* knowledge area.

V. Psychometric Analyses of Galileo G3 Assessment Scales

The following discussion provides an overview of ATI's approach to basic psychometric issues associated with the use of Galileo assessment scales in the context of a dynamic approach to assessment that accommodates the rapid change inherent in education today.

A. Identifying Samples

In a dynamic assessment system in which the primary goal of assessment is to provide information for planning, the sample of children used to establish the psychometric properties of assessment instruments will under the best of circumstances be composed of children in programs currently using the system. When the sample is composed of current users, it is possible to update psychometric properties on a continuous basis. Continuous updating is advisable since psychometric properties may change over time. Moreover, continuous updating facilitates scale modification to meet changing curriculum needs. When scales are widely used, frequent updating is both practical and desirable. Despite the benefits of continuous updating, it is also useful to include historical samples that reflect the characteristics of children previously participating in the system. Historical samples provide continuity with the past, which facilitates the analysis of change occurring over time. In Galileo, psychometric analyses for assessment scales are updated on a regular basis using samples drawn from the current population; however, the estimates derived from these analyses are placed on a common scale with the estimates derived from previous analyses in order to maintain continuity. In the most recent research investigation, IRT analyses were conducted on child observations on the G3 assessment scales with sample sizes ranging from approximately 300 for the birth to 8 month scales to over 45,000 for the scales for 3- through 5-year-old children. Tables 1, 2, 3, 4, 5, and 6 illustrate the demographic characteristics of the samples for each scale. The proportions of children in each demographic category are reported in terms of age, gender and the Head Start

Program Information Report classifications for race, ethnicity, disability status and type, and primary language. As Table 1 reveals, the age distributions appear to be shifted towards the upper end of the age range for each scale. This may be due to several factors including smaller sample sizes (see Table 7 for sample sizes), variations in the frequency of assessment of children at various ages, and/or the possible presence of outliers created by inaccurate child birth dates in the system. Additional analyses are currently underway to explore these possibilities.

TABLE 1
Descriptive statistics for child age given in months at time of observation

Age Range and Scale	Mean	Median	Mode	Standard Deviation
00-08 months: G3 Approaches to Learning	20.8	9	8	21.0
00-08 months: G3 Cognitive Development and General Knowledge	14.6	8	8	16.6
00-08 months: G3 Language, Communication, Reading, & Writing	15.9	8	8	19.0
00-08 months: G3 Physical Development and Health	14.2	8	8	16.6
00-08 months: G3 Social and Emotional Development	14.7	8	8	16.8
08-18 months: G3 Approaches to Learning	19.0	16	15	12.6
08-18 months: G3 Cognitive Development and General Knowledge	17.5	15	17	10.5
08-18 months: G3 Language, Communication, Reading & Writing	17.5	15	15	10.3

TABLE 1 – Continued
Descriptive statistics for child age given in months at time of observation

Age Range and Scale	Mean	Median	Mode	Standard Deviation
08-18 months: G3 Physical Development and Health	17.3	15	15	10.8
08-18 months: G3 Social and Emotional Development	17.5	16	15	10.8
18-24 months: G3 Approaches to Learning	23.8	23	23	8.1
18-24 months: G3 Cognitive Development and General Knowledge	23.8	23	23	8.5
18-24 months: G3 Language, Communication, Reading and Writing	23.7	23	23	8.3
18-24 months: G3 Physical Development and Health	23.4	23	23	8.0
18-24 months: G3 Social and Emotional Development	23.7	23	23	8.4
2-3 years: G3 Approaches to Learning	34.7	33	35	19.6
2-3 years: G3 Cognitive Development and General Knowledge	33.9	33	35	8.7
2-3 years: G3 Language, Communication, Reading & Writing	33.6	33	35	8.2

Age Range and Scale	Mean	Median	Mode	Standard Deviation
2-3 years: G3 Physical Development and Health	34.2	33	35	9.0
2-3 years: G3 Social and Emotional Development	33.8	33	35	8.5
3-5 years: G3 Approaches to Learning	51.7	52	59	7.8
3-5 years: G3 Creative Arts	51.7	52	59	7.8
3-5 years: G3 Early Math	51.9	52	59	8.6
3-5 years: G3 English Language Acquisition	51.4	52	59	8.0
3-5 years: G3 Language	51.8	52	59	7.6
3-5 years: G3 Literacy	51.8	52	59	7.5
3-5 years: G3 Logic and Reasoning	51.7	52	59	7.8
3-5 years: G3 Nature and Science	51.7	52	59	7.5
3-5 years: G3 Physical Development & Health	51.7	52	59	7.8
3-5 years: G3 Social and Emotional Development	51.7	52	59	8.3
3-5 years: G3 Social Studies	51.7	52	59	7.6
3-5 years: Galileo® School Readiness	51.6	52	58	10.3

TABLE 2
Proportion of children classified as male or female

Age Range and Scale	Male	Female
Birth-8 months		
G3 Approaches to Learning	0.52	0.48
G3 Cognitive Development and General Knowledge	0.52	0.48
G3 Language, Communication, Reading, & Writing	0.49	0.51
G3 Physical Development and Health	0.50	0.50
G3 Social and Emotional Development	0.51	0.49
8-18 months		
G3 Approaches to Learning	0.51	0.49
G3 Cognitive Development and General Knowledge	0.49	0.51
G3 Language, Communication, Reading, & Writing	0.51	0.49
G3 Physical Development and Health	0.51	0.49
G3 Social and Emotional Development	0.51	0.49
18-24 months		
G3 Approaches to Learning	0.51	0.49
G3 Cognitive Development and General Knowledge	0.51	0.49
G3 Language, Communication, Reading, & Writing	0.53	0.47
G3 Physical Development and Health	0.53	0.47
G3 Social and Emotional Development	0.52	0.48
2-3 years		
G3 Approaches to Learning	0.52	0.48
G3 Cognitive Development and General Knowledge	0.52	0.48
G3 Language, Communication, Reading, & Writing	0.52	0.48
G3 Physical Development and Health	0.52	0.48
G3 Social and Emotional Development	0.52	0.48
3-5 years		
G3 Approaches to Learning	0.50	0.50
G3 Early Math	0.50	0.50
G3 English Language Acquisition	0.50	0.50
G3 Language	0.50	0.50
G3 Literacy	0.50	0.50
G3 Logic and Reasoning	0.50	0.50
G3 Nature and Science	0.50	0.50
G3 Physical Development and Health	0.50	0.50
G3 Social and Emotional Development	0.50	0.50

TABLE 2 – Continued
Proportion of children classified as male or female

	Male	Female
3-5 years		
G3 Social Studies	0.50	0.50
G3 School Readiness	0.50	0.50
Overall	**0.50**	**0.50**

TABLE 3
Proportion of children classified under each of the Race classifications on the PIR form

Age Range and Scale	American Indian or Alaskan Native	Asian	Biracial /Multi-racial	Black or African American	Native Hawaiian or other Pacific Islander	White	Other	Unsp-ecified
Birth-8 months								
G3 Approaches to Learning	0.03	0.01	0.10	0.37	0.01	0.45	0.04	0.00
G3 Cognitive Development and General Knowledge	0.02	0.01	0.12	0.32	0.01	0.46	0.06	0.00
G3 Language, Comm-unication, Reading, & Writing	0.02	0.01	0.11	0.31	0.01	0.47	0.06	0.00
G3 Physical Development and Health	0.02	0.01	0.12	0.33	0.01	0.46	0.05	0.00
G3 Social and Emotional Development	0.02	0.01	0.12	0.31	0.01	0.48	0.05	0.00
8-18 months								
G3 Approaches to Learning	0.01	0.00	0.08	0.40	0.00	0.39	0.09	0.03
G3 Cognitive Development and General Knowledge	0.01	0.00	0.09	0.39	0.00	0.40	0.07	0.04

TABLE 3 – Continued
Proportion of children classified under each of the Race classifications on the PIR form

Age Range and Scale	American Indian or Alaskan Native	Asian	Biracial /Multi-racial	Black or African American	Native Hawaiian or other Pacific Islander	White	Other	Unsp-ecified
8-18 months								
G3 Language, Comm-unication, Reading & Writing	0.01	0.00	0.10	0.40	0.00	0.40	0.06	0.04
G3 Social and Emotional Development	0.01	0.00	0.09	0.40	0.00	0.41	0.06	0.03
18-24 months								
G3 Approaches to Learning	0.01	0.00	0.08	0.38	0.00	0.41	0.09	0.02
G3 Cognitive Development and General Knowledge	0.01	0.00	0.09	0.37	0.00	0.42	0.08	0.03
G3 Language, Comm-unication, Reading & Writing	0.01	0.00	0.07	0.38	0.00	0.41	0.09	0.03
G3 Physical Development and Health	0.01	0.00	0.09	0.37	0.00	0.42	0.09	0.02
G3 Social and Emotional Development	0.01	0.00	0.09	0.37	0.00	0.41	0.09	0.02
2-3 years								
G3 Approaches to Learning	0.01	0.00	0.09	0.33	0.00	0.45	0.09	0.03
G3 Cognitive Development and General Knowledge	0.01	0.00	0.09	0.33	0.00	0.46	0.08	0.03

TABLE 3 – Continued
Proportion of children classified under each of the Race classifications on the PIR form

Age Range and Scale	American Indian or Alaskan Native	Asian	Biracial /Multi-racial	Black or African American	Native Hawaiian or other Pacific Islander	White	Other	Unsp-ecified
2-3 years								
G3 Language, Comm-unication, Reading & Writing	0.01	0.00	0.09	0.33	0.00	0.44	0.09	0.03
G3 Physical Development and Health	0.01	0.00	0.09	0.33	0.00	0.45	0.08	0.03
G3 Social and Emotional Development	0.01	0.00	0.09	0.33	0.00	0.45	0.08	0.03
3-5 years								
G3 Approaches to Learning	0.01	0.01	0.06	0.31	0.00	0.48	0.12	0.01
G3 Creative Arts	0.01	0.01	0.06	0.31	0.00	0.48	0.12	0.01
G3 English Language Acquisition	0.01	0.01	0.04	0.29	0.00	0.46	0.18	0.01
G3 Language	0.01	0.01	0.06	0.31	0.00	0.49	0.12	0.01
G3 Literacy	0.01	0.01	0.06	0.31	0.00	0.49	0.12	0.01
G3 Logic and Reasoning	0.01	0.01	0.06	0.31	0.00	0.48	0.12	0.01
G3 Nature and Science	0.01	0.01	0.06	0.31	0.00	0.49	0.12	0.01
G3 Physical Development & Health	0.01	0.01	0.06	0.31	0.00	0.49	0.12	0.01
G3 Social and Emotional Development	0.01	0.01	0.06	0.31	0.00	0.49	0.12	0.01

Age Range and Scale	American Indian or Alaskan Native	Asian	Biracial /Multi-racial	Black or African American	Native Hawaiian or other Pacific Islander	White	Other	Unsp-ecified
3-5 years								
G3 Social Studies	0.01	0.01	0.06	0.31	0.00	0.48	0.12	0.01
Galileo® School Readiness	0.02	0.01	0.06	0.36	0.01	0.44	0.09	0.01
Overall	**0.01**	**0.01**	**0.06**	**0.31**	**0.00**	**0.48**	**0.12**	**0.01**

TABLE 4
Proportion of children identified as Hispanic or Latino on PIR form

Age Range and Scale	PIR Ethnicity: Hispanic or Latino	
	Yes	**No**
Birth-8 months		
G3 Approaches to Learning	0.14	0.86
G3 Cognitive Development and General Knowledge	0.13	0.87
G3 Language, Communication, Reading, & Writing	0.14	0.86
G3 Physical Development and Health	0.13	0.87
G3 Social and Emotional Development	0.14	0.86
8-18 months		
G3 Approaches to Learning	0.20	0.80
G3 Cognitive Development and General Knowledge	0.18	0.82
G3 Language, Communication, Reading & Writing	0.18	0.82
G3 Social and Emotional Development	0.18	0.82
18-24 months		
G3 Approaches to Learning	0.19	0.81
G3 Cognitive Development and General Knowledge	0.18	0.82
G3 Language, Communication, Reading and Writing	0.19	0.81
G3 Physical Development and Health	0.19	0.81
G3 Social and Emotional Development	0.19	0.81
2-3 years		
G3 Approaches to Learning	0.19	0.81
G3 Cognitive Development and General Knowledge	0.18	0.82
G3 Language, Communication, Reading & Writing	0.18	0.82
G3 Physical Development and Health	0.18	0.82
G3 Social and Emotional Development	0.19	0.81

Age Range and Scale	PIR Ethnicity: Hispanic or Latino	
	Yes	No
3-5 years		
G3 Approaches to Learning	0.38	0.62
G3 Creative Arts	0.39	0.61
G3 English Language Acquisition	0.50	0.50
G3 Language	0.38	0.62
G3 Literacy	0.38	0.62
G3 Logic and Reasoning	0.39	0.61
G3 Nature and Science	0.39	0.61
G3 Physical Development & Health	0.39	0.61
G3 Social and Emotional Development	0.39	0.61
G3 Social Studies	0.39	0.61
Galileo® School Readiness	0.29	0.71
Overall	**0.39**	**0.62**

TABLE 5
Proportion of children classified with each of various disabilities on the PIR form

	Health Impairment	Speech or Language Impairment	Autism	Non-Categorical/ Develop-mental Delay	Other	None
Birth-8 months						
G3 Approaches to Learning	0.03	0.13	0.00	0.09	0.00	0.75
G3 Cognitive Development and General Knowledge	0.04	0.04	0.00	0.07	0.00	0.86
G3 Language, Comm-unication, Reading, & Writing	0.03	0.03	0.00	0.07	0.03	0.83
G3 Physical Development and Health	0.04	0.04	0.00	0.07	0.04	0.82
G3 Social and Emotional Development	0.04	0.04	0.00	0.11	0.00	0.82
8-18 months						
G3 Approaches to Learning	0.00	0.05	0.00	0.10	0.02	0.83
G3 Cognitive Development and General Knowledge	0.00	0.07	0.00	0.11	0.02	0.80
G3 Language, Comm-unication, Reading & Writing	0.00	0.07	0.00	0.10	0.02	0.81
G3 Social and Emotional Development	0.02	0.06	0.00	0.10	0.03	0.79

	Health Impairment	Speech or Language Impairment	Autism	Non-Categorical/ Develop-mental Delay	Other	None
18-24 months						
G3 Approaches to Learning	0.02	0.17	0.08	0.22	0.05	0.47
G3 Cognitive Development and General Knowledge	0.02	0.18	0.08	0.23	0.06	0.44
G3 Language, Comm-unication, Reading and Writing	0.02	0.18	0.09	0.26	0.05	0.40
G3 Physical Development and Health	0.02	0.18	0.08	0.21	0.05	0.47
G3 Social and Emotional Development	0.02	0.17	0.08	0.21	0.05	0.48
2-3 years						
G3 Approaches to Learning	0.01	0.21	0.04	0.37	0.04	0.34
G3 Cognitive Development and General Knowledge	0.01	0.22	0.04	0.34	0.03	0.36
G3 Language, Comm-unication, Reading & Writing	0.01	0.20	0.05	0.36	0.03	0.35

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	Health Impairment	Speech or Language Impairment	Autism	Non-Categorical/ Develop-mental Delay	Other	None
2-3 years						
G3 Physical Development and Health	0.01	0.20	0.04	0.35	0.03	0.36
G3 Social and Emotional Development	0.01	0.19	0.04	0.34	0.03	0.39
3-5 years						
G3 Approaches to Learning	0.01	0.23	0.01	0.11	0.03	0.62
G3 Creative Arts	0.01	0.23	0.01	0.11	0.03	0.62
G3 English Language Acquisition	0.01	0.25	0.01	0.11	0.03	0.60
G3 Language	0.01	0.23	0.01	0.11	0.03	0.62
G3 Literacy	0.01	0.23	0.00	0.10	0.03	0.63
G3 Logic and Reasoning	0.01	0.23	0.01	0.10	0.03	0.63
G3 Nature and Science	0.01	0.23	0.01	0.10	0.03	0.63
G3 Physical Development & Health	0.01	0.23	0.01	0.11	0.03	0.62
G3 Social and Emotional Development	0.01	0.23	0.01	0.10	0.03	0.63
G3 Social Studies	0.01	0.23	0.00	0.10	0.03	0.63
Galileo® School Readiness	0.03	0.27	0.01	0.11	0.05	0.62
Overall	**0.01**	**0.23**	**0.01**	**0.11**	**0.03**	**0.61**

TABLE 6
Proportion of children classified as speaking each of various languages as their primary language on the PIR form

	English	Spanish	Caribbean Languages	Other	Unspecified
Birth-8 months					
G3 Approaches to Learning	0.87	0.11	0.01	0.01	0.00
G3 Cognitive Development and General Knowledge	0.90	0.09	0.01	0.01	0.00
G3 Language, Communication, Reading, & Writing	0.89	0.09	0.01	0.01	0.00
G3 Physical Development and Health	0.90	0.08	0.01	0.01	0.00
G3 Social and Emotional Development	0.90	0.08	0.01	0.01	0.00
8-18 months					
G3 Approaches to Learning	0.84	0.13	0.02	0.01	0.00
G3 Cognitive Development and General Knowledge	0.86	0.11	0.03	0.01	0.00
G3 Language, Communication, Reading & Writing	0.87	0.10	0.03	0.01	0.00
G3 Social and Emotional Development	0.85	0.11	0.02	0.02	0.00

TABLE 6 – Continued
Proportion of children classified as speaking each of various languages as their primary language on the PIR form

	English	Spanish	Caribbean Languages	Other	Unspecified
18-24 months					
G3 Approaches to Learning	0.86	0.13	0.01	0.00	0.00
G3 Cognitive Development and General Knowledge	0.87	0.12	0.01	0.00	0.00
G3 Language, Communication, Reading and Writing	0.86	0.12	0.01	0.00	0.00
G3 Physical Development and Health	0.86	0.13	0.02	0.00	0.00
G3 Social and Emotional Development	0.86	0.13	0.02	0.00	0.00
2-3 years					
G3 Approaches to Learning	0.84	0.14	0.01	0.00	0.00
G3 Cognitive Development and General Knowledge	0.85	0.14	0.01	0.00	0.00
G3 Language, Communication, Reading & Writing	0.84	0.14	0.01	0.01	0.00
G3 Physical Development and Health	0.85	0.13	0.01	0.01	0.00
G3 Social and Emotional Development	0.84	0.14	0.01	0.01	0.00

TABLE 6 – Continued
Proportion of children classified as speaking each of various languages as their primary language on the PIR form

	English	Spanish	Caribbean Languages	Other	Unspecified
3-5 years					
G3 Approaches to Learning	0.73	0.24	0.02	0.01	0.00
G3 Creative Arts	0.73	0.24	0.02	0.01	0.00
G3 English Language Acquisition	0.58	0.38	0.02	0.02	0.00
G3 Language	0.73	0.24	0.02	0.01	0.00
G3 Literacy	0.73	0.24	0.02	0.01	0.00
G3 Logic and Reasoning	0.74	0.25	0.00	0.01	0.00
G3 Nature and Science	0.74	0.25	0.00	0.01	0.00
G3 Physical Development & Health	0.74	0.25	0.00	0.01	0.00
G3 Social and Emotional Development	0.74	0.25	0.00	0.01	0.00
G3 Social Studies	0.74	0.25	0.00	0.01	0.00
Galileo® School Readiness	0.82	0.16	0.00	0.02	0.00
Overall	**0.73**	**0.25**	**0.01**	**0.01**	**0.00**

B. Evaluating Test Information

Test information can be thought of as the inverse of measurement error. Measurement error typically varies from one ability level to the next. Measurement error is generally lowest for the middle ability levels and highest for extreme ability levels. Measures of test information provide a way to assess measurement error at different points in the ability distribution. An assessment tool that provides a substantial amount of information about ability at a given point on the latent ability continuum contains very little error at that point on the continuum. Conversely, an assessment tool that provides little information about ability at a particular point on the continuum will contain a large amount of measurement error at that point on the continuum.

The amount of information provided by an assessment scale is a direct function of the amount of information in the individual capabilities that make up the scale (Lord, 1980). Just as

the amount of information provided by a scale tends to vary across the ability distribution, the amount of information associated with a particular capability can also be expected to vary across the ability range. For example, capabilities that are relatively easy tend to provide maximal information about the ability of individuals at the lower end of the ability continuum whereas capabilities that are relatively difficult tend to provide maximal information about the ability of individuals at the upper end of the ability continuum. An examination of variations in information across the ability continuum indicates the points at which the scale is most sensitive to differences in ability. For the Galileo® G3 assessment scales that point tends to be near the middle of the ability continuum. This is desirable in that it indicates that the scales tend not to be too difficult or too easy for the children assessed. A sample test information curve for the *G3 Physical Development and Health Scale* for 3- through 5-year-olds is presented in Figure 1.
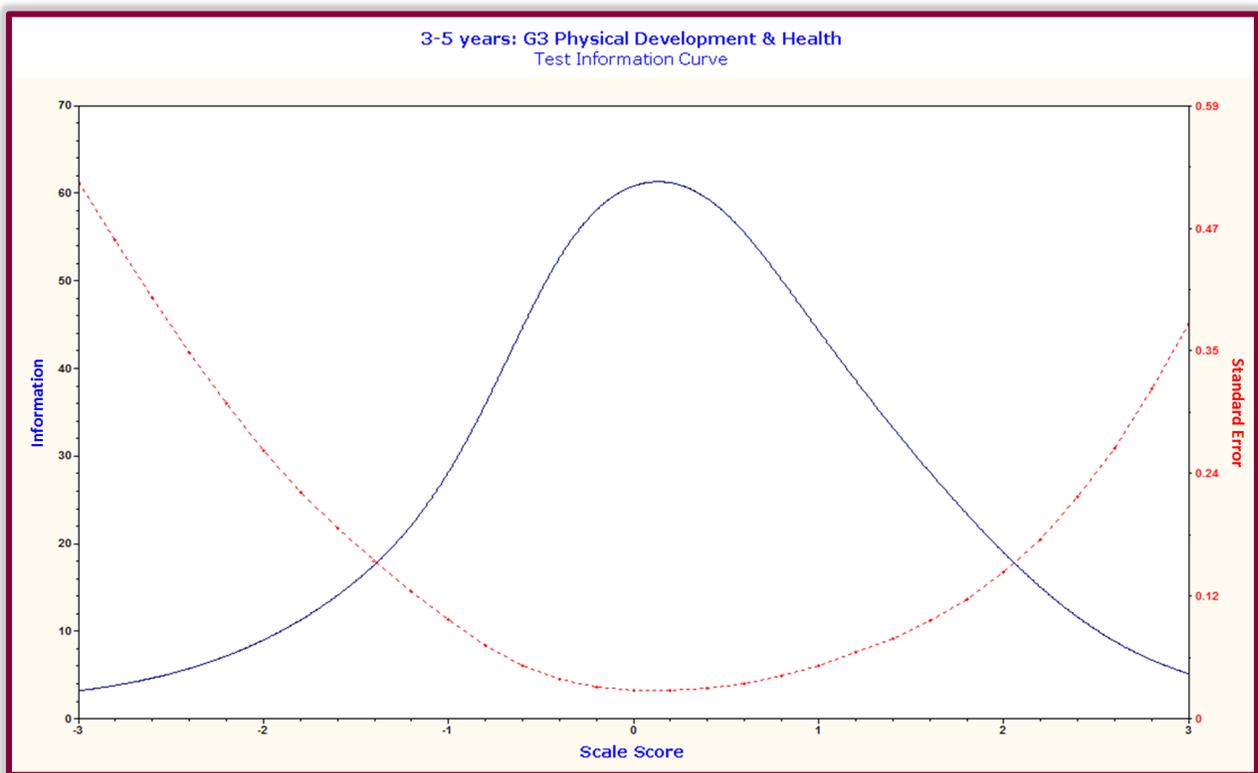
Figure 1
Sample Test Information Curve

C. Evaluating Reliability

In order for an assessment instrument to be useful, it is also necessary to have confidence in the capability of the instrument to provide a consistent, reliable measure of the ability being assessed. Measures of internal consistency of an instrument provide one widely used approach to the measurement of reliability. The marginal reliability coefficient (Thissen & Wainer, 2001) is linked to item response theory and is closely related to test information. The marginal reliability coefficient combines measurement error estimated at different points on the ability continuum into an overall reliability coefficient, which corresponds closely to conventional estimates of reliability. Psychometric analyses of the Galileo G3 assessment scales indicate adequate levels of reliability. The marginal reliability estimates, presented in Table 7, were

routinely well above 0.90, with a mean of 0.94, indicating that the scales have a high degree of internal consistency with regard to the abilities that are measured.

TABLE 7
Marginal reliability estimates for the Galileo® G3 assessment scales

Scale	Number of Indicators on Scale	Sample Size	Marginal Reliability
Birth-8 months:G3 Approaches to Learning	24	365	0.93
Birth-8 months: G3 Cognitive Development and General Knowledge	53	294	0.96
Birth-8 months: G3 Language, Communication, Reading & Writing	34	295	0.95
Birth-8 months: G3 Physical Development and Health	39	281	0.95
Birth-8 months: G3 Social and Emotional Development	58	285	0.97
8-18 months: G3 Approaches to Learning	29	678	0.93
8-18 months: G3 Cognitive Development and General Knowledge	65	642	0.97
8-18 months: G3 Language, Communication, Reading & Writing	39	638	0.95
8-18 months: G3 Physical Development and Health	42	630	0.93
8-18 months: G3 Social and Emotional Development	71	642	0.97
18-24 months: G3 Approaches to Learning	27	568	0.92
18-24 months: G3 Cognitive Development and General Knowledge	56	552	0.96
18-24 months: G3 Language, Communication, Reading & Writing	52	550	0.95
18-24 months: G3 Physical Development and Health	47	571	0.95
18-24 months: G3 Social and Emotional Development	64	550	0.96
2-3 years: G3 Approaches to Learning	26	1,752	0.91
2-3 years: G3 Cognitive Development and General Knowledge	55	1,694	0.95
2-3 years: G3 Language, Communication, Reading & Writing	43	1,600	0.93
2-3 years: G3 Physical Development and Health	41	1,666	0.94
2-3 years: G3 Social and Emotional Development	53	1,660	0.95
3-5 years: G3 Approaches to Learning	30	47,649	0.92

Scale	Number of Indicators on Scale	Sample Size	Marginal Reliability
3-5 years: G3 Creative Arts	36	46,420	0.91
3-5 years: G3 Early Math	47	47,540	0.92
3-5 years: G3 English Language Acquisition	30	29,162	0.94
3-5 years: G3 Language	33	47,306	0.93
3-5 years: G3 Literacy	50	46,994	0.92
3-5 years: G3 Logic and Reasoning	36	45,872	0.89
3-5 years: G3 Nature and Science	56	45,581	0.93
3-5 years: G3 Physical Development and Health	74	46,827	0.97
3-5 years: G3 Social and Emotional Development	47	47,147	0.95
3-5 years: G3 Social Studies	45	45,317	0.90
3-5 years: G3 School Readiness	88	1,088	0.95
Mean Reliability Estimate			**0.94**

D. Validating Knowledge Areas Using Multi-Factor Analyses

Multi-factor IRT analysis techniques (e.g., Cai, Yang, & Hansen, 2011) can be implemented to evaluate the extent to which the subscales included within the knowledge areas within the Galileo G3 assessment scales can be empirically validated. For example, the Galileo *G3 Approaches to Learning Scale* for ages 3 through 5 years contains four knowledge areas within it: *Taking Initiative and Exhibiting Curiosity*, *Developing Creativity and Inventiveness*, *Goal Setting and Planning*, and *Learning Cooperation*. It is assumed that in addition to a general factor labeled *Approaches to Learning*, there are additional specific factors defined by the capabilities included in each of the knowledge areas in the *G3 Approaches to Learning Scale*. Multi-factor analysis makes it possible to test this assumption. The Likelihood Ratio chi-squared statistic is used to determine whether or not the multi-factor model improves significantly on the fit to the data provided by a one-factor model. The results of the analyses that have been conducted on the Galileo G3 assessment scales are presented in Table 8. In all cases the multi-factor model provided a significantly better fit to the data than the unidimensional model. These findings support the assumption of subscales within knowledge areas.

TABLE 8
Summary of comparison of the fit of single factor and multi-factor IRT models applied to child observations on the Galileo® G3 assessment scales. In all cases the multi-factor model was superior

Scale	Likelihood Ratio Chi-Square	Difference in Degrees of Freedom	p value
3-5 years: G3 Approaches to Learning	15597.4	30	<.001
3-5 years: G3 Creative Arts	9168.8	36	<.001
3-5 years: G3 Early Math	4911.8	69	<.001
3-5 years: G3 English Language Acquisition	7615.2	30	<.001
3-5 years: G3 Language	9918.0	33	<.001
3-5 years: G3 Literacy	12190.8	50	<.001
3-5 years: G3 Logic and Reasoning	12362.3	36	<.001
3-5 years: G3 Nature and Science	6947.4	56	<.001
3-5 years: G3 Physical Development & Health	35550.5	74	<.001
3-5 years: G3 Social and Emotional Development	20055.1	47	<.001
3-5 years: G3 Social Studies	5829.0	44	<.001
3-5 years: Galileo School Readiness	4460.8	88	<.001

Although the results of the multi-factor analyses support a multi-faceted model of the ability measured by each scale, there are practical reasons to prefer a unidimensional model for the measurement and reporting of ability in this context. First, since the general factor is typically observed to be highly correlated with associated specific factors, the unidimensional model produces a sufficiently precise estimate of student ability with the added benefit of increased parsimony and efficiency of analysis. Second, and perhaps most importantly, a single measure of ability is easier for the target audience (e.g., teachers, parents) to understand and interpret.

E. Establishing Developmental Sequences Using IRT Parameter Estimates

The ordering of capabilities to form developmental progressions within knowledge areas facilitates the gathering of information indicating what kinds of things children will be ready to learn as development progresses. ATI patented Galileo Pre-K Online technology implements IRT computations in real time to provide instructional recommendations. This unique and powerful technology is one of the most important features of Galileo.

IRT assumes that the probability of being able to perform a given capability is a function of psychometric characteristics of the capability including difficulty and discrimination. In a two parameter IRT model, the discrimination parameter reflects the sensitivity of the capability to changes in ability. High values (i.e., values of one or greater) indicate capabilities that are highly

sensitive to changes in ability. Low values indicate capabilities with low sensitivity to changes in ability. As discrimination values fall, the number of capabilities required to assess ability with adequate precision increases. The difficulty parameter indicates the difficulty of the capability being assessed. There is a 50/50 chance that a child with an average ability will display mastery of capabilities with difficulty values at zero. Values greater than zero indicate high levels of difficulty. Values less than zero indicate low levels of difficulty.

Item response models (Bock & Aitkin, 1981; Thissen, 1991; Thissen & Wainer, 2001) assume that capabilities may vary in difficulty independently from the abilities of individuals performing them. Developmental paths may be constructed by ordering capabilities in a sequence according to their empirically established difficulties (e.g., Bergan, 1988). The nature of developmental sequences is determined not only by variations in the difficulty of capabilities, but also by variations in the discrimination of capabilities. When discrimination varies across capabilities, the probability of performing an easy task effectively will not always be higher than the probability of performing a more difficult task. At some levels of ability the probabilities may be reversed so that the capability that overall tends to be more difficult will be easier for individuals at those levels of ability. While constant discrimination suggests a stair-step assumption regarding learning, variations in discrimination imply individual differences in the ways in which children progress along a path of development. In some cases a more difficult capability will be evidenced prior to an easier capability.

A two-parameter item response model, which allows for variations in both discrimination and difficulty, was used to estimate item parameters for the G3 assessment scales. The IRT item parameter estimates for each of the capabilities on the Galileo® G3 assessment scales are presented in Tables 9 through 40. As the tables illustrate, the discrimination parameters reveal that the capabilities on the G3 assessment scales discriminate well, meaning that the capabilities can measure differences between children of similar levels of development. Low discrimination parameter estimates (i.e., less than 1.0) were observed for very few capabilities; however, even when low values are observed, the capabilities must still be retained as part of the scale because they reflect skills deemed important in federal and state standards and valued by society. As is shown in the tables, the parameter estimates for the capabilities contained within each scale also span a broad range of difficulties, suggesting that these capabilities are appropriate for measuring children of varying abilities. In addition, the difficulty parameters reveal the ordering of capabilities within a knowledge area along a developmental path. Since difficulty is measured on the same scale as the child's developmental level, the child's developmental level and this developmental progression of ordered capabilities can be used to determine next instructional steps as well as to guide the development of the Galileo Pre-K Online Curriculum.

TABLE 9
Birth-8 months: G3 Approaches to Learning

Birth-8 months: G3 Approaches to Learning		IRT Parameter Estimates	
		Discrimination	Difficulty
Eagerness and Curiosity	Babbles when alone, trying several different sounds.	1.72	-1.63
	Gazes at parents, caregivers, and teachers when being fed or changed.	2.59	-1.33
	Reacts to objects, voices, and sounds by either becoming more quiet or active, or by changing body position gestures, or facial expressions.	2.52	-1.13
	Explores objects using a variety of senses (e.g., mouthing, waving, banging).	3.17	-0.80
	Positions or moves their body toward an interesting object.	2.77	-0.53
	Actively explores the world by using their bodies and senses, as well as tools, materials, and equipment.	3.84	0.04
	Shows continued interaction with adults by vocalizing and smiling while a book is being read.	2.61	0.11
Persistence	Grasps, releases, re-grasps and re-releases an object.	1.76	-1.30
	Kicks or swats a mobile to repeat a sound or motion.	1.69	-1.25
	Explores objects (e.g., books) repeatedly with their hands and mouths.	3.22	-0.84
	Bangs an object repeatedly while exploring its properties.	2.37	-0.26
	Gets the attention of the parent, teacher or caregiver in some way (e.g., reaching up and crying).	2.43	-0.20
	Looks at pictures in a book for an extended period of time.	2.13	0.46

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TABLE 9 – Continued
Birth-8 months: G3 Approaches to Learning

Birth-8 months: G3 Approaches to Learning		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Persistence	Asks or gestures that they want the same song or story repeated over and over again.	2.20	1.07
	Fills a container with small objects and dumps them out repeatedly.	2.30	1.14
Creativity and Inventiveness	Turns toward and tracks voices, people, and objects.	1.79	-1.79
	Rolls from their backs to their stomachs when looking for a toy.	2.46	-0.72
	Uses multiple senses at one time to explore objects (e.g., looking, touching, mouthing, and banging).	3.29	-0.62
	Inspects their own hands, fingers, feet, and toes by touching, looking, and mouthing.	3.07	-0.60
	Raises bottle as the level of milk drops.	2.96	-0.20
	Drops a toy or object and looks for it.	3.40	-0.09
	Reacts with movement to the sound of music.	3.22	0.17
	Participates in spontaneous interactions with peers, like making silly faces or imitating sounds.	3.29	0.60
	In the absence of a preferred object, substitutes another object to calm self when upset.	3.07	0.67

TABLE 10
Birth-8 months: G3 Cognitive Development and General Knowledge

Birth-8 months: G3 Cognitive Development and General Knowledge		IRT Parameter Estimates	
		Discrimination	Difficulty
Exploration and Discovery	Responds to loud noises by being startled or crying.	1.85	-1.66
	Appears to be comforted by familiar voices.	3.17	-1.47
	Smiles at familiar faces.	3.59	-0.96
	Looks at, reaches for, and then attempts to grab an object (e.g., bottle or toy).	3.51	-0.95
	Laughs aloud when lightly tickled.	2.58	-0.82
	Looks longer at human faces than at objects.	2.46	-0.75
	Inspects her/his own hands, feet, fingers, and/or toes.	3.17	-0.56
	Touches and mouths objects for sensory exploration.	3.51	-0.43
	Babbles and then pauses to wait for familiar adults to respond.	2.91	-0.14
	Along with adults, looks at picture books.	1.92	-0.13
	Shakes toys to elicit a response or sound.	2.54	0.10
	Bangs a variety of objects on the floor or table (e.g., utensils, blocks, and toys).	3.00	0.18
	Makes faces back at familiar adults.	1.90	0.53
	Responds to familiar words (e.g., bottle, blanket, and teddy bear) by looking at, pointing to, or reaching for objects.	2.57	0.89
	Enjoys rolling a ball to familiar adults.	2.44	1.25
Concept Development and Memory	Cries when in need of something.	2.45	-1.06
	Watches and follows the movement of a mobile.	2.74	-0.89
	Reaches for breast or bottle when hungry.	2.89	-0.70

Birth-8 months: G3 Cognitive Development and General Knowledge	IRT Parameter Estimates	
	Discrimination	Difficulty
Concept Development and Memory		
Demonstrates knowing/recognition of family members (e.g., smiling, cooing, moving, reaching).	3.25	-0.49
Watches and follows both horizontal and vertical movements of objects.	2.73	-0.47
Imitates familiar sounds and movements.	0.85	-0.45
Anticipates feeding time (e.g., responds to stimuli such as appearance of a bottle).	3.57	-0.44
Responds by turning and smiling when her/his name is spoken by familiar adults.	3.25	-0.28
Uses different facial expressions to express different emotions.	2.23	-0.07
Shows pleasure when presented with a familiar object.	3.13	0.08
Knocks down a block tower or nesting cups.	1.66	0.42
Reaches for a mobile or other similar object to make it move.	2.59	0.43
Pulls the cover off a toy hidden from view.	2.92	0.58
Protests when left with unfamiliar people (e.g., cries, attempts to reach for familiar adult).	2.35	0.69
Enjoys repeating a newly learned activity.	3.09	0.71
Finds hidden objects.	3.25	1.06
Vocalizes when being read a familiar book by a familiar adult.	2.82	1.11
Problem Solving and Creative Expression		
Anticipates being lifted to be held, fed or changed and moves body accordingly.	2.37	-0.35
Begins to smile as a social interaction.	3.70	-0.32
Reaches for objects within view.	3.05	-0.28

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Birth-8 months: G3 Cognitive Development and General Knowledge	IRT Parameter Estimates	
	Discrimination	**Difficulty**
Problem Solving and Creative Expression — Cries in different ways for different reasons (e.g., hunger, pain, fear).	2.38	-0.26
Moves toward a familiar adult when a stranger appears.	1.16	-0.05
Begins to differentiate between strangers and familiar people.	1.56	0.04
Plays with a single toy for two to three minutes.	3.38	0.12
Stretches out arms in a motion to be picked up.	3.19	0.17
Moves to music with familiar adults.	2.26	0.23
Raises her/his bottle as the level of liquid drops.	3.39	0.28
Smiles as she/he figures out how to move around an object.	2.02	0.31
Seeks out familiar adults for play.	3.27	0.33
Vocalizes to communicate needs.	2.95	0.37
Looks to parents, caregivers, and teachers for help.	3.19	0.45
Imitates facial expressions, sounds, and gestures.	2.30	0.52
Smiles while banging a block or other object on the floor.	3.10	0.66
Claps hands to music along with a familiar adult	2.01	0.70
Points, gestures, and makes sound to indicate what she/he wants.	3.25	0.99
Demonstrates some movement to rhythms.	2.78	1.02
Makes choices related to toys and clothing.	2.84	1.34
Moves away from loud noises.	2.68	1.37

TABLE 11
Birth-8 months: G3 Language, Communication, Reading, and Writing

Birth-8 months: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Listening and Understanding	Moves arms and legs upon hearing a familiar voice.	1.97	-1.96
	Startles, blinks, or opens her/his eyes wide when hearing a loud noise.	2.75	-1.51
	Gazes at the face of an adult and makes facial expressions as the adult talks.	2.79	-0.88
	Turns her/his head in the direction of a sound (e.g., telephone ringing).	1.55	-0.87
	Turns and smiles when her/his name is called by an adult.	2.89	-0.59
	Pays attention to objects in the environment when prompted by an adult.	2.58	-0.23
	Uses some sign or body language to indicate a need (e.g., "more" "eat").	2.14	0.56
	Focuses on books/pictures as adults describe them.	2.14	0.69
Communicating and Speaking	Makes sucking motions to communicate hunger.	1.18	-1.61
	Begins to coo using vowel sounds and other sounds consistent with the home language.	2.17	-0.78
	Babbles using repeated syllables (e.g., "ma ma ma").	2.36	-0.13
	Takes turns making sounds with an adult.	2.57	0.16
	Uses her/his body to communicate (e.g., waving and pointing and holding hands over eyes for peek-a-boo).	2.57	0.61
	Uses word-like sounds to get needs met (e.g., points to dessert and jabbers).	3.29	1.03

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Birth-8 months: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	Difficulty
Early Reading and Print Awareness	Explores sounds through babbling and imitation.	2.20	-0.56
	Investigates books by chewing, shaking, and banging.	3.34	-0.37
	Reaches for a book.	2.99	-0.18
	Focuses attention on picture books with bold and colorful images.	2.53	0.10
	Babbles while looking at a book with an adult.	2.73	0.34
	Turns pages of books.	3.08	0.91
	Points at a book to have the same story read again and again.	3.58	1.29
Early Writing	Gazes into the eyes of familiar adults during nursing or drinking from a bottle.	3.09	-1.19
	Smiles in response to a smiling face.	2.89	-0.92
	Watches the faces of familiar adults during routine activities (e.g., diaper changing, bathing)	3.14	-0.90
	Follows a moving object with her/his eyes.	3.19	-0.83
	Brings hands together at the middle of her/his body.	3.15	-0.36
	Pushes her/his body up with arms when on tummy.	2.78	-0.27
	Reaches, grasps, and places objects in her/his mouth.	1.92	-0.09
	Passes an object from one hand to another.	3.02	-0.04
	Holds toys with both hands.	2.17	0.08
	Imitates cooing sounds made by familiar adults.	2.06	0.18
	Mimics hand clapping and waving bye-bye.	3.10	0.79
	Repeats motions to make additional marks on paper.	3.28	1.35
	Imitates writing by scribbling, without regard to direction or location.	2.93	1.50

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TABLE 12
Birth-8 months: G3 Physical Development and Health

Birth-8 months: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Gross Motor Development: Demonstrates Healthy Physical Development	Rolls over from back to front.	1.18	-0.76
	Shows alertness during waking periods.	2.41	-0.56
	Cooperates with daily routines.	1.74	0.07
Gross Motor Development: Demonstrates Balance, Control, and Coordination	Turns head from side to side, kicks feet, and moves hands.	1.84	-1.29
	Sits with adult support.	3.18	-0.50
	Pushes chest and head up from a flat surface.	2.33	0.10
	Stands firmly on legs and bounces actively when held in standing position.	2.81	0.29
	Sits without adult support.	2.51	0.78
	Begins to crawl.	2.21	0.91
Fine Motor Development: Demonstrates Healthy Perceptual-Motor Development	Follows a human face with her/his eyes.	2.67	-1.08
	Examines her/his own hands.	3.31	-0.35
	Gradually coordinates eye movements to moving objects in field of vision.	3.49	0.04
Fine Motor Development: Demonstrates Perceptual-Motor Strength, Control, and Coordination	Plays with her/his fingers and puts hands in mouth.	2.73	-0.70
	Grasps the fingers of another person.	3.10	-0.36
	Looks at objects as he/she transfers them from hand to hand.	3.01	0.86
	Picks up small objects with thumb and forefinger.	2.82	1.18
Self-Care: Participates in Self-Care	Coordinates sucking, swallowing, and breathing during feeding.	3.03	-0.82
	Moves pureed food to the back of the mouth to swallow.	3.15	0.51
	Reaches for and holds bottle while being fed by an adult.	3.05	0.82
	Begins to feed herself/himself simple finger foods.	2.67	1.13
	Drinks from a cup with help.	2.34	1.66

TABLE 12 – Continued
Birth-8 months: G3 Physical Development and Health

Birth-8 months: G3 Physical Development and Health	IRT Parameter Estimates	
	Discrimination	Difficulty
Self Help: Participates in Basic Health and Safety Routines		
Makes sounds in response to adult vocalizations during diaper-changing routines.	1.96	-0.05
Responds to adult feeding cues by kicking feet or turning head.	3.09	0.15
Relaxes during bathing and washing routines.	1.57	0.17
Responds positively to sleeping routines by relaxing when rocked.	2.55	0.24
Health: Shows Characteristics of Good Nutritional Health		
Eats meals on a fairly regular schedule.	2.35	-0.04
Begins to accept single, pureed solid foods.	2.52	0.39
Eats adequate meals during mealtime.	2.53	0.48
Health: Demonstrates Auditory Skills that Support Healthy Development		
Becomes calm when hearing voices of familiar adults or environmental sounds.	2.82	-0.60
Turns head in response to a sound.	3.47	-0.57
Turns and smiles when her/his name is spoken by a familiar adult.	3.20	-0.14
Watches adults involved in listening and vocalizing activities.	2.53	0.63
Health: Shows Characteristics of Good Oral Health		
Takes meals from a bottle at mealtime.	2.65	-0.49
Shows evidence of clean and healthy-looking gums and teeth.	2.74	0.05
Teethes with appropriate and sanitized teething toys.	3.24	0.10
Reaches for a drinking cup.	2.91	1.31
Health: Shows Basic Physical Needs are Met		
Quiets, attends, or smiles when comforted by an adult.	2.61	-0.12
Relaxes when rocked.	3.33	-0.08
Shows nutritional needs are met (e.g., pushes bottle away, stops sucking, falls asleep).	2.02	0.28

TABLE 13
Birth-8 months: G3 Social and Emotional Development

Birth-8 months: G3 Social and Emotional Development	IRT Parameter Estimates	
	Discrimination	Difficulty
Trust and Emotional Security: Experiencing and Developing Secure Relationships — **Exhibits mutual eye gazes during routine activities.**	2.44	-1.86
Listens and observes facial expressions attentively, responding by cooing, smiling, crying, or reaching out.	3.66	-1.10
Turns head, looking away, frowning, and/or arching her/his back to end or avoid interactions.	2.12	-0.79
Looks around while being held on the shoulders of a familiar adult.	1.40	-0.18
Demonstrates a strong preference for familiar adults by becoming upset when these adults leave the room.	2.64	0.01
Imitates the actions of familiar adults (e.g., clapping).	1.84	0.23
Stiffens/leans away from a stranger who tries to pick them up.	1.99	0.39
Shows a strong preference for familiar adults through behaviors such as glancing back and seeking comfort from them in times of exploration.	1.32	0.47
Begins to show interest in other children, playing side-by-side using the same or similar toys.	1.86	0.52
Shows empathy for familiar others, especially those perceived to be hurt or sad.	1.96	1.66
Trust and Emotional Security: Responding to the Environment — **Responds to touch by relaxing (e.g., when back is rubbed).**	2.43	-0.90
Reaches for and grasps objects.	2.98	-0.49
Responds to sound by cooing when songs are sung by familiar adults.	2.83	-0.43
Responds to light and dark by squinting when lights are turned on in a dark room.	1.74	-0.14

Birth-8 months: G3 Social and Emotional Development	IRT Parameter Estimates	
	Discrimination	Difficulty
Trust and Emotional Security: Responding to the Environment		
Responds to temperature by crying to show that they are uncomfortable.	1.71	0.08
Enjoys playing with new toys (e.g., new sand toys in the sand box).	1.97	0.77
Enacts familiar routines within familiar surroundings (e.g., splashing water when placed in the bath tub).	2.36	0.93
Self-Regulation: Emotional Regulation		
Cries when hungry, uncomfortable, or unhappy.	3.46	-1.54
Kicks legs in excitement and settles when seeing a familiar adult.	3.45	-0.54
Turns head and breaks eye contact, frowns, and/or arches back when over stimulated.	2.39	-0.19
Looks at and possibly cries themselves when another child cries.	1.75	-0.12
Raises arms to familiar adults for comfort or to be picked up.	3.20	0.10
Looks toward familiar adults for help when becoming upset.	2.54	0.23
Uses a comfort object, such as a blanket or stuffed toy, for security when feeling stressed.	2.34	0.75
Shows beginning signs of jealousy and attempts to adapt (e.g., crawls to and raises arms toward parent who is holding another child).	2.34	1.01
Self-Regulation: Behavioral Regulation		
Stops crying, often when cuddled/picked up by a familiar adult.	3.60	-1.36
Relaxes when cuddled and rocked or spoken to in a soft voice.	2.99	-0.68
Returns to sleep once awakened by a sound or movement.	1.86	-0.19
Engages in self-calming behavior (e.g., sucks on her/his hand to calm before sleep).	2.01	-0.01

Birth-8 months: G3 Social and Emotional Development	IRT Parameter Estimates	
	Discrimination	Difficulty
Self-Regulation: Behavioral Regulation	**Uses transitional objects (e.g., blanket, bear, pacifier) to calm her/himself when tired.** 1.55	0.39
	Begins to recognize boundaries while not yet having the capacity to stop impulses. 3.14	1.25
Self-Regulation: Social Problem-Solving	**Smiles at others.** 3.06	-1.23
	When babbling or cooing, pauses to wait for a response from an adult. 2.08	-0.24
	Cries, rocks back and forth, and lifts arms to signal for help. 3.15	0.25
	Gains the attention of peers through vocalizations, reaching out, and smiling. 3.28	0.30
	Vocalizes and points to get the attention of a familiar adult. 3.32	0.88
	Looks to familiar adults for help when he/she falls down while attempting to walk. 3.99	0.91
Self-Concept: Mutual Relationships	**Responds to the presence of familiar adults by kicking her/his feet and smiling.** 2.60	-0.64
	Cuddles head on the neck and shoulder of a familiar adult. 2.89	-0.58
	Imitates and terminates a social smile and repeats the behavior as adults respond. 2.95	-0.03
	Reaches for and prefers to be held by familiar adults. 3.18	0.19
	Tries to imitate the kisses of familiar adults. 3.08	0.81
	Touches or imitates another child sitting nearby. 2.71	0.90
	Offers a toy to a familiar adult. 3.05	1.10
Self-Concept: Self Awareness and Connectedness to Others	**Begins to look and smile at her/himself in the mirror.** 2.99	-0.23
	Realizes she/he has control over her/his hands. 3.21	-0.15

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Birth-8 months: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	Difficulty
Self-Concept: Self Awareness and Connectedness to Others	Explores the face and other body parts of parents, caregivers, and teachers.	3.05	-0.06
	Smiles and claps hands when they successfully accomplish a task (e.g., climbing up stairs).	3.15	0.72
	Repeats an action when it makes people laugh.	3.17	0.80
	Protests when given a non-preferred food rather than a preferred food.	2.07	0.89
	Tries to encourage games (e.g., covers eyes to encourage a game of peek-a-boo).	3.12	0.95
Self-Concept: Sense of Competence and Confidence	Cries in particular ways to get needs met.	2.94	-0.54
	Recognizes that adults respond to their cues (e.g., crying, squirming) and stop playing or interacting.	2.21	-0.19
	Recognizes that her/his actions can affect an object (e.g., kicking a mobile to make it move over and over).	2.93	0.16
	Moves toward and gets a favorite toy, then smiles.	3.17	0.27
	Frequently checks for familiar adults in new situations.	3.36	0.64
	Plays with a preferred toy more than others.	2.46	1.01
	Smiles as she/he helps with simple tasks (e.g., picking up toys).	3.18	1.32

TABLE 14
8-18 months: G3 Approaches to Learning

8-18 months: G3 Approaches to Learning		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Eagerness and Curiosity	Reacts to objects, voices, and sounds by either becoming more quiet or active, or by changing body position gestures, or facial expressions.	2.31	-1.84
	Explores objects using a variety of senses (e.g., mouthing, waving, banging).	3.29	-1.44
	Shows continued interaction with adults by vocalizing and smiling when they are being read to.	2.68	-0.95
	Begins to explore the environment independently.	2.29	-0.80
	Actively explores the world by using their bodies and senses, as well as tools, materials, and equipment.	3.30	-0.66
	Plays side-by-side with another child using the same or similar toys.	2.88	-0.50
	Imitates or initiates familiar activities or games (e.g., cooking and stirring, pretend telephone).	2.57	-0.44
	Shows interest in new experiences (e.g., reaching out to touch the rain, stopping play to watch a garbage truck).	3.37	-0.24
	Points to an unfamiliar picture in a book and looks at adult to provide the name for the object.	2.42	0.38
Persistence	Gets the attention of the parent, teacher or caregiver in some way (e.g., reaching up and crying).	1.99	-1.70
	Fills a container with small objects and dumps them out repeatedly.	1.85	-0.69
	Looks at pictures in a book for an extended period of time.	2.41	-0.62
	Repeats a new skill, such as going up and down a step.	3.20	-0.20
	Participates in back-and-forth sound play with adults by imitating their words, sounds, and inflections.	3.05	-0.14

TABLE 14 – Continued
8-18 months: G3 Approaches to Learning

8-18 months: G3 Approaches to Learning		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Persistence	Remembers the location of, and searches for a favorite object.	2.83	0.00
	Asks or gestures that they want the same song or story repeated over and over again.	1.99	0.13
	Attempts to get help to obtain objects out of reach by seeking adult assistance.	2.75	0.13
	Plays the same music and movement activity over and over.	2.25	0.40
	Requests that a favorite book be read over again.	3.53	0.59
Creativity and Inventiveness	Drops a toy or object and looks for it.	3.05	-0.98
	Participates in spontaneous interactions with peers, like making silly faces or imitating sounds.	1.37	-0.91
	Reacts with movement to the sound of music.	3.25	-0.76
	Uncovers an object that has been shown to the child and then covered.	3.01	-0.17
	Attempts to open a container to get an object.	3.36	-0.06
	Participates in sand and water activities.	2.22	0.05
	Engages in pretend play (e.g., feeds baby doll with bottle, pretends to lock/unlock door).	2.48	0.19
	Uses tools to retrieve items that are out of reach (e.g., using a string to pull a toy toward self).	2.27	0.32
	In the absence of a preferred object, substitutes another object to calm self when upset.	2.71	0.36
	Stomps feet to loud music and tiptoes to soft music.	2.16	0.92

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TABLE 15
8-18 months: G3 Cognitive Development and General Knowledge

8-18 months: G3 Cognitive Development and General Knowledge		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Exploration and Discovery	Shakes toys to elicit a response or sound.	1.92	-2.68
	Touches and mouths objects for sensory exploration.	1.62	-2.28
	Bangs a variety of objects on the floor or table (e.g., utensils, blocks, and toys).	1.84	-2.19
	Crawls to explore their environment.	1.39	-1.74
	Reaches out to be picked up when she/he wants attention.	1.87	-0.88
	Follows one-step directions.	1.54	-0.86
	Makes faces back at familiar adults.	2.15	-0.70
	Enjoys rolling a ball to familiar adults.	2.18	-0.64
	Holds a toy phone to her/his ear and "talks".	2.11	-0.64
	Responds to familiar words (e.g., bottle, blanket, teddy bear) by looking at, pointing to, or reaching for objects.	2.36	-0.62
	Twists away when told he/she is not allowed to do something.	1.85	-0.48
	Drops a toy or a bottle on the floor and watches to see what happens.	1.59	-0.29
	Shows objects to familiar adults.	3.03	-0.17
	Fills and dumps sand, toys, and blocks.	2.70	-0.17
	Shows pleasure at attempting hand movements to some finger plays.	2.36	-0.06
	Takes things apart.	2.36	0.01
	Places items in containers and then pours them out, repeatedly.	2.85	0.08
	Tries to help when an adult is bathing or changing them.	2.43	0.22

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8-18 months: G3 Cognitive Development and General Knowledge		IRT Parameter Estimates	
		Discrimination	Difficulty
Exploration and Discovery	Shows pleasure when read to by smiling or using words such as "Yea!" or "More!"	2.23	0.55
	Activates toys such as a jack-in-the-box.	1.55	0.78
	Follows two-step directions.	1.83	0.97
	States clear preferences regarding colors, foods, and clothes.	1.66	1.78
Concept Development and Memory	Reaches for a mobile or other similar object to make it move.	1.23	-1.65
	Enjoys repeating a newly learned activity.	1.08	-1.36
	Watches and follows both horizontal and vertical movements of objects.	1.33	-0.98
	Uses different facial expressions to express different emotions.	2.27	-0.83
	Pulls the cover off a toy hidden from view	1.50	-0.62
	Protests when left with unfamiliar people (e.g., cries, attempts to reach for familiar adult).	1.63	-0.47
	Looks at, goes over to, and touches familiar adults.	2.58	-0.42
	Finds hidden objects.	2.15	-0.13
	Plays for brief periods of time with another child.	2.66	-0.12
	Points to indicate needs.	3.08	0.06
	Makes a detour to retrieve an object.	2.49	0.26
	Asks for more (e.g., food, objects, activity).	2.70	0.28
	Pokes, drops, pushes pulls, and squeezes things to see what will happen.	1.83	0.31
	Points to objects in the environment (e.g., pictures of family, body parts, animals, favorite book).	3.44	0.40

8-18 months: G3 Cognitive Development and General Knowledge		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Concept Development and Memory	**Vocalizes when being read a familiar book by a familiar adult.**	2.51	0.41
	Pretends to call familiar people on a play phone.	2.50	0.41
	Explores pegboards with fingers, trying to put objects into holes.	2.35	0.66
	Shows a preference for favorite books.	2.33	0.68
	Associates spoken words with familiar objects or actions.	3.00	0.72
	Shows preference among play partners.	2.78	0.79
	Enacts familiar events or household chores.	3.17	0.87
	Places items back in their "correct" place.	2.42	1.05
	Matches sounds to pictures of animals.	2.51	1.35
Problem-Solving and Creative Expression	**Raises her/his bottle as the level of liquid drops.**	0.90	-2.08
	Plays with a single toy for two to three minutes.	1.50	-1.52
	Looks to parents, caregivers, and teachers for help.	1.83	-0.95
	Vocalizes to communicate needs.	1.75	-0.44
	Reaches out to be picked up when she/he wants attention.	2.05	-0.32
	Demonstrates some movement to rhythms.	2.37	0.02
	Enjoys messy activities, such as finger painting.	2.47	0.20
	Attempts to use hand movements for finger plays.	3.20	0.26
	Makes choices related to toys and clothing.	1.91	0.27
	Points, gestures, and makes sounds to indicate what she/he wants.	2.44	0.29

| 8-18 months: G3 Cognitive Development and General Knowledge | IRT Parameter Estimates | |
	Discrimination	Difficulty
Problem-Solving and Creative Expression		
Moves away from loud noises.	1.95	0.35
Vocalizes when being read a familiar book.	2.94	0.48
Says "no-no" to express feelings.	2.67	0.49
Points to a picture, looking for familiar adults to name the picture.	3.11	0.50
Chooses to solve simple tasks (e.g., attempting a simple puzzle).	3.17	0.68
Occasionally says "no" instead of hitting or crying when another child takes her/his toy.	2.67	0.91
Uses trial and error to fit different shapes into holes or to stack things in order.	2.40	1.03
Tries out various ways to get her/his arms into the sleeves of a jacket/sweater.	2.85	1.10
Uses a stick or object to obtain something out of reach.	2.29	1.40
Demonstrates assertiveness by saying "No!" or "Me Do it" when adults try to help with self-care tasks.	2.48	1.46

TABLE 16
8-18 months: G3 Language, Communication, Reading, and Writing

8-18 months: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Listening and Understanding	Turns and smiles when her/his name is called by an adult.	1.70	-2.61
	Pays attention to objects in the environment when prompted by an adult (e.g., adult points and talks about the flowers).	1.71	-1.45
	Looks in the likely location when asked by an adult where an object/person might be (e.g., "Where is the kitty?").	1.78	-0.70
	Focuses on books/pictures as adults describe them.	2.16	-0.56
	Uses some sign or body language to indicate a need (e.g., "more" "eat").	1.74	-0.54
	Follows a one-step direction from an adult.	1.83	-0.53
	Points to body parts when asked.	1.75	0.30
Communicating and Speaking	Babbles using repeated syllables (e.g., "ma ma ma").	1.14	-1.98
	Uses her/his body to communicate (e.g., waving and pointing and holding hands over eyes for peek-a-boo).	1.97	-1.01
	Uses sounds to name people, such as dada and mama.	1.87	-0.54
	Produces the sounds found in her/his home language.	1.71	-0.42
	Says a few basic words (e.g., "mama", "dada").	1.89	-0.35
	Takes turns making sounds with an adult.	1.96	-0.33
	Uses word-like sounds to get needs met (e.g., points to dessert and jabbers).	2.69	-0.15
	Uses gestures, sounds, words, and movements to initiate an interaction or game (e.g., patty-cake).	2.68	-0.01

8-18 months: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	Difficulty
Listening and Understanding	**Uses one-word utterances or short phrases to influence the actions of others (e.g., "mine").**	2.51	0.33
	Uses two-word sentences to share ideas, feelings, or needs.	2.21	1.11
Early Reading and Print Awareness	**Babbles while looking at a book with an adult.**	1.10	-1.52
	Turns pages of books.	2.26	-1.09
	Explores books made of a variety of materials (e.g., paper, vinyl, cardboard).	1.82	-0.84
	Focuses attention on picture books with bold and colorful images.	2.45	-0.67
	Responds positively to the rhythm and repetition of familiar voices, sounds, rhymes, and songs in their home language.	2.22	-0.29
	Uses gestures, sounds, or facial expressions to show a memory for familiar stories, rhymes, or songs.	2.89	0.37
	Points to pictures in books as they are named by an adult.	3.00	0.54
	Picks out their favorite book from several choices.	2.43	0.56
	Recognizes specific books by their covers.	2.85	0.94
	Points at a book to have the same story read again and again.	3.24	0.94
Early Writing	**Holds toys with both hands.**	1.52	-2.02
	Passes an object from one hand to another.	2.21	-1.29
	Turns head or pushes plate away when they have had enough to eat.	1.99	-0.92
	Moves toward the door when parents get ready to leave.	2.40	-0.64
	Picks up small objects using finger and thumb.	2.30	-0.49

8-18 months: G3 Language, Communication, Reading, and Writing	IRT Parameter Estimates	
	Discrimination	**Difficulty**
Early Writing — Holds large crayons and transfers them from one hand to another.	2.89	-0.23
Imitates writing by scribbling without regard to direction or location.	2.57	0.15
Uses a variety of writing tools (e.g., pencils, crayons, markers, paints).	2.81	0.38
Repeats motions to make additional marks on paper.	2.47	0.54
Pulls at his/her diaper when it is wet.	1.76	0.78
Shows scribbling or markings to others.	2.86	0.78
Makes purposeful marks on paper.	2.22	0.81

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TABLE 17
8-18 months: G3 Physical Development and Health

8-18 months: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	Difficulty
Gross Motor Development: Demonstrates Healthy Physical Development	Demonstrates regular sleeping habits.	2.12	-1.28
	Cooperates with daily routines.	1.45	-0.81
	Shows independence as she/he moves around in a safe environment.	2.13	-0.54
	Show interest in people and objects.	2.18	-0.50
Gross Motor Development: Demonstrates Balance, Control, and Coordination	Sits with adult support.	1.26	-2.27
	Walks without help.	1.29	-1.20
	Crawls on hands and knees.	1.94	-1.17
	Sits in a chair without adult support.	2.23	-0.61
	Climbs up and walks down stairs with adult assistance.	2.26	-0.04
Fine Motor Development: Demonstrates Healthy Perceptual-Motor Development	Gradually coordinates eye movements to moving objects in field of vision.	1.77	-1.33
	Tracks a moving object with interest.	2.65	-0.88
	Puts objects in a box.	3.08	-0.19
	Points to objects/people that attract her/his attention.	2.49	-0.09
Fine Motor Development: Demonstrates Perceptual-Motor Strength, Control, and Coordination	Picks up small objects with thumb and forefinger.	2.25	-0.85
	Looks at objects as he/she transfers them from hand to hand.	2.92	-0.32
	Uses two objects together (e.g., putting a spoon in a cup and moving the spoon around).	2.71	0.38
	Builds a tower of two to four cubes.	2.06	0.41

TABLE 17 – Continued
8-18 months: G3 Physical Development and Health

8-18 months: G3 Physical Development and Health	IRT Parameter Estimates	
	Discrimination	Difficulty
Self Help: Participates in Self-Care — Drinks from a cup with help.	1.55	-1.07
Self Help: Participates in Self-Care — Regularly feeds him/herself finger foods.	3.34	-0.44
Self Help: Participates in Self-Care — Uses vocalizations and/or gestures to indicate basic needs.	2.20	-0.01
Self Help: Participates in Self-Care — Cooperates with dressing and undressing (e.g., poking arm into sleeve and pulling off sock).	2.65	0.39
Self Help: Participates in Self-Care — Provides assistance in picking up toys.	2.60	0.43
Self Help: Participates in Basic Health and Safety Routines — Responds to adult feeding cues by kicking feet or turning head.	1.82	-0.98
Self Help: Participates in Basic Health and Safety Routines — Responds positively to sleeping routines by relaxing when rocked.	2.94	-0.61
Self Help: Participates in Basic Health and Safety Routines — Anticipates meals by pointing and reaching.	2.73	-0.11
Self Help: Participates in Basic Health and Safety Routines — Relaxes during bathing routines and grabs for the wash cloth.	2.56	0.40
Self Help: Participates in Basic Health and Safety Routines — Participates in sleeping routines, such as listening to a story before a nap.	3.01	0.53
Self Help: Participates in Basic Health and Safety Routines — Vocalized when she/he sees a tub being filled.	3.06	0.77
Health: Shows Characteristics of Good Nutritional Health — Eats adequate meals during mealtime.	2.55	-0.84
Health: Shows Characteristics of Good Nutritional Health — Begins to eat balanced meals on a regular schedule.	3.85	-0.38
Health: Shows Characteristics of Good Nutritional Health — Consumes a variety of healthy foods from all food groups when offered by an adult.	3.60	-0.23

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TABLE 17 – Continued
8-18 months: G3 Physical Development and Health

8-18 months: G3 Physical Development and Health	IRT Parameter Estimates	
	Discrimination	**Difficulty**
Health: Demonstrates Auditory Skills that Support Healthy Development	Moves to music.	2.80	-0.49
	Watches adults involved in listening and vocalizing activities.	2.14	-0.43
	Participates in listening and vocalizing activities (e.g., finger plays and songs).	2.74	-0.15
	Begins to imitate words and word sounds.	2.50	0.02
Health: Shows Characteristics of Good Oral Health	Cooperates with daily cleaning of gums and teeth.	2.15	-0.33
	Eats healthy snacks.	3.10	-0.29
	Drinks water when offered.	3.44	-0.19
	Decreases use of pacifiers and bottles.	2.70	-0.09
Health: Shows Basic Physical Needs are Met	Quiets, attends, or smiles when comforted by an adult.	2.91	-0.74
	Shows nutritional needs are met (e.g., pushes bottle away, stops sucking, falls asleep).	2.92	-0.37
	Demonstrates an interest in actively exploring the environment.	3.01	-0.21

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TABLE 18
8-18 months: G3 Social and Emotional Development

8-18 months: G3 Social and Emotional Development	IRT Parameter Estimates	
	Discrimination	Difficulty
Trust and Emotional Security: Experiencing and Developing Secure Relationships		
Shows a strong preference for familiar adults through behaviors such as glancing back and seeking comfort from them in times of exploration.	1.00	-2.52
Imitates the actions of familiar adults (e.g., clapping).	1.48	-1.45
Claps and smiles in a back and forth manner with a parent, caregiver, or teacher.	1.64	-1.15
Shows affection, such as hugs and kisses.	2.05	-0.89
Becomes distressed in the presence of unfamiliar adults.	1.92	-0.35
Begins to show interest in other children, playing side-by-side using the same or similar toys.	1.83	-0.35
Begins to enjoy and initiate humor, such as laughing in response to games.	2.45	-0.31
Seeks help from trusted parents, caregivers, and teachers.	1.87	-0.24
Shows empathy for familiar others, especially those perceived to be hurt or sad.	2.11	0.85
Trust and Emotional Security: Responding to the Environment		
Responds to touch by relaxing (e.g., when back is rubbed).	1.46	-1.87
Reaches for and grasps objects.	2.54	-1.73
Enjoys playing with new toys (e.g., new sand toys in the sand box).	2.18	-0.72
Explores a new food with all their senses.	1.70	-0.13
Enacts familiar routines within familiar surroundings (e.g., splashing water when placed in the bath tub).	2.38	0.17
Demonstrates increasing ability to move around in the environment (e.g., leaving the sandbox to pull a duck toy across the play area).	2.15	0.17

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TABLE 18 – Continued
8-18 months: G3 Social and Emotional Development

8-18 months: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Trust and Emotional Security: Responding to the Environment	Recognizes and accepts her/his own blanket.	2.07	0.20
	Uses familiar objects in new and different ways (e.g., a shoe as a telephone).	2.22	0.59
	Uses adults as tools, as in asking to be picked up to reach the toy on the shelf.	2.17	0.74
Self-Regulation: Emotional Regulation	Turns head and breaks eye contact, frowns, and/or arches back when over stimulated.	1.17	-1.61
	Looks toward familiar adults for help when becoming upset.	2.61	-0.60
	Looks at, and possibly cries too, when another child cries.	1.51	-0.54
	Recognizes the smiles on familiar adults' faces.	2.23	-0.38
	Demonstrates the ability to be comforted by familiar adults when frightened.	2.46	-0.12
	Shows beginning signs of jealousy and attempts to adapt (e.g., crawls to and raises arms toward parent who is holding another child).	2.39	-0.11
	Uses emotional expressions to obtain desired objects, such as pouting, whining, and crying.	2.42	-0.10
	Uses a comfort object, such as a blanket or stuffed toy, for security when feeling stressed.	1.47	0.12
	Pats a crying child on the back as parents, caregivers, or teachers help the hurt child.	2.19	1.20
Self-Regulation: Behavioral Regulation	Engages in self-calming behavior (e.g., sucks on her/his hand to calm before sleep).	0.87	-1.00
	Returns to sleep once awakened by a sound or movement.	1.98	-0.59
	Stops and looks at familiar adults when her/his name is called.	1.94	-0.33

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TABLE 18 – Continued
8-18 months: G3 Social and Emotional Development

8-18 months: G3 Social and Emotional Development	IRT Parameter Estimates	
	Discrimination	Difficulty
Self-Regulation: Behavioral Regulation — **Looks to their parents, caregivers, and teachers when a loud sound scares them.**	2.51	-0.16
Uses transitional objects (e.g., blanket, bear, pacifier) to calm her/himself when tired.	1.78	0.07
Responds positively to redirection by familiar adults.	2.36	0.17
Begins to attend during short, focused activities (e.g., listening to simple stories being read).	2.50	0.41
Begins to recognize boundaries while not yet having the capacity to stop impulses.	2.92	0.54
Moves away from a sticky plant when redirected by parents, caregivers, and teachers.	1.63	0.72
Self-Regulation: Social Problem-Solving — **Cries, rocks back and forth, and lifts arms to signal for help.**	1.41	-1.14
Gains the attention of peers through vocalizations, reaching out, and smiling.	1.80	-0.42
Seeks comfort from parents, caregivers, and teachers when hurt or frightened.	2.78	-0.08
Looks to familiar adults for help when he/she falls down while attempting to walk.	2.93	-0.01
Uses emotional expressions to obtain desired objects, such as pouting, whining, and crying.	2.82	0.00
Vocalizes and points to get the attention of a familiar adult.	2.61	0.08
Moves nearer to a familiar adult when noticing a stranger entering the room.	2.62	0.26
Calls for help from a familiar adult to intervene in a dispute with another child (e.g., grabbing toys away).	2.28	1.23

TABLE 18 – Continued
8-18 months: G3 Social and Emotional Development

8-18 months: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	Difficulty
Self-Concept: Mutual Relationships	Imitates and terminates a social smile and repeats the behavior as adults respond.	1.35	-0.62
	Tries to imitate the kisses of familiar adults.	1.72	-0.14
	Frequently check for familiar adults in new situations.	2.13	-0.08
	Offers a toy to a familiar adult.	2.89	0.05
	Shows preferences for familiar adults when hurt or needing comfort.	2.43	0.18
	Touches or imitates another child sitting nearby.	2.88	0.27
	Looks across the room to familiar adults periodically when playing with peers.	2.79	0.56
	Plays away from familiar adults with occasional trips to touch them.	2.31	0.63
	Recognizes the name of a friend.	2.14	0.73
Self-Concept: Self Awareness and Connectedness to Others	Tries to encourage games (e.g., covers eyes to encourage a game of peek-a-boo).	1.31	-0.08
	Repeats an action when it makes people laugh.	1.86	0.08
	Protests when given a non-preferred food rather than a preferred food.	1.97	0.08
	Pays attention to her/his reflection in the mirror.	2.18	0.14
	Smiles and claps hands when they successfully accomplish a task (e.g., climbing up stairs).	2.52	0.22
	Moves his/her body to fit inside a tunnel toy with a peer or sibling.	2.85	0.30
	Holds onto a favorite toy and looks toward a familiar adult as another child approaches.	3.27	0.61

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TABLE 18 – Continued
8-18 months: G3 Social and Emotional Development

8-18 months: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	Difficulty
Self-Concept: Self Awareness and Connectedness to Others	Points to her/himself in a photograph.	2.40	1.13
	Points to and names several of her/his own body parts.	2.03	1.42
Self-Concept: Sense of Competence and Confidence	Recognizes that adults respond to their cues (e.g., crying, squirming) and stop playing or interacting.	1.59	-0.55
	Enjoys music and movement activities.	3.16	-0.30
	Recognizes that her/his actions can affect an object (e.g., kicking a mobile to make it move over and over).	1.85	-0.13
	Plays with a preferred toy more than others.	2.54	0.36
	Smiles as she/he helps with simple tasks (e.g., picking up toys).	2.85	0.41
	Cooperates with dressing and undressing activities.	2.51	0.56
	Initiates simple games and chooses things to explore.	3.08	0.74
	Attempts to engage in independent activities (e.g., taking off an open coat) and not giving up immediately if having difficulty.	2.36	1.34
	Uses words to get her/his needs met (e.g., "More juice.").	1.84	1.67

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TABLE 19
18-24 months: G3 Approaches to Learning

| 18-24 months: G3 Approaches to Learning | IRT Parameter Estimates | |
	Discrimination	Difficulty
Eagerness and Curiosity — Shows interest in new experiences (e.g., reaching out to touch the rain, stopping play to watch a garbage truck).	1.63	-0.85
Plays side-by-side with another child using the same or similar toys.	2.24	-0.72
Begins to explore the environment independently.	2.64	-0.64
Explores most areas of the classroom.	1.44	-0.29
Tries new art materials such as play dough or finger painting, musical instruments, or other new toys.	2.08	-0.02
Imitates adult activities such as reading a magazine or helping to set the table.	1.57	0.04
Eagerly seeks and takes pleasure in learning new skills.	2.25	0.42
Points to an unfamiliar picture in a book and looks at adult to provide the name for the object.	2.04	0.52
Shows interest in sorting (e.g., sorting colored pegs into single-color piles, putting the small buttons in one container and the big buttons in another).	1.73	1.50
Persistence — Participates in back-and-forth sound play with adults by imitating their words, sounds, and inflections.	1.27	-0.45
Insists on feeding self (e.g., eating finger foods, using utensils, pouring juice).	2.47	-0.41
Remembers the location of and searches for a favorite object.	1.71	-0.18
Tries various shapes in a shape-sorting toy until the shape finally fits.	1.93	0.61
Plays the same music and movement activity over and over.	2.30	0.73

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TABLE 19 – Continued
18-24 months: G3 Approaches to Learning

18-24 months: G3 Approaches to Learning		IRT Parameter Estimates	
		Discrimination	Difficulty
Persistence	**Repeats activities or games over and over, such as building a block structure, taking it apart, and rebuilding it.**	2.89	0.86
	Insists on completing a task even when assistance is needed.	2.81	0.87
	Requests that a favorite book be read over again.	2.20	0.94
Creativity and Inventiveness	**Engages in pretend play (e.g., feeds baby doll with bottle, pretends to lock/unlock door.)**	2.36	-0.07
	Participates in sand and water activities.	1.60	0.18
	Uses tools to retrieve items that are out of reach (e.g., using a string to pull a toy toward self).	1.14	0.26
	Views objects from all sides.	2.39	0.48
	Uses objects together as tools.	1.97	0.96
	Models everyday activities and pretends to take on the roles of other people (e.g., mommy, daddy, baby, teacher).	3.08	1.08
	Finds solutions to simple problems (e.g., riding toy is stuck on another toy so the child backs up and drives around the toy).	2.46	1.12
	Scribbles on a piece of paper to communicate (e.g., makes a "shopping list").	1.41	1.17
	Stomps feet to loud music and tiptoes to soft music.	1.61	1.18
	Uses a variety of materials during play to represent objects and events (e.g., uses pegs with play dough as candles for cake).	2.18	1.30

TABLE 20
18-24 months: G3 Cognitive Development and General Knowledge

18-24 months: G3 Cognitive Development and General Knowledge		IRT Parameter Estimates	
		Discrimination	Difficulty
Exploration and Discovery	Places items in containers and then pours them out, repeatedly.	1.70	-1.16
	Responds to familiar words (e.g., bottle, blanket, teddy bear) by looking at, pointing to, or reaching for objects.	1.96	-0.49
	Drops a toy or a bottle on the floor and watches to see what happens.	1.53	-0.41
	Follows two-step directions.	1.73	-0.17
	Pulls on the hand of adults when wanting to communicate.	2.64	0.11
	Stacks blocks and knocks them down.	2.18	0.13
	Explores the contents of cabinets and drawers.	1.60	0.21
	Verbalizes "mine" when showing a favorite object.	1.65	0.94
	Describes activities, such as "Me eat".	1.87	1.07
	Explores objects by taking things apart, stacking sorting, tracing, etc.	2.49	1.09
	Successfully completes simple inset puzzles.	1.65	1.13
	Verbalizes observations, such as "Milk gone!" or "Daddy here!"	2.11	1.13
	Speaks in short sentences (of one to three words) using and misusing plurals (e.g., saying "feets" for "feet").	1.72	1.14
	Plays "dress-up", imitating the behaviors of familiar adults.	1.77	1.20
	Begins to take care of her/his hair using a comb or brush.	1.56	1.78
	States clear preferences regarding colors, foods, and clothes.	1.07	2.19

18-24 months: G3 Cognitive Development and General Knowledge	IRT Parameter Estimates	
	Discrimination	Difficulty
Concept Development and Memory		
Pretends to call familiar people on a play phone.	1.45	-0.27
Enacts familiar events or household chores.	0.92	0.10
Pulls/pushes a wagon or cart around the play area possibly putting toys in it.	2.19	0.23
Finds hidden objects.	1.63	0.25
When she/he spills a liquid (e.g., milk), says "uh-oh".	2.51	0.52
Laughs at funny things.	1.66	0.60
Associates spoken words with familiar objects or actions.	2.21	0.61
Makes a detour to retrieve an object.	2.02	0.68
Pokes, drops, pushes pulls, and squeezes things to see what will happen.	2.44	0.70
Places items back in their "correct" place.	2.13	0.74
Insists that most objects are "mine".	2.65	0.85
Repeats words over and over.	2.04	1.15
Matches sounds to pictures of animals.	1.69	1.22
Searches for removed or lost objects.	2.13	1.23
Begins to identify with children of the same age and gender.	2.26	1.25
Participates in rearranging areas of the room.	2.41	1.55
Occasionally asks about a favorite adult when the adult is not present.	2.01	1.71
Asks to hear her/his favorite song over and over.	2.51	1.71
Wants to tell her/his age to a familiar adult.	2.13	2.67

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18-24 months: G3 Cognitive Development and General Knowledge		IRT Parameter Estimates	
		Discrimination	Difficulty
Problem-Solving and Creative Expression	Points, gestures, and makes sounds to indicate what she/he wants.	1.34	-0.57
	Enjoys messy activities, such as finger painting.	1.78	-0.08
	Demonstrates some movement to rhythms.	1.87	-0.04
	Uses a spoon to get food into her/his mouth.	2.01	0.18
	Chooses to solve simple tasks (e.g., attempting a simple puzzle).	1.64	0.60
	Identifies her/his own clothing items.	1.95	0.62
	Begins to develop her/his own likes and dislikes.	2.34	0.64
	Uses cups and other containers when playing with sand and water.	1.90	0.65
	Begins to enjoy small-group activities facilitated by an adult.	1.86	0.77
	Wants to get her/his own way even if it conflicts with adults.	1.87	0.83
	Uses trial and error to fit different shapes into holes or to stack things in order.	2.49	1.01
	Uses objects for other than their intended purposes.	2.51	1.08
	Tries out various ways to get her/his arms into the sleeves of a jacket/sweater.	2.70	1.13
	Uses materials such as pencils, paints, and play dough in different and varied ways.	2.59	1.23
	Demonstrates assertiveness by saying "No!" or "Me Do it" when adults try to help with self-care tasks.	2.82	1.25
	Takes an adult's hand, leads the adult to the block area, and gives the adult a block.	2.27	1.33

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18-24 months: G3 Cognitive Development and General Knowledge		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Problem-Solving and Creative Expression	Demonstrates some persistence and creativity in solving a problem (e.g., turns puzzle pieces in various directions to complete the puzzle).	2.36	1.60
	Uses negotiation and language, with the help from adults, to solve problems when playing with peers.	3.26	1.80
	Threads beads by coordinating a string into the bead opening.	1.76	2.17
	Brings others into their play (e.g., "Let's go on a bus ride. Here are the seats, and you be the driver").	2.69	2.19
	Points to pictures that represent feelings and names the emotions.	2.66	2.25

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TABLE 21
18-24 months: G3 Language, Communication, Reading, and Writing

18-24 months: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Listening and Understanding	Looks in the likely location when asked by an adult where an object/person might be (e.g., "Where is the kitty?").	1.02	-1.10
	Uses some sign or body language to indicate a need (e.g., "more" "eat").	1.40	-0.97
	Follows a one-step direction from an adult.	2.42	-0.93
	Points to body parts when asked.	2.12	-0.50
	Listens to the reading of a short picture book (e.g., 10 pages).	1.39	-0.29
	Finds her/his shoes when it is time to get dressed.	2.27	-0.10
	Identifies objects in the environment (e.g., picture of a dog in a book) when asked by an adult.	2.56	0.20
	Reacts to funny portions of a story by smiling or laughing.	1.72	0.50
Communicating and Speaking	Uses sounds to name people, such as dada and mama.	1.54	-1.10
	Says a few basic words (e.g., "mama," "dada").	2.65	-0.79
	Uses one-word utterances or short phrases to influence the actions of others (e.g., "mine").	2.37	-0.12
	Repeats words heard or gestures seen.	2.61	-0.08
	Uses negative words (e.g., "no").	2.21	0.02
	Talks on a toy telephone in pretend play.	1.57	0.09
	Names pictures in books.	2.64	0.51
	Uses two-word sentences to share ideas, feelings, or needs.	2.58	0.75
	Engages in short conversation with other children and/or adults.	2.34	0.94
	Practices conversational skills during pretend play.	2.89	1.28

18-24 months: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Communicating and Speaking	Repeats or tries different words/sentences to get another child or adult to respond.	2.32	1.30
	Combines words to create meaningful short sentences.	2.93	1.52
	Invents new words for fun and experimenting.	1.73	1.66
	Uses question words (e.g., "why" and "what").	2.26	1.77
	Asks questions to obtain information or assistance.	2.61	2.24
	Recognizes that a pause means that it is his/her turn to talk.	1.44	2.42
Early Reading and Print Awareness	Picks out their favorite book from several choices.	1.17	-0.38
	Brings books over to adults to read.	2.56	-0.21
	Points to pictures in books as they are named by an adult.	2.11	0.14
	Pretends to read a book or story.	2.19	0.32
	Recognizes specific books by their covers.	1.90	0.67
	Requests having a favorite book read over and over.	2.44	0.81
	Points to appropriate picture in a book when asked by an adult.	2.94	0.88
	Demonstrates basic book knowledge (e.g., holding book upright, turning pages right to left).	1.71	1.19
	Engages in "pretend" reading with other children during play activities.	1.71	1.20
	Asks adults to repeat favorite rhymes, fingerplays, or stories.	2.64	1.26
	Uses words to label and describe pictures/objects in books.	2.84	1.26
	Repeats portions of familiar books and rhymes.	2.90	1.32
	Comments on characters in books.	2.35	2.14

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18-24 months: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Early Reading and Print Awareness	Makes connections between her/his own experiences and those presented in books/stories.	2.94	2.25
Early Writing	Moves toward the door when parents get ready to leave.	1.26	-1.28
	Uses a variety of writing tools (e.g., pencils, crayons, markers, paints).	1.65	-0.05
	Scribbles spontaneously often using circular motions.	2.33	0.08
	Attempts to feed, dress, or cuddle their dolls and stuffed animals.	1.59	0.23
	Shows scribbling or markings to others.	1.70	0.26
	Uses a toy telephone to "talk to Grampa."	2.12	0.60
	Makes purposeful marks on paper.	1.72	0.72
	Crawls around on hands and knees, pretending to be a dog or cat.	1.54	0.79
	Climbs into a box and making motor sounds.	1.74	1.20
	Holds pencil with thumb and forefinger.	1.16	1.81
	Draws horizontal and vertical lines.	1.37	2.06
	Uses scribbles on paper to communicate a message.	2.11	2.32
	Asks adult to write words on her/his drawings or paper.	2.58	2.58
	Recognizes the first letter in her/his first name.	1.08	3.80

TABLE 22
18-24 months: G3 Physical Development and Health

18-24 months: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	Difficulty
Gross Motor Development: Demonstrates Healthy Physical Development	Shows independence as she/he moves around in a safe environment.	1.04	-2.95
	Approaches or stands next to other children and adults in play situations.	1.21	-1.55
	Actively participates in everyday health routines (e.g., washing hands).	1.59	-1.31
Gross Motor Development: Demonstrates Balance, Control, and Coordination	Climbs up and walks down stairs with adult assistance.	1.38	-2.19
	Walks to a destination without help.	2.24	-1.48
	Pushes and pulls large objects.	2.23	-1.18
	Runs although she/he may have difficulty stopping and turning.	1.78	-0.78
	Stands on tiptoes to reach for an object.	1.29	-0.14
Fine Motor Development: Demonstrates Healthy Perceptual-Motor Development	Puts objects in a box.	1.36	-1.97
	Searches visually when she/he drops a small object on the floor.	1.71	-0.49
	Tries to turn the key on a wind-up toy.	0.77	0.33
	Imitates the hand motions of finger plays (e.g., "Where is Thumpkin?").	1.67	0.40
Fine Motor Development: Demonstrates Perceptual-Motor Strength, Control and Coordination	Uses two objects together (e.g., putting a spoon in a cup and moving the spoon around).	1.29	-0.91
	Empties and fills containers.	2.28	-0.78
	Builds a tower of two to four cubes.	1.99	-0.52
	Hold book firmly with two hands.	2.37	-0.37
	Scribbles using a variety of materials (e.g., chalk, finger paints, crayons).	2.34	-0.35
	String large beads into a piece of yarn.	1.32	1.73

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TABLE 22 – Continued
18-24 months: G3 Physical Development and Health

18-24 months: G3 Physical Development and Health	IRT Parameter Estimates	
	Discrimination	**Difficulty**
Self Help: Participates in Self-Care		
Cooperates with dressing and undressing (e.g., poking arm into sleeve and pulling off sock).	1.45	-0.95
Eats with a spoon with some assistance.	3.10	-0.82
Provides assistance in picking up toys.	2.18	-0.44
Helps adults with dressing her/him (e.g., giving a matching sock, holding out a shoe after socks are on.)	1.83	0.41
Takes off an open shirt or coat without help.	1.54	0.47
Unzips zippers.	1.45	0.93
Self Help: Participates in Basic Health and Safety Routines		
Helps feed self.	2.68	-0.59
Brushes teeth with help.	2.78	-0.11
Participates in "getting ready for" routines (e.g., going to sink to look for toothbrush or choosing a book to read).	2.52	0.23
Participates in sleeping routines, such as listening to a story before a nap.	1.70	0.29
Participates in bathing/washing routines (e.g., using a washcloth or towel).	2.41	0.40
Helps set the table.	0.80	2.26
Health: Shows Characteristics of Good Nutritional Health		
Feeds her/himself first using hands and then with a spoon.	3.26	-0.70
Consumes a variety of healthy foods from all food groups when offered by an adult.	1.85	-0.49
Takes age-appropriate amounts of food with encouragement from adults.	1.67	-0.04
Makes personal food choices from several healthy options.	2.22	0.35

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TABLE 22 – Continued
18-24 months: G3 Physical Development and Health

18-24 months: G3 Physical Development and Health	IRT Parameter Estimates	
	Discrimination	Difficulty
Health: Demonstrates Auditory Skills that Support Healthy Development		
Looks at the adult giving directions and then follows the directions.	1.90	-0.54
Participates in listening and vocalizing activities (e.g., finger plays and songs).	1.64	-0.37
Begins to imitate words and word sounds.	2.07	-0.35
Smiles upon hearing the names of familiar objects and people.	2.35	-0.02
Begins to use language, such as two-word phrases, to communicate with others.	2.30	0.56
Sings simple songs and finger plays.	1.88	0.74
Health: Shows Characteristics of Good Oral Health		
Participates in the daily cleaning of teeth.	2.79	-0.32
Chooses a cup over a bottle or pacifier.	2.23	-0.31
Chews all food completely prior to swallowing.	2.43	-0.20
Health: Shows Basic Physical Needs are Met		
Demonstrates an interest in actively exploring the environment.	2.80	-0.53
Lies down or remains quiet during rest periods.	1.71	-0.42
Uses vocalizations, gestures or words to indicate basic needs.	1.71	-0.26
Washes and dries hands with some supervision.	2.46	-0.16

TABLE 23
18-24 months: G3 Social and Emotional Development

18-24 months: G3 Social and Emotional Development	IRT Parameter Estimates	
	Discrimination	Difficulty
Trust and Emotional Security: Experiencing and Developing Secure Relationships		
Shows affection, such as hugs and kisses.	1.06	-2.74
Begins to enjoy and initiate humor, such as laughing in response to games.	1.49	-0.86
Participates in parallel play.	1.25	-0.26
Shows empathy for familiar others, especially those perceived to be hurt or sad.	1.46	0.11
Exhibits emerging social play (e.g., seeks out familiar adults to help dress a doll).	2.25	0.14
Insists on routines for transitions (e.g., when parents drop-off the child at the center).	1.37	0.17
Seeks help from trusted parents, caregivers, and teachers.	2.72	0.27
Seeks support from familiar adults to resolve conflicts with peers.	1.73	0.47
Trust and Emotional Security: Responding to the Environment		
Tries out new games and toys.	2.28	-1.94
Explores a new food with all their senses.	0.83	-1.34
Uses familiar objects in new and different ways (e.g., a shoe as a telephone).	1.39	-0.30
Begins to use a book appropriately (e.g., opens it and looks at the pictures rather than banging it on the floor).	2.17	-0.14
Demonstrates increasing ability to move around in the environment (e.g., leaving the sandbox to pull a duck toy across the play area).	2.97	-0.07
Demonstrates increasing ability to manipulate objects (e.g., bouncing up and down on objects).	2.64	0.08
Uses adults as tools, as in asking to be picked up to reach the toy on the shelf.	1.83	0.13
Plays with toys meaningfully (e.g., preparing food in housekeeping).	1.63	0.22

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TABLE 23 – Continued
18-24 months: G3 Social and Emotional Development

18-24 months: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Self-Regulation: Emotional Regulations	**Recognizes the smiles on familiar adults' faces.**	1.24	-1.73
	Demonstrates the ability to be comforted by familiar adults when frightened.	2.46	-0.66
	Seeks comfort from familiar adults when hurt or frightened.	2.46	-0.44
	Begins to end tantrums with some redirection.	2.02	0.18
	Pats a crying child on the back as their parents, caregivers, and teachers help the hurt child.	1.92	0.51
	Begins to recognize that others smile when they smile, and others look unhappy when they cry.	2.56	0.53
	Engages in reassuring self-talk or changing goals when frustrated or frightened.	2.14	1.43
Self-Regulation: Behavioral Regulation	**Looks to their parents, caregivers, and teachers when a loud sound scares them.**	1.36	-1.12
	Stops and looks at familiar adults when her/his name is called.	2.51	-0.77
	Follows directions with adult assistance.	2.39	-0.40
	Begins to attend during short, focused activities (e.g., listening to simple stories being read).	2.94	-0.21
	Uses words or crying to get someone's attention.	2.69	-0.09
	Responds positively to redirection by familiar adults.	1.98	-0.05
	Waits to take her/his turn.	1.58	0.01
	Look to their parents, caregivers, and teachers for help when unable to complete a task.	3.39	0.25
	Listens to and follows simple rules in small group activity.	2.30	0.49
Self-Regulation: Social Problem-Solving	**Uses emotional expressions to obtain desired objects, such as pouting, whining, and crying.**	2.15	-0.54

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TABLE 23 – Continued
18-24 months: G3 Social and Emotional Development

18-24 months: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Self-Regulation: Social Problem-Solving	Seeks comfort from parents, caregivers, and teachers when hurt or frightened.	3.37	-0.38
	Moves nearer to a familiar adult when noticing a stranger entering the room.	1.32	-0.19
	Puts away toys when asked by a familiar adult.	2.42	0.00
	Moves around another child that is in her/his way (e.g., going up a slide).	2.54	0.08
	Stands up for her/his ownership rights (e.g., says "mine" to a child who takes her/his toy).	2.69	0.38
	Calls for help from a familiar adult to intervene in a dispute with another child (e.g., grabbing toys away).	2.81	0.60
Self-Concept: Mutual Relationships	Recognizes the name of a friend.	1.54	-0.27
	Shows preferences for familiar adults when hurt or needing comfort.	2.46	-0.25
	Looks across the room to familiar adults periodically when playing with peers.	2.66	0.05
	With the help of teachers, begins to effectively handle separation from parents when they leave her/him at the early care/education setting.	1.72	0.11
	Acknowledges the presence/arrival of familiar adults when they see them (e.g., says "hi").	2.66	0.14
	Plays away from familiar adults with occasional trips to touch them.	2.86	0.16
	Initiates play with a familiar peer.	2.69	0.51
Self-Concept: Self Awareness and Connectedness to Others	Pays attention to her/his reflection in the mirror.	2.34	-0.37
	Moves their body to fit inside a tunnel toy with a peer or sibling.	1.46	-0.30

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TABLE 23 – Continued
18-24 months: G3 Social and Emotional Development

18-24 months: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Self-Concept: Self Awareness and Connectedness to Others	Indicates ownership of an object when it is taken by another child (e.g., says "Mine, mine!").	2.48	0.24
	Points to and names several of their own body parts.	1.70	0.32
	Shows particular interest in a special book, music selection, or other object, event, or activity.	2.83	0.40
	Points to her/himself in a photograph.	2.00	0.45
	Uses "I", "mine", and "me" often.	1.82	0.76
	Notices that another child has features (e.g., brown hair) similar to her/his own.	2.18	2.04
	Identifies other children as "boys" and "girls".	1.85	2.12
Self-Concept: Sense of Competence and Confidence	Cooperates with dressing and undressing activities.	2.35	-0.15
	Initiates simple games and chooses things to explore.	1.74	-0.14
	Continues to engage in a performance activity (e.g., dance) as familiar adults applaud.	2.50	0.20
	Uses words to get her/his needs met (e.g., "More juice.").	2.09	0.50
	Seeks help from familiar adults after unsuccessfully attempting to complete a task.	3.26	0.59
	Shows "drawing" or scribbling to a familiar adult.	2.14	0.60
	Attempts to engage in independent activities (e.g., taking off an open coat) and not giving up immediately if having difficulty.	2.96	0.69
	Shows interest in wanting to dress her/himself.	2.17	0.83
	Shows increased interest in toileting.	1.38	1.25

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TABLE 24
2-3 years: G3 Approaches to Learning

2-3 years: G3 Approaches to Learning		IRT Parameter Estimates	
		Discrimination	Difficulty
Eagerness and Curiosity	Tries new art materials such as play dough, finger painting, musical instruments, or other new toys.	1.68	-1.89
	Explores most areas of the classroom.	1.42	-0.81
	Explores new toys to see how they work.	1.97	-0.75
	Imitates adult activities such as reading a magazine or helping to set the table.	1.70	-0.74
	Plays beside other children, imitating the play of another child.	1.87	-0.41
	Enjoys opportunities to help parents, caregivers, and teachers (e.g., assisting with setting the table or folding the clothes).	2.18	-0.27
	Participates independently in an increasing variety of experiences.	1.91	-0.02
	Looks at insects, leaves, or other things from nature, examines and watches them move or grow.	1.96	0.09
	Shows interest in sorting (e.g., sorting colored pegs into single-color piles, putting the small buttons in one container and the big buttons in another).	1.43	0.59
Persistence	Insists on feeding self (e.g., eating finger foods, using utensils, pouring juice).	2.40	-0.98
	Tries various shapes in a shape-sorting toy until the shape finally fits.	1.50	-0.62
	Listens closely and turns the pages of a storybook that is being read by a parent, caregiver, or teacher.	2.49	-0.61
	Insists on completing a task even when assistance is needed.	1.53	-0.16
	Repeats activities or games over and over, such as building a block structure, taking it apart, and rebuilding it.	2.48	0.08

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TABLE 24 – Continued
2-3 years: G3 Approaches to Learning

2-3 years: G3 Approaches to Learning		IRT Parameter Estimates	
		Discrimination	Difficulty
Persistence	**Requests that a favorite book be read over again.**	2.27	0.15
	Shows interest in completing simple puzzles, stringing beads successfully, and repeating attempts to use scissors.	1.96	0.32
	Maintains concentration in an activity despite distractions or interruptions.	1.61	0.72
Creativity and Inventiveness	**Uses a variety of materials during play to represent objects and events (e.g., uses pegs with play dough as candles for cake).**	1.02	-0.09
	Uses objects together as tools.	1.39	0.28
	Reorganizes objects to solve a problem (e.g., stacking so blocks don't fall).	1.82	0.45
	Models everyday activities and pretends to take on the roles of other people (e.g., mommy, daddy, baby, teacher).	1.97	0.47
	Finds solutions to simple problems (e.g., riding toy is stuck on another toy so the child backs up and drives around the toy).	2.13	0.47
	Acts out familiar life scenes (e.g., picking up a bag or lunch box and saying, "I go to work").	2.11	0.70
	Scribbles on a piece of paper to communicate (e.g., making a shopping list).	1.31	0.83
	Combines materials, objects, equipment in new ways to produce multiple uses.	1.93	1.07
	Experiments with a variety of strategies to solve a problem or complete a task.	2.20	1.10

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TABLE 25
2-3 years: G3 Cognitive Development and General Knowledge

2-3 years: G3 Cognitive Development and General Knowledge		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Exploration and Discovery	Successfully completes simple inset puzzles.	1.02	-1.68
	Washes hands or picks up toys when directed to do so.	2.21	-1.02
	Successfully hooks toys together.	1.55	-0.84
	Asks for help when needed.	2.17	-0.59
	Explores objects by taking things apart, stacking sorting, tracing, etc.	2.11	-0.57
	Verbalizes observations, such as "Milk gone!" or "Daddy here!"	2.33	-0.53
	Sometimes says "Please" and "Thank you" without prompting.	1.95	-0.01
	Inspects/manipulates moving parts of toys (e.g., wheels).	1.82	-0.01
	Makes play dough creations.	1.79	0.18
	Finds details in a favorite picture book.	1.98	0.23
	Repeatedly does the same puzzles.	1.93	0.37
	Chooses toys or activities based on who is playing.	2.04	0.49
	Labels or describes "drawings" or scribbles.	1.52	0.51
	Asks questions while a book is being read by a familiar adult.	2.10	0.81
	Persistently asks "Why?".	1.90	1.25
Concept Development and Memory	Places items back in their "correct" place.	1.32	-0.96
	Laughs at funny things.	2.28	-0.60
	Completes three-or four-piece puzzles.	1.65	-0.29
	Participates in rearranging areas of the room.	1.30	-0.05
	Pokes, drops, pushes, pulls, and squeezes objects to see what will happen.	1.64	-0.03
	Searches for removed or lost objects.	1.49	0.04

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| 2-3 years: G3 Cognitive Development and General Knowledge | IRT Parameter Estimates | |
	Discrimination	Difficulty
Concept Development and Memory — Sings several songs, poems, or finger plays with adults.	2.15	0.10
Puts an object "on top of" or "under" the table, upon request.	2.39	0.34
Asks to hear her/his favorite song over and over.	1.47	0.51
Wants to be assigned a "job".	1.93	0.55
Uses words to describe feelings (e.g., "happy").	2.13	0.84
Answers questions about prior events.	2.40	1.17
Sorts objects (e.g., beads) by color or by size.	1.32	1.18
Lines objects up in one-to-one relationships (e.g., shoe/sock, fork/plate).	1.97	1.30
Identifies a "best friend".	1.80	1.31
Pretends to be a character from a story or show.	2.68	1.37
Understands that some family/friends may live far away.	2.03	1.58
Wants to tell her/his age to a familiar adult.	1.56	1.77
Asks questions that include "How many?" or "How much?".	2.11	1.82
Problem-Solving and Creative Expression — Uses a spoon to get food into her/his mouth.	1.86	-1.51
Wants to get her/his own way even if it conflicts with adults.	1.53	-0.39
Begins to enjoy small-group activities facilitated by an adult.	2.31	-0.36
Claps to express appreciation or joy.	1.99	-0.30
Uses materials such as pencils, paints, and play dough in different and varied ways	1.74	-0.22
Threads beads by coordinating a string into the bead opening.	1.13	-0.19

2-3 years: G3 Cognitive Development and General Knowledge		IRT Parameter Estimates	
		Discrimination	Difficulty
Problem-Solving and Creative Expression	Demonstrates the ability to move in time with music.	2.14	0.11
	Joins in or tries to sing songs and finger plays without encouragement.	2.40	0.18
	Takes toys/materials from one area to another area for play (e.g., takes toys from the dress-up corner to the block area).	1.72	0.27
	Takes on roles during pretend play.	2.41	0.50
	Imitates other children's play or begins to play with others in associative play.	2.25	0.53
	Initiates interactions with playmates.	2.07	0.55
	Comforts crying peers.	1.58	0.61
	Demonstrates some persistence and creativity in solving a problem (e.g., turns puzzle pieces in various directions to complete the puzzle).	2.12	0.62
	Brings others into their play (e.g., "Let's go on a bus ride. Here are the seats, and you be the driver").	2.40	0.73
	Points to pictures that represent feelings and names the emotions.	1.78	0.78
	Persists with objects, or with frustrating toys.	2.35	0.82
	Finds solutions basic everyday problems (e.g., peels paper off a crayon to continue coloring).	2.49	0.84
	Names parts of her/his pictures.	2.03	0.87
	Begins to locate/select materials for an activity (e.g., gets out art supplies for a project but may forget things or not get enough).	2.38	0.92
	Makes up words to describe objects, events, emotions.	1.91	1.68

TABLE 26
2-3 years: G3 Language, Communication, Reading, and Writing

2-3 years: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	Difficulty
Listening and Understanding	Identifies objects in the environment (e.g., picture of a dog in a book) when asked by an adult.	1.69	-1.49
	Listens to the reading of a short picture book (e.g., 10 pages).	2.03	-1.32
	Finds her/his shoes when it is time to get dressed.	1.38	-1.29
	Sings simple songs or finger plays with help from an adult.	2.09	-0.61
	Reacts to funny portions of a story by smiling or laughing.	1.98	-0.44
	Responds appropriately to questions about a picture book being read.	2.00	0.35
Communicating and Speaking	Practices conversational skills during pretend play.	1.53	-0.55
	Enjoys repeating rhymes and songs.	2.48	-0.38
	Combines words to create meaningful short sentences.	2.55	-0.24
	Repeats or tries different words/sentences to get another child or adult to respond.	1.95	-0.08
	Participates in conversations at snack and play times.	2.32	0.23
	Uses words to describe activities (e.g., playing catch) or functions of objects (e.g., spoon for eating).	3.04	0.36
	Initiates conversations with others using toys, experiences, books, or pretend play.	2.19	0.38
	Asks questions to obtain information or assistance.	2.64	0.44
	Uses descriptive words with objects (e.g., "pretty flowers").	2.71	0.46
	Asks questions to get the attention of an adult.	1.91	0.53
	Responds to comments or questions from others during a conversation.	2.05	0.77

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2-3 years: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Communicating and Speaking	Uses basic rules of grammar in speech (e.g., personal pronouns, plurals, position words).	2.09	0.90
	Asks questions to keep a conversation going.	2.47	1.08
	Recognizes that a pause means it is his/her turn to talk.	1.79	1.15
Early Reading and Print Awareness	Repeats portions of familiar books and rhymes	1.45	-0.20
	Smiles as they ask questions and repeat stories, songs, and rhymes.	2.18	0.01
	Demonstrates basic book knowledge (e.g., holding book upright, turning pages right to left).	1.57	0.02
	Requests rereading of favorite books.	1.82	0.22
	Engages in "pretend" reading with other children during play activities.	1.90	0.48
	Selects books, sometimes, over other activities when given a choice.	1.45	0.73
	Uses "reading" in play activities.	1.82	0.77
	Makes connections between her/his own experiences and those presented in books/stories.	1.21	0.83
	Retells a familiar story, poem, or song in his/her own words.	2.03	1.17
	Asks adults to read printed information such as signs, labels, advertisements.	2.66	1.47
	Recognizes that a spoken word/speech can be written and read.	2.49	1.48

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2-3 years: G3 Language, Communication, Reading, and Writing		IRT Parameter Estimates	
		Discrimination	Difficulty
Early Writing	Pretends to cook food using housekeeping props.	1.77	-0.44
	Shows scribbling work to others.	1.92	-0.13
	Draws horizontal and vertical lines.	1.03	-0.02
	Brings a "cake" from the sand area and asks familiar adults to "eat it".	1.93	0.58
	Holds pencil with thumb and forefinger.	1.36	0.69
	Stacks several blocks and then calls it "my house".	1.85	0.73
	Asks adult to write words on her/his drawings or paper.	1.33	0.86
	Use scribbles on paper to communicate a message.	1.57	1.43
	Draws figures and shapes to convey meaning.	2.06	1.58
	Communicates by scribbling with some letter-like shapes.	2.08	1.82
	Child asks adult to write a story told by the child.	2.68	1.97
	Recognizes the first letter in her/his first name.	1.23	2.08

TABLE 27
2-3 years: G3 Physical Development and Health

| 2-3 years: G3 Physical Development and Health | IRT Parameter Estimates | |
	Discrimination	Difficulty
Gross Motor Development: Demonstrates Healthy Physical Development — **Approaches or stands next to other children and adults in play situations.**	1.18	-2.50
Actively participates in everyday health routines (e.g., washing hands).	1.71	-1.85
Begins to put away toys when clean-up is announced.	1.42	-0.92
Develops self-care skills, such as helping to dress him/herself.	0.81	-0.11
Gross Motor Development: Demonstrates Balance, Control, and Coordination — **Runs although she/he may have difficulty stopping and turning.**	1.15	-2.16
Walks to a destination without help.	2.43	-1.68
Jumps in place and off low objects, such as a step.	1.91	-0.87
Stops and turns while running.	1.53	-0.58
Walks up and down stairs independently, using alternating feet, and without holding rail.	1.26	-0.22
Fine Motor Development: Demonstrates Healthy Perceptual-Motor Development — **Imitates the hand motions of finger plays (e.g., "Where is Thumpkin").**	0.86	-1.16
Sorts basic shapes (e.g., triangles and squares).	0.78	0.44
Sort objects by a dimension, such as size or color.	1.28	0.95
Does not need corrective/assistive visual devices or properly uses needed corrective and assistive visual devices consistently (e.g., glasses).	1.02	1.83
Fine Motor Development: Demonstrates Perceptual-Motor Strength, Control, and Coordination — **Empties and fills containers.**	1.99	-1.06
Strings large beads onto a piece of yarn.	0.94	-0.71
Uses one hand to turn the pages of a book.	1.77	-0.41
Pulls apart large pop-it beads and tries to push them together again.	1.66	-0.03

TABLE 27 – Continued
2-3 years: G3 Physical Development and Health

2-3 years: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	Difficulty
Fine Motor Development: Demonstrates Perceptual-Motor Strength, Control, and Coordination	**Watches lines and squiggles appear as they move a writing tool (marker, paint brush) over a piece of paper.**	1.76	0.23
Self Help: Participates in Self-Care	**Insists on washing and drying his/her own hands.**	2.13	-0.73
	Unzips zippers.	1.01	-0.60
	Helps adults with dressing her/him (e.g., giving a matching sock, holding out a shoe after socks are on).	1.93	-0.60
	Begins to use a fork.	1.51	-0.53
	Helps with toileting by pulling her/his pants down and up.	1.62	-0.48
	Dresses him/herself with help for difficult steps (e.g., getting their arms into sleeve holes).	2.51	0.03
Self Help: Participates in Basic Health and Safety Routines	**Brushes teeth with help.**	1.43	-1.11
	Feeds his/herself without help.	2.23	-0.98
	Participates in "getting ready for" routines (going to sink to look for toothbrush or choosing a book to read).	1.60	-0.83
	Participates in sleeping/napping routines by getting and arranging comfort items.	1.72	0.36
	Participates in bathing/washing routines (e.g., using a washcloth or towel).	1.70	0.54
Health: Demonstrates Auditory Skills that Support Healthy Development	**Sings simple songs and finger plays.**	1.17	-0.68
	Uses language to communicate with parents, caregivers, teachers, and peers.	1.25	-0.65
	Looks at the adult giving directions and then follows the directions.	1.99	-0.34
	Responds to instructions during group time.	2.38	0.19

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TABLE 27 – Continued
2-3 years: G3 Physical Development and Health

2-3 years: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	Difficulty
Health: Demonstrates Auditory Skills that Support Healthy Development	Does not need assistive audiological devices or uses needed assistive audiological devices, such as hearing aids, if appropriate.	1.80	0.34
	Expands understandable vocabulary.	1.28	0.80
Health: Shows Characteristics of Good Oral Health	Chews all food completely prior to swallowing.	2.00	-1.23
	Begins to independently brush their teeth with supervision.	1.85	-0.70
	Cooperates by opening mouth for quick visual exam.	2.06	0.26
Health: Shows Basic Physical Needs are Met	Washes and dries hands with some supervision.	2.49	-1.34
	Makes use of inside and outside environments to play in.	2.62	-0.52
	Has calm and settled rest periods.	1.54	-0.45

TABLE 28
2-3 years: G3 Social and Emotional Development

2-3 years: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	Difficulty
Trust and Emotional Security: Experiencing and Developing Secure Relationships	Participates in parallel play.	1.30	-1.93
	Exhibits emerging social play (e.g., seeks out familiar adults to help dress a doll).	1.33	-0.84
	Engages in positive social play alongside, and occasionally with, other children.	1.94	-0.53
	Insists on routines for transitions (e.g., when parents drop-off the child at the center).	1.46	-0.37
	Seeks support from familiar adults to resolve conflicts with peers.	1.72	0.03
	Starts to imitate adult social behaviors such as using words like "please" and "thank you".	1.84	0.06
	Verbally or nonverbally invites a peer to play.	1.84	0.39
	Takes on the role of an adult figure in pretend play.	1.70	0.41
	Responds to another child's or adult's distress with efforts to assist.	2.09	0.50
Trust and Emotional Security: Responding to the Environment	Demonstrates increasing ability to manipulate objects (e.g., bouncing up and down on objects).	1.22	-1.02
	Begins to use a book appropriately (e.g., opens it and looks at the pictures rather than banging it on the floor).	1.67	-0.92
	Tries out new games and toys.	2.41	-0.55
	Plays with toys meaningfully (e.g., preparing food in housekeeping).	2.63	-0.35
	Uses play materials in the intended way (e.g., building with blocks).	2.48	-0.27
	Starts becoming more comfortable when entering new environments.	1.80	-0.23
	Plays without disrupting or destroying the work of others.	1.57	0.37

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TABLE 28 – Continued
2-3 years: G3 Social and Emotional Development

| 2-3 years: G3 Social and Emotional Development | IRT Parameter Estimates | |
	Discrimination	Difficulty
Self-Regulation: Emotional Regulation — Begins to recognize that others smile when they smile, and others look unhappy when they cry.	1.16	-0.54
Begins to end tantrums with some redirection.	1.50	-0.28
Feels badly and expresses concern about breaking established rules.	2.45	0.94
Begins using emotionally charged words (e.g., "I'm mad") to get needs met, as opposed to simply acting out needs.	2.23	1.14
Engages in reassuring self-talk or changing goals when frustrated or frightened.	1.66	1.32
Self-Regulation: Behavioral Regulation — Follows directions, with adult assistance.	1.68	-1.15
Plays beside another child for short periods of time.	2.43	-0.66
Uses words or crying to get someone's attention.	2.35	-0.57
Waits to take her/his turn.	1.82	-0.15
Listens to and follows simple rules in small group activity.	2.38	-0.06
Continues to use comfort objects such as blankets and stuffed animals to calm her/himself.	2.00	0.81
Self-Regulation: Social Problem-Solving — Puts away toys when asked by a familiar adult.	2.27	-0.48
Moves around another child that is in her/his way (e.g., going up a slide).	1.88	-0.42
Stands up for her/his ownership rights (e.g., says "mine" to a child who takes her/his toy).	2.33	-0.39
Tells another child "No. Stop!" when her/his toy is taken.	2.93	-0.05
Seeks help from familiar adults when another child takes her/his toy.	2.72	0.03
Shares occasionally with other children.	2.60	0.06

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TABLE 28 – Continued
2-3 years: G3 Social and Emotional Development

2-3 years: G3 Social and Emotional Development	IRT Parameter Estimates	
	Discrimination	**Difficulty**
Self-Concept: Mutual Relationships — Acknowledges the presence/arrival of familiar adults when they see them (e.g., says "hi").	1.79	-0.61
With the help of teachers, begins to effectively handle separation from parents when they leave her/him at the early care/education setting.	1.72	-0.30
Initiates play with a familiar peer.	2.39	-0.01
Seeks help from familiar adults after unsuccessfully attempting to complete a task.	3.36	0.14
Enjoys an activity of interest (e.g., art) with a friend.	2.66	0.17
Approaches a new person after familiar adults have talked with that person for a while.	2.03	0.45
Self-Concept: Self Awareness and Connectedness to Others — Points to and names several of their own body parts.	1.53	-0.53
Points to her/himself in a photograph.	2.79	-0.45
Insists on doing thing on her/his own (e.g., carrying own plate to the table).	2.56	0.22
Talks about her/his family.	2.28	0.60
Identifies other children as "boys" and "girls".	2.26	0.70
Refers to her/himself by positive characteristics (e.g., "smart" or "strong").	2.65	1.51
Notices that another child has features (e.g., brown hair) similar to her/his own.	1.51	1.76
Talks about the neighborhood, city, or area in which she/he lives.	2.18	2.20

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TABLE 28 – Continued
2-3 years: G3 Social and Emotional Development

2-3 years: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Self-Concept: Sense of Competence and Confidence	Continues to engage in a performance activity (e.g., dance) as familiar adults applaud.	1.61	-0.05
	Shows increased interest in toileting.	1.66	-0.04
	Shows interest in wanting to dress herself/himself.	2.19	0.27
	Demonstrates growing competence and confidence during activities (e.g., climbs higher and higher on a playground structure).	2.56	0.32
	Shares successes at independent accomplishments with adults (e.g., opens her/his own lunchbox and showing how they did it).	3.44	0.69
	Gets materials needed for an activity, without prompts.	1.72	0.80

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TABLE 29
3-5 years: G3 Approaches to Learning

3-5 years: G3 Approaches to Learning		IRT Parameter Estimates	
		Discrimination	Difficulty
Taking Initiative and Exhibiting Curiosity	Explores most areas of the classroom.	1.39	-2.87
	Selects activities or objects from a choice of at least two in a daily routine.	2.03	-0.96
	Participates in an increasing variety of experiences independently.	2.18	-0.40
	Selects activities that are within her/his capabilities, most of the time.	2.21	-0.17
	Initiates preferred purposeful activities when playing in interest centers.	2.37	0.00
	Asks questions to find out about topics presented in the classroom (e.g. who, what, where, why, or how).	1.50	1.25
	Combines materials, objects, equipment in new ways to produce multiple uses.	2.03	1.72
Developing Creativity and Inventiveness	Maintains interest in an activity for an appropriate period of time.	1.75	-1.33
	Uses a variety of materials during play to represent objects and events (e.g., uses pegs with play dough as candles for cake).	0.86	-1.06
	Completes a simple self-selected activity or task.	2.01	0.29
	Finds solutions to simple problems (e.g., riding toy is stuck on another toy so the child backs up and drives around the toy).	1.65	0.63
	Maintains concentration in an activity despite distractions or interruptions.	1.56	0.99
	Corrects her/his own mistakes, some of the time.	2.66	1.17
	Experiments with a variety of strategies to solve a problem or complete a task.	1.80	1.43

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TABLE 29 – Continued
3-5 years: G3 Approaches to Learning

3-5 years: G3 Approaches to Learning		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Developing Creativity and Inventiveness	Persists with a difficult or non-preferred activity.	1.98	1.56
	Checks to see if a simple task has been completed, without being asked.	2.57	1.95
Goal Setting and Planning	While playing, says what s/he wants to accomplish, when asked.	1.38	-0.43
	Sets a goal prior to beginning of an activity or a project.	1.36	0.48
	Says, signs, or gestures whether or not a simple task has been completed.	2.02	0.76
	Sets a goal, and with adult help, plans a small number of steps to achieve it.	2.03	0.83
	Revises, with adult help, a plan that has not produced the intended result.	1.98	2.27
Learning Cooperation	Shares part or all of something with an adult.	1.54	-0.87
	Is helpful to an adult when prompted.	1.66	-0.36
	Takes turns playing with a toy or object.	1.64	-0.17
	Shares part or all of something with a peer.	1.90	-0.07
	Voluntarily helps a peer.	1.88	0.59
	Says, signs, or gestures when it is her/his turn in a game or activity.	1.96	1.01
	Establishes proximity to peers during an unstructured child-directed activity.	1.62	1.11
	Maintains proximity to peers during an unstructured child-directed activity.	1.68	1.35
	Completes a task (e.g. art project, assignment, drawing, skit) with a partner.	1.43	1.69

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TABLE 30
3-5 years: G3 Creative Arts

3-5 years: G3 Creative Arts		IRT Parameter Estimates	
		Discrimination	Difficulty
Enjoying Music and Movement	Shows an interest in using musical instruments to produce sounds.	0.67	-2.49
	Shows an interest in listening to short musical selections.	1.06	-1.37
	Sings or hums familiar songs or tunes.	1.20	-0.61
	Talks about the kinds of music enjoyed (e.g., favorites).	2.04	-0.22
	Uses movement to express what is being felt/heard in various songs or tunes.	1.27	0.07
	Experiments with singing/humming in different ways (e.g., loud/soft, fast/slow).	1.69	1.35
	Identifies the names of familiar instruments (e.g., drum, horn, guitar, etc.).	1.39	1.95
	Synchronizes movements to different patterns of beat/tempo, most of the time.	1.80	2.37
	Uses instruments/songs to express feelings (e.g., happy, sad, angry, scared).	1.51	2.46
	Matches the type of sound to a particular instrument.	1.45	2.81
	Invents songs or tunes using voice or musical instruments.	1.51	2.84
	Matches pitch and tempo during a singing activity most of the time.	1.62	2.96
	Identifies differences in tempo, tone, and volume, most of the time.	1.54	3.03
	Uses instruments or songs to represent events (e.g., thunder, animal sounds).	1.27	3.39
Creating Visual Art	Works with other children on a cooperative art project (e.g., mural).	0.76	-0.86
	Takes care of art materials/supplies (e.g., washes brushes, covers paint).	1.13	0.19

TABLE 30 – Continued
3-5 years: G3 Creative Arts

3-5 years: G3 Creative Arts		IRT Parameter Estimates	
		Discrimination	Difficulty
Creating Visual Art	Creates collages with various materials and textures (e.g., fabrics, pictures).	1.34	1.10
	Draws representations of human and animal figures.	1.30	1.27
	Selects materials that will be needed for a self-initiated art project.	1.52	1.89
	Describes the steps/plan for constructing a self-initiated art project.	1.75	1.89
	Uses various tools to create art projects (e.g., rollers, string, straws).	1.32	2.15
	Draws recognizable environmental objects (e.g., house, trees, ball).	1.48	2.22
	Draws some details in representations of animals, people, or objects.	1.39	2.30
	Describes a self-made art project (tells what it is about) to a child or adult.	1.69	2.31
	Creates 3-dimensional masks (e.g., clowns, animals) with various materials.	1.20	2.85
	Recombines and experiments with art materials to see what happens.	1.54	2.92
	Participates in various art activities (e.g., paint, sculpture, collage, masks).	1.32	3.18
	Uses a variety of colors to create moods or feelings in artwork.	1.14	3.74
	Draws a series of pictures that depict a story.	1.33	3.96
Participating in Dramatic Play	Uses dramatic play to express feelings (e.g., fear).	0.87	0.08
	Acts out a real or make-believe character during dramatic play.	1.35	0.40
	Acts out stories or situations during a dramatic play activity.	1.52	1.28

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TABLE 30 – Continued
3-5 years: G3 Creative Arts

3-5 years: G3 Creative Arts		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Participating in Dramatic Play	Practices "working out" new situations (e.g., going to doctor, new baby, trip).	2.21	1.98
	Uses dramatic play to practice cooperation (e.g., who sets table, cooks).	1.84	2.12
	Describes the story or situation that will occur during dramatic play.	1.99	2.17
	Uses dramatic play to ask questions to gain new knowledge from others.	1.72	2.91

TABLE 31
3-5 years: G3 Early Math

3-5 years: G3 Early Math		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Counting and Comparing	Counts to find how many are in a group up to 5.	1.90	-1.22
	Uses one-to-one correspondence when counting objects.	1.13	-1.08
	Counts to find how many are in a group up to 10.	1.80	-0.15
	Counts forward from a number > 1 to find how many are in a group.	1.63	-0.11
	Counts to find out how many are in a group greater than 10.	1.84	0.49
	Counts backward to find how many are left.	1.46	1.71
	Separates a group into two sets and identifies the number of items in both sets.	0.71	1.76
	Writes numerals to indicate 6 or less objects.	1.46	1.98
	Answers questions about two sets of items using comparison terminology (e.g., more, less, greater than, fewer than, equal to).	1.41	1.99
	Writes numerals to indicate between 7 and 10 objects.	1.62	2.42
	Writes numerals to indicate between 11 and 20 objects.	1.63	3.07
Identifying Numerals	Identifies numerals 0 to 5.	1.01	-0.50
	Identifies numerals 6 to 10.	1.63	1.07
	Identifies numerals 11 to 20.	1.65	2.29
Adding	Adds one to a small group, when asked.	1.57	-0.89
	Indicates that a small group has more after some have been added.	2.13	0.68
	Adds two small groups by combining the groups and counting all the objects.	2.32	1.37

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TABLE 31 – Continued
3-5 years: G3 Early Math

3-5 years: G3 Early Math		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Subtracting	Indicates that a small group has less after taking some away.	1.96	0.11
	Indicates that one was taken away from a small group.	1.60	0.82
	Indicates how many are left after taking one from a small group.	2.00	1.46
Understanding Fractions	Shows where to divide a whole object to make two halves.	1.75	0.55
	Exchanges two halves for a whole.	2.30	1.52
	Separates a group of objects in half.	1.80	2.07
Sorting	Matches objects to an example.	1.55	-1.61
	Sorts diverse objects based on a physical attribute (e.g., shape).	2.11	-0.47
	Sorts diverse objects based on multiple attributes (e.g., size and shape).	2.16	0.85
	Sorts diverse objects by one attribute, and then by another (e.g., size, then shape).	2.16	0.93
Ordering	Identifies the shorter or taller of two persons or things.	2.55	-0.25
	Identifies the shortest or tallest in a group.	2.69	0.28
	Arranges objects in order by size.	1.79	0.96
	Places an object in its proper position in a group ordered by size.	2.19	1.64
Comprehending Spatial Concepts	Understands object position concepts (e.g., under, top, bottom, inside, behind).	1.93	0.33
	Understands object directionality concepts (e.g., right, left, up, down).	2.05	0.48
Learning about Shapes	Identifies familiar shapes (e.g., circle, square, triangle, diamond) by name.	1.87	-0.57
	Places a circle, square, or triangle appropriately on a foam board.	1.75	-0.06
	Creates new shapes from familiar shapes by folding, cutting, or twisting.	1.66	1.71

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TABLE 31 – Continued
3-5 years: G3 Early Math

3-5 years: G3 Early Math		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Learning about Shapes	Identifies the sides and corners in a shape.	1.51	2.11
Noticing Patterns	Repeats alternating movement patterns (e.g., up/up/down, up/up/down).	1.80	0.14
	Repeats an alternating visual pattern (e.g., red/green/red/green).	1.90	0.58
	Repeats an alternating auditory pattern (e.g., loud/soft claps).	1.64	1.03
	Extends a number series (e.g., 1,2,3 blocks to 4 blocks).	1.76	1.86
	Creates an alternating visual pattern using art or play materials.	1.57	1.88
	Repeats a pattern alternating numbers of objects (e.g., 1 cup/2 spoons).	1.99	2.39
Measuring	Uses non-standard unit (e.g., cut-out paper squares) to measure area.	1.85	0.94
	Uses non-standard units (e.g., paper cups) to measure volume.	1.69	2.09
	Uses non-standard units (e.g., paper clips) to measure length.	1.14	2.18
	Uses a familiar measuring device (e.g., ruler, scale, measuring cups).	1.15	2.82

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TABLE 32
3-5 years: G3 English Language Acquisition

3-5 years: G3 English Language Acquisition		IRT Parameter Estimates	
		Discrimination	Difficulty
Comprehending Spoken Language for English Learners	Plays with English-speaking children.	3.69	-1.22
	Follows teacher directions by listening and copying the actions of peers.	2.75	-0.91
	Waves or shows nonverbal response when teacher says "hello" and "good-bye".	3.85	-0.71
	Identifies objects, colors, or body parts by pointing.	1.40	-0.40
	Appropriately moves hands and feet during finger plays (e.g., hokie pokie, itsy-bitsy spider).	3.34	-0.38
	Shakes head "yes" or "no" to answer questions appropriately.	3.39	-0.36
	Communicates nonverbally in response to words (e.g., snack, lunch, bathroom, juice).	3.53	-0.17
	Follows a simple direction (e.g., open the door, hang up your jacket).	2.72	-0.17
	Responds to questions (e.g., who, what, where, why, when, and how).	2.83	0.49
	Follows multi-step directions.	2.19	0.85
Speaking for English Learners	Responds to greeting with "hello" or "good-bye".	2.82	-0.90
	Gives one word answers to questions.	3.37	-0.50
	Sings or repeats single words during conversations and songs.	3.64	-0.12
	Asks for items in English (e.g., water, toy, pencil, book).	3.50	-0.11
	Participates/talks with peers during free play.	3.74	0.08
	Answers teacher's questions during structured class time.	3.50	0.48
	Uses a verb and noun together.	3.44	0.58
	Talks in complete sentences.	2.94	0.58

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TABLE 32 – Continued
3-5 years: G3 English Language Acquisition

3-5 years: G3 English Language Acquisition		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Speaking for English Learners	Tells/talks about a personal experience in English.	3.50	0.79
	Asks questions (e.g., who, what, where, why, when, and how).	3.55	0.84
	Expresses emotions (e.g., happiness, sadness, anger) with English words.	2.98	0.86
Participating in Literature for English Learners	Points to and identifies pictures using one word descriptions.	2.07	-0.42
	Puts thumb up or thumb down to answer question in circle time.	2.00	0.43
	Answers the question with one word, "What is this book about?"	2.61	0.56
	Answers questions in English during circle time.	3.10	0.59
	Recites a learned English poem or song.	1.28	0.93
	Talks about a story read in English.	3.03	0.98
	Answers questions about a story (e.g., who, what, where, when, and how).	2.97	1.20
	Puts pictures in sequence to retell a story.	1.83	1.65
	Identifies the beginning, middle, and end of a story.	2.68	2.08

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TABLE 33
3-5 years: G3 Language

3-5 years: G3 Language		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Listening and Understanding	Follows a simple one-step direction.	1.37	-3.29
	Listens attentively to a conversation, story, poem, or song.	1.43	-2.58
	Follows a small set of step-by-step directions, without prompts.	1.12	-1.60
	Asks questions and/or makes comments about a story, poem, or song.	1.55	-0.40
	Reacts appropriately to an exclamation (e.g., stop, look up, freeze).	1.05	0.00
	Retells a familiar story, poem or song in his/her own words.	1.11	0.18
Listening and Understanding: Receptive Vocabulary	Understands nouns commonly found in books for young children.	0.85	-2.36
	Understands action words (e.g., give, run).	2.17	-2.07
	Understands negative words (e.g., not, no).	1.94	-1.38
	Understands positional words (e.g., top, bottom, on, in).	1.85	-0.38
	Understands words that describe the qualities of objects (e.g., color, soft, cold).	2.65	0.40
	Understands pronouns (e.g., she, he, it).	2.18	0.61
	Understands past and future tense (e.g., went, will).	1.94	1.38
Speaking and Communicating: Self Expression	Repeats or tries different words/sentences to get another child or adult to respond.	0.76	-1.12
	Uses appropriate words or gestures to share information or experiences.	1.72	-0.50
	Uses appropriate words or gestures to relate feelings, needs, or opinions.	2.04	-0.13
	Asks questions to obtain information or assistance.	1.68	0.20

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TABLE 33 – Continued
3-5 years: G3 Language

3-5 years: G3 Language		IRT Parameter Estimates	
		Discrimination	Difficulty
Speaking and Communicating: Conversation	Takes turns being a speaker.	1.05	-1.45
	Responds to comments or questions from others during a conversation.	1.71	-0.64
	Adjusts conversation to changes in topic.	2.00	0.76
	Changes inflection during a conversation to communicate meaning.	2.44	1.17
Speaking and Communicating: Expressive Vocabulary	Uses negative words (e.g., not, no).	1.61	-0.82
	Uses basic rules of grammar in speech (e.g., personal pronouns, plurals, position words).	1.12	-0.24
	Combines words to create meaningful short sentences.	1.43	-0.13
	Uses descriptive words with objects (e.g. pretty flowers).	2.11	0.29
	Uses pronouns to refer to people and things (e.g., she, he, it).	1.74	0.43
	Uses past and future tenses (e.g., went, will).	2.07	1.03
	Uses possessive endings (e.g., Jose's, Emma's).	1.99	1.27
	Uses compound sentences (e.g., sentences joined by and, but, or).	1.98	1.42
	Takes apart and puts together compound words.	1.16	2.69
Appreciating Literature: Story Telling	Recalls story events using some spoken dialogue.	1.44	-0.93
	Draws pictures or uses dramatic play or music to tell a story.	1.48	-0.20
	Makes up a story from beginning, to middle, to end.	1.32	2.11

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TABLE 34
3-5 years: G3 Literacy

3-5 years: G3 Literacy		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Recognizes Sounds: Phonological Awareness	Recognizes matching and dissimilar sounds of consonants and vowels.	0.59	-0.46
	Says both syllables of a two-syllable word, with distinct separation.	1.44	0.39
	Distinguishes between some beginning consonant sounds in spoken language.	1.32	0.42
	Distinguishes between some ending consonant sounds in spoken language.	2.39	0.92
	Recognizes rhymes in poems, readings, or conversation, most of the time.	1.52	1.11
	Creates rhyming words in play activities.	1.30	1.76
	Distinguishes between some vowel sounds in spoken language.	1.61	2.54
	Puts sounds together to make short words (e.g., k-a-t, cat).	1.11	2.65
	Segments short words into their component sounds (e.g., trick, t-r-i-k).	2.04	3.03
Increasing Book Knowledge and Appreciation: Story Reasoning	Uses picture cues to tell what is happening in a story.	1.48	-0.98
	Predicts story events using picture or verbal cues.	2.25	-0.23
	Makes guesses about why things happen or change in a story.	1.89	0.38
Expanding Book Knowledge and Appreciation: Interest in Books	Selects books, sometimes, over other activities when given a choice.	1.06	-1.66
	Handles books and other reading material with care.	1.35	-1.05
	Views reading materials one page at a time (front to back), most of the time.	1.56	-0.21
	Request rereading of favorite book.	1.43	-0.20

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TABLE 34 – Continued
3-5 years: G3 Literacy

3-5 years: G3 Literacy		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Expanding Book Knowledge and Appreciation: Interest in Books	Makes connections between her/his own experiences and those presented in books/stories.	1.78	0.80
	Initiates conversation with a peer or an adult about a story, book or poem.	0.58	0.90
	Engages in pretend reading with other children, doll, or toy animal.	1.99	0.95
	Requests a favorite book by title, author, or illustrator.	1.32	1.69
Developing Print Awareness and Concepts	Demonstrates basic book knowledge (e.g., holding book upright, turning pages right to left).	1.46	-1.24
	Recognizes that a spoken word/speech can be written and read.	2.20	0.31
	Knows that print conveys information to the reader (e.g., a message, facts, how to do something).	2.29	0.84
	Recognizes that sentences are read from left to right.	1.67	1.44
	Recognizes that pages are read from top to bottom.	2.37	1.65
Building Early Reading Skills	Recognizes his/her name in print.	1.71	-0.81
	Asks adults to read printed information such as signs, labels, advertisements.	1.44	0.05
	Predicts what word might come next in a familiar story, some of the time.	2.19	0.77
	Recognizes that words are separated by spaces.	1.79	1.97
	Identifies familiar short words in print, some of the time.	1.93	2.63
	Reads a printed label or a sign on a familiar object, some of the time.	1.45	2.82
	Reads familiar words in a sentence from a book/poem, with assistance.	1.66	2.99
	Tracks by moving his/her finger along text as it is read by an adult.	1.29	3.01

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TABLE 34 – Continued
3-5 years: G3 Literacy

3-5 years: G3 Literacy		IRT Parameter Estimates	
		Discrimination	Difficulty
Building Early Writing Skills	Uses scribble on paper to communicate a message.	1.54	-1.23
	Uses a variety of writing tools and materials to communicate with others.	1.42	-0.97
	Holds pencil with thumb and forefinger.	1.35	0.21
	Draws horizontal and vertical lines.	1.67	0.31
	Communicates by scribbling and with some letter-like shapes.	2.70	0.36
	Writes some letters.	1.55	0.44
	Copies her/his name from a sample.	1.63	0.52
	Draws figures and shapes to convey meanings.	2.09	0.54
	Write her/his name, without assistance.	1.51	1.24
	Writes using inventive spelling.	1.56	2.52
	Communicates by writing complete words.	1.51	2.99
Developing Alphabet Knowledge	Names 1 or more letters.	1.78	-0.57
	Identifies all the letters in her/his name.	1.31	-0.34
	Points to and names the first letter in familiar words.	2.11	0.43
	Names 10 or more letters.	1.53	1.19
	Identifies 1 or more sounds to corresponding letters.	1.49	1.28
	Identifies 10 or more sounds to corresponding letters.	1.76	2.17

TABLE 35
3-5 years: G3 Logic and Reasoning

3-5 years: G3 Logic and Reasoning		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Using Symbols in Dramatic Play	Decides on a scene to act out.	1.02	0.20
	Uses dramatic play to make-believe with objects (e.g., cooking an egg).	1.16	0.86
	Mimics a movie, book, or past experience.	1.85	0.94
	Uses objects to represent characters (e.g., stuffed animal as the dad).	2.32	1.10
	Acts out different roles (e.g., child, adult) in dramatic play situations.	1.54	1.33
	Uses body to act out pretend scene.	2.01	1.57
	Talks to peers in pretend character.	1.67	1.71
	Assigns parts to self and peers to act out scene.	2.44	1.72
	Uses materials in inventive/creative ways (e.g., table/chairs become airplane).	1.67	1.85
	Practices building relationships with other children (offering direction, help).	1.42	2.05
	Reacts to peers remaining in pretend character.	2.14	2.07
	Acknowledges a difference between pretend game and the reality of the classroom.	2.07	2.30
	Identifies parts of a story that could be real or make-believe (e.g., blue people, flying pigs).	1.66	2.53
	Uses drawings to embellish scene.	1.76	2.63
Reasoning and Problem-Solving	Seeks assistance from an adult when attempting to solve a problem.	1.30	-1.19
	Seeks assistance from peers when attempting to solve a problem.	2.38	0.49
	Uses concrete materials to solve a problem (e.g., blocks to count).	3.04	1.70

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TABLE 35 – Continued
3-5 years: G3 Logic and Reasoning

3-5 years: G3 Logic and Reasoning		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Reasoning and Problem-Solving	Reorganizes objects to solve a problem (e.g., stacking so blocks don't fall).	1.60	1.82
	Suggests an alternative solution to solve a problem, without assistance.	2.86	1.91
	Tries out new ideas to see if they will work.	1.94	2.08
	Acts out a simple word problem using objects (e.g., shows 3 toy lizards then takes 1 toy lizard away).	2.05	3.12
	Draws a picture of a simple word problem (e.g., draws three dogs and then draws three more).	1.94	3.51
Sorting and Classifying	Identifies which object does not belong in a group.	1.30	0.51
	Describes the similarities/differences between two events (e.g., day/night).	2.15	1.56
	Associates events/experiences with their intent(s) (e.g., school: learning).	3.54	1.70
	Provides rationale for sorting objects into specific groups (e.g., all flat).	2.18	1.93
Examining Cause and Effect	Observes the effects of an action.	1.66	0.89
	States the cause of an effect (e.g., what caused the tricycle to stop).	2.76	2.07
	Predicts the effects of an action.	2.12	2.22
Solving Puzzles	Puts a simple puzzle together, without assistance.	0.96	-0.11
	Uses trial and error to solve a problem or puzzle.	1.58	0.66
	Uses solution from a basic puzzle to solve a more difficult puzzle.	2.09	1.93
	Places 2 to 3 pictures in sequential order.	1.78	2.43

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TABLE 35 – Continued
3-5 years: G3 Logic and Reasoning

3-5 years: G3 Logic and Reasoning		IRT Parameter Estimates	
		Discrimination	Difficulty
Solving Puzzles	**Creates a duplicate AB pattern when shown an AB pattern (e.g., green, red, green, red).**	1.25	2.65
	Describes the sequential steps to perform a basic activity.	2.26	2.78
	Creates an original AB pattern when shown an AB pattern (e.g., circle, square, circle, square).	1.65	2.94

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TABLE 36
3-5 years: G3 Nature and Science

3-5 years: G3 Nature and Science		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Using Senses and Scientific Devices to Learn	Uses senses (e.g., touch, smell) to learn about the natural and physical world.	1.31	-2.95
	Attempts to learn about objects by taking them apart and rebuilding (e.g., puzzles, Legos).	1.08	-2.39
	Uses tools to measure materials and make comparisons (e.g., scales, rulers).	1.79	0.83
Observing and Describing Living Things	Describes what an animal is doing as it is being observed.	1.36	-1.98
	Talks about characteristics of living things (e.g., leaf is soft).	1.80	-0.52
	Describes the typical behaviors/habits of a familiar animal.	1.76	0.02
	Draws/talks about what living things need to survive (e.g., plants need water).	1.37	0.86
	Draws/talks about observed life cycle changes in a familiar plant.	2.31	1.06
	Draws/talks about changes in her/himself over time.	1.71	1.33
	Describes/draws the type of shelter used by familiar animals.	1.85	1.33
	Draws/talks about observed life cycle changes in a familiar animal.	1.78	2.23
Observing and Describing Physical Phenomena	Draws/talks about different weather conditions (e.g., sunny, rainy).	1.45	-1.98
	Draws/talks about physical changes observed in objects (e.g., ice melting).	1.97	0.24
	Draws/talks about patterns in the physical world (e.g., seasons, day/night).	1.52	1.35
	Associates objects/events with different temperatures (e.g., ice-low temp.).	1.37	1.66
	Draws/talks about aspects of Earth (e.g., soil, trees, mountains, ocean).	1.30	1.80

TABLE 36 – Continued
3-5 years: G3 Nature and Science

3-5 years: G3 Nature and Science		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Classifying Living Things	Distinguishes plants from animals.	1.42	-1.80
	Distinguishes between land and water animals.	1.79	-0.03
	Classifies animals into groups by the way they move (e.g., flying, running).	1.82	0.73
	Classifies animals into those that are domestic and those that are wild.	2.04	1.10
	Classifies animals based on their habitat (e.g., ground vs. tree dwelling).	1.84	1.76
Classifying Physical Phenomena	Classifies objects by their state (e.g., liquid, solid, gas).	1.14	0.67
	Classifies objects into living and non-living categories.	1.82	0.86
	Classifies objects based on their physical composition (e.g., metal, rock, soil).	1.98	1.85
	Classifies objects based on whether they are found in nature or made by people.	1.98	2.20
	Classifies objects based on whether or not they require electricity/battery.	1.34	2.72
Predicting Outcomes about Living Things	Predicts what might come next in a life cycle sequence (e.g., seed to plant).	1.77	-0.03
	Predicts that a plant will die if it does not receive water.	2.15	0.18
	Predicts that an animal will seek shelter in bad weather.	2.33	1.33
	Predicts that a plant will die if it does not receive sufficient light.	1.72	1.53
	Predicts that human activity may threaten animal habitat/survival.	2.47	2.49
	Predicts that extreme weather (drought, freeze) will injure plants/wildlife.	1.60	2.72

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TABLE 36 – Continued
3-5 years: G3 Nature and Science

3-5 years: G3 Nature and Science		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Predicting Outcomes about Living Things	Predicts that plants may be destroyed when an animal population increases.	2.19	2.95
Predicting Physical Phenomena	Predicts that it is likely to rain when dark clouds come.	2.11	-1.14
	Predicts which way a scale will tip when a weight is added to one side.	1.41	0.40
	Predicts direction of an object when acted upon directly (e.g., thrown, pushed).	2.09	1.03
	Predicts changes in objects when heat/cold is applied (e.g., ice melts).	1.93	2.10
	Predicts that the steeper the incline, the faster an object will move.	1.22	2.63
	Predicts changes in objects when liquid is added (e.g., sand, paper).	1.34	2.79
Gathering and Presenting Data	Participates in simple investigations to answer questions.	2.89	-0.97
	Uses observation as a way to gather data about an object or an event.	1.75	0.55
	Confirms observations with another child/adult.	1.81	0.97
	Repeats a procedure/action several times to confirm outcomes/patterns.	1.89	1.76
	Uses more than one approach to gather data/answer a question (e.g., book, adult).	1.70	2.39
	Generalizes data findings to similar situations (e.g., all seeds grow in soil).	1.53	2.54
	Describes her/his data to other peers/adults.	1.46	2.60
	Presents observations in a variety of ways (e.g., drawings, charts, maps).	1.00	3.09
Explaining Events and Outcomes	Shares ideas/thoughts when observing the natural world/physical phenomena.	2.53	-0.74

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TABLE 36 – Continued
3-5 years: G3 Nature and Science

3-5 years: G3 Nature and Science		IRT Parameter Estimates	
		Discrimination	Difficulty
Explaining Events and Outcomes	**Provides an explanation for why an event/outcome occurred (e.g., flower wilted).**	2.57	0.87
	Attempts to explain why living things change (e.g., leaves turn brown).	1.50	1.65
	Provides two explanations for why an event/outcome occurred (e.g., birds left).	2.38	1.73
	Tries to explain results of an experiment (e.g., bigger sponge holds more water).	1.40	2.62
Questioning and Developing Hypotheses	**Describes the functions of objects (e.g., containers hold things).**	1.87	-0.12
	Asks "Why" questions to learn more about a current/past event.	1.66	0.56
	Asks "How" objects and events are different/same.	1.63	1.74
	Asks "What will happen if" questions to help predict a future event.	1.67	1.77

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TABLE 37
3-5 years: G3 Physical Development and Health

3-5 years: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Obtaining Nutrition	Chews all food completely prior to swallowing.	1.12	-2.74
	Feeds his/herself without help.	1.53	-1.95
	Independently selects and eats a variety of food types.	1.86	-0.34
	Serves self an appropriate amount of food.	2.09	0.24
	Identifies examples of foods that are healthy.	1.72	0.53
Practicing Hygiene	Washes and dries hands with some supervision.	2.19	-1.22
	Brushes teeth with help.	1.72	-0.98
	Insists on washing and drying own hands.	1.65	-0.86
	Begins to independently brush his/her teeth with supervision.	2.19	-0.40
	Disposes of tissues appropriately in a container.	2.60	-0.33
	Brushes teeth in a correct fashion, without assistance.	2.67	0.04
	Uses tissues properly to blow/wipe nose, without assistance.	2.45	0.21
	Covers mouth appropriately when coughing or sneezing.	2.12	0.36
	Requests or initiates hand washing when needed (e.g., before eating).	2.87	0.52
Exercising	Exercises large muscles (e.g., running, swinging, hopping, throwing).	2.27	-1.45
	Participates actively in outdoor group games (e.g., kickball).	1.86	-0.62
	Identifies a variety of games/exercises that help enhance fitness.	1.12	0.38
	Talks about ways exercise keeps us healthy, with assistance.	1.52	0.70

TABLE 37 – Continued
3-5 years: G3 Physical Development and Health

3-5 years: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	Difficulty
Dressing	Unzips zippers.	1.64	-0.63
	Unfastens clothing (e.g., snaps, Velcro, buttons, zippers), without assistance.	2.74	-0.28
	Fastens clothing (e.g., snaps, Velcro, buttons, zippers), without assistance.	2.32	0.06
	Puts on front-opening garment, without assistance.	2.92	0.19
	Puts on pull-over garment, without assistance.	2.93	0.49
	Puts on shoes correctly, without assistance.	2.18	0.99
	Ties own shoes, without assistance.	1.71	1.64
Toileting	Uses bathroom, without assistance.	2.32	-1.40
	Initiates a trip to the bathroom, without being prompted.	3.20	-0.62
	Completes bathroom activities (clothing up/down, wiping, flushing) independently.	3.86	-0.43
	Disposes of toilet paper/paper towels appropriately.	3.64	-0.30
	Remains dry and unsoiled between bathroom trips.	2.57	-0.25
Understanding of Health and Safety Practices	Has calm and settled rest periods.	1.32	-0.73
	Cooperates by opening mouth for a quick visual exam.	1.93	0.23
	Understands that parents and teachers are helpful resources.	2.84	0.27
	Follows fire safety/fire drill rules, without assistance.	1.71	0.42
	Follows outdoor and indoor play rules, without prompts.	2.43	0.52
	Knows to stay away from harmful objects (e.g., broken glass, holes, rusty iron).	2.54	1.04

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TABLE 37 – Continued
3-5 years: G3 Physical Development and Health

3-5 years: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Understanding of Health and Safety Practices	Tells why classroom rules are important (e.g., walk in the classroom, keep hands and feet to oneself).	2.13	1.12
	Tells why basic health practices are necessary (e.g., why people have to brush teeth, wash hands).	2.30	1.29
	Tells why people need to go to the doctor and dentist.	2.21	1.29
	Describes basic traffic safety rules, without assistance.	2.36	1.59
	Identifies nonedible/poisonous substances, without assistance.	2.30	1.90
	Identifies potentially dangerous situations/activities, without assistance.	2.35	2.01
	Does not need corrective/assistive visual devices or properly uses needed corrective and assistive visual devices consistently (e.g., glasses).	1.34	2.14
	Does not need assistive audiological devices or uses needed assistive audiological devices, such as hearing aids, if appropriate.	1.39	2.44
Developing Gross Motor Control and Balance	Walks to a destination without help.	1.68	-1.02
	Jumps in place and off low objects, such as a step.	2.04	-0.35
	Climbs up and down stairs.	2.87	-0.33
	Climbs a short ladder (e.g., on playground toys).	2.66	-0.13
	Moves around obstacles with balance and direction.	2.85	0.00
	Walks along a line on the floor, most of the time.	2.21	0.09
	Stops and turns while running.	2.42	0.19
	Balances on one foot for five seconds.	1.57	0.31

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TABLE 37 – Continued
3-5 years: G3 Physical Development and Health

3-5 years: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Developing Gross Motor Control and Balance	Jumps forward several times, maintaining balance most of the time.	2.93	0.42
	Walks along a wide beam, most of the time.	2.62	0.46
	Pedals a tricycle, steers and makes turns around obstacles and corners.	2.00	0.48
	Hops with direction and control, most of the time.	2.79	0.59
	Jumps backward without losing balance.	2.60	1.02
	Gallops maintaining direction and control, most of the time.	2.22	1.13
	Skips with direction and control, most of the time.	2.14	1.39
Developing Gross Motor Coordination	Throws a ball a short distance with accuracy, most of the time.	1.85	-0.17
	Kicks a ball a short distance with accuracy, most of the time.	2.44	0.34
	Catches a ball thrown underhand from 3 to 5 feet, most of the time.	2.30	0.79
	Dribbles a large ball several times with both hands.	2.29	1.30
	Dribbles a large ball several times with one hand.	2.26	1.76
Developing Fine Motor Dexterity and Control	Eats with a fork and a spoon, or other appropriate utensils.	1.53	-1.95
	Begins to use a fork.	1.74	-0.79
	Correctly holds a pencil or crayon.	2.32	0.18
	Cuts with scissors along a straight line.	2.03	0.75
	Cuts with scissors along a curved line.	2.10	1.32
	Uses scissors to cut out a pre-formed simple shape.	1.93	1.49

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TABLE 37 – Continued
3-5 years: G3 Physical Development and Health

3-5 years: G3 Physical Development and Health		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Developing Hand-Eye Coordination	Strings large beads on a piece of yarn.	1.97	-0.15
	Builds short structures with blocks or other materials (e.g., 3 blocks high).	2.78	-0.13
	Builds tall structures with blocks or other materials (e.g., 10 blocks high).	2.65	0.46
	Uses computer keyboard/mouse for writing/drawing, without assistance.	1.88	1.26

TABLE 38
3-5 years: G3 Social and Emotional Development

3-5 years: G3 Social and Emotional Development		IRT Parameter Estimates	
		Discrimination	Difficulty
Learning About Self	Knows his/her gender.	1.64	-2.29
	Knows his/her own first and last names.	1.33	-2.16
	Knows his/her age.	1.27	-2.01
	Describes his/her physical attributes (what I look like).	1.56	0.02
	Refers to her/himself by positive characteristics (e.g., "smart" or "strong").	1.37	0.17
	Talks about his/her interests (what I like to do).	0.97	0.26
	Says positive things about his/her appearance.	1.66	0.27
	Answers the question, "How do you feel?" with a feeling word (e.g., angry, happy, mad, sad, alone).	1.29	0.51
	Begins using emotionally charged words (e.g., "I'm mad") to get needs met, as opposed to simply acting out needs.	1.48	1.03
	Talks positively about a recent accomplishment.	1.35	1.52
	Engages in reassuring self-talk or changing goals when frustrated or frightened.	1.65	1.58
Learning Cooperation	Follows established rules and routines in the classroom.	1.02	-2.21
	Makes transitions between activities with minimal assistance.	1.74	-1.29
	Comfortably accepts guidance and directions from a familiar adult.	2.20	0.42
	Uses classroom materials safely and for their intended purpose.	1.90	0.60

TABLE 38 – Continued
3-5 years: G3 Social and Emotional Development

| 3-5 years: G3 Social and Emotional Development | IRT Parameter Estimates | |
	Discrimination	Difficulty
Resolving Conflicts		
Seeks support from familiar adults to resolve conflicts with peers.	1.14	-1.60
Moves around another child that is in her/his way (e.g., going up a slide).	1.77	-0.88
Stands up for her/his ownership rights (e.g., says "That's mine" to a child who takes her/his toy).	2.36	-0.23
Expresses wants and needs in conflict situations.	2.55	-0.09
Says, signs, or gestures to a child who is being offensive to stop the behavior.	2.70	0.12
Uses negotiation to reach a solution.	1.80	0.27
Shows the ability to compromise in conflict resolution.	2.77	0.33
Suggests strategy (e.g., sharing) to resolve a dispute over an object/play thing.	2.47	0.92
Uses passive strategies to manage escalating conflicts (e.g., avoids, disengages).	2.27	1.44
Maintains a negotiated plan.	2.17	1.52
Discovering Independence in Daily Activities		
Accepts arrival and departure transitions as routine parts of the day.	2.21	-0.81
Gets materials needed for an activity, without prompts.	1.75	-0.49
Insists on routines for transitions (e.g., when parents drop-off the child at the center).	1.82	-0.31
Carries out a classroom routine, without prompts (e.g., putting coat in cubby).	2.41	-0.01
Comforts self by engaging in calming/soothing activities some of the time.	2.37	0.01

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TABLE 38 – Continued
3-5 years: G3 Social and Emotional Development

3-5 years: G3 Social and Emotional Development	IRT Parameter Estimates	
	Discrimination	Difficulty
Responds appropriately to greeting by familiar peers.	2.12	-2.00
Initiates greeting of familiar peers.	2.14	-1.27
Says, signs, or gestures the names of friends.	3.27	-0.84
Verbally or nonverbally invites a peer to play.	2.83	-0.49
Plays without disrupting or destroying the work of others.	2.39	-0.11
Recognizes the impact of his/her actions on others' feelings.	2.52	-0.05
Sustains a cooperative participation with others.	1.17	0.19
Begins to recognize that others smile when they smile, and others look unhappy when they cry.	2.46	0.29
Expresses encouragement in a variety of ways (e.g., clapping, cheering).	2.24	0.29
Joins a cooperative play activity using appropriate verbal/nonverbal strategies.	2.60	0.32
Chooses to express self to others safely/respectfully in calm situations.	3.18	0.42
Respects the rights of others.	2.07	0.55
Usually recognizes that inappropriate behavior leads to consequences.	2.63	0.69
Accepts the consequences for own inappropriate behavior most of the time.	2.22	0.69
Recognizes inappropriate behavioral choices of self most of the time.	2.77	0.79
Chooses to express self to others safely/respectfully in difficult situations.	2.94	0.93
Expresses empathy or caring for others by consoling, comforting, or helping.	2.12	1.02

(The row label **Building Social Relationships** spans the left category column.)

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TABLE 39
3-5 years: G3 Social Studies

3-5 years: G3 Social Studies		IRT Parameter Estimates	
		Discrimination	Difficulty
Discovering Family	Shares personal family stories and traditions.	0.84	-2.87
	Identifies family members and relationship to each.	1.78	-0.89
	Tells each family member's duties or responsibilities in the household. (e.g., who cooks, who does laundry).	1.89	0.70
Participating in the Classroom Community	Demonstrates cooperative behaviors such as helping, turn-taking, sharing, comforting, and compromising.	1.36	-0.86
	Demonstrates increasing ability to make independent choices.	2.17	-0.03
	Engages in problem-solving behavior with diminishing support from adults (e.g., negotiating roles in play).	2.30	1.34
	Demonstrates increasing ability to follow through on plans.	1.97	1.40
	Demonstrates awareness of the outcomes of one's own choices.	1.93	1.68
Exploring the Greater Community	Describes or illustrates the roles/responsibilities of community workers.	1.68	0.14
	Signs, gestures, or talks about neighborhood resources (library, post office).	2.80	0.52
	Tells why cars and people need to stop at red lights.	2.49	0.74
	Identifies landmarks to describe location of residence or school (e.g., school is by the store).	2.87	1.46
	Differentiates the United States flag from other flags by pointing.	1.87	2.02

TABLE 39 – Continued
3-5 years: G3 Social Studies

3-5 years: G3 Social Studies		IRT Parameter Estimates	
		Discrimination	Difficulty
Looking at Spatial Representation and Map Skills	Demonstrates and uses terms related to location, direction, and distance.	1.75	0.80
	Demonstrates an understanding of how to get around in familiar environments such as home, neighborhood, or school, under supervision.	3.10	1.21
	Describes and represents the inside and outside of familiar environments such as home, school, or playground.	3.37	1.29
	Demonstrates the ways that streets and buildings can be identified by symbols, such as letters, numbers or logos (e.g., addresses, street signs).	2.58	2.28
	Demonstrates how maps can be useful to finding places such as streets, homes, and places to visit.	2.08	2.80
Examining the Environment	Identifies road by pointing.	2.15	0.05
	Identifies school building by pointing.	1.56	0.59
	Identifies trees and flowers in real world or in pictures.	2.02	0.72
	Recognizes and names the immediate surroundings of home following supervised explorations (e.g., water to drink, dirt to plant).	3.28	0.98
	Names animals that live in neighborhood (e.g., birds, ants, raccoons, coyotes, snakes).	1.88	1.48
	Identifies land formations around school yard (e.g., mountains, hills).	2.80	1.76
	Identifies that animals live in plants (e.g., birds nest in trees or cacti).	1.93	2.04
	Draws/talks about plants, animals, and people who live or use a specific place (e.g., ocean, forest, desert).	1.73	2.35

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TABLE 39 – Continued
3-5 years: G3 Social Studies

3-5 years: G3 Social Studies		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Conserving Resources	**Throws trash in garbage can.**	1.53	-1.22
	Points out recycling container in the classroom.	1.98	1.46
	Tells what goes into the recycling container in the classroom.	2.31	1.88
	Makes use of used materials when possible (e.g., scratch paper, uses both front and back of paper).	1.80	2.07
	Tells adult why putting trash in garbage cans is good for the environment (e.g., trash can hurt animals, trash can clog streams).	2.21	2.70
	Describes what recycling is.	1.76	3.04
	Tells why recycling is important (e.g., saves trees, trash doesn't take up space in dumps).	2.00	3.05
Talking about the Past, Present, and Future	**Begins to use or respond to the language of time such as related to daily routines or schedules.**	2.30	0.16
	Begins to use the language of time (e.g., day, night, yesterday, today, tomorrow).	2.29	0.86
	Identifies events that might occur in the future.	2.03	1.77
	Labels days by function (e.g., school day, field trip day).	2.21	1.82
	Predicts future career or what life will be like as an adult (e.g., "I will be a fireman when I grow up.").	1.58	2.27
	Shares episodes of personal history from birth to present, through personal memorabilia or connected to stories.	2.15	2.33
	Arranges sequences of personal and shared events through pictures, growth charts, and other media.	2.38	2.74

TABLE 39 – Continued
3-5 years: G3 Social Studies

3-5 years: G3 Social Studies		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Respecting Diversity	**Shows recognition of and respect for differences between genders.**	3.05	0.83
	Shows respect for those with special needs.	2.80	1.11
	Shows respect for members of different cultures.	1.64	1.57
	Tells one way a classmate is like him/herself (e.g., we both have brown eyes).	1.89	1.74
	Shows respect for varying family structures.	1.73	1.81

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TABLE 40
3-5 years: Galileo School Readiness

3-5 years: Galileo School Readiness	IRT Parameter Estimates	
	Discrimination	Difficulty
Cognition and General Knowledge		
Counts to find how many are in a group up to 5. (G3 Early Math)	1.20	-1.10
Demonstrates cooperative behaviors such as helping, turn-taking, sharing, comforting, and compromising. (G3 Social Studies)	1.27	-0.77
Sorts diverse objects based on a physical attribute (e.g., shape). (G3 Early Math)	1.03	-0.74
Begins to use the language of time (e.g., day, night, yesterday, today, tomorrow). (G3 Social Studies)	1.35	0.00
Begins to use or respond to the language of time such as related to daily routines or schedules. (G3 Social Studies)	1.06	0.02
Uses dramatic play to make-believe with objects (e.g., cooking an egg). (G3 Logic and Reasoning)	1.48	0.12
Describes or illustrates the roles/responsibilities of community workers. (G3 Social Studies)	1.19	0.16
Counts to find how many are in a group up to 10. (G3 Early Math)	1.19	0.20
Predicts which way a scale will tip when a weight is added to one side. (G3 Nature and Science)	0.61	0.26
Predicts what might come next in a life cycle sequence (e.g., seed to plant). (G3 Nature and Science)	1.44	0.73
Counts forward from a number > 1 to find how many are in a group.(G3 Early Math)	1.09	0.74
Demonstrates and uses terms related to location, direction, and distance. (G3 Social Studies)	0.95	0.86
Uses concrete materials to solve a problem (e.g., blocks to count). (G3 Logic and Reasoning)	2.10	0.96

TABLE 40 – Continued
3-5 years: Galileo School Readiness

3-5 years: Galileo School Readiness		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Cognition and General Knowledge	Tells each family member's duties or responsibilities in the household. (e.g., who cooks, who does laundry). (G3 Social Studies)	1.30	1.04
	Provides an explanation for why an event/outcome occurred (e.g., flower wilted). (G3 Nature and Science)	2.51	1.17
	Separates a group into two sets and identifies the number of items in both sets. (G3 Early Math)	0.35	1.18
	Provides rationale for sorting objects into specific groups (e.g., all flat). (G3 Logic and Reasoning)	2.42	1.22
	Predicts direction of an object when acted upon directly (e.g., thrown, pushed). (G3 Nature and Science)	3.44	1.29
	Uses tools to measure materials and make comparisons (e.g., scales, rulers). (G3 Nature and Science)	1.16	1.34
	Classifies objects into living and non-living categories. (G3 Nature and Science)	2.38	1.34
	Acknowledges a difference between pretend game and the reality of the classroom. (G3 Logic and Reasoning)	1.35	1.54
	Indicates how many are left after taking one from a small group. (G3 Early Math)	2.01	1.79
	Adds two small groups by combining the groups and counting all the objects. (G3 Early Math)	2.44	1.83
	Provides two explanations for why an event/outcome occurred (e.g., birds left). (G3 Nature and Science)	3.30	1.85
	Asks "What will happen if" questions to help predict a future event. (G3 Nature and Science)	1.86	2.08

TABLE 40 – Continued
3-5 years: Galileo School Readiness

3-5 years: Galileo School Readiness		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Cognition and General Knowledge	Uses non-standard units (e.g., paper clips) to measure length. (G3 Early Math)	0.95	2.18
	Tries to explain results of an experiment (e.g., bigger sponge holds more water). (G3 Nature and Science)	1.75	2.83
	Presents observations in a variety of ways (e.g., drawings, charts, maps). (G3 Nature and Science)	1.80	2.84
	Writes numerals to indicate 6 or less objects. (G3 Early Math)	1.54	2.91
	Writes numerals to indicate between 7 and 10 objects. (G3 Early Math)	1.88	3.17
	Writes numerals to indicate between 11 and 20 objects. (G3 Early Math)	1.76	3.36
Language and Literacy	Understands nouns commonly found in books for young children. (G3 Language)	1.75	-1.94
	Understands action words (e.g., give, run). (G3 Language)	1.69	-1.54
	Uses scribble on paper to communicate a message. (G3 Literacy)	1.19	-1.54
	Uses picture cues to tell what is happening in a story. (G3 Literacy)	1.59	-1.33
	Demonstrates basic book knowledge (e.g., holding book upright, turning pages right left). (G3 Literacy)	1.25	-1.00
	Communicates by scribbling and with some letter-like shapes. (G3 Literacy)	2.27	0.16
	Predicts story events using picture or verbal cues. (G3 Literacy)	2.03	0.27

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TABLE 40 – Continued
3-5 years: Galileo School Readiness

3-5 years: Galileo School Readiness		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Language and Literacy	**Asks questions and/or makes comments about a story, poem, or song. (G3 Language)**	1.46	0.32
	Retells a familiar story, poem or song in his/her own words. (G3 Language)	1.04	0.51
	Recognizes matching and dissimilar sounds of consonants and vowels. (G3 Literacy)	0.80	0.51
	Recognizes that a spoken word/speech can be written and read. (G3 Literacy)	1.93	0.51
	Understands positional words (e.g., top, bottom, on, in). (G3 Language)	1.40	0.53
	Says both syllables of a two-syllable word, with distinct separation. (G3 Literacy)	1.85	0.72
	Identifies all the letters in her/his name. (G3 Literacy)	1.49	0.84
	Knows that print conveys information to the reader (e.g., a message, facts, how to do something). (G3 Literacy)	1.89	0.85
	Copies her/his name from a sample. (G3 Literacy)	1.55	0.97
	Points to and names the first letter in familiar words. (G3 Literacy)	2.42	1.22
	Names 10 or more letters. (G3 Literacy)	1.61	1.57
	Write her/his name, without assistance. (G3 Literacy)	1.58	1.58
	Recognizes rhymes in poems, readings, or conversation, most of the time. (G3 Literacy)	2.16	1.64
	Reads a printed label or a sign on a familiar object, some of the time. (G3 Literacy)	2.42	2.25
	Recognizes that pages are read from top to bottom. (G3 Literacy)	0.61	2.80

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TABLE 40 – Continued
3-5 years: Galileo School Readiness

3-5 years: Galileo School Readiness		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Language and Literacy	Requests a favorite book by title, author, or illustrator. (G3 Literacy)	1.07	2.95
	Reads familiar words in a sentence from a book/poem, with assistance. (G3 Literacy)	2.31	2.96
	Puts sounds together to make short words (e.g., k-a-t, cat). (G3 Literacy)	1.93	2.97
	Segments short words into their component sounds (e.g., trick, t-r-i-k). (G3 Literacy)	1.82	3.22
	Recognizes that sentences are read from left to right (G3 Literacy)	0.42	3.39
Approaches to Learning	Takes turns playing with a toy or object (G3 Approaches to Learning)	1.12	-1.20
	Sings or hums familiar songs or tunes. (G3 Creative Arts)	1.72	-0.59
	Uses movement to express what is being felt/heard in various songs or tunes. (G3 Creative Arts)	2.08	-0.39
	Combines materials, objects, equipment in new ways to produce multiple uses. (G3 Approaches to Learning)	1.91	0.06
	Draws representations of human and animal figures. (G3 Creative Arts)	1.97	0.29
	Uses dramatic play to practice cooperation (e.g., who sets table, cooks). (G3 Creative Arts)	1.83	0.89
	Sets a goal, and with adult help, plans a small number of steps to achieve it. (G3 Approaches to Learning)	3.85	1.20
	Asks questions to find out about topics presented in the classroom (e.g. who, what, where, why, or how). (G3 Approaches to Learning)	1.28	1.37
	Revises, with adult help, a plan that has not produced the intended result. (G3 Approaches to Learning)	2.84	1.59

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TABLE 40 – Continued
3-5 years: Galileo School Readiness

3-5 years: Galileo School Readiness	IRT Parameter Estimates	
	Discrimination	**Difficulty**
Physical Development and Health — Completes bathroom activities (clothing up/down, wiping, flushing) independently. (G3 Physical Development & Health)	1.30	-1.80
Independently selects and eats a variety of food types. (G3 Physical Development & Health)	0.86	-1.71
Participates actively in outdoor group games (e.g., kickball). (G3 Physical Development & Health)	0.87	-0.95
Climbs up and down stairs. (G3 Physical Development & Health)	1.64	-0.77
Climbs a short ladder (e.g., on playground toys). (G3 Physical Development & Health)	1.12	-0.52
Correctly holds a pencil or crayon. (G3 Physical Development & Health)	0.66	-0.01
Follows fire safety/fire drill rules, without assistance. (G3 Physical Development & Health)	0.52	0.26
Requests or initiates hand washing when needed (e.g., before eating). (G3 Physical Development & Health)	1.29	0.51
Uses computer keyboard/mouse for writing/drawing, without assistance. (G3 Physical Development & Health)	1.71	0.93
Identifies examples of foods that are healthy. (G3 Physical Development & Health)	2.12	0.98
Tells why classroom rules are important (e.g., walk in the classroom, keep hands and feet to oneself). (G3 Physical Development & Health)	1.79	1.30
Knows to stay away from harmful objects (e.g., broken glass, holes, rusty iron). (G3 Physical Development & Health)	0.74	1.37

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TABLE 40 – Continued
3-5 years: Galileo School Readiness

3-5 years: Galileo School Readiness		IRT Parameter Estimates	
		Discrimination	**Difficulty**
Physical Development and Health	Skips with direction and control, most of the time. (G3 Physical Development & Health)	1.95	1.61
	Identifies potentially dangerous situations/activities, without assistance. (G3 Physical Development & Health)	1.62	1.81
	Uses scissors to cut out a pre-formed simple shape. (G3 Physical Development & Health)	1.17	1.87
Social and Emotional Development	Follows established rules and routines in the classroom. (G3 Social and Emotional Development)	1.10	-1.82
	Carries out a classroom routine, without prompts (e.g., putting coat in cubby). (G3 Social and Emotional Development)	1.40	0.25
	Plays without disrupting or destroying the work of others. (G3 Social and Emotional Development)	1.45	0.57
	Joins a cooperative play activity using appropriate verbal/nonverbal strategies. (G3 Social and Emotional Development)	1.55	0.89
	Chooses to express self to others safely/respectfully in calm situations. (G3 Social and Emotional Development)	1.89	0.91
	Shows the ability to compromise in conflict resolution. (G3 Social and Emotional Development)	1.37	2.00

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