Utah Education Policy Center

# H.B. 513 Early Intervention Program

## Evaluation Report

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# Introduction

This evaluation report provides an overview of the implementation and outcomes associated with the adaptive learning technology, H.B. 513 Early Intervention Program that was approved during the 2012 Utah legislative session. The H.B. 513 Early Intervention Program allocated $2,500,000 to school districts and charter schools across the state to purchase adaptive learning technology software that would target kindergarten and first grade students believed to be, or having the potential to be, "at-risk" in the areas of reading, math, or science. Districts and charter schools submitted requests for funding to the Utah State Office of Education (USOE) in September of 2012, and the program was initiated at varying times in schools during the 2012-13 academic year.

## Purpose of Evaluation

The Utah Education Policy Center conducted an evaluation of the first year of implementation of this new program at the request of the USOE. The purpose of the evaluation was to describe the implementation of the H.B. 513 Early Intervention Program and to document associated outcomes.

This report is intended to be used by state, district, and school employees to improve the quality and effectiveness of classroom instruction by providing information about the use and role of the H.B. 513 Early Intervention Program and associated software used in early childhood education in Utah. Further, this report offers specific recommendations for improving utilization of the software, including how data are collected and analyzed in subsequent evaluations of early intervention programs in Utah.

We begin with a brief overview of the program, followed by a review of the literature on the effectiveness of computer assisted instructional software. We then provide an overview of the evaluation study, including the methods that were used to answer the evaluation questions. We then discuss the findings followed by the conclusions, which include recommendations for future implementation of early intervention programs that rely on use of computer assisted instructional software.

## Program Overview

Through a request for proposals process, the USOE identified five vendors and seven computer software programs that districts and charter schools could select for use. Five of the seven software programs are focused on literacy development and two are focused on math programs. Of the 32,237 original requests for software licenses from districts and charter schools, 28,646 (89%) were for reading software and 3,591 (11%) were for math software. School districts and charters submitted their requests for funding to implement the program in September of 2012 and the program was initiated in 277 schools across 28 districts and 22 charter schools during the 2012-13 academic year. The focus of this report follows the critical mass of implementation, which was on literacy development.

# Literature Review

## Use of Electronic Technology in Educational Contexts

Far beyond all other species, humans have mastered the ability to convert natural resources into useful tools. These useful tools are what we refer to as technology and it is no surprise that various technologies have made their way into the classroom for the purpose of promoting learning objectives. As education became formalized, we have seen technologies that include scrolls, the abacus, chalkboards, pencils, books, and calculators used as educational tools. In contemporary times, computers and related electronic devices have become what we often think of as technology within educational contexts.

During the 1960s, the first hint of computer use in classrooms emerged (Hartley, 2010). By 1970, the perspectives of developmental psychologist Jean Piaget had influenced Seymour Papert to create an influential form of computer based technologies for student use (http://www.edutopia.org/technology-integration-history). Papert's computer program allowed students to interact with computers to learn principles of geometry. Later in that same decade and moving into the 1980's, the first mainframe-based system emerged. This system, known as PLATO (Programmed Logic for Automated Teaching Operations) allowed multiple users to connect at the same time (Woolley, 1994).

Since the time of early electronic educational programs, electronic technology has increasingly become a part of our everyday lives. Given the ubiquitous growth and use of electronic communications and media devices, it is no surprise that the use of such devices has remained relevant in educational contexts. Shattuck (2007) identified that an educational technology movement began in the 1990's and, by all accounts, has only gained strength. However, the integration of electronic technologies into the classroom has not been without its critiques and challenges (see Hokanson & Hooper, 2000).

In order for educators to use electronic technology successfully in classrooms, several factors must be in place. While the actual physical resources of hardware and software must be present, the effectiveness of these tools depends on the ways in which they are utilized and integrated within classrooms by teachers. Adams (2003) refers to this component as *underware*, which he suggested is the pedagogy that underpins the use of the hardware and software. Similarly, the notion that teachers and their attitudes, beliefs, and abilities affect the use of technology in the classroom has been documented by many authors (Buadeng-Andoh, 2012; Christmann & Badgett, 2003; Lovell & Phillips, 2009). However, it is not just the teachers that influence the use of technology in classrooms, but also conditions at the school (Macaruso & Walker, 2008). The support of school leadership, professional development, and having IT support are examples of school-level support that can influence the integration of technology in the classroom (Buadeng-Andoh, 2012).

There are many electronic technologies that are now utilized by teachers to support learning in classrooms, but this report will focus on a specific type of technology, computer software programs that are designed to be instructional. It is a goal of this report to examine the research literature and reach conclusions about the effectiveness of instructional computer programs and to determine what key features, if any, researchers have identified that make them most effective. Complicating any review of literature related to the use and effectiveness of such technology is the wide range of terms used to describe them. Gibbs, Graves, and Bernas (2001) referred to these types of software programs as Multimedia Instructional Courseware (MIC) and described them as "software developed for the purpose of providing instruction" (p 1). Adams (2003) chose the term Computer-based Learning (CBL) and explained that CBL is the "use of a computer for the purposes of helping people to learn" (p. 5). Additionally, authors have referred to similar software programs as multimedia software (Karemaker, Pitchford, & O'Malley, 2010), Computer-assisted Learning software (CAL) (Hartley, 2010; Schar & Krueger, 2000), and Computer-based Instruction software (CBI) (Hannafin & Rieber, 1989), among others.

While the examples above largely represent attempts to describe an instructional class of computer software programs generally, some authors have also used these and other terms for the purpose of precisely identifying features of the software programs that they studied. Examples of terminology used to describe specific programs is represented in the work of Tracey and Young (2007), who referred to Waterford Early Reading Program (WERP) software as an Integrated Learning System (ILS), which "refers to a software package that includes content that is individualized to the child's learning needs and an assessment system that provides information to the teacher regarding each child's progress with the program" (p. 447). Similarly, Longberg (2012) referred to Imagine Learning software as ILS and identified sequential instruction as a defining feature of ILS programs. In this report, we refer to the general group of computer software programs that are designed to be instructional as Computer Assisted Instruction (CAI) programs (e.g., Bishop & Santoro, 2006; Blok, Oostdam, Otter, & Overmaat, 2002; Christmann & Badgett, 2003; Macaruso & Walker, 2008) and will use the specific name of individual software programs where appropriate.

## Computer Assisted Instruction

Computer Assisted Instruction is one tool that many educators have embraced as a means to support early literacy development in general, and students who are considered at-risk of having difficulty learning to read, specifically. There is widespread consensus that children who do not learn to read are at greater risk of developing learning issues or other problems later in life, and the early grades are critical for establishing a foundation for literacy (Bishop & Santoro, 2006; Good, Gruba, & Kaminski, 2001). Children who have reading difficulty in first grade may continue to struggle and once a child reaches third or fourth grade, it is often too late to address the reading problems that developed in previous grades. In fact, "there is an 80% probability that a poor first grade reader will still be a poor reader in the fourth grade" (Bishop & Santoro, 2006, p. 57).

Unfortunately, the potential problem identified above remains relevant within the United States. Citing a National Assessment of Education Progress report from 1995, Pindiprolu and Forbush (2009) noted that only “31 percent of the nation’s fourth grade students performed at or above proficiency levels” (p. 71). The situation is reported to be even worse among children affected by poverty (Good et al., 2001). For these reasons, students who fail to read on grade level, or who face challenges such as poverty or being an English language learner (ELL) in the early grades, are considered to be *at risk* and therefore require additional support. Early intervention strategies can be effective and the use of CAI is one early intervention strategy that schools are implementing to support at-risk students (Mioduser, Tur-Kaspa, & Leitner, 2000; Tracey & Young, 2007).

The research literature regarding CAI programs is decidedly limited, often from international sources, and authors have consistently remarked that there is a lack of evidence to support conclusions about best practices and effectiveness of such programs (Pindiprolu & Forbush, 2009). Christmann and Badgett (2003) went so far as to suggest that there is a favorability bias toward publishing studies that support the claim for effectiveness of CAI. While that accusation may or may not be justified, the studies conducted to date have yielded somewhat inconsistent results (Karemaker et al., 2010).

A number of studies have failed to find support for CAI. Larson (2007) cited several studies that did not find support for CAI programs; “Nauss (2002), Campbell (2000), and Ritchie (1999) all conducted studies that did not find computer-assisted instruction to improve reading achievement” (p. 25). In a recent dissertation, Longberg (2012) tested Imagine Learning English software and found no treatment effect regardless of time spent with the software. It remains unclear if these and other studies that have failed to find support for CAI have truly uncovered their ineffectiveness or if the reported lack of success is merely an artifact of the research designs, implementation differences, or variation in performance across unique groups of students (Christmann & Badgett, 2003).

The limited availability of quality studies, small sample sizes, variation in methods, variation in implementation, and low reported effect sizes are all common among investigations into the effectiveness of CAI (Blok et al., 2002; Karemaker et al., 2010). For example, Blok et al. (2002) analyzed 42 studies as part of a meta-analysis and deemed most of those studies to be of low quality. The same authors noted that CAI programs can be effective, but also cautioned that the studies included in their analysis reported very small effect sizes. Lovell and Phillips (2009) stated that “few studies examine different methods of integration, the extent of technology integration, or suitability of authorized software programs for teaching reading or writing in mainstream classrooms” (p. 198). As each CAI program gets studied one at a time, conclusions about the overall effectiveness of CAI become difficult to reach because each study includes varied samples of students and potentially inconsistent fidelity to the programs, and they examine software programs with wide-ranging features (Larson, 2007). Despite these caveats, there is also evidence that CAI is effective.

Christmann and Badgett (2003) conducted a meta-analysis of 39 studies and reported that overall, CAI had a positive effect for elementary students. Similarly, Camacho (2002) claimed that most, but not all, published studies found support for CAI. Further evidence for effectiveness can be found in the work of Pindiprolu and Forbush (2009), who evaluated two software programs and found them both effective for improving at least one important aspect of literacy development. Likewise, Reitma and Wesseling (1998) reported the effectiveness of a CAI program that taught blending letter sounds into words. Longberg (2012) summarized the disparate reports of effectiveness in the literature by concluding that the research regarding effectiveness of CAI is presently too underdeveloped to allow for definitive conclusions.

Given the complexity and interdisciplinary nature or CAI research, it is not surprising that unanswered research questions remain. The use of each individual CAI program occurs in unique contexts that include other potentially influential variables such as the teachers' integration of the CAI program and the preliteracy or literacy skills of each student (Larson, 2007). For example, Sang, Valcke, Braak, Tondeur, & Zhu (2011) determined that use of technology in the classroom depends on teachers' motivation and beliefs. Christmann and Badgett (2003) suggested that computers are being integrated with disregard for the requisite infrastructure of teacher attitudes, teacher preparation, administrative support, and student characteristics. They recommended that "educators should have a solid, empirically-based understanding of the optimal usages of CAI" (p. 92).

The role of the classroom teacher in the use of CAI should not be underestimated. Unfortunately, there is no consensus on the measurement of teacher integration of technology (Hsu, 2010) and practitioners appear to be adopting programs without fully understanding their potential for effectiveness (Pindiprolu & Forbush, 2009). Macuruso and Walker (2008) agreed that classroom controls such as teacher and other classroom variables are rarely accounted for, but should be due to their influence on effectiveness.

Further complicating matters is the interdisciplinary nature of CAI (Bishop & Santoro, 2006). Longberg (2012) observed that CAI engages three bodies of literature: literacy development, intervention strategies for ELL, and CAI. The complexity and interdisciplinary nature of this work has presumably caused some difficulty in the design and implementation of research projects. Karemaker et al. (2010) remarked that literacy development is generally divided into several components, but many CAI studies have taken broad, comprehensive approaches to testing the effectiveness of software programs. It may be difficult to avoid this situation of interdisciplinary complexity because the most effective programs must implement sound literacy theory integrated through the highest level of computer functionality.

We offer the following table (Table 1) of conclusions about current computer assisted instruction research and provide some considerations that researchers have noted from their reviews of existing studies:

**Table 1. Conclusions and Considerations for CAI Research**

| Conclusions about CAI research | Considerations for CAI research |
|---|---|
| • Some studies have failed to find support for CAI, while others have documented positive outcomes. | • Teachers and other classroom variables are rarely accounted for, but should be due to their influence on effectiveness. |
| • There is a lack of evidence to support conclusions about best practices and effectiveness. | • Current studies often have small sample sizes and variations in methods, which diminish their quality. |
| • The research regarding effectiveness of CAI is presently too underdeveloped to allow for definitive conclusions. Many unanswered research questions remain. | • CAI is inherently interdisciplinary, engaging three main bodies of literature: literacy development, intervention strategies for ELL, and CAI. |
| | • Current research includes programs implemented with widely varied fidelity, programs with wide-ranging features and samples of students with varied characteristics that often go unaccounted for. |

## What makes CAI Effective?

Along with the caveats and challenges identified above, authors have noted a number of key features that presumably contribute to the effectiveness of CAI programs. *As instructional tools, the best CAI programs are designed in response to established learning theory and they offer students the opportunity to interact with context specific curriculum (see Lovell & Phillips, 2009).* For example, Grover (1986) tested the effectiveness of software programs that were designed based on cognitive development principles against those that were not and reported that the theory-based software outperformed the alternative. Similarly, Bishop and Santoro (2006) emphasized the need for "applying proven reading teaching principles" (p. 58).

Provided a strong theoretical foundation is in place, it is the functional features that allow a software program to be classified as instructional (Karemaker et al., 2010). This section will focus first on the conclusions that researchers and authors have made regarding the content that should be included in CAI software programs, and secondly on the functional features that make CAI programs effective instructional tools. We begin with a brief consideration of literacy development, which will establish key content features.

### Literacy Development

Depending on one's perspective, accounts of how we learn to read can be varied and there are numerous empirical tests of theories that have verified effective explanations for literacy development. Some perspectives conceptualize literacy as an outcome of successfully mastering a variety of intermediate skills such as phonological awareness and knowing about letters, while others focus on the central importance of one's ability to make meaning of letters and words (Snow, 2006; Xue & Meisels, 2004). While one perspective views learning to read as an inherently solitary act, another focuses on the social nature and value of reading (Snow, 2006). These and other contemporary beliefs about the circumstances through which we learn how to read influence curriculum and the instructional decisions of teachers and software developers alike. While it is beyond the scope of this report to provide a comprehensive review of literacy development literature, we provide here a very brief overview in order to establish some key aspects of literacy development.

Regardless of one's beliefs about how we learn to read, it is worth recognizing that modern, conventional approaches to literacy development focus on developing particular skills and subskills. Researchers have identified these sets of skills through years of studies that identified components of literacy development that most consistently and successfully predict literacy (Snow, 2006). For example, the ability to recognize written words is believed to be the foundation of reading (Karemaker et al., 2010). Blok et al., (2002) suggested that the most important subskills for learning to read are phonological awareness, letter identification with letter sound association, word identification and recognition, and text reading. In one summary of early literacy intervention, Longberg (2012) concluded that decoding (phonics & phonemic awareness) and language comprehension are critical to reading successfully.

Phonological awareness is often recognized as one of the most important foundational steps to learning how to read, as it is generally believed to be a critical aspect of achieving early literacy skills (Crim et al., 2008; Macaruso & Walker, 2008). Phonological awareness is the ability to analyze the sound structure of words through the use of syllables, sound segmenting, and blending (Macaruso & Walker, 2008). Phonemic awareness and phonics are decoding subskills that one must acquire in order to learn to read (Xue & Meisels, 2004). Hence, subskills such as learning the alphabet and the relationships of sounds with letters are important (Xue & Meisels, 2004).

One pair of authors summed up literacy development research by suggesting that the best way to achieve early literacy is to have a strong foundation in systematic phonics, as well as focusing on the process of meaning making in reading and writing (Xue & Meisels, 2004). This conclusion is reflected elsewhere in the literature. Pindiprolu and Forbush (2009) cited a National Reading Panel (NRP) study that promoted five key reading components, including phonemic awareness, phonics, fluency, vocabulary, and comprehension. These same features appear in the work of Larson (2007), who identified these same five components as the best practices in literacy and reading. Again, Tracy and Young (2007) named instruction and practice in phonics, phonemic awareness, vocabulary, fluency, and comprehension as the effective features of early literacy that should receive attention.

## Key Features of Computer Assisted Instruction

Learning how to read is a complex task that involves many steps and engages a number of cognitive processes (Mioduser et al., 2000). It is not surprising to find variation in the capacity to learn to read from one student to another (Pindiprolu & Forbush, 2009). However, this poses a problem for teachers who are attending to the needs of many students. Whole class teaching cannot meet the needs of all students, and interactive multimedia, such as CAI, can provide learner-specific opportunities for practice (Karemaker et al., 2010). As such, offering individualized instruction is one important way that CAI is believed to help students who are at risk. This is important because individualization matches students' needs with software features, and therefore the curriculum content, that is most relevant to their immediate needs (Lovell & Phillips, 2009).

As a feature of CAI, individualized instruction is commonly expressed as *adaptive feedback* (Adams, 2003). In the software programs that are deemed most effective, this type of feedback is not static; it is used to guide students through the curriculum and is what makes the software adaptive (Bishop & Santoro, 2006; Lovell & Phillips, 2009). Feedback should be constructive and should allow students to make corrections to wrong answers and/or should offer learners control in moving through content (Adams, 2003). Feedback is very important for readers who are struggling (Larson, 2007). The best type of feedback facilitates opportunities for students to focus on content suited to their immediate needs. If students have mastered content, they advance through the curriculum; if not, they receive more practice (Bishop & Santoro, 2006). This type of adaptive feedback is recognized throughout the literature as a key feature of the most effective CAI programs, but there are other features that researchers have also documented as effective.

Although high quality experimental designs that test the effectiveness of CAI features are limited in number and quality, some experimental studies have made recommendations regarding effectiveness. We identify such studies as either related to content (literacy development) or functionality of the CAI software program. Empirical studies add further support to the literacy development content features identified above. For example, Mioduser et al. (2000) assigned students to one of three study groups with one of the treatment groups including CAI. The group that used CAI software saw the greatest gains in phonological awareness, word recognition, and letter naming. They emphasized the need for students to associate letters and sounds through interactive audio and determined that motivational value of the software programs was an additional important feature. Tracey and Young (2007) conducted an experiment that tested the Waterford Early Reading Program (WERP) and found that children in the treatment group performed significantly better than the control group on two of three measures. The version of WERP used in their study focuses on automatic letter recognition, phonemic awareness, vocabulary and comprehension.

Key features of functionality have also been identified through empirical research. Macaruso and Walker (2008) conducted an experiment that compared traditional instruction against an experimental group that used a CAI phonological awareness program. All of the students had the same classroom teacher. The researchers concluded that the CAI group experienced significant gains in phonological awareness skills, which was consistent with previous findings of Macuruso, Hook, and McCabe (2006).  Not surprisingly, children who had the lowest pretest scores achieved the greatest gains. The CAI programs from the Macuruso and Walker study offered specific features, such as pictorial displays, that provided positive feedback and contributed to children's interest in CAI. Such features allowed children to practice at their own pace. Commenting on Macuruso and Walker's study, Lovell & Phillips (2009) said that these CAI programs "targeted specific skills in sequence, offered feedback to students and teachers, and automatically branched to address remediation activities as required" (p. 200).

Literature reviews have pointed out a number of key features for CAI software programs. According to Grover (1986), the features of the more effective programs included cues for coordination between keyboard and screen, meaningfully presented instructional materials (graphic displays), the nature of the feedback, and the use of reinforcement. Larson (2007) pointed out the importance of feedback, interactivity, and encouragement as best practices. In the literature that framed Mioduser and colleagues' (2000) study, they identified digitized speech (associating letter forms and sounds), selection of letters or words and hearing the sounds (touch screens), drill generation, and individualization as critical features.

In addition to the studies and recommendations for best practices cited above, authors have made recommendations about the key features to consider when evaluating CAI software. For example, Gibbs et al. (2001) reviewed a number of approaches to evaluating software and used a Delphi approach to narrow 91 criteria down to 14 categories, but their work offered limited recommendations that were not utilized in future work by researchers who asked similar research questions. The work of Good et al. (2001) provided guidance regarding the use of Dynamic Indicators of Basic Early Literacy Skills (DIBELS) to assess literacy development. In doing so, they named phonological awareness, alphabetic principles, and accuracy and fluency as three criteria that should be used to assess early literacy. These three criteria appear in both the literacy and CAI literatures.

Perhaps the most directly useful work is that of Bishop and Santoro (2006), who recommended that interface design, content, and instructional design are three ideal categories for evaluating CAI software. Each category was accompanied by an additional explanation that further specified important features to evaluate. The software's interface should be easy to use and should offer an accessible entry point in such a way that unnecessary demands are not placed on the user. Content should focus on phonological awareness and alphabetic understanding. Instructional design should include systematic functionality, instructional support, assessment of the learners' progress, and should be motivating. They indicated that supplemental structured practice, applying reading principles systematically, and feedback are three features in particular that can help at-risk students.

Lovell and Phillips (2009) used quality of the software design, skills taught, and instructional soundness as three areas on which to evaluate CAI programs to test the suitability of 13 reading and writing software programs for primary grades. They deemed a program non-instructional if it failed to track student progress, provide feedback, or adapt based on student responses. Lovell and Phillips essentially adopted Bishop & Santoro's (2005) framework. Karemaker et al. (2010) proclaimed that effectiveness depends on the features and functionality of the software.

From the above literature review, we offer the following Table 2 as a summary of the essential components of CAI and the components of the software programs associated with Utah's H.B. 513 early intervention program. Like Lovell and Phillips, we rely heavily on the work of Bishop and Santoro, but in an effort to simplify the presentation of features, we collapsed the three categories into content and functionality. In some cases these categories are not entirely discrete. The sequential nature of the content, for example, overlaps both categories.

**Table 2. Summary of Essential CAI Components**

| Content | Functionality |
|---|---|
| • Theoretical foundation | • Sequential & systematic presentation of content |
| • Instruction in Phonological awareness | • Individualized Instruction through adaptive feedback |
| • Instruction in Phonics | • Assessment system that tracks student progress |
| • Instruction in Fluency | • Assessment information is available to teachers |
| • Instruction in Vocabulary | • Quality graphic and audio displays |
| • Instruction in Comprehension | • Motivational instruction support |

The list of content and functionality features displayed above is not comprehensive; however, it does represent many key features that have been associated with effective CAI software programs. In choosing potentially effective CAI software programs, one might consider the extent to which these features are present. Such an approach might include ratings of quality for each feature and would include a range of scale points in order to assess the variability among the programs, as each software program may offer more or less of some features than others. One problem with such a scale would be the subjectivity of the reviewer. Overcoming that problem would require the development of a detailed rubric. In our review of the literature we did not find such a pre-existing scale and developing one is beyond the scope of this project. Therefore, we offer the following brief explanation of the alignment of the CAI software programs adopted for H.B. 513 for 2012-13 with the recommendations from the literature.

The responses to the RFP served as the primary data source to determine whether or not the content and functionality features were present within the software. These documents provided an explanation of the software's effectiveness, content, and functionality, among other things. The UEPC did not set out to conduct an assessment of the software features. If the vendor documents claimed that the features were present, we accepted them as being present. Interested readers are encouraged to consult the responses to the RFP and other documents cited in this report if they wish to become more familiar with specific software features and nuances across vendors and software programs.

**We concluded that, to some degree, each of the CAI software programs adopted for H.B. 513 included all of the content and functionality features that were identified in the literature** and displayed in Table 2**.** In some cases a vendor's software may not have named the specific content feature, but still included it, either by using a different name for the feature, or simply in reporting the way that the software functioned. For example, Curriculum Associates does not name fluency as a content feature that is addressed in the software program. However, their program offers additional practice in learning high-frequency words and we concluded that fluency is addressed as students make their way through the content of the program. Similarly, Voyager includes high-frequency words and sufficient features to account for fluency. Imagine Learning offers the additional categories of songs and chants, conversation, read-alongs, letter recognition, and beginning reading. These topics, combined with the other features, covered the content areas of phonics and fluency, even though they are not named as such. Waterford includes an additional feature called language concepts. **Each of the vendors noted their reliance on literacy development theory, which provided additional evidence that they included the content features identified in the literature.**

The key functionality features were also reported to varying degrees. All of the vendors offered the standards of adaptive presentation of content, feedback, and student progress reporting features that allowed teachers to choose various ways of viewing student progress and performance. Some vendors emphasize particular functionality features over others, which may help to identify distinctions between their products. For example, the Voyager software, Ticket to Read, prides itself on a motivational component as students collect rewards while they move through the content.

Having now provided brief explanations of the use of electronic technology in educational contexts, computer assisted instruction, and the potential effectiveness of computer assisted instruction, the following section will explain the methods used to answer the evaluation questions associated with the Early Intervention Program that was implemented throughout Utah during the 2012-13 academic year. This section begins by introducing the evaluation questions and offers additional information regarding the functionality of the software programs, especially related to tracking student performance.

## Methods

The evaluation questions presented in Table 3 were developed in collaboration with a representative from the USOE, who had responsibilities for oversight on the implementation of HB 513. These questions address three areas: 1) the **context** in terms of participant characteristics and resources, 2) **implementation** in terms of support, fidelity, student use, and tracking student progress, and 3) the **outcomes** related to teacher and administrator satisfaction, student learning gains, and the relationship between the amounts of time spent working with the software programs and learning outcomes. Table 3 also identifies the data sources that were used to answer the evaluation questions. Following Table 3 is a description of the data sources, samples, and analyses.

**Table 3. Evaluation Questions and Data Sources**

| # | Evaluation Questions | Data Sources |
|---|---|---|
| **Context** | | |
| 1 | What were the characteristics of the participating schools, teachers, and students that used each program? | SIS, school survey |
| 2 | What resources did participating schools have, need, and use to implement the H.B. 513 Early Intervention Program based on the recommendations of the software providers? | school survey |
| **Implementation** | | |
| 3 | What was the nature of the training and technical support offered by vendor representatives and provided for administrators, teachers and paraprofessionals to use the H.B. 513 Early Intervention Program? | school survey |
| 4 | To what extent did the implementation of the H.B. 513 Early Intervention Program use align with the recommendations of the software providers? | school survey, vendor data |
| 5 | What was the relationship between student baseline performance (DIBELS first administration) and software usage? | SIS, vendor data, school survey |
| 6 | To what extent were the software programs user-friendly and accessible for students and teachers? | school survey |
| 7 | To what extent did the schools have adequate support (from vendors, from school staff) to utilize resources (e.g., staff, infrastructure, technology, space, time) to successfully implement the adaptive learning technologies? | school survey |
| 8 | Was the H.B. 513 Early Intervention Program used in the participating schools to support student learning and track progress, particularly with the alignment of curriculum (Utah core standards), instruction, and assessments (school improvement plans)? If so, in what ways? | school survey |
| **Outcomes** | | |

| # | Evaluation Questions | Data Sources |
|---|---|---|
| 9 | To what extent were teachers, paraprofessionals, administrators, and IT staff satisfied with the program? | school survey |
| 10 | What were the learning gains of students as reported by vendors' assessments? | vendor data |
| 11 | What was the relationship among time spent working with the software programs, demographics, and learning outcomes as measured by the vendors' assessments? | SIS, vendor data |
| 12 | What was the relationship among time spent working with the software program, demographics, and learning outcomes as measured by DIBELS? | SIS, vendor data, DIBELS |

## Data Sources, Samples, and Analyses

This subsection will introduce each of the four data sources identified in Table 3 and will provide a brief explanation of how the data sources were developed and used to answer the evaluation questions. Each data source was first analyzed for quality and then carefully prepared for descriptive and/or predictive analyses. Descriptive statistics inform the context, implementation, and selected outcomes evaluation questions. The predictive statistics inform outcome questions by exploring the relationships among software use, student characteristics, and performance outcomes. The following subsections provide brief descriptions of each of the data sources and the samples that were utilized from each data source.

### Source: School and IT Specialist Survey

The School Survey was designed specifically for the H.B. 513 project by the UEPC evaluation team. The first phase of the survey design was to carefully consider the evaluation questions and respondent groups. The primary sources for developing the survey items were the vendor responses to the Requests for Proposal (RFP), personal communications with the vendors, and research literature on computer-assisted instruction (e.g., Buadeng-Andoh, 2012; Larson, 2007; Lovell & Phillips, 2009; Ma, Andersson, & Streith, 2005). The survey was designed so that as the respondents indicated their roles in the first pages of the online survey they were routed to the appropriate set of questions for teachers or administrators. A second survey was sent directly to the Information Technology (IT) specialists at the districts and charter schools. These surveys asked respondents to respond to questions about resources, support, training, and how the software was utilized in the schools.

### *Sample: School and IT Specialist Survey*

The sampling frame for the School Survey included all schools that purchased software licenses within the H.B. 513 program. The School Survey was emailed directly to school principals with a request for them to complete the survey and to forward the electronic survey link and request to participate along to kindergarten and first grade teachers and paraprofessionals. The contact list used for the School Survey administration was provided by the USOE and contained 278 school principal contacts. Following the email request to complete the survey, principals received two reminders. In addition to those reminders, a USOE representative reminded the districts of the importance of participation in the evaluation study.

The number of respondents to the school survey is presented in Table 4. Please note that because we asked principals to forward the survey links to teachers and paraprofessionals, we do not have the number of teacher or paraprofessionals who were contacted and, therefore, we cannot calculate the response rates for these two groups. In addition, because of the low numbers of paraprofessionals who responded to this survey, we have included their responses with teacher responses for analysis purposes.

**Table 4. School Survey Response Rates**

| | Number contacted | Responses | Response Rate | Percent of Survey Respondents |
|---|---|---|---|---|
| Schools | 278 | 87 | 31% | - |
| School Administrator | 278 | 74 | 27% | 33% |
| Teacher | - | 149 | - | 67% |
| **Total** | | **223** | | **100%** |

The number of school survey respondents by vendor is presented in Table 5. This table includes all respondents to the school survey. Although the responses in Table 5 appear to represent a very unequal distribution of responses by vendors, this distribution is consistent with the number of licenses that were purchased for use in Utah schools.

**Table 5. Total Percent of School Survey Responses by Vendor**

| | Number of Survey Responses | Number of Licenses Purchased | Percent of Survey Respondents | Percent of Licenses Purchased |
|---|---|---|---|---|
| **Compass Learning** | 5 | 124 | 2% | <1% |
| **Curriculum Associates math** | 5 | 2,233 | 2% | 7% |
| **Waterford Math** | 5 | 1,294 | 2% | 4% |
| **Curriculum Associates reading** | 9 | 3,233 | 4% | 10% |
| **Waterford Reading** | 20 | 3,392 | 9% | 11% |
| **Voyager (ticket to read)** | 26 | 1,601 | 12% | 5% |
| **Imagine Learning** | 153 | 20,365 | 69% | 63% |
| **Total** | **223** | **32,242** | **100%** | **100%** |

The sampling frame for the IT Specialist Survey included the districts and charter schools that purchased software licenses through the H.B. 513 Early Intervention Program. The IT Specialist Survey was emailed directly to the IT departments that worked with software vendors and schools to implement the H.B. 513 initiative. The contact list used for the IT Specialist Survey administration was provided by the USOE and contained 65 district and charter school representatives. Following the email request to complete the survey, the IT specialists received two reminders. Final respondent numbers from the IT Specialist Survey are presented in Table 6. Please note that the contact information did not specify whether the IT specialists were school or district level employees. As such, the response rates for these two groups could not be calculated.

**Table 6. IT Specialist Survey Response Rates**

| | Number contacted | Responses | Response Rate | Percent of Survey Respondents |
|---|---|---|---|---|
| Director of Information Technology Department | - | 19 | - | 51% |
| IT Support Specialist | - | 18 | - | 49% |
| **Total** | **65** | **37** | **57%** | **100%** |

The number of IT specialist survey respondents who responded for each vendor is presented in Table 7. This table includes all respondents to the IT specialist survey.

**Table 7. Total Percent of IT Specialist Survey Responses by Vendor**

| | Responses | Percent of Survey Respondents |
|---|---|---|
| Compass Learning | 1 | 3% |
| Curriculum Associates | 2 | 5% |
| Imagine Learning | 9 | 24% |
| Waterford | 12 | 32% |
| Voyager | 13 | 35% |
| **Total** | **37** | **100%** |

Given the small number of survey responses for some vendors on both the School Survey and the IT Specialist Survey, most of the results presented are aggregated for all vendors. Readers are encouraged to consider the pattern of vendor representation presented in Table 6 and Table 7 as they interpret the results.

### *Analysis: School and IT Specialist Survey*

The School and IT Specialist Survey data were cleaned by deleting empty rows from respondents who started taking the survey but chose not to continue. Evaluators used descriptive and frequency statistics to analyze the School and IT Specialist Survey data, the results of which were used to answer the evaluation questions by describing the context, implementation, and outcomes.

### Source: Student Information Systems (SIS)

The SIS data were received on request from the USOE under a data sharing agreement established between the USOE and the UEPC in February 2010 and according to the parameters of the RFP and a data share agreement between the USOE and the UEPC. Table 9 and Appendix A: Participation Table present the most specific details available regarding H.B. 513 participation and software use.

#### *Sample: SIS*

The sampling frame for the final version of the SIS data set included all kindergarten (48,916) and first grade (49,104) students in Utah. That sample was narrowed for various analyses, the details of which are included in the results section and appendices. Further description of this sample is available in the results section, Table 9.

#### *Analysis: SIS*

Descriptive statistics compared demographic differences between students in participating and non-participating schools. Unfortunately, this could only be accomplished at the school level because we had no way to know which students at the schools actually used the software. The SIS data were merged with Dynamic Indicators of Basic Early Literacy Skills (DIBELS) and vendor data so that demographic differences such as gender, race/ethnicity, English language learner (ELL), special education, and low income could be included as covariates in the predictive analyses.

### Source: Dynamic Indicators of Basic Early Literacy Skills (DIBELS)

The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) is a popular literacy assessment that is often used to assess the literacy development of students in the elementary grades. It is reportedly a valid and reliable measure of a specific set of foundational literacy skills (Doyle, Gibson, Gomez-Bellange, Kelly, & Tang, 2008; Good, Gruba, & Kaminski, 2001). DIBELS is used to predict success or failure in future reading ability, which allows teachers to locate children that may need additional support learning to read. Similarly, DIBELS can be used to assess the effectiveness of the early literacy strategies that are being employed within a classroom (Good et al., 2001).

In the current version of DIBELS (DIBELS Next), there are indicators and a composite score that are selectively measured at the beginning, middle, and end of the academic year for first grade students. The DIBLES measures are: Phoneme Segmentation Fluency (PSF), Nonsense Word Frequency CLS (NWF-CLS), Nonsense Word Frequency WWR (NWF-WWR), DIBELS Oral Reading Fluency – Words Correct (DORF-WC), DIBELS Oral Reading Fluency-Accuracy (DORF-Accuracy), Retell, and a composite score. Fluency is the degree of accuracy and speed of response, hence the DIBELS requires students to respond within a designated time frame of 1 – 3 minutes depending on the indicator and then scores are calculated based on the number of correct answers given. In order to capture all possible administrations of the DIBELS indicators in Utah public schools, we included a request for the 6 DIBELS indicators and overall composite DIBELS scores.

The UEPC evaluation team requested DIBELS data because it provided the most uniformly accessible student growth measure of literacy skills. As such, DIBELS provided a measure of student performance, although only for first graders, that could be used to document student growth in relationship to their use of the computer software programs. This aspect of the evaluation was entirely dependent on the ability to merge the vendor and DIBELS data. Once the vendor data were received we discovered that the merge could be conducted in a very limited capacity (see summary of data sources and merging section below).

### *Sample: DIBELS*

The sample of students included in the analyses of DIBELS data was dependent on the ability to merge the vendor data (software use) with the SIS data (demographic characteristics) and DIBELS data (outcome measure). The merge of these three data sources depended on each one including valid student identification numbers (ID). However, the vendor data included very few valid student IDs, which resulted in small samples for two vendors and no samples for the other vendors. The final sample of students included in the analyses with DIBELS data included 870 (22%) students for Curriculum Associates and 299 (2.3%) students from Imagine Learning. There were no student IDs to match with DIBELS for the remaining two vendors, therefore they were not included in this set of analyses.

### *Analysis: DIBELS*

The goal of the analyses with the DIBELS data was to examine the relationships among time spent using the software and learning gains on DIBELS assessment, controlling for demographics. We used multi-level regression models (hierarchical linear modeling) to explore relationships at the student level for two of the vendors.

## Source: Vendor Data

From the outset of the project, all of the vendors agreed to make usage and outcomes data (student performance) available. While the usage data is relatively straightforward, the student performance data is much more complicated and functions differently for each of the software programs. Further, understanding student performance gains requires knowledge of how each software program works. Due to the complexity and variation across vendor software programs, the evaluation team contacted representatives from each software vendor to discuss software functionality, implementation, and outcomes. Below is a summary of the information the UEPC evaluation team requested of vendors:

- Is usage data readily available?
- What are the performance measures and how often are they collected?
- In what ways are the software programs adaptive and will the adaptive nature of the programs require calibration or standardization of performance measures? If so, what are appropriate ways to address this?

- What other data are available relevant to this evaluation study?

The conversations with the vendors provided further understanding of the recommended implementation and usage requirements. In-depth discussions of how each of the vendors measured student performance revealed a lack of alignment among the software programs and potential student performance measures. Unfortunately, such outcome data are critical in order to reach conclusions about the effectiveness of the software programs and their ability to support and enhance student learning, which was the expected outcome of implementing these software programs in the schools. The information obtained from each vendor, and additional supporting documents provided by the vendors, rounded out the sources that informed a final request for data that was made to the USOE by the UEPC evaluation team.

There were five vendors involved in the H.B. 513 initiative. Despite numerous requests, we received data from only four of those vendors. The data files from three of the four vendors were not of useable quality initially, which required a lengthy process of discussing data quality issues with three vendors and receiving revised versions of data sets. Once the final versions of data sets from all four vendors were received in late August, we began preparing the data for merging with SIS and DIBELS data files and for the analyses.

### *Sample: Vendor Data*

The state of Utah purchased 2,108 licenses of Curriculum Associates (CA) math software and 3,108 licenses of CA reading software, for a total of 5,216 licenses at 34 schools (including 6 charter schools) in 7 districts. The final sample of students totaled 3,019 in 22 schools. Within this sample there were 1,178 rows of student data for math and 2,644 rows of student data for reading, revealing that 803 students used both the math and reading software.

From Imagine Learning, the state purchased 20,365 licenses for 230 schools (including 6 charter schools) in 19 districts. Once the cleaning process was complete, the final data set contained 17,463 rows of student data for 194 schools in 19 districts.

From Voyager Learning the state purchased 1,601 licenses of the Ticket to Read software for 37 schools (including 4 charter schools) in 5 districts. The final data set contained 1,431 rows of student data and included 22 schools in 5 districts.

The state purchased 1,294 licenses of Waterford’s math software and 3,392 licenses of Waterford’s reading software (4,687 total) for 81 schools (including 7 charter schools) in 6 districts. The final sample of students totaled 2,681 in 48 schools in 10 districts and charters. Within this sample there were 1,267 students who used the math software and 2,189 students who used reading software, revealing that 775 students used both the math and reading software. Table 8 offers a summary of the number of software licenses by vendor.

**Table 8. Number of Software Licenses by Vendor**

| Vendor | Licenses purchased | Schools with licenses | Sample of students | Sample of schools |
|---|---|---|---|---|
| Curriculum Associates | 5,216 | 34 | 3,019 | 22 |
| Imagine Learning | 20,365 | 230 | 17,492 | 194 |
| Voyager Ticket to Read | 1,601 | 37 | 1,431 | 22 |
| Waterford | 4,687 | 81 | 2,681 | 48 |

### *Analysis: Vendor Data*

The analyses of the vendor data was critical to the evaluation project because it provided answers to both implementation (usage) and outcomes evaluation questions that reflected the actual amount of time that students spent using the software and attempted to document the learning gains of students as they were reported by the vendors. The vendor data were used in both descriptive and predictive data analyses, the details of which are provided in Appendix B: Evaluation Methods.

Usage data is presented in the results section. For three of the vendors we report the recommendations for use in terms of recommended number of minutes per session compared to the actual number minutes per session that the students used the software. Imagine Learning, Voyager, and Waterford provided data on the total number of minutes the software was used and the number of sessions. For Curriculum Associates we report usage data in the metric they provided, which was the number of lessons completed rather than minutes of use. We divided the total number of minutes (or total time logged on) by the number of sessions or the number of lessons, respectively. We further disaggregated the usage data by kindergarten and first grade students. The following subsection introduces how we approached the analysis and reporting of student performance for each of the vendors. Again, we note that only four of the vendors provided data.

### Measures of Student Performance

During data collection from vendors, one of the most important questions asked by the evaluation team was also one of the most difficult questions for the vendors to answer: "How do you measure student performance?" The reason for the difficulty in answering this question is largely because it depends on what one wants to know about student performance. For instance, measurement of student performance on literacy attainment is highly inconsistent among the software programs. Similarly, it is difficult to make broad statements about student performance across each of the vendors because each software program is different in terms of function, implementation, and criteria for progression through the program. This point is important because, as explained below, each software program functions differently in terms of how students are routed through the curriculum and how much content constitutes a given strand, lesson, unit or organized section of the content material.

In order to reach conclusions about student progress based solely on data provided by the vendors, the UEPC evaluation team constructed a standardized score for each student participant for whom data were provided. The standardized scores were constructed in response to a lack of availability of a conclusive student performance measure offered by the vendors. This approach has substantial and noteworthy limitations. Foremost among those limitations is that in order to interpret the student performance score, one must have an understanding of the functionality and features of the software programs. The following explanation of how each software vendor reportedly measures student progress provides a foundation for the standardized student performance measure. The sources for this information included personal communications with the vendors, the responses to the RFP, and additional documents provided by the vendors. Readers are encouraged to consult additional explanations provided by the vendors.

### *Curriculum Associates Reading and Math*

Curriculum Associates' (CA) software offers diagnostic tests and progress monitoring as two types of assessment for students. The diagnostic test is reportedly aligned with Common Core State Standards and is used to place students into the curriculum at a point that is appropriate for each student's individualized needs. A student begins the test by answering questions that are consistent with her or his grade level and then, as the student responds to the questions, the test questions adapt based on the responses. The diagnostic test places students into a specific location within the curriculum for each strand (e.g., phonological awareness, phonemics, high frequency words, vocabulary, comprehension-literature, comprehension-informational text) based on their performance. Administration of this diagnostic test is at the discretion of teachers, but CA recommends three or four times per year. The diagnostic assessment results in four measures: a scaled score (300-800), a grade level equivalent score (early, mid, or late plus the grade), a pass rate (the percent of lessons in which students scored 75% or higher), and time on task. The CA representatives also added that Lexile scores are a fifth performance measure that is available from each diagnostic test administration.

Progress monitoring is a second type of assessment that tracks student progress more regularly than the diagnostic. At the conclusion of each module, students complete a graded activity that provides ongoing assessment of their progress. If they do not pass the quiz, then they are routed back through the instructional module and administered a new version of the quiz. If they do not pass the quiz on the second attempt, then they are directed to a different domain and the teacher is alerted that the student requires additional support. Regular reports of student progress can be accessed by teachers, administrators, and parents for both the diagnostic tests and regular progress monitoring. The above is true for both reading (6 domains) and math (4 domains).

Curriculum Associates provided the UEPC with the grade level equivalence scores at the first and final sessions, Lexile scores, and first and final diagnostic overall scaled scores. In the results section we present the descriptive statistics for the latter. In order to further specify growth based on software used, we used the final diagnostic assessment overall scaled scores minus the first diagnostic assessment overall scaled scores to create a measure of growth. Since the Curriculum

Associates software is aligned with the state's core standards, this measure served as a suitable performance score for students.

### *Imagine Learning*

Students begin their experience with Imagine Learning software by taking an initial assessment test which determines where they enter the curriculum. The results are available immediately. As students continue to work through the eight strands (e.g., vocabulary, phonemic awareness, listening comprehension, conversation, songs and chants, read alongs, letter recognition, beginning reading), they take tests to determine if they have mastered the content. If they have mastered the content they progress to the next level within the curriculum, if not, they participate in additional lessons until they achieve mastery. Therefore, one can observe student progress by calculating the amount of the curriculum that students work through. Students also receive a score for each lesson or group of lessons and an average score can be calculated from those. According the response to the RFP, "Student progress for the literacy curriculum is measured by the number of lessons completed and individual percentage scores…" (p. 39). Imagine Learning can also provide Lexile scores, however they did not make those available to the evaluation team.

Imagine Learning provided overall scores for each of their curriculum strands, the initial level at which each student tested into the software program, as well as the final level at which the student finished at the conclusion of software use. This allowed us to first calculate the amount of content covered by subtracting the initial level from final level, which resulted in a number that represented the amount of content covered by each student. We divided the amount of content covered by each student's overall score to calculate a standardized score that accounted for content covered as well as performance scores. The newly created standardized scores were used in the outcomes analyses to determine the relationship between time spent working with the software and student performance.

### *Waterford Reading and Math*

For the reading software, students complete a *Reading Placement* test that places them into the curriculum at the place that is appropriate based on each student's learning needs. Alternatively, teachers have the ability to intervene in the placement process and enter students into the curriculum level of their (teachers') choosing. Through conversation with a Waterford representative, the UEPC evaluation team learned that this option was not made explicitly available to the teachers in Utah. However, once we received data from Waterford and found uneven distributions in student placement levels, we contacted Waterford and the representative suggested that schools had manually moved the starting point of students, which overrides the adaptive placement. A Reading Placement score of ≥80% on the first unit advances students to the next set of units. A Reading Placement score of <80% directs students into additional instruction within the unit of testing. There are three levels through which students can advance. Students also receive an average mastery score based on their performance on the unit tests. Of additional interest is that within the units there are objectives and activities; based on students' performance as they work through the objectives and activities, the software has a *sequencing* feature that constantly routes each student toward the material that is most aligned with her or his unique learning needs.

Waterford's math software functions much in the same way as the reading software described above. A noteworthy difference is that 70% is the cut score for the *Math Placement* test and that test is designed to be taken only once. For the scoring of activities within units, 80% is required for a student to show mastery.

Waterford provided the level and percentage at first session, level and percentage at final session, and overall score for each language arts strand (i.e., phonological awareness, phonics, comprehension vocabulary, language concepts, and fluency) and each math strand (i.e., numbers and operators, geometry, measurement, time, money, and data analysis and problem solving). To calculate a growth score, we first created a *growth level* variable by subtracting the first level and percent from final level and percent. We calculated a *growth score* variable as the student performance outcome variable by dividing the overall scores for reading and math by 100 and multiplying that by the growth level score that we calculated previously. Dividing the overall scores by 100 was required because the growth level values were in hundredths and the growth scores were in whole numbers.

### *Voyager (Ticket to Read)*

The Voyager Ticket to Read software is uniquely different from those described above in that it is not an instructional software program (personal communication with Janet MacPherson, March 6, 2013); it does not include a measure of performance. Ticket to Read offers students an opportunity to practice phonics and reading. Like the other programs, it places students within the program based on an initial diagnostic. All kindergarten students start at the beginning of the phonics component and first grade students complete a phonics assessment that determines their starting point. As the sessions are completed successfully students advance through the software or receive additional practice if needed. After the placement, student performance determines their movement throughout the software, but teachers have the option to override that and place students in various places within the software.

Voyager makes a reading assessment tool available to schools. The reading assessment is called Vital Indicators of Progress (VIP) and is reportedly "completely equivalent to the DIBELS" (MacPherson & Peyton, 2010, p. 1). Since Utah administers the DIBELS to first grade students, this was initially expected to provide an important opportunity to use DIBELS scores as a measure of success for students who used the Ticket to Read software. However, without student IDs the data could not be merged at the student level and the DIBELS data could not be matched directly to student use of the Ticket to Read program.

Since Ticket to Read does not require students to take any performance assessment as it is a supplemental program, this software was left with no direct measure of student performance. It is the assumption of Voyager that districts use measures from core reading programs to measure progress. An oral reading fluency measure of any type can be used to place students into an appropriate point in the Ticket to Read program, however, there was no built-in performance test or requirement for an oral reading fluency measure associated with Ticket to Read in Utah public schools during the 2012-13 academic year.

### *Compass Learning*

Compass Learning was scheduled for use in three Utah schools. At the time of the data request, one school had withdrawn. By the end of the academic year, Compass Learning had not renewed the contract and did not provide any data for this project.

## Summary of Data Sources and Data Merging

To this point we have introduced each data source, the sample associated with that source, and the general approach used to analyze those data. This subsection will describe how each of these sources was merged together so that the outcomes evaluation questions could be answered.

### *Student-level Data Merge*

The ability to merge the vendor data with the SIS and DIBELS data was a cornerstone of the outcomes analysis. Merging vendor data with SIS data would allow evaluators to 1) describe the demographic characteristics of the students, which could be used to determine if the H.B. 513 program targeted students who were considered to be at risk, and 2) to include the demographic variables as covariates in outcomes analyses. Merging vendor data with the DIBELS data would allow evaluators to measure first grade students' performance with a measurement tool that is external to the vendor software. However, the student level merging of these data was extremely limited.

The student level merges of data from vendors, SIS, and DIBELS required that each of these data sources included a unique student identification variable that was common across all three. *Students' state identification numbers (SSID) were identified as the common variable. However, in cases where vendors did not provide valid SSIDs, it was not possible to merge these data with SIS and DIBELS data.*

The merging of student data occurred in two steps. First, SIS data was merged onto vendor data. In the second step, DIBELS data were merged onto the new vendor/SIS data. The following summarizes the merge for each vendor:

- Curriculum Associates provided data on 3,019 students and 870 cases (22%) could be matched with DIBELS and SIS data, but only 823 (21%) of those cases included student use statistics.
- Imagine Learning provided data on 17,463 students and 399 cases (2.3%) could be matched with DIBELS and SIS data.

- Voyager provided data on 1,430 students and 52 students (3.6%) matched with SIS data. This match rate was too low to facilitate analyses and no additional student level merges were conducted with the Voyager data.
- Waterford provided data on 4,535 students and 45 students (0.009%) matched with SIS data. This match rate was too low to facilitate analyses and no additional student level merges were conducted with the Waterford data.

Although only a fraction of the Curriculum Associates data and Imagine Learning data merged successfully with SIS and DIBELS data, the student numbers were sufficient to conduct a student level analysis. The failed matching of student data for the Voyager and Waterford data meant that no student level growth analysis could be performed with the DIBELS data for those vendors.

# Results

Findings for this evaluation study are presented here in three main sections, including the context, implementation, and outcomes of the H.B. 513 Early Intervention Program. The context subsection sets the stage by describing students, schools, and teachers. The implementation subsection addresses the resources, training and technological support, student and teacher use of the software, and the accessibility of the software. The outcomes subsection presents satisfaction ratings and student learning gains.

## Context

To begin, we establish a context for the results section by presenting information about the characteristics of the participating and non-participating schools and students. We also provide basic information about teachers' background and experience. Additionally, this subsection presents teachers' perceptions of the program's accessibility to students. Teacher and administrator perceptions of the alignment of the software's content with curriculum are also presented. Finally, we present satisfaction ratings of teachers, administrators, and IT specialists.

### Schools and Students

The SIS data provided information about schools and students throughout the state. From a contact list provided by the USOE, we identified schools as participating or not participating in the Early Intervention Program. We were able to identify the schools that applied to participate in the program, but information about the number of licenses that were made available to each school, or the specific students who used the software, was not available. Describing the students who used the software depended on the inclusion of valid SSID numbers within the usage data provided by the vendors. As explained in the methods section, very few valid SSID numbers were linked to usage data.

Table 9 displays school level differences in terms of grade level, gender, race/ethnicity, English language learner, special education, chronic absence, Title I, and low income status by participating and non-participating schools. Comparing participating and non-participating schools, more participating schools enrolled English language learners (10.4%) than non-participating schools (6.1%). In addition, 38% of the participating schools were identified as school-wide Title 1 schools while 20% of the non-participating schools were identified as Title I schools. Further, 41% of participating schools enrolled students who were eligible for the Free and Reduced Price Lunch program (low income) while 29.4% of the non-participating schools enrolled eligible students.

**Table 9. Characteristics of Participating Schools and Students**

| | Participating Schools | | Non-Participating Schools | |
|---|---|---|---|---|
| | N | % | N | % |
| **Grade Level** | | | | |
| Kindergarten | 23,396 | 50.3 | 25,520 | 49.6 |
| First Grade | 23,124 | 49.7 | 25,980 | 50.4 |
| **Gender** | | | | |
| Male | 24,177 | 52.0 | 26,663 | 51.8 |
| Female | 22,343 | 48.0 | 24,837 | 48.2 |
| **Race/Ethnicity** | | | | |
| White | 35,224 | 75.7 | 40,900 | 79.4 |
| Hispanic | 8,246 | 17.7 | 6,884 | 13.4 |
| Other | 3,050 | 6.6 | 599 | 7.2 |
| **English Language Learner** | 4,841 | 10.4 | 3,127 | 6.1 |
| **Special Education** | 3,690 | 7.9 | 3,491 | 6.8 |
| **Chronic Absenteeism** | 346 | 0.7 | 234 | 0.5 |
| **Title I Schools** | 17,885 | 38.4 | 10,311 | 20.0 |
| Targeted Assistance Title I School | 4,660 | 10.0 | 5,598 | 10.9 |
| **Low Income Family** | 19,142 | 41.1 | 15,120 | 29.4 |

Source: SIS, vendor data, participant contact list

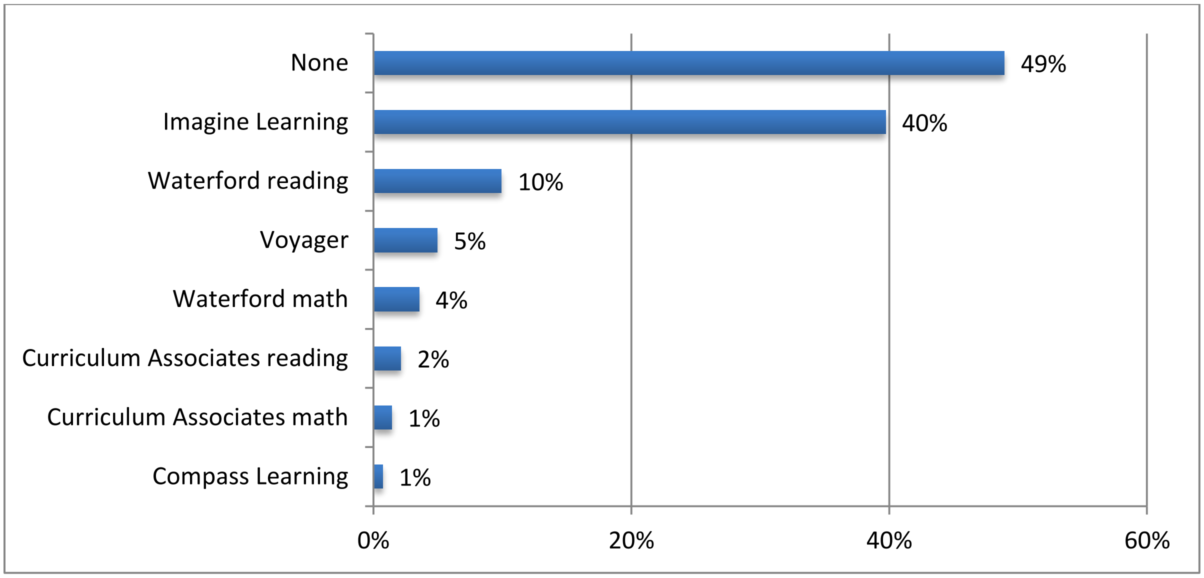
## Teachers

Several questions were included on the School Survey to inform our understanding of the characteristics of the teachers. We asked teachers about their teaching experience, education, previous experience working with the software programs, and their personal perspectives regarding working with computers. Responses to those questions are presented below.

Among teachers who responded to the survey, the number of years teaching ranged from 1 to 55, with a mean of 13.7 years (SD = 9.90) and a median of 10. The educational background of these teachers included 104 teachers who held BS or BA degrees and 43 teachers who held masters degrees. They held a wide range of additional certifications and endorsements including ESL, early childhood, reading, math, and arts, among others. The gender representation was heavily skewed toward females with 144 female teachers and 2 male teachers responding.

Teachers identified software programs they had used in previous academic years. Figure 1 displays the percentages of teachers who had previous experience using the software programs and how that experience varied across the vendors' software programs. Notably, about half (49%) of the teachers who responded to this survey had not used any of these programs in previous academic years.

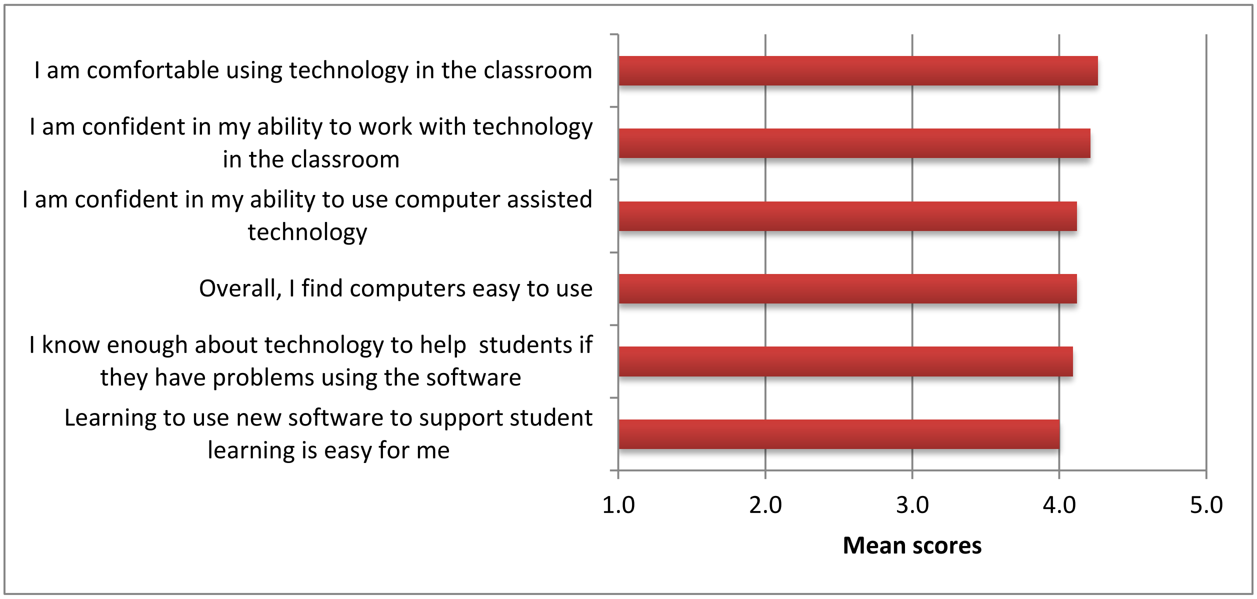
**Figure 1. Software Programs Used by Teachers in Previous Academic Years**




Source: School Survey - Teachers (N=141)

Teachers' personal perspectives regarding computer use can have substantial effects on how computer based early intervention programs are implemented (Ma et al., 2005). Therefore, teachers were asked to what degree they agreed with statements about their own experience using computer technology. Figure 2 shows teachers' mean ratings of perspectives of technology use. Overall, teachers reported relatively positive perspectives about their own computer use.

**Figure 2. Mean Ratings of Teachers' Perspectives of Technology Use**

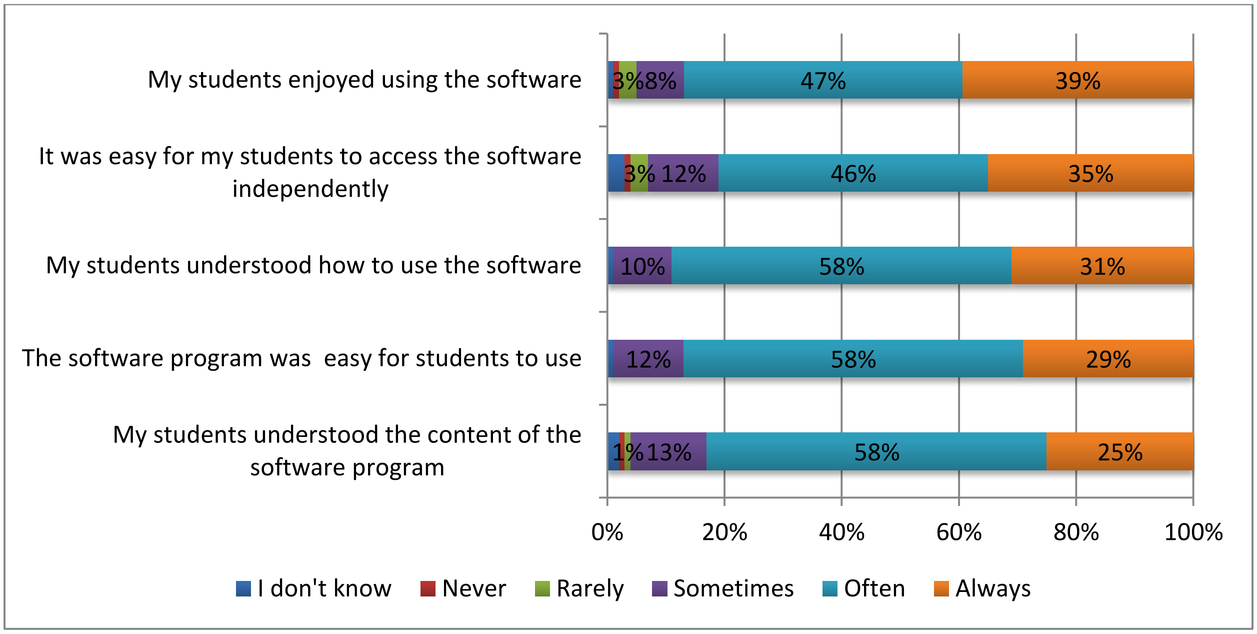



Source: School Survey - Teachers (N=147)
Scale: Strongly Disagree (1) to Strongly Agree (5)

## *Teacher Perceptions of Program Accessibility*

Here, we report teachers' frequency ratings of program accessibility and the user friendliness of student interactions with the software (See Figure 3). Teachers responded very favorably to questions about student software use, suggesting that students understood how to use the software (89% always and often), that they enjoyed using the software (86% always and often), and that the students understood the content (83% always and often). Further, they reported that the software programs were easy for students to use (87% always and often) and easy for the students to access independently (81% always and often).

**Figure 3. Software Accessibility for students**

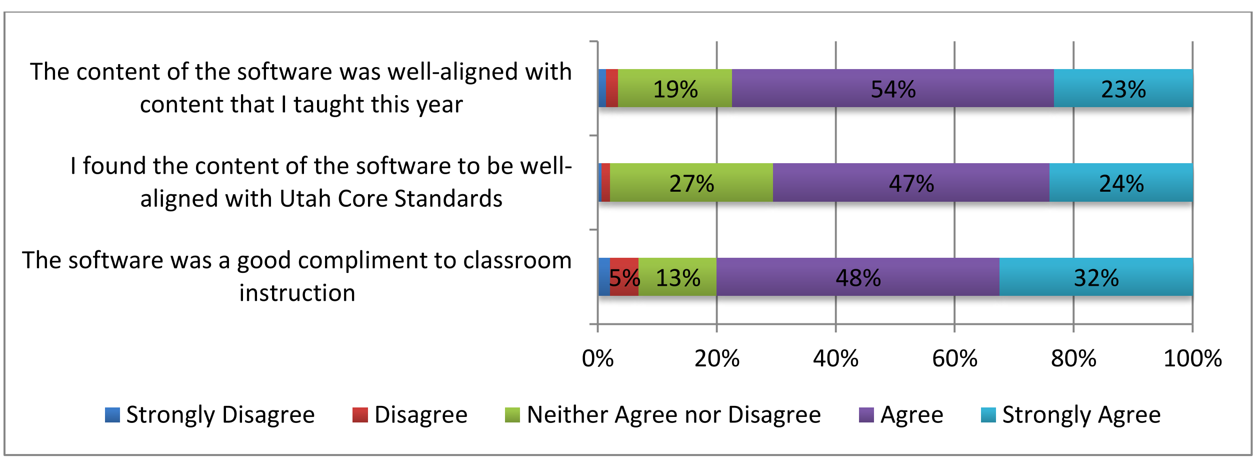



Source: School Survey – Teachers (N=144+/-1)

## Alignment with Curriculum, School Improvement Plans, and Instruction

Teacher perceptions of the alignment of the software programs' content and the current curriculum and instruction are presented in **Error! Reference source not found.**. The teachers strongly agreed (23%) or agreed (54%) that the content of the software was well-aligned with the content that they taught and strongly agreed (24%) and agreed (47%) that the content of the software was well-aligned with the Utah Core Standards. They also reported a great deal of agreement (32% strongly agreed and 48% agreed) that the software was a good complement to classroom instruction. These results suggest that teachers felt that the content of the software programs was aligned with content and instruction in the classroom.

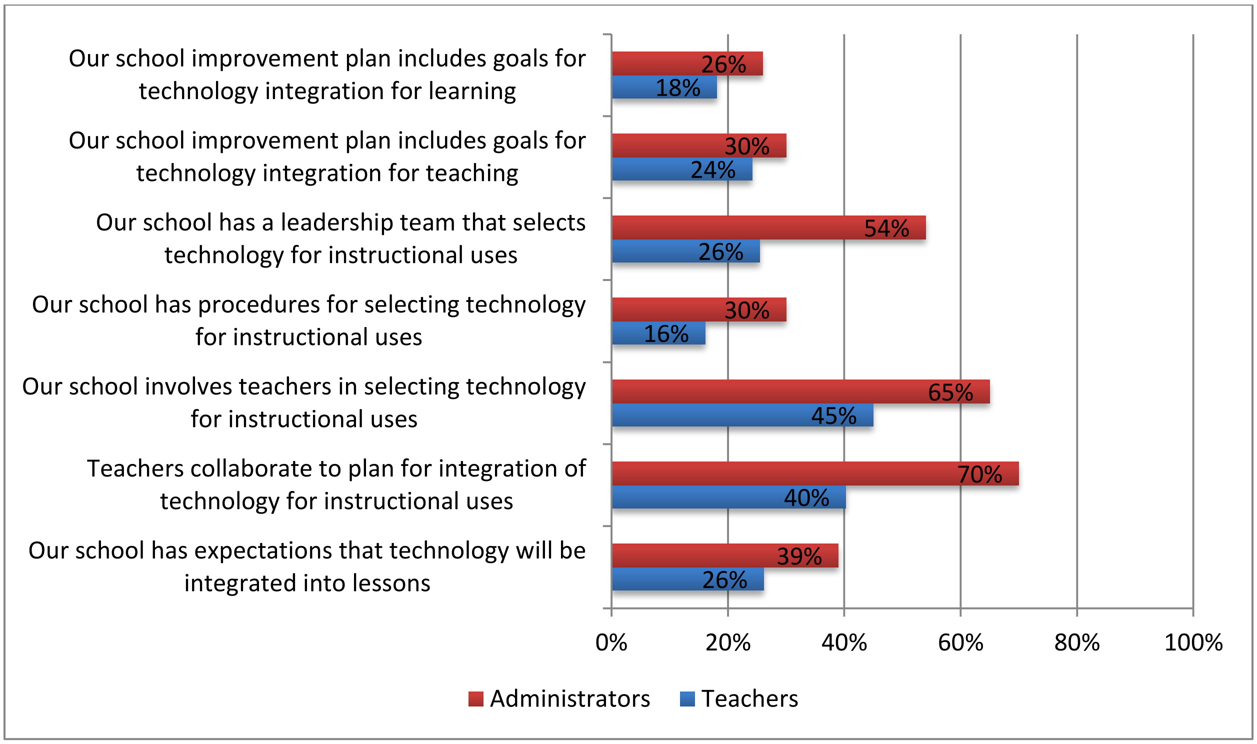
**Figure 4. Alignment with Curriculum and Instruction**




Source: School Survey – Teachers (N=146-149)

If technology is to be used in classrooms to support student learning, it should be well aligned with school improvement plans and instructional practices.  Figure 5 reports findings from a series of related yes or no questions to which both administrators and teachers responded. Few teachers (18%) and administrators (26%) felt that school improvement plans included goals for technology integration for learning. Similarly, 24% of teachers and 30% of administrators felt that school improvement plans included goals for technology integration for teaching. On every item, administrators responded more positively than did teachers. This was especially the case regarding the use of school leadership teams to select technology (28% difference between administrators and teachers) and teacher collaboration to plan for the integration of technology for instructional use (30% difference between administrators and teachers). Less than half of administrators (39%) indicated that their schools had expectations that technology would be integrated into lessons and even fewer teachers (26%) said the same.

**Figure 5. Alignment of Technology Use with School Improvement Plans and Instruction**

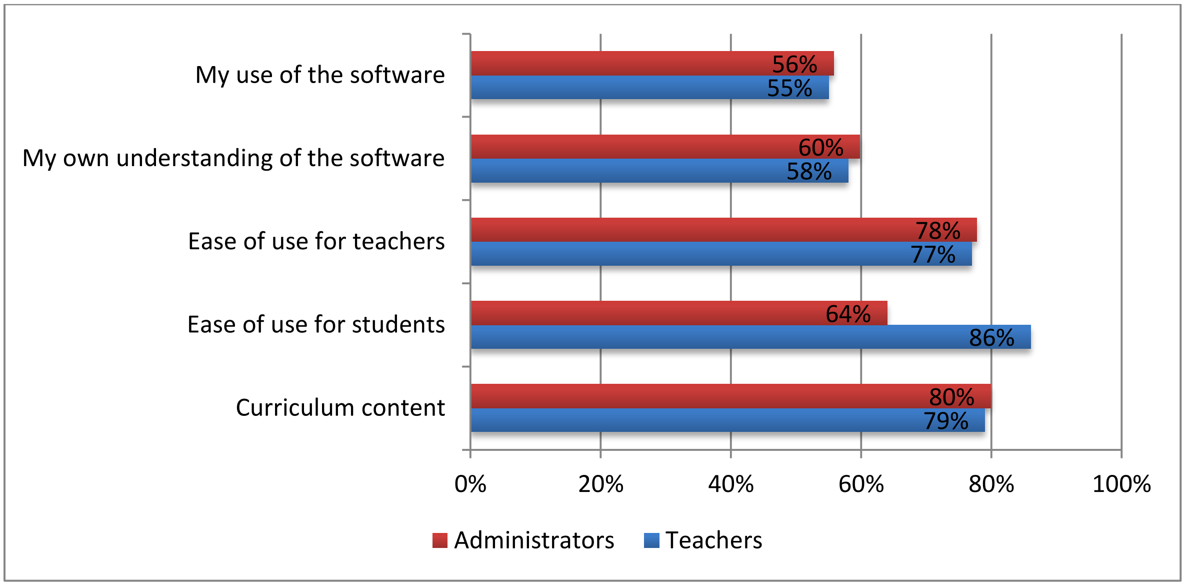



Source: School Survey – Teachers (N=149); Administrators (N=73)

## Satisfaction with Program

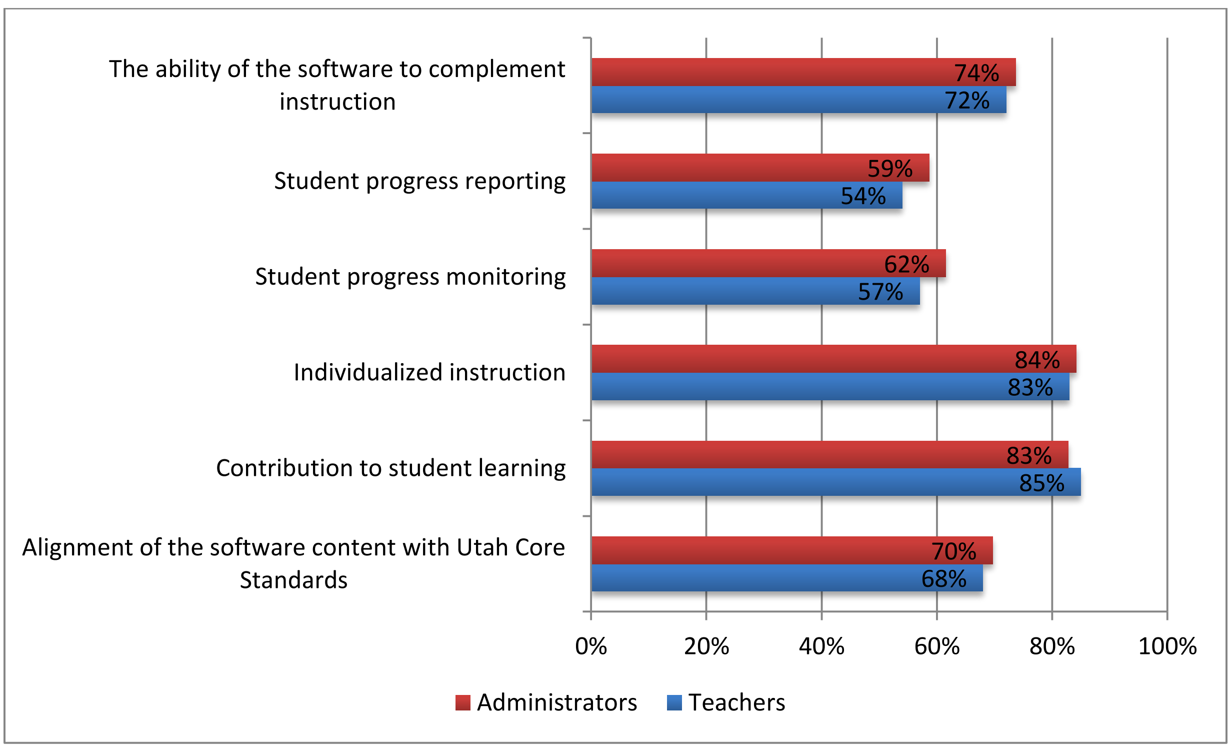
Administrators and teachers rated their satisfaction with the software programs. Figure 6 shows that administrators and teachers were largely in agreement in their satisfaction ratings of many aspects of the H.B. 513 Early Intervention Program. The biggest satisfaction differential between administrators and teachers was in regards to the ease of use for students, in which teachers were 22% more satisfied than administrators. Figure 7 shows administrators' and teachers' satisfaction with the influence of student use of the software on student learning. Similar to Figure 6, teachers and administrators were largely in agreement. The full range of responses to these items from both teachers and administrators is available in Appendix C: Results Tables.

**Figure 6. Percent of Teachers and Administrators who Reported Being Satisfied or Very Satisfied with Aspects of the Software**




Source: School Survey – Teachers (N=134-137); Administrators (N=69+/1)

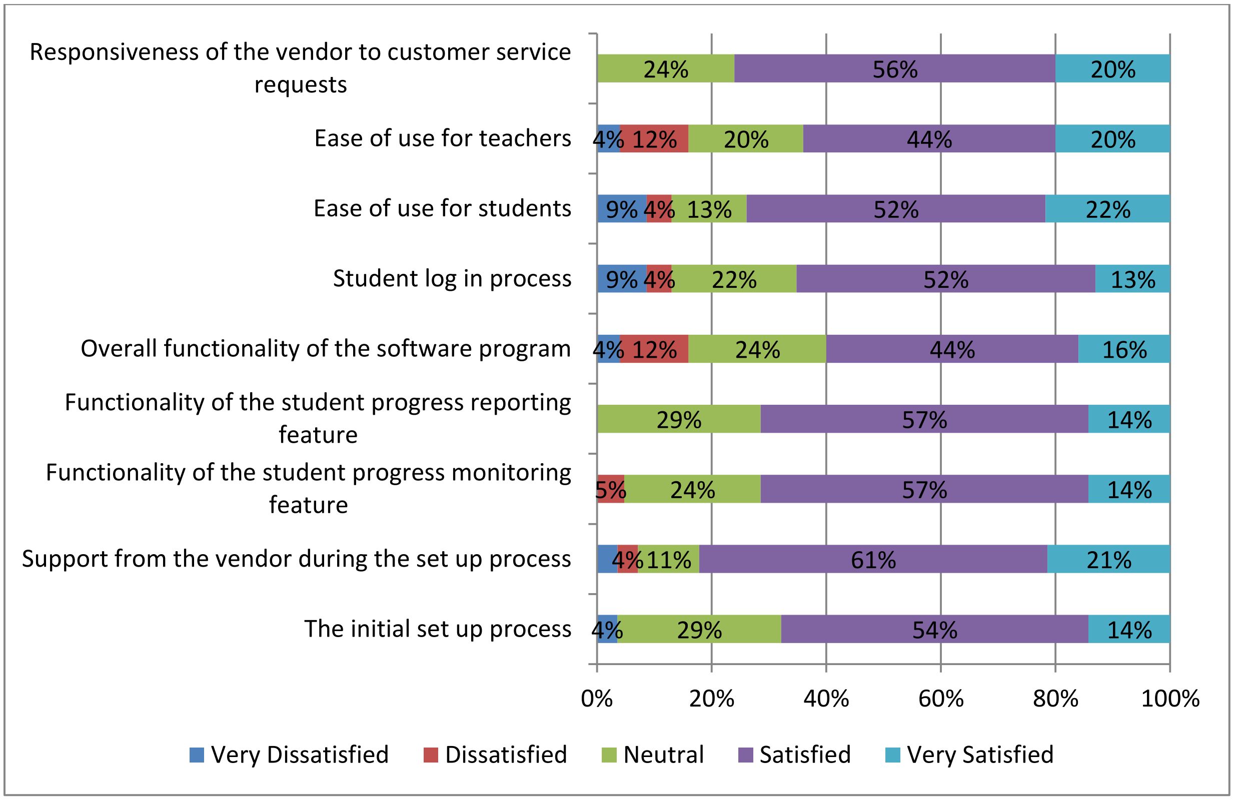
**Figure 7. Percent of Teachers and Administrators who Reported Being Satisfied or Very Satisfied with the Influence of the Software on Student Learning**




Source: School Survey – Teachers (N=134-137); Administrators (N=69+/1)

Figure 8 provides perspective from the IT Specialists, who responded favorably in terms of their satisfaction, especially for the support provided by vendors during the set up process (82% very satisfied and satisfied) and the responsiveness of vendors to customer service requests (76% very satisfied and satisfied).

**Figure 8. IT Specialists' Satisfaction Ratings**




Source: IT Specialists Survey – IT Specialists (N=21-28)

This subsection reported results related to the characteristics of participating schools, teachers, and students, and it considered perceptions of the accessibility of the software and the alignment of the software's content with curriculum. It also presented the satisfaction ratings of teachers, administrators and IT specialists. The following subsection continues the report of results related to implementation.

## Implementation

This subsection address issues of implementing the H.B. 513 Early Intervention Program by first considering the resources required to implement the program and then by examining training and technological support, student and teacher use of the software, and the accessibility of the software.

## Resources

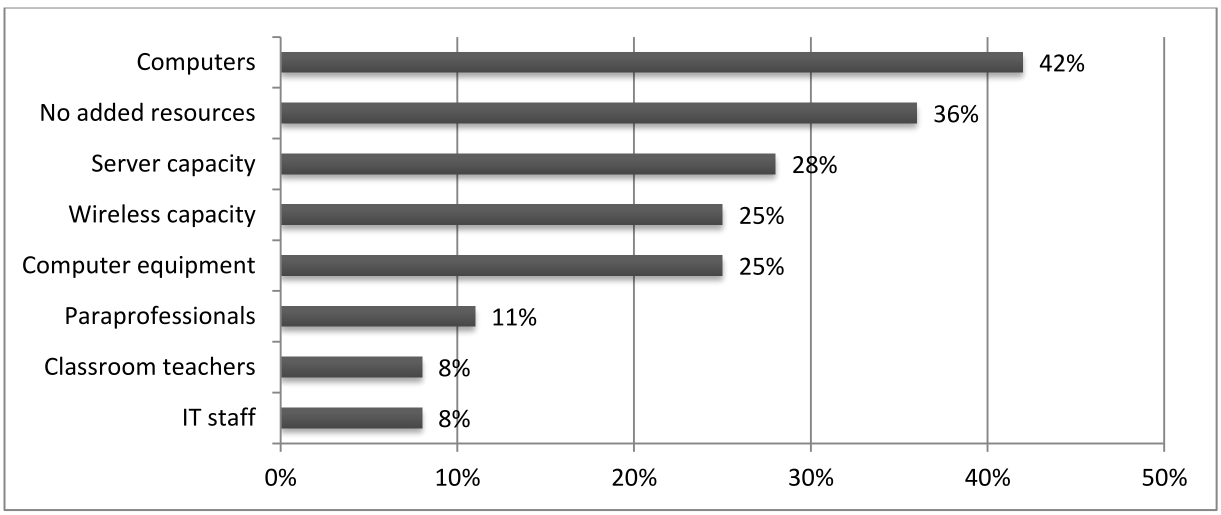
Implementation of the H.B 513 Early Intervention Program throughout the state required resources such as staff, space, and technology. This subsection presents information about resource acquisition, staffing and supervision, the locations in which the students used the software, and the adequacy of schedules and infrastructures to accommodate software use.

The IT specialists and school administrators were asked what resources the schools acquired specifically for use with the H.B. 513 Early Intervention Program. The responses from both the IT specialists and school administrators regarding resources acquired are presented in Figure 9 and Figure 10 respectively.

For IT Specialists, computers were the most commonly reported acquisition (42%), followed by server capacity (28%), wireless capacity (25%), and computer equipment (25%). Just over one-third of IT specialists reported that no new resources were added (36%).

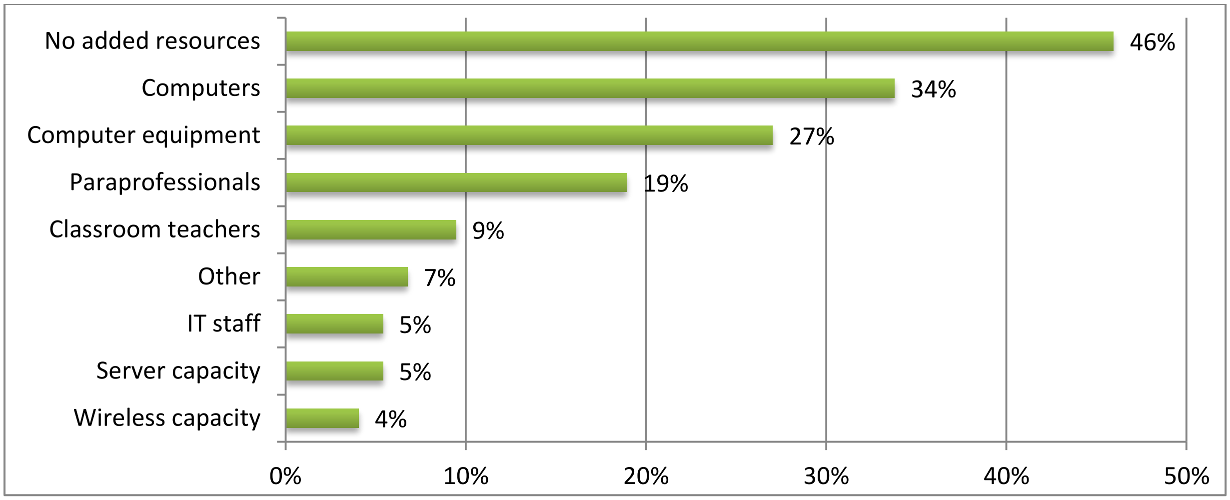
In comparison, school administrators reported computers (34%), computer equipment (27%), and paraprofessionals (19%) as the top three resources that they acquired for implementation of computer assisted instruction software. However, almost half (46%) of the administrators reported that they added no new resources to implement the new software.

**Figure 9. IT Specialists' Reports of Resources Acquired to Implement H.B. 513 Early Intervention Program**




Source: IT Specialist Survey (N=36) *This question allowed for multiple responses.

**Figure 10. Administrators' Reports of Resources Acquired to Implement H.B. 513 Early Intervention Program**




Source: School Survey - Administrators (N=74) *This question allowed for multiple responses.

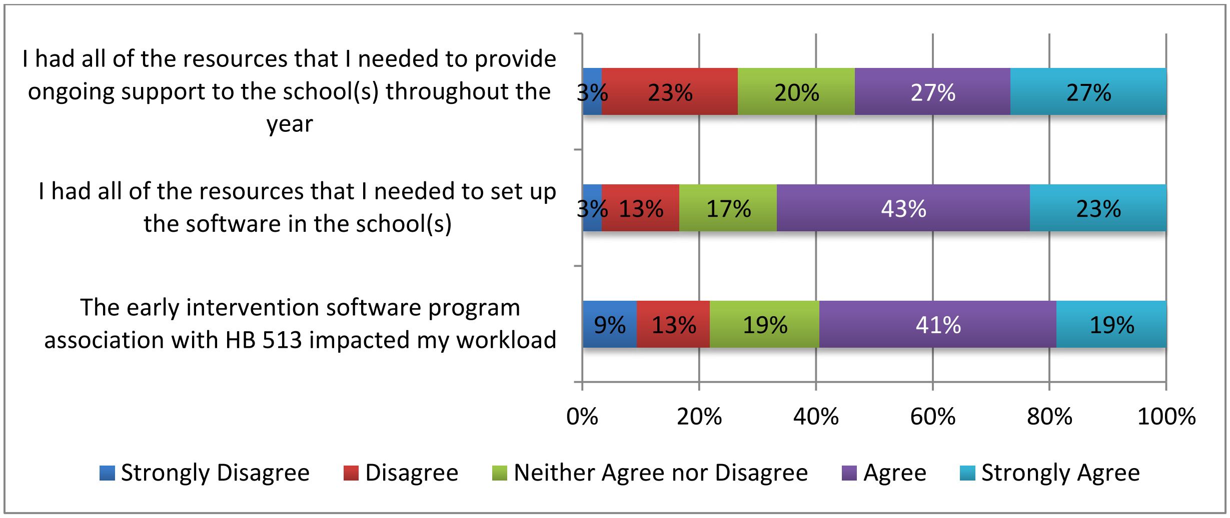
Administrators were asked to identify the funding sources that were used to purchase additional equipment (i.e., hardware, software, etc.) necessary to implement the software programs associated with the H.B. 513 Early Intervention Program, and 46% of the administrators did not acquire additional resources. Among the administrators who purchased additional equipment, they indicated using the following resources:

- School funds (28%)
- District funds (19%)
- Grant funds (9%)
- Other (8%)

While not the case for every district or school, implementing the new software required purchases of additional equipment, hiring of new staff, and upgrading technological infrastructure. The question remains, were the resources sufficient to meet the demands associated with implementing the new technology?

Figure 11 shows the extent to which the IT Specialists reported that they had the resources that they needed to set up the software in the schools and provide ongoing support. The distributions of responses to these questions favor the conclusion that most IT specialists had what they needed. However, 23% disagreed that they had all of the resources that they needed to provide ongoing support and 16% disagreed or strongly disagreed that they had all of the resources that they needed to set up the software in the schools. Most agreed that implementing the program impacted their workload to some extent.

**Figure 11. IT Specialist as Resource for Implementing H.B. 513 Early Intervention Program**




Source: IT Specialist Survey (N=31+/-1)

The following subsection looks more closely at teachers' perspectives regarding the availability of resources for using the software in terms of staffing and supervision.

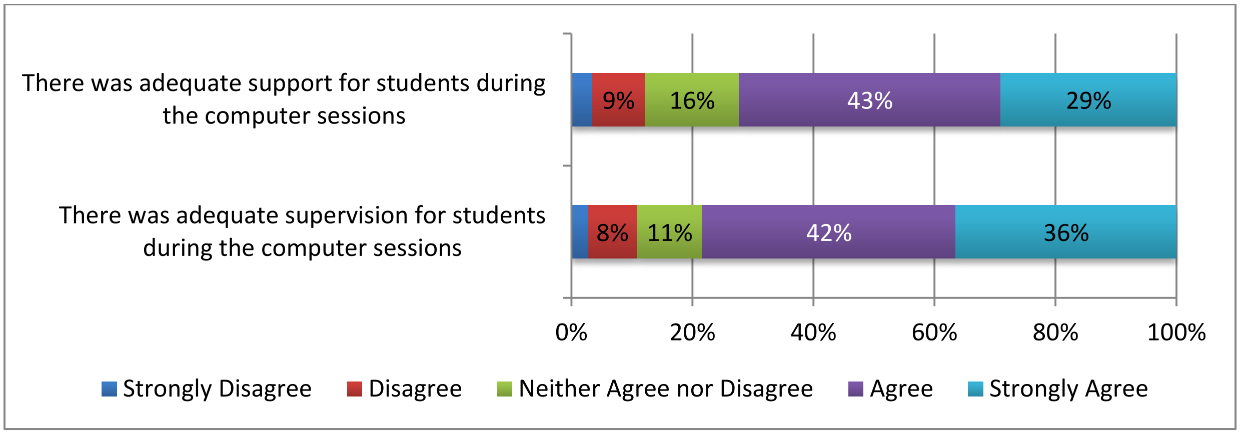
### *Staffing and Supervision Responsibilities*

Teachers responded to a series of questions about the resources and supervision required to implement the H.B. 513 Early Intervention Program. We asked them to identify who supervised the students while they used the software at school and to rate the adequacy of support and supervision of students.

In most cases, the teachers (89%) were involved with the supervision of students while they worked with the software. However, they reported that paraprofessionals (43%), computer lab staff members (36%), and others (9%) also contributed to supervising students. This question allowed for multiple responses and the results suggest that in some cases there was more than one school faculty or staff member supervising students. We know from a related question that 17% of teachers always had the support of a paraprofessional when students were using the software, 16% often, 18% sometimes, 16% rarely, and 32% never had the support of a paraprofessional when students were using the software.

Figure 12 shows that most teachers strongly agreed (36%) or agreed (42%) that students were adequately supervised during computer sessions. Similarly, most teachers strongly agreed (29%) and agreed (43%) that students had adequate support during computer sessions. This finding was also reflected in a related question in which teachers reported that using the software never (56%) and rarely (19%) created discretionary time for them during the school day.

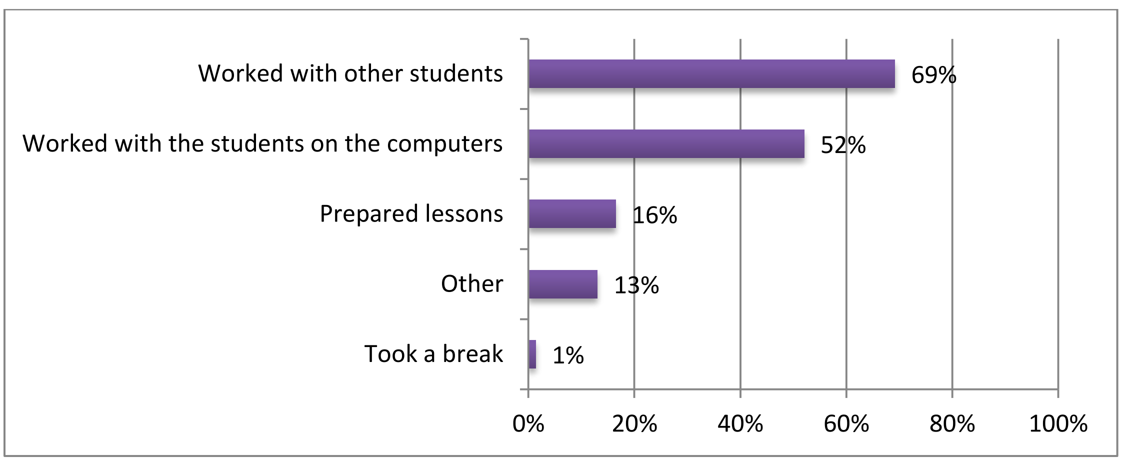
**Figure 12. Supervision and Support for Students to Use H.B. 513 Early Intervention Program**




Source: School Survey - Teachers (N=148)

We also asked teachers about what they did while students worked with the software and, in order to account for the varied ways of working with students and engaging in other tasks, allowed them to make multiple selections. Somewhat consistent with the responses above, about half (52%) of the teachers typically worked directly with students on the computers and 69% worked with other students. This suggests that most teachers were working with students, but a small number of teachers (16%) reported that they prepared lessons and 13% did other tasks (See Figure 13). The other tasks in which teachers engaged included grading, planning, helping students, and a variety of unique situations in which student computer use did not involve teachers.

**Figure 13. Teacher Activities While Students Worked with the H.B. 513 Early Intervention Program**



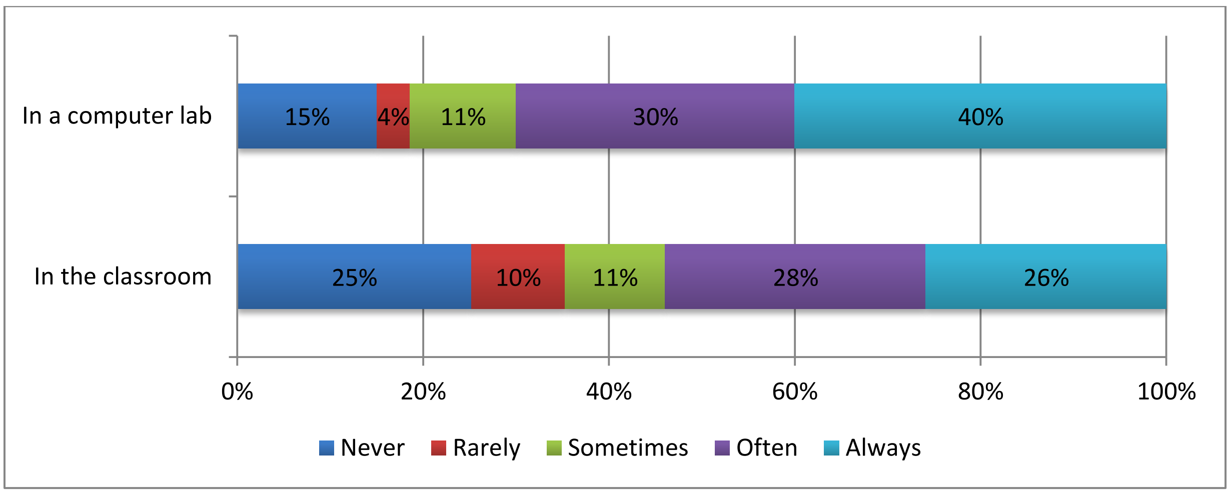

Source: School Survey - Teachers (N=146)

In most cases, teachers felt that students had adequate support and adequate supervision. However, the ideal situation would see all of the teachers responding favorably to these items. It is somewhat curious that 89% of teachers were reportedly involved with the supervision of students while they worked with the software, but 69% indicated that they worked with other students during computer use sessions. Perhaps this is explained by variations in implementation regarding the location and scheduling of the sessions taking place both in classrooms and in computer labs.

### *Space and Location of Software Use*

Students used the software in a variety of settings. These settings included computer labs, in classrooms, and in some cases the software was available for student use offsite and beyond school hours. Teachers indicated the frequency with which their students used computers in both classrooms and computer labs. Figure 14 shows the frequencies with which students used the software in a computer lab or in the classroom. It appears that computer labs were used slightly more frequently (70% often and always) than classrooms (54% often and always).

**Figure 14. Location of Early Intervention Program Software Use**



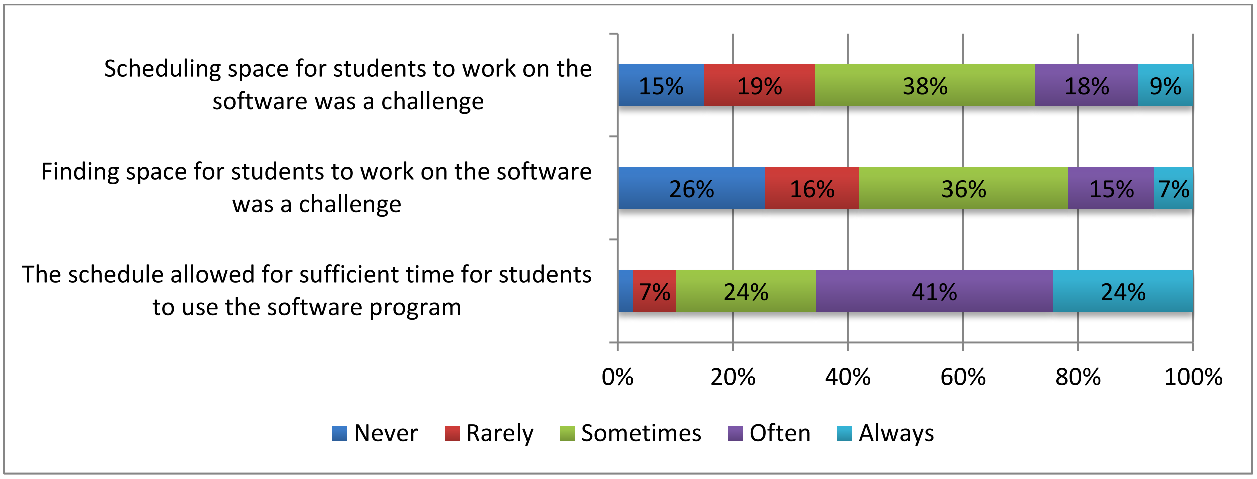

Source: School Survey - Teachers (N=147)

Respondents were also provided the opportunity to indicate if their students used the software in other spaces besides classrooms and computer labs. There were 4 responses that identified other spaces at school in which students used the software, including ESL teacher room, after school, and on personal computers or electronic devices.

Teachers were asked specifically if their students used the software at home and 14% said yes, 60% said no, and 17% did not know. Not all of the software was designed to be accessed by students off-site. Vendors were asked to indicate the number of times that students accessed their software offsite. Curriculum Associates reading software was accessed offsite by 24% of the students and their math software by 30% of students for whom they provided usage data. Imagine Learning's documented offsite use was too small to report and neither Voyager nor Waterford provided data regarding offsite use.

Classroom and lab space is a limited resource for all schools, but creates challenges for some more than others. Figure 15 provides insight into the frequency that finding physical space and space in the schedule for students to work on computers was a challenge. The most common response by administrators was that both scheduling space (38%) and finding physical space (36%) were a challenge at least some of the time. In regards to scheduling, teachers indicated that their schools allowed for sufficient time for students to use the software (24% always and 41% often).

**Figure 15. Scheduling and Finding Space for Software Use**




Source: School Survey - Administrators (N=73-74); Teachers (N=148)

Issues related to the impact of software implementation on daily schedules were also noted by teachers and administrators in a section of the School Survey that asked about the challenges associated with implementation. Some administrators and teachers felt that there wasn't enough time in the school day to fit software use into the instructional day.

> *Finding time for students to use it in the already busy schedule, especially when we use the computers for testing.* (Administrator: School Survey)

> *Time to do so in class time frame. I have little time to instruct and work with students and there was not enough time for me, myself, to take students to the lab to use this program. There is not web access for any computers in my room outside of my teacher computer.* (Teacher: School Survey)

As for the question of whether or not the resources were available to meet the demands associated with implementing the new technology, it appears that many teachers and IT specialists felt that the resources were in place. For example, 42% of teachers strongly agreed and 30% agreed that there were enough computers available for students. However, 11% neither agreed nor disagreed, 10% disagreed, and 7% strongly disagreed, suggesting that there is room for improvement. In a related question, teachers were asked about the frequency with which students had a difficult time using the software because the computers did not work well. While most teachers reported that they rarely (34%) or sometimes (40%) had problems with the computers, only 10% said that they never had problems with the computers and 1% always had problems, but 15% said that they had problems often. While, overall, these responses favor the conclusion that most teachers had enough computers and most of the computers functioned to standard, still other teachers did not. For example, this topic also appeared in the open ended question of the challenges associated with implementation.

> *Many times at the beginning it would not work correctly and getting the students logged in was a pain. However, once the glitches were fixed then it was very student-friendly. There were only a few times throughout the year where it wouldn't work.* (Teacher: School Survey)

> *The biggest problem was that the program would often freeze on screens and not let students log out or that the sound would disappear during some of the videos…* (Teacher: School Survey)

> *It moves too slowly. For only a couple of sessions per week and only 30 minutes per session, it seemed to take forever for the kids to progress...* (Teacher: School Survey)

> *Starting off with the program was slow. We had difficulties with the program, it was slow and undependable. But, it soon became better and the students enjoyed their time on it.* (Teacher: School Survey)

The quotes above represent the views of teachers who may have had unique challenges with the software. They also highlight the potential for variation in performance throughout the school year.

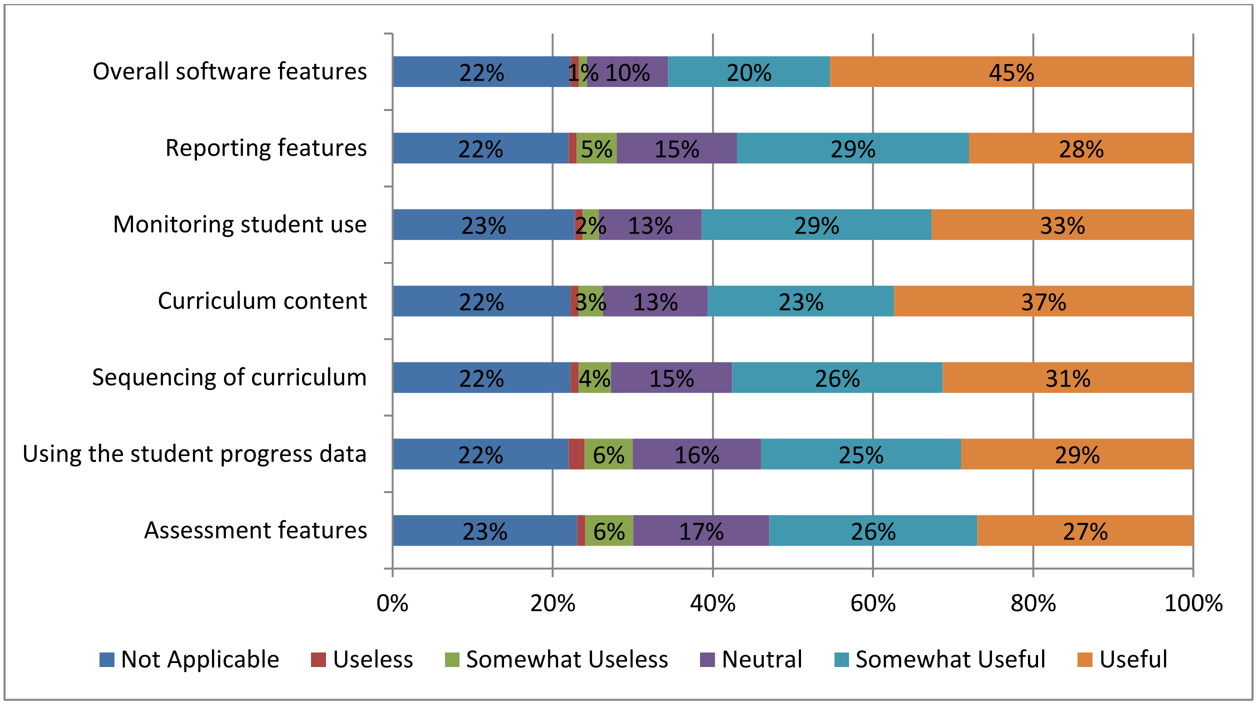
## Training and Technical Support

This subsection address two evaluation questions by reporting findings about the training and support offered to teachers by IT departments and software vendors. We begin below by reporting the percentage of teachers who participated in various types of professional development (PD) trainings offered by the software vendors. The most common (54%) form of PD was an initial face-to-face training. Additionally, the vendors made a variety of other training formats available and 17% of teachers participated in additional face-to-face training, 17% in online training resources, and 18% in live online trainings.

### *Teachers*

Teachers rated the usefulness of the training that they received from the software vendors in seven topical areas. Figure 16 shows their responses. Teachers rated the training about overall software features as the most useful (45% useful and 20% somewhat useful). Only a few (1%) teachers rated the training topics as useless. A relatively surprising percentage (22% - 23%) of teachers rated the training areas as not applicable.

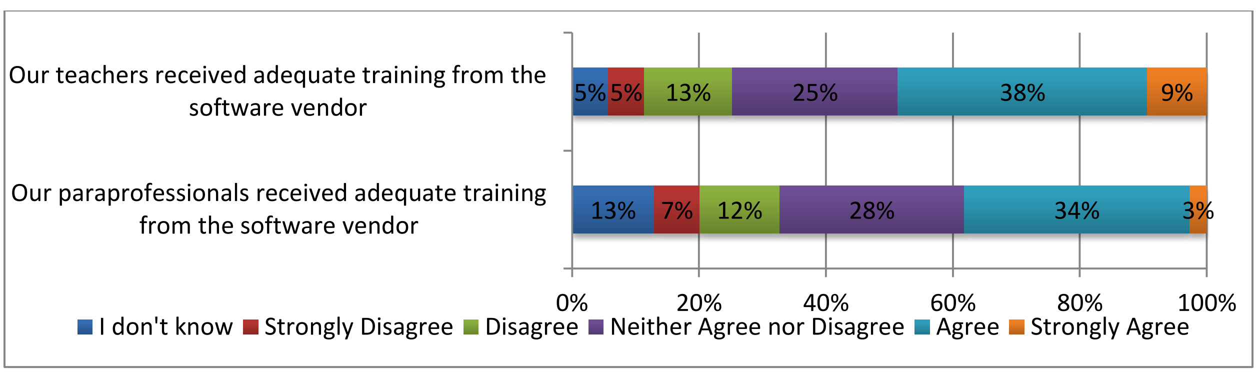
**Figure 16. Teachers' Ratings of Training Usefulness**




Source: School Survey – Teachers (N=144 +/- 1)

Administrators weighed in on the value of the PD that teachers and paraprofessionals received (see Figure 17). While a few administrators indicated that they did not know, most agreed or were neutral regarding the adequacy of the training that teachers and paraprofessionals received from the software vendors. However, almost 20% disagreed or strongly disagreed that the trainings were adequate and only a few strongly agreed that the trainings were adequate, suggesting that administrators' perceptions of the teacher and paraprofessional trainings were relatively low.

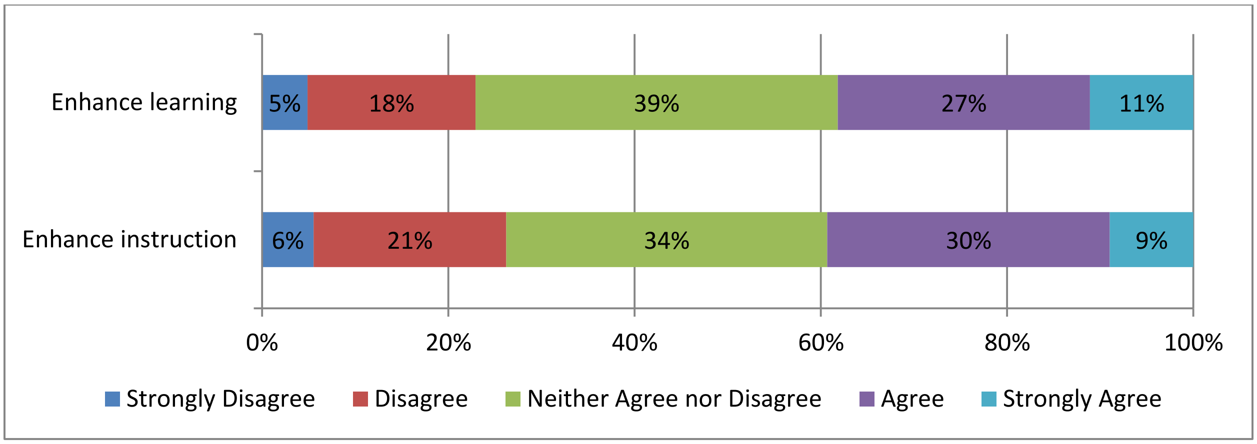
**Figure 17. Administrators' Perceptions of Teacher and Paraprofessional Training**




Source: School Survey – Administrators (N=73)

Besides the technical aspects of being able operate the equipment and software programs, actually understanding how to use the software as a learning tool may be among the most important skills for teachers. As a final measure of whether or not the training was adequate, we offer Figure 18, which shows the extent to which teachers disagreed and agreed about the adequacy of resources that demonstrated how the software could be used to enhance instruction and learning. Most teachers neither agreed nor disagreed (34% and 39% respectively), and a noteworthy percentage disagreed and strongly disagreed (27% and 23% respectively) that the resources were adequate for these purposes. These results suggest that although most teachers may have responded positively regarding the usefulness of many PD topics (see Figure 16), they may not have fully understood how these various topics can best be utilized to maximize student learning.

**Figure 18. Adequacy of Resources that Demonstrated How Software Can be Used to Enhance Learning and Instruction**



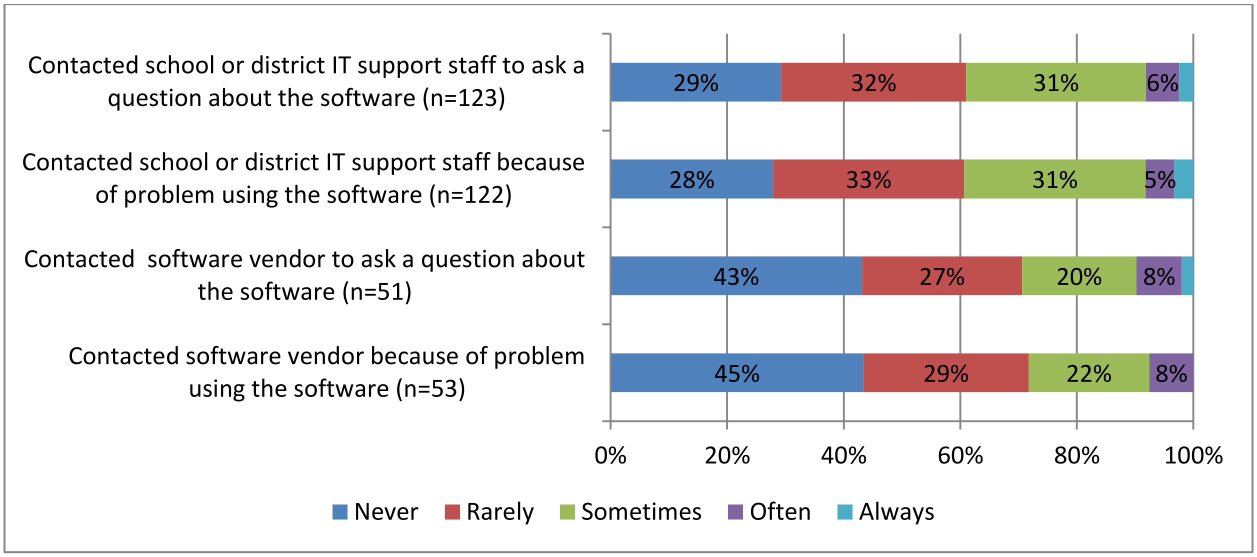

Source: School Survey – Teachers (N=144)

In addition to PD opportunities, most teachers (83%) were provided with the support of an Information Technology (IT) specialist, either at school or from the district, who could help them if they needed it. Nine percent reported they did not, and 8% indicated they did not know if they had access to an IT specialist. Teachers who reported having access to IT specialists were also asked about the frequency of interactions they had with IT specialists. Figure 19 indicates that about 60% of teachers who had access to IT specialists never or rarely contacted them with problems or questions.

In some instances, school representatives may have needed to contact vendors directly to ask questions or solve problems with the software. We asked teachers who contacted the software vendors when there was a problem and 36% of the teachers said that they were responsible to contact vendors directly. The remainder of the teachers indicated that principals (14%), IT support staff (36%), or other personnel (11%) were appointed as the designees to contact vendors. Twenty percent of the teachers indicated that there was no need to contact the vendor.

Figure 19 also includes responses of teachers who were appointed to contact vendors with questions and problems. Among those teachers who reported having contact with the software vendors, there was a large percentage (70% and 74%) who reported never or rarely contacting the vendors about questions or problems.

**Figure 19. Teacher Contact with School or District IT Specialists and Software Vendor**



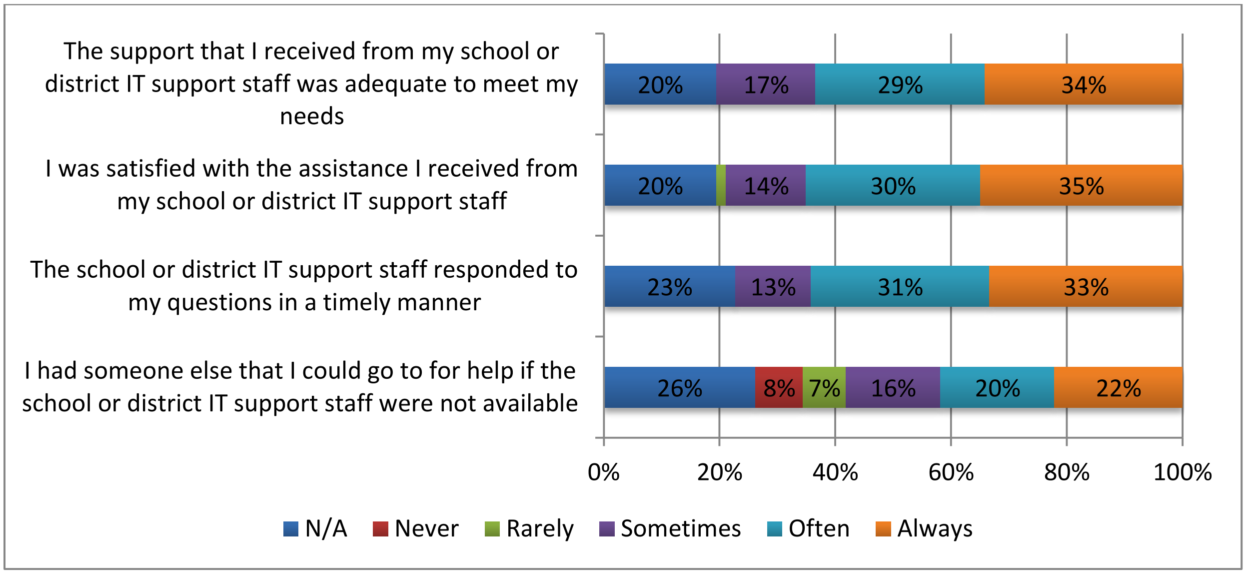

Source: School Survey – Teachers

The following two figures report greater detail about the frequency with which teachers had the support they needed. Figure 20 displays the responses for teachers who contacted school or district IT support and

Figure 21 displays the responses to a similar set of questions for teachers who contacted vendors. Among the teachers who contacted IT support from either resource, most of them were satisfied and had their needs met. However, there was a small percentage of teachers (4% - 6%) who reported that the vendors never provided the support they needed (

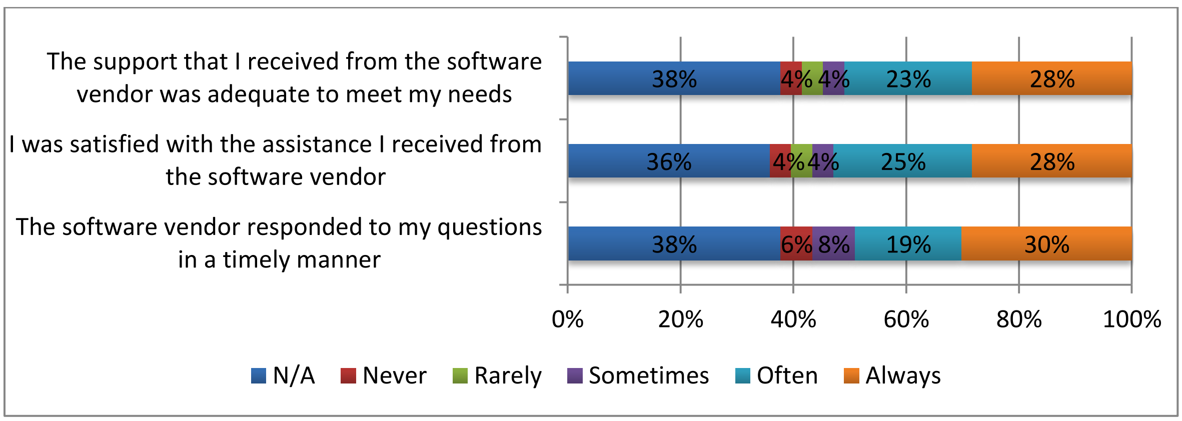
Figure 21). Finally, 15% of the teachers indicated that there was never or rarely someone available to help them if they could not access their school or district IT resource.

**Figure 20. Teacher Satisfaction with School or District IT Support to Use Software Program**




Source: School Survey – Teachers (N=122+/ 1)

**Figure 21. Teacher Satisfaction with Vendor Support to Use Software Program**



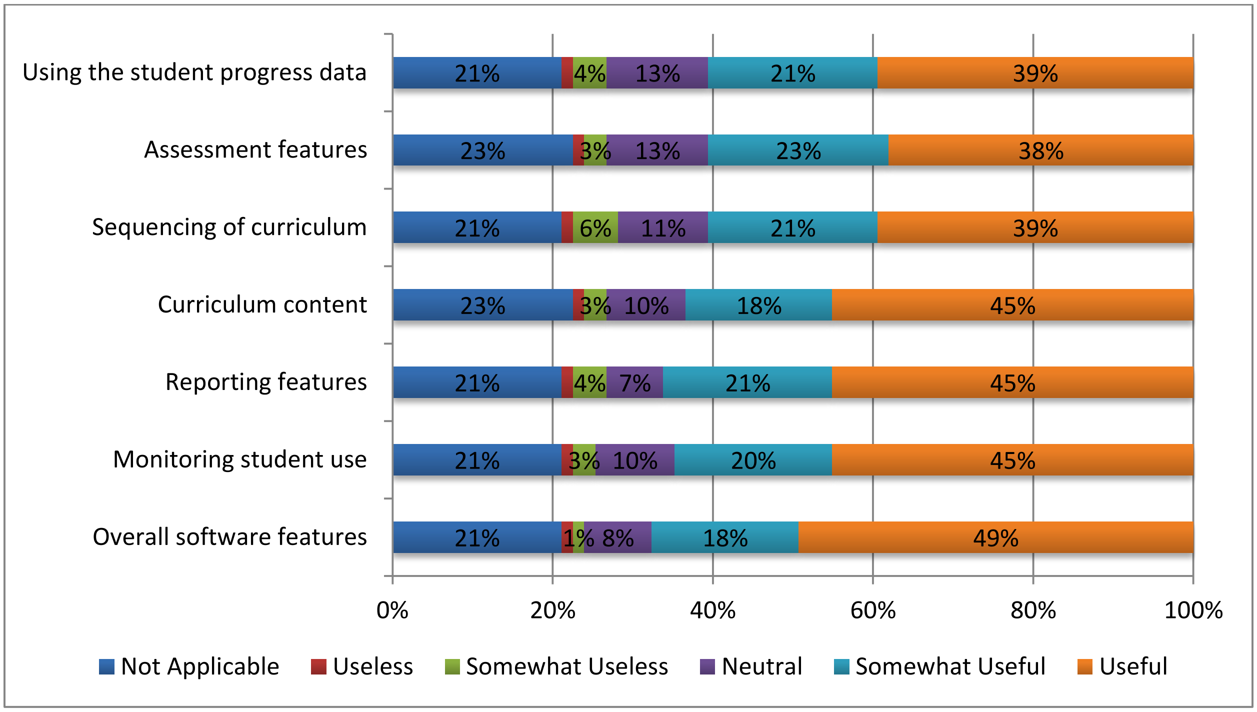

Source: School Survey – Teachers (N=53)

### *Administrators*

Administrators also participated in professional development opportunities related to using the software. Their participation was similar to that of teachers, with 58% participating in an initial face-to-face training, 24% participating in additional face-to-face training, 19% utilizing online trainings resources, and 17% participating in live online trainings.

Administrators rated the usefulness of the training that they received from the software vendors in seven topical areas. Figure 22 shows their responses. The administrators' responses were very similar to that of the teachers. Administrators rated the training about overall software features as the most useful (49% useful and 18% somewhat useful). Only a few (1%) administrators rated the training topics as useless. A relatively surprising percentage (21% - 23%) of administrators rated the training areas as not applicable.

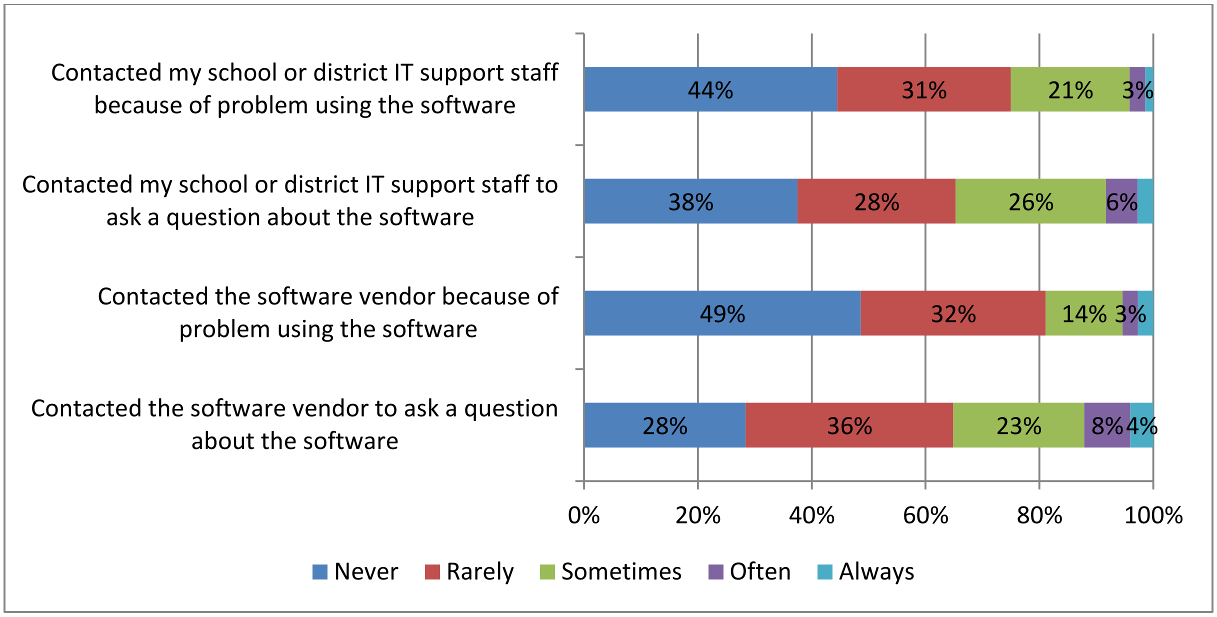
**Figure 22. Administrators' Ratings of Training Usefulness**




Source: School Survey - Administrators (N=71)

We asked administrators about the frequency of their interactions with school or district IT specialists and vendors. Figure 23 indicates that about 44% of administrators never contacted their school or district IT support to discuss problems using the software and 31% did so rarely. Even fewer (49% never and 32% rarely) contacted the vendors because of problems using the software. Contacting school or district IT support personnel to ask questions about the software was also a rare occurrence for administrators with 38 % reporting never and 28% rarely. Similarly, administrators rarely reached out to the vendors to ask questions, with 28% of administrators reporting never, 36% rarely, and 23% sometimes. Like the teachers, it was relatively uncommon for administrators to seek additional support.

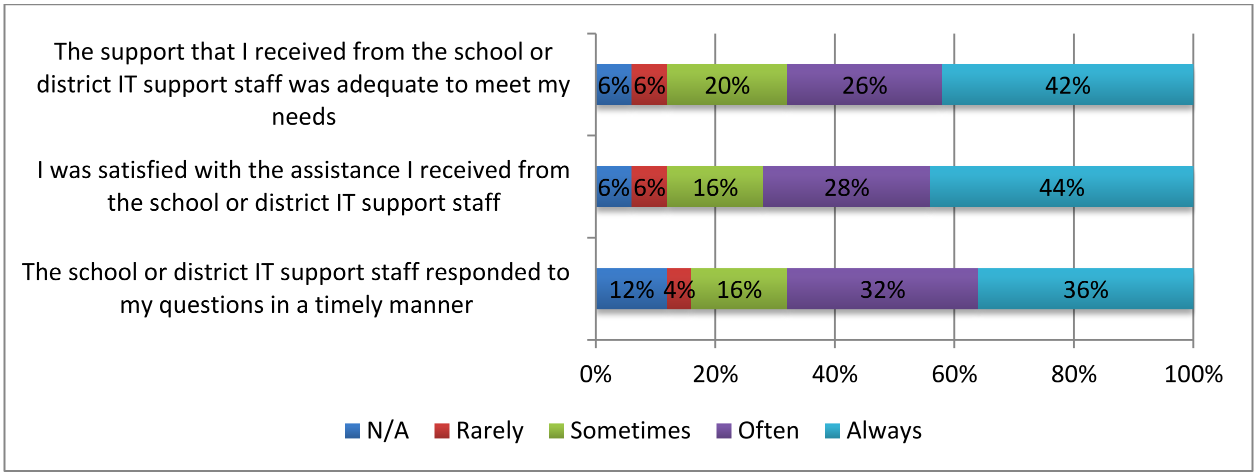
**Figure 23. Frequency of Administrators' Contact with School or District IT Specialists and Software Vendors**




Source: School Survey – Administrators (N=72)

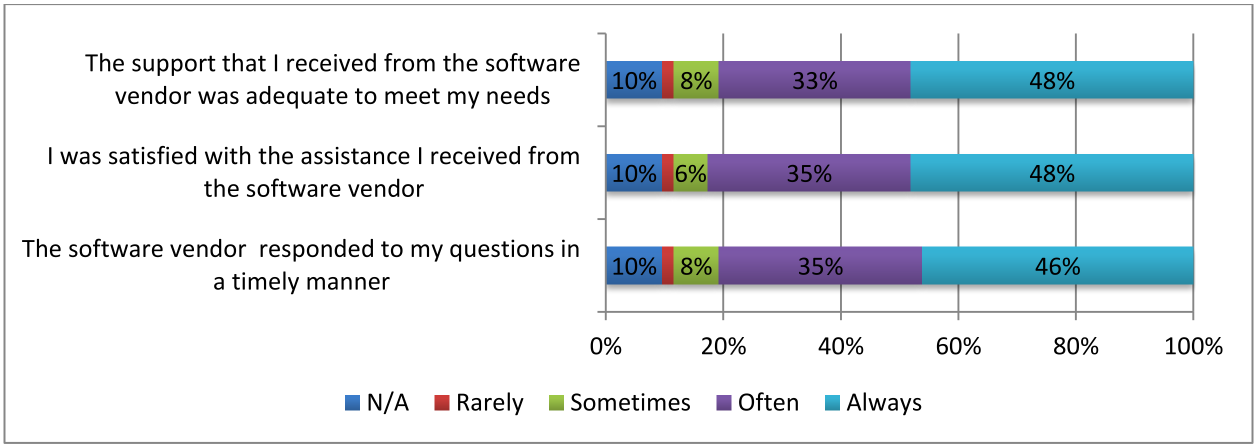
The following two figures report greater detail about the frequency with which administrators had the support they needed. Figure 24 displays the responses for administrators who contacted school or district IT support and Figure 25 displays the responses to a similar set of questions for contacting vendors. Among the administrators who contacted IT support from either resource, most were satisfied and had their needs met. In fact, none of the administrators reported that IT specialists failed to meet their needs. Regarding the support provided by school or district IT personnel, most (68% often and always) administrators reported that the support was adequate to meet their needs and that IT support staff responded to them in a timely manner (32% often and 36% always). Similarly, they were satisfied with the assistance they received (28% often and 44% always). Regarding the support provided by the vendors, 81% - 83% (often and always) of the administrators indicated that they received adequate support, were satisfied, and that the vendors responded in a timely manner.

**Figure 24. Administrator Satisfaction with School or District IT Support to Use Software Program**




Source: School Survey – Administrators (N=51+/-1)

**Figure 25. Administrator Satisfaction with Vendor Support to Use Software Program**




Source: School Survey – Administrators (N=51+/-1)

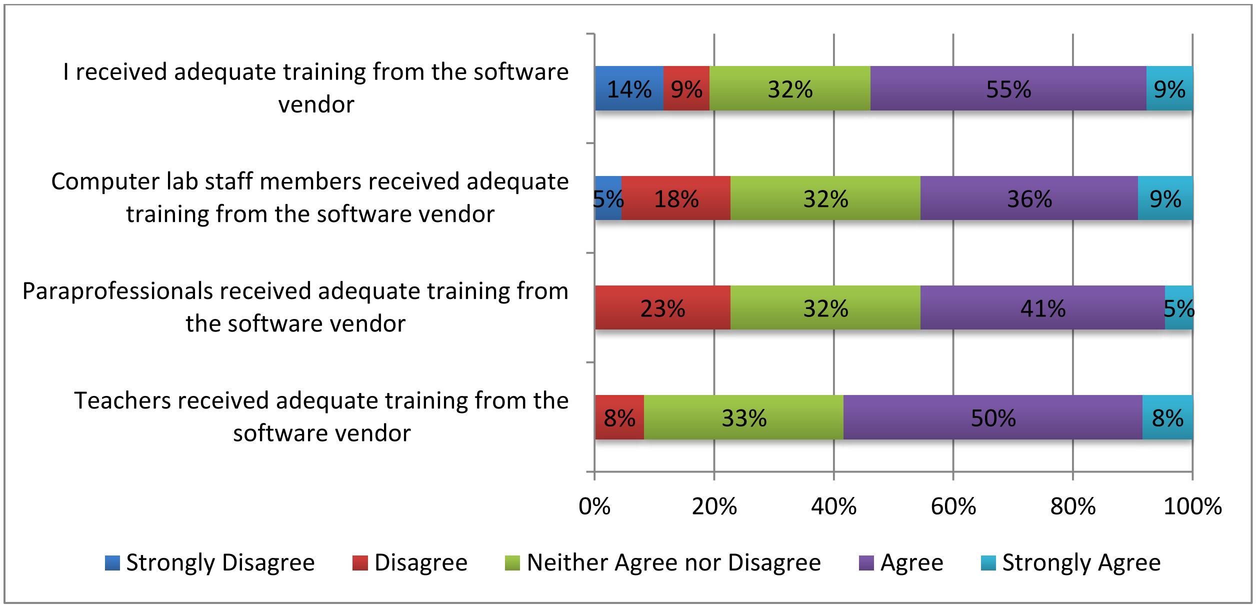
## *IT Specialists*

IT specialists also participated in professional development opportunities related to using the software. Their participation was somewhat different from that of teachers and administrators, with 26% participating in an initial face-to-face training, 13% participating in additional face-to-face training, 19% utilizing online training resources, and 16% participating in live online video trainings.

In addition to participating in trainings, IT Specialists also provided training for teachers and administrators. More than half (59%) of the IT Specialists provided informal training, 25% provided formal training, and 16% coordinated webinars or other online trainings.

IT Specialists rated the adequacy of the training received by themselves and by school staff members. Figure 26 shows that the IT Specialists strongly agreed (9%) and agreed (55%) that they received adequate training from the vendors. They were generally positive about the training received by computer lab staff members (45% strongly agreed and agreed), paraprofessionals (46% strongly agreed and agreed), and teachers (58% strongly agreed and agreed).

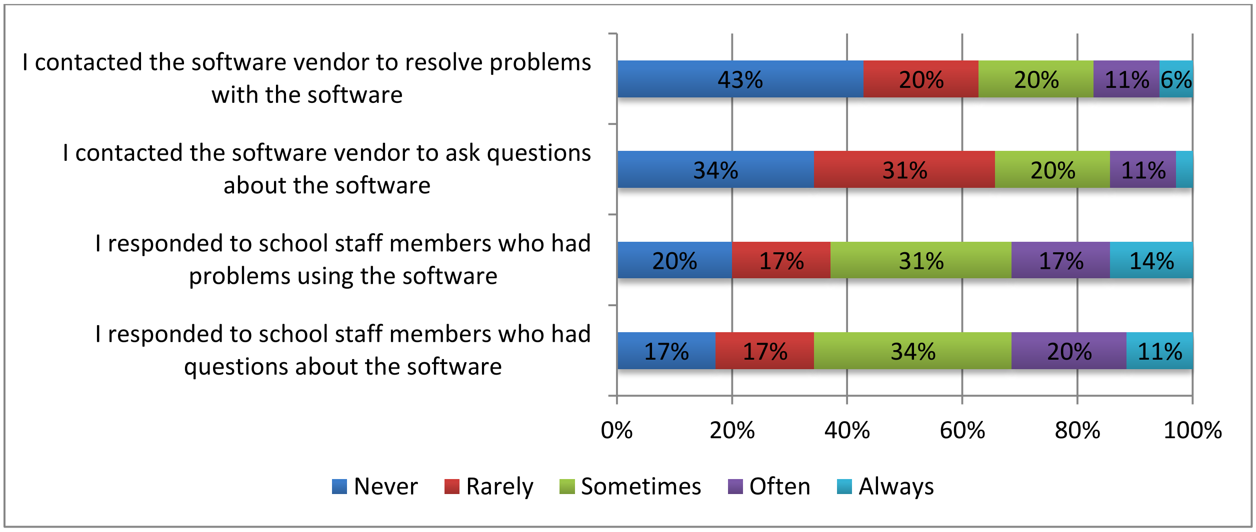
**Figure 26. Adequacy of Training for IT Specialists**




Source: IT Specialists Survey – IT Specialists (N=25+/-1)

We asked IT Specialists about the frequency of their interactions with vendors and the frequency with which they responded to questions from school staff members. Figure 23 showed that 43% of IT Specialists never contacted the vendors to resolve problems with the software and 20% did so rarely. Similarly, 33% never contacted vendors to ask questions about the software and 31% did so rarely. IT Specialists also responded to school staff members who had problems using the software and fielded questions about the software. The frequencies with which they did were fairly evenly distributed, with sometimes (31% and 34% respectively) as the most common response.

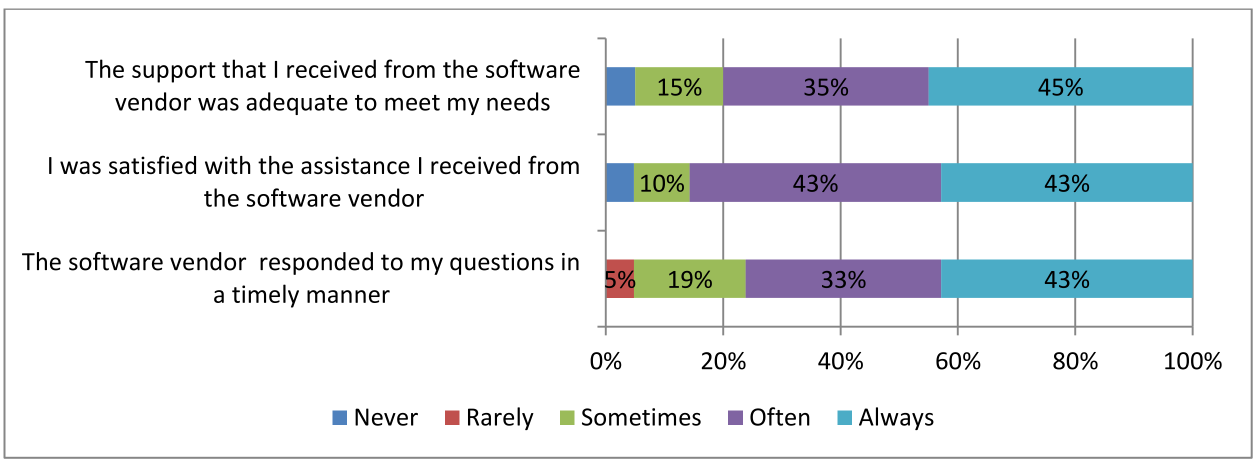
**Figure 27. Frequency of IT Specialists' Contact with Software Vendors and School Staff Members**




Source: IT Specialists Survey– IT Specialists (N=35)

The following figure, Figure 28, shows that among the IT Specialists who contacted the vendors, most were satisfied and had their needs met. IT Specialists reported that the support they received from vendors was adequate to meet their needs 45% always and 35% often, that they were satisfied with the assistance they received 43% always and 43% often, and that the vendors responded to their questions in a timely manner 43% always and 35% often.

**Figure 28. IT Specialists' Satisfaction with Vendor Support to Use Software Program**




Source: IT Specialists Survey– IT Specialists (N=20+/1)

The UEPC evaluation team asked the vendors to provide data that would document the number of calls for support received by each vendor. Only Waterford provided these data. Waterford reported that they fielded 90 calls from 30 schools.

This subsection addressed two evaluation questions that explored the nature of the training and technical support offered by vendor representatives to use the software associated with the H.B. 513 Early Intervention Program and the extent to which the schools had adequate support (from school staff and from vendors) to utilize resources to successfully implement the adaptive learning technologies. Almost half of the teachers and administrators reported having participated in initial face-to-face trainings, but most teachers and administrators reported that they found value in the usefulness of the trainings in which they participated. However, questions remain regarding the extent to which teachers fully understood how they could use the software to maximize student learning. Finally, on most accounts, the results suggested that teachers, administrators, and IT Specialists had adequate support for the ongoing use of the software during the school year.

## Usage

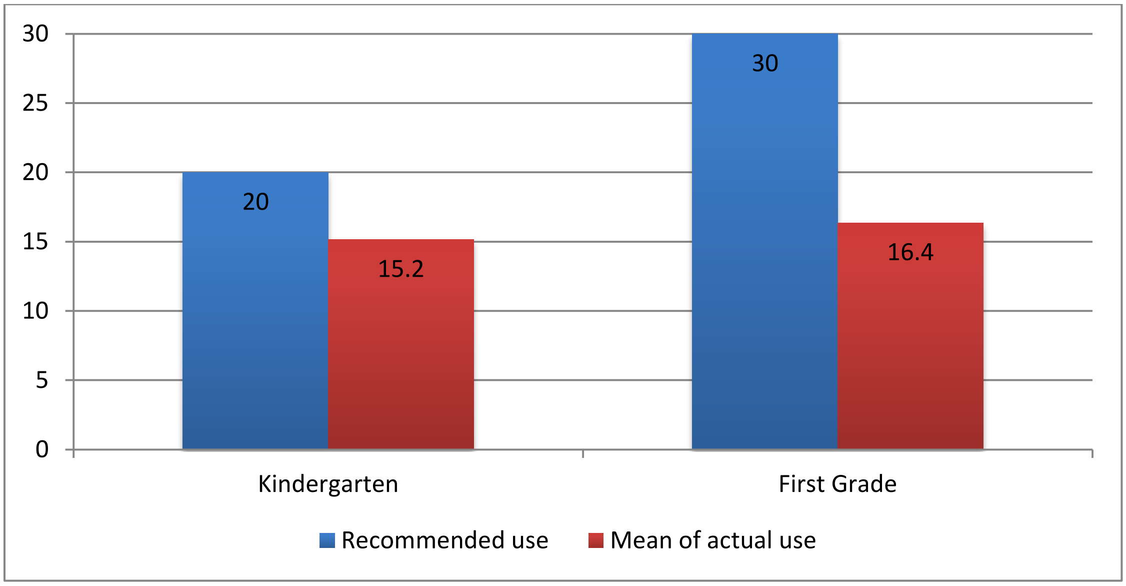
This subsection reports the findings related to the extent to which usage of the software associated with H.B. 513 Early Intervention Program aligned with the recommendations of the software vendors in terms of the minutes of use per session. A second set of results focuses on usage by describing how teachers assessed students' needs and made decisions about the time allocated to software use.

### *Adherence to Vendor Recommendations*

The vendors suggest recommendations for the number of days and amount of time that students should spend working with the software in order to realize benefits. The UEPC evaluation team received usage data from each vendor and used that to calculate the extent to which schools met the recommendations for minutes of use per session. Using the number of sessions is limited by the possibility that students may have logged on more than once during a daily session due to a variety of situations including timing out of the session or other computer issues. See Appendix B: Evaluation Methods for an explanation of why we chose not to report usage data for days per week.

Figure 29 shows the recommended number of minutes per session compared to the actual number of minutes per session that students used the Imagine Learning software on average. Based on these comparisons, the students who used the Imagine Learning data did not meet the recommended usage requirements for minutes per session.

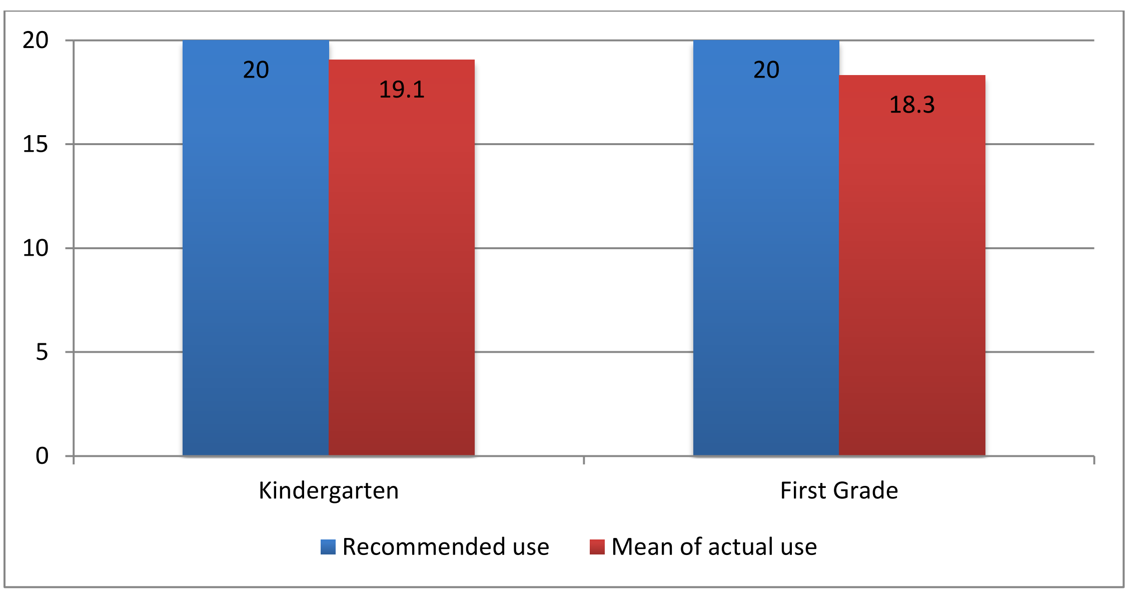
**Figure 29. Imagine Learning Recommended Use and Actual Use: Minutes per Session**




Source: Imagine Learning vendor data (Kindergarten N=7517; First Grade N=9361)

For the Voyager Ticket to Read software, the vendor recommended that students use the software at least 20 minutes per session. The Kindergarten students were closer to meeting this standard than were the first graders. As shown in Figure 30, students who used the Voyager software did not quite meet the minimum usage requirements for minutes per session. However, they were within 2 minutes of complying with the recommendation for minutes per session.

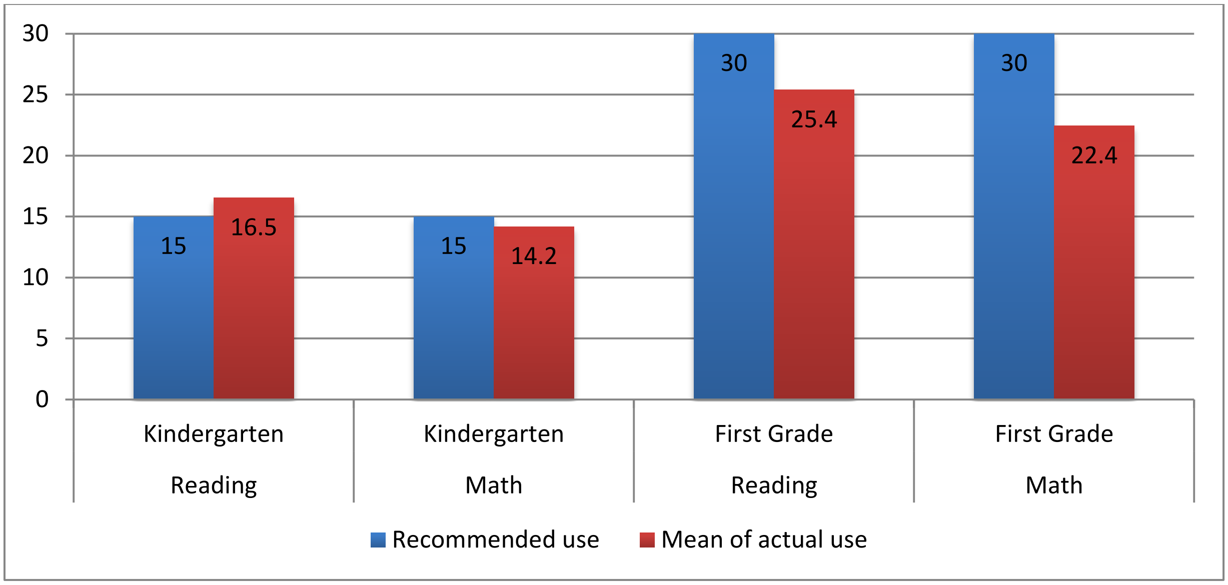
**Figure 30. Voyager Recommended Use and Actual Use: Minutes per Session**




Source: Voyager vendor data: (Kindergarten N=680; First Grade N=751)

The recommended and actual usage for Waterford software is presented in Figure 31. For the average minutes per session, kindergarten students exceeded the recommendation for reading and were very close to meeting the recommendation for math. Although first grade students did not meet the recommendation for minutes of use per session, their average minutes per session exceeded that of other vendors.

**Figure 31. Waterford Recommended Use and Actual Use: Minutes per Session**

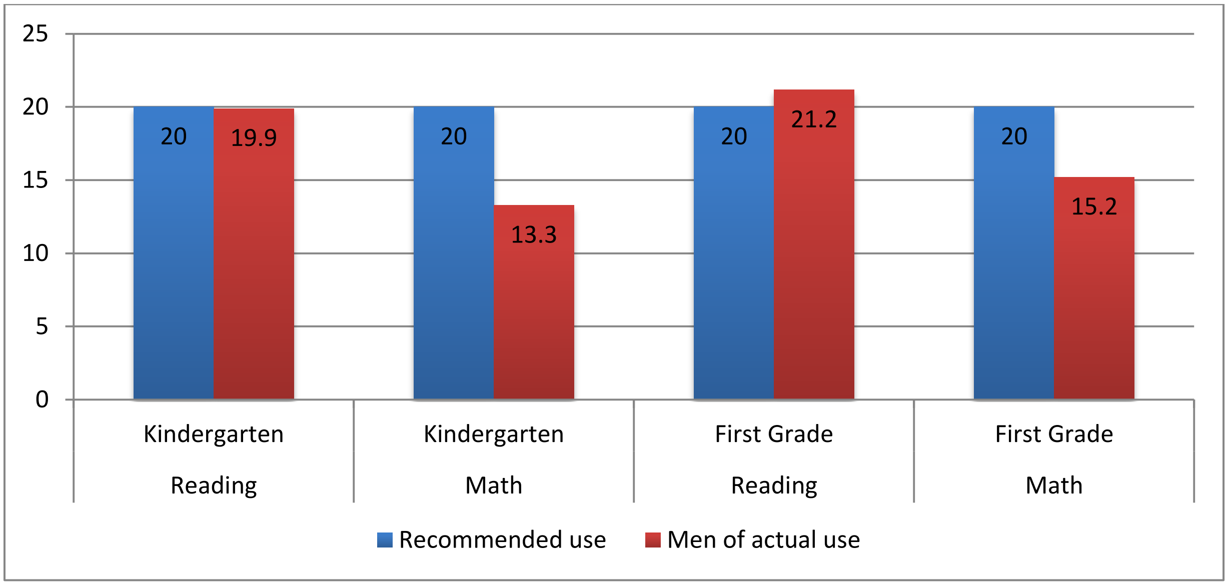



Source: Waterford vendor data: (Kindergarten reading N=1034 and math N=535; First Grade reading N=1101 and math N=573)

Calculating usage data for Curriculum Associates was different than for the other three vendors. Rather than providing the total number of sessions, Curriculum Associates provided the total number of lessons completed. Therefore, the data presented in Figure 32 are based on different metrics than those of the other three vendors and because of that, there is no comparison between CA usage data and the other three vendors.

Curriculum Associates recommends that students spend at least one hour a week in the online instruction and suggests that sessions last 20-40 minutes. They have designed their software to accommodate 20 minutes sessions by allowing students to save their work and return to it in a future session.

**Figure 32. Curriculum Associates Recommended Use and Actual Use: Number of Minutes per Lesson**




Source: Curriculum Associates vendor data: (Kindergarten reading N=1287 and math N=558; First Grade reading N=1357 and math N=620)

Table 10 provides a summary of the tables above. It displays the extent to which student use (based on the average usage presented above) met the vendor recommendations for minutes per session by each vendor and grade.

**Table 10. Extent to which student use met vendor recommendations for minutes per session**

| Vendor | Kindergarten | First grade |
|---|---|---|
| Imagine Learning | 76% | 55% |
| Voyager Ticket to Read | 96% | 92% |
| Waterford reading | >100% | 85% |
| Waterford math | 95% | 75% |
| Curriculum Associates reading | 100% | >100% |
| Curriculum Associates math | 67% | 76% |

Source: Vendor data

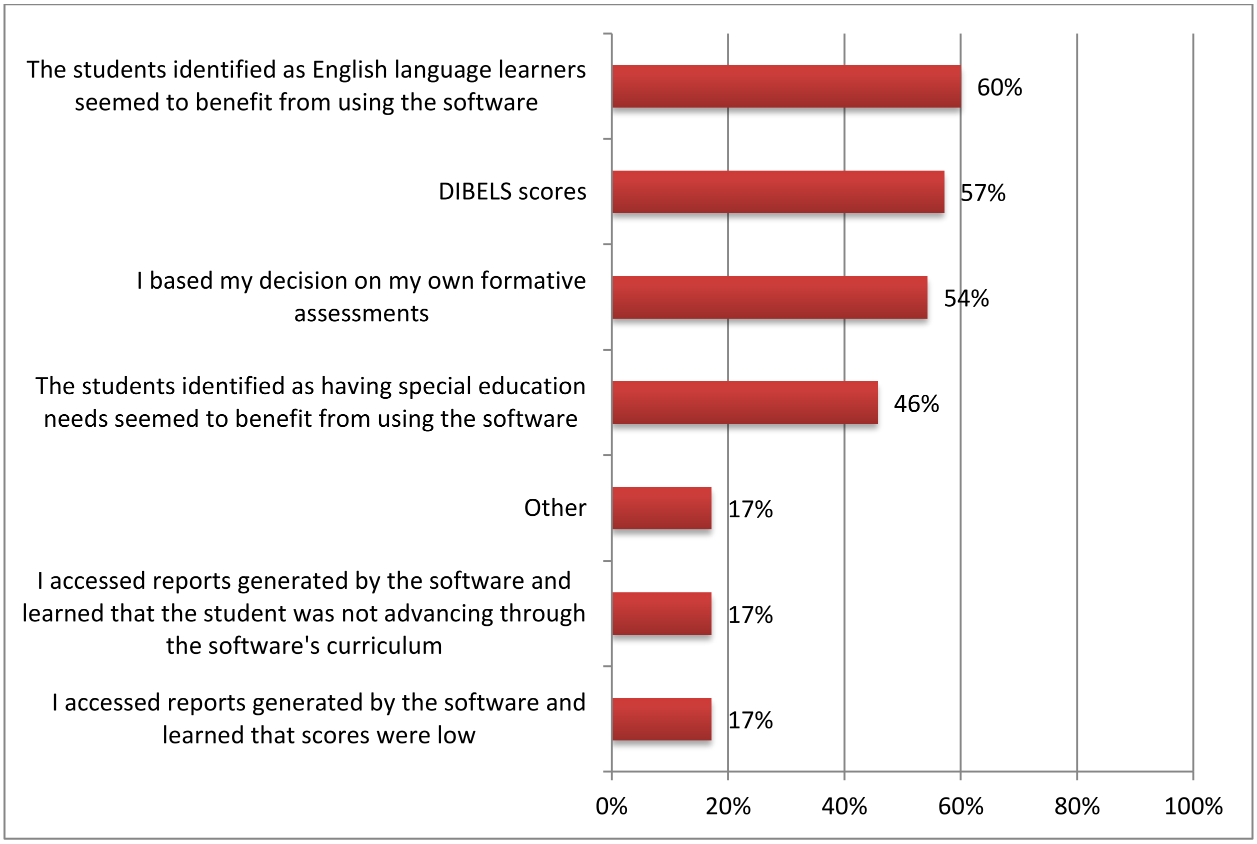
As a validity check to see if teachers knew the vendor recommendations, we included a question on the School Survey that asked teachers to identify the recommendations of the vendors from a list of choices. Although there was only enough data available to report the findings for Voyager and Imagine Learning, we learned that only 1 of the 17 teacher respondents who used the Voyager software could accurately identify the recommended weekly minutes of use from a list of options. For Imagine Learning, 69 of 108 (64%) of the teacher respondents accurately identified the recommended weekly minutes of use. These findings suggested that some of the shortcomings in actual use might be due to a lack of knowledge regarding recommended usage requirements. Interestingly, in a separate question, 56% of teachers strongly agreed or agreed that they had enough time during a school day to accommodate the vendor recommendations regarding student use, while 32% strongly disagreed or disagreed.

This subsection has presented results that address the extent to which the implementation of the H.B. 513 Early Intervention Program's software use aligned with the recommendations of the software providers. The following subsection focuses on usage by describing how teachers made decisions about student software use and whether or not students who may have needed the additional support offered by the H.B. 513 Early Intervention Program received access to the software according to their needs.

### *Relationship between Student Needs and Software Use*

As an early intervention program, it is a goal of H.B. 513 to serve the students who need it most. In Figure 33, we present the findings from a related survey question that explored the question of whether or not the students who needed additional support were given additional access to use the software. A question on the School Survey asked teachers if students spent equal time working with the software and 58% reported that, yes, the students in their classes spent the same amount of time using the software. The teachers who reported assigning additional time for students to work with the software were asked to indicate the factors that contributed to their decision to assign additional time working with the software. Figure 33 shows their responses.

**Figure 33. Factors Used by Teachers When Assigning Students Additional Time with Software**




Source: School Survey – Teachers (N=35) *This question allowed for multiple responses.

Among the 40%of teachers who reported that they assigned additional time for some students to use the software, the first most common response was that teachers assigned additional time for English language learners. The second most common source of information that teachers used to identify those students who needed additional help was DIBELS scores. This could have been the case only for first grade students because kindergarten students do not take the DIBELS.

The use of DIBELS scores to identify students who were at risk of having difficulty learning to read is a primary purpose for administering the measure. Understanding the relationship between students' performance on the first DIBELS administration and the time they spent using the software provides further insight into whether or not teachers used the DIBELS as a means to identify students who needed additional help learning to read and whether or not those students utilized the resources available to them through the H.B. 513 Early Intervention Program.

We conducted an exploration of the relationship between student performance on the first DIBELS administration and software usage in two ways.  First, we ran simple correlations between DIBELS scores at the beginning of the year and the total number of hours and total number of sessions for which students used the software.  Second, we predicted software use for each student based on the student's demographics and then from the student's demographics plus the student's score on the first DIBELS administration.

The lack of student ID numbers provided by the vendors drastically limited the ability to answer questions at the student level. As such, we were able to merge vendor data, DIBELS data, and SIS data for a small number of students. In total, 1,222 students could be matched. This included 21% of the students that used Curriculum Associates software and 2.3% of the students that used Imagine Learning software.

Simple correlations between beginning of the year DIBELS scores and use statistics showed both significant and non-significant negative relationships between student baseline performance and software usage. The negative relationships were such that students with lower DIBELS scores used the software more frequently and/or for more hours than students with higher baseline DIBELS scores. **This finding suggests that in this sample of students who used the software, the students who needed the additional support of more time using the software did, in fact, have additional opportunities to work with the software.**

A second analysis considered the relationships between baseline DIBELS scores and software use in more detail. For this analysis, we ran sequential regressions, first predicting software use from demographic variables only, and then we added the baseline DIBELS scores. The second model was compared to the first to understand how well baseline DIBELS performance predicted software use over and above the use predicted by demographics alone. Demographic variables included gender, race, English language proficiency, low income, and special education designation. *This approach allowed us to distinguish if students may have been targeted for use because of demographic group membership rather than because of the specific academic needs reflected by DIBELS scores.* For example, as Figure 33 suggested, ELL students could have been required to use the software more often than other students. This second analysis allowed us to determine if, independent of demographic variables, students' academic needs correlated with use.

Results from the analysis with *total number of hours* of software use as the outcome showed that the set of demographic indicators did significantly predict number of hours spent with the software for both vendors. Specifically, students who were English language learners, from low income homes, or white (with all other demographics controlled for) used the software more than students who were not ELL, not from low income homes, or not white. For users of Imagine Learning software, DIBELS baseline scores successfully predicted hours of software use over and above what was predicted by demographics alone. For Curriculum Associates, the baseline scores did not predict hours of software use over and above demographics.

Results from the analysis with *total number of sessions* as the outcome showed that demographic variables significantly predicted the number of sessions for Curriculum Associates software users, but not for Imagine Learning software users. Again, students who were ELL, from low income homes, and students who were white (with all other variables controlled) were more likely to use the software. For students using Curriculum Associates software, baseline DIBELS scores successfully predicted the number of sessions over and above what was predicted by student demographics. Table 11 shows the results for the models predicting software use by demographics and by demographics plus baseline DIBELS scores.

**Table 11. Demographics and Demographics Plus Baseline DIBELS Scores software use predictions**

| Vendor | Outcome | Demographics only | Demographics plus baseline DIBELS |
|---|---|---|---|
| Curriculum Associates | Number of Sessions | Yes | Yes |
| | Number of Hours | Yes | No |
| Imagine Learning | Number of Sessions | No | No |
| | Number of Hours | Yes | Yes |

Source: Vendor data, DIBLES, and SIS

*Conclusions drawn from the results presented above are limited to the small sample of students for whom usable data were available.* Of the students with usable data, there is evidence that:

- Students with lower baseline DIBELS scores used the software more frequently.
- For students using Curriculum Associates software, there was evidence that the students with lower baseline DIBELS scores also used the software for a greater number of sessions than students with higher DIBELS scores.
- For students using Imagine Learning software, there was evidence that the students with lower baseline DIBELS scores also used the software for a greater number of hours than students with higher DIBELS scores.
- There was also evidence that the significant relationships between baseline DIBELS scores and software use were independent of student demographics for both vendors and that certain demographic categories, including ELL, used the software more than others.

## Student Learning

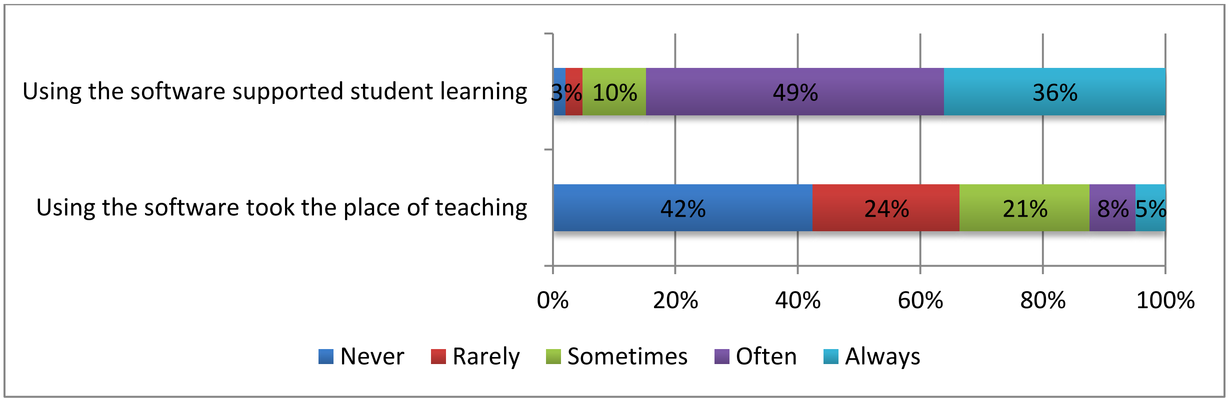
This subsection addresses the extent to which the software associated with the H.B. 513 Early Intervention Program was used to support student learning and track progress. Specifically, we report results concerning teachers' perceptions of the value of software use for student learning, the use of student performance reports to improve student learning opportunities, and the alignment of the software with curriculum, school improvement plans, and instruction.

### *Support of Student Learning*

The following findings focus on the extent to which teachers and administrators felt that the use of the software programs in schools supported student learning. Additionally, we consider the extent to which teachers and administrators utilized the reporting features of the software to maximize student learning.

Figure 34 introduces teacher responses to two questions about using the software. Most teachers felt that using the software supported student learning (36% always and 49% often). A few teachers (5% always and 8% often) felt that using the software took the place of teaching.

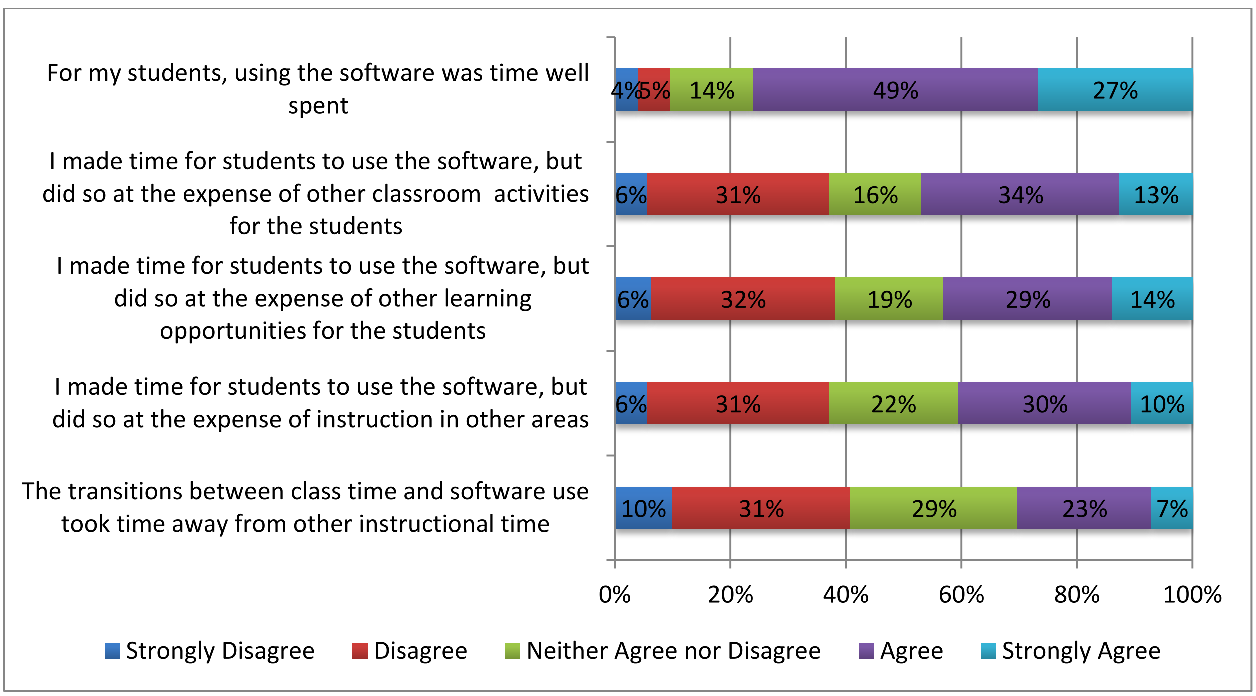
**Figure 34. Teachers' Use of Software to Support Student Learning**




Source: School Survey – Teachers (N=144)

Figure 35 provides further insight into teachers' perceptions of software use in the schools. The topics in this figure build on those reported in Figure 34 by covering a range of important considerations that involve the value of time spent working with the software. For example 76% of the teachers strongly agreed or agreed that using the software was time well spent for their students. However, they acknowledged that using the software came at the expense of other classroom activities (47% strongly agreed and agreed), other learning opportunities (43% strongly agreed and agreed) and instruction in other areas (40% strongly agreed and agreed).

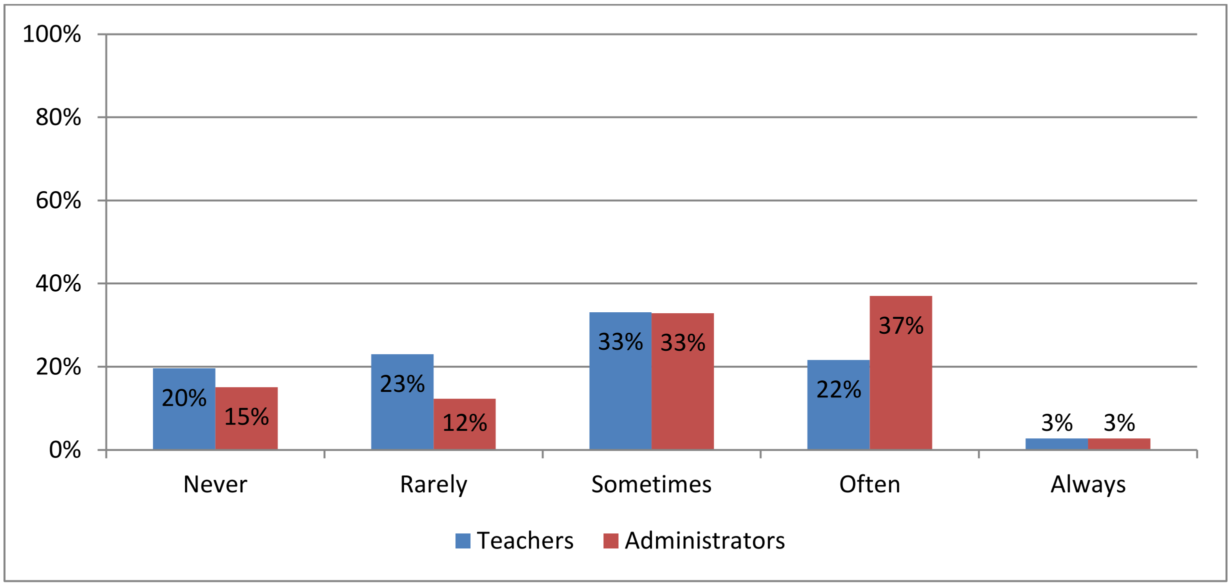
**Figure 35. Teachers' Perceptions of Software Use**




Source: School Survey – Teachers (N=142-146)

One important software feature that teachers and administrators can use to support student learning are the student performance reports. Each vendor offers options for accessing student performance reports that include information about student usage, lessons completed, type and amount of curriculum covered, and student performance in the form of scores from a variety of assessments. Figure 36 displays the frequency with which teachers and administrators accessed student performance reports. Considering the potential usefulness of such reports, it is surprising that 3% of teachers accessed these reports always, 22% often, and 33% sometimes.

**Figure 36. Frequency of Accessing Student Performance Reports**

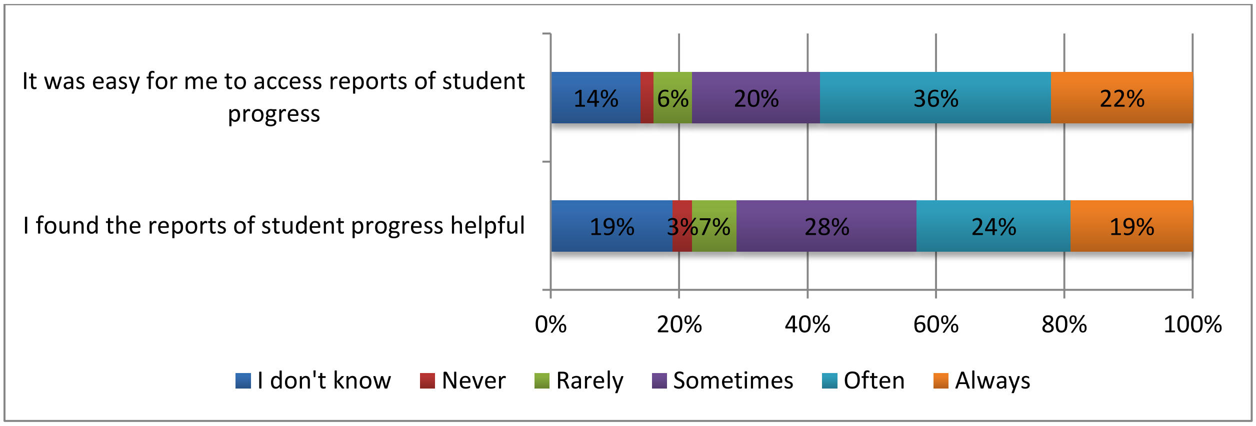



Source: School Survey – Teachers (N=146); Administrators (N=73)

The UEPC evaluation team asked the vendors to provide data that would document the extent to which teachers and administrators accessed student performance reports. Only Voyager provided these data, which appeared incomplete because it only accounted for two schools. For the Voyager software, student performance reports were reportedly accessed 119 times, for 30 students, across 2 schools.

Figure 37 provides additional information about teachers' access to the student performance reports. Nineteen percent of the teachers did not know if the reports were helpful or not, but 43% indicated that they were helpful always or often. Teachers reported that the reports were easy to access 22% always and 36% often. However, such findings are problematized by the low frequencies with which teachers accessed the reports.

**Figure 37. Teacher Access to Student Performance Reports**



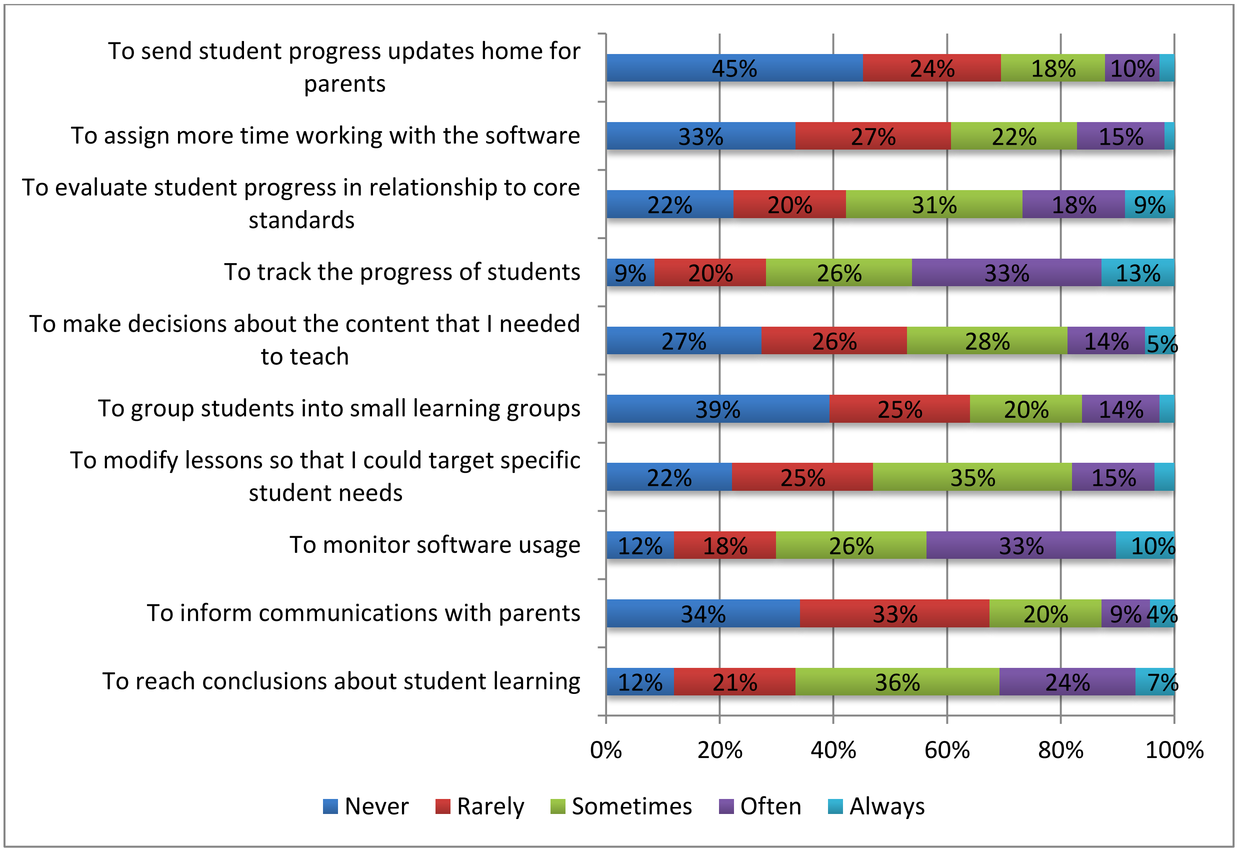

Source: School Survey – Teachers (N=145+/1)

To learn more about how teachers and administrators used the student performance reports, we asked them to rate the frequency with which they used the reports for a variety of purposes. Figure 38 shows the results for teachers and Figure 39 for administrators. These stakeholders responded to some of the same questions and to some different questions, based on their roles and responsibilities.

For teachers, the least common (45% never and 24% rarely) uses of the student performance reports were to send the reports home for parents to review and to inform communications with parents (34% never and 33% rarely). Forty-one percent of administrators reported using the student performance reports to inform communications with parents sometimes. Monitoring software usage was popular among both teachers and administers, with 43% of teachers and 52% of administrators reporting that they monitored software usage always and often. Almost half of the administrators reported (8 % always and 39% often) using the reports to reach conclusions about student learning, while only a third of teachers did the same (7% always and 24% often).

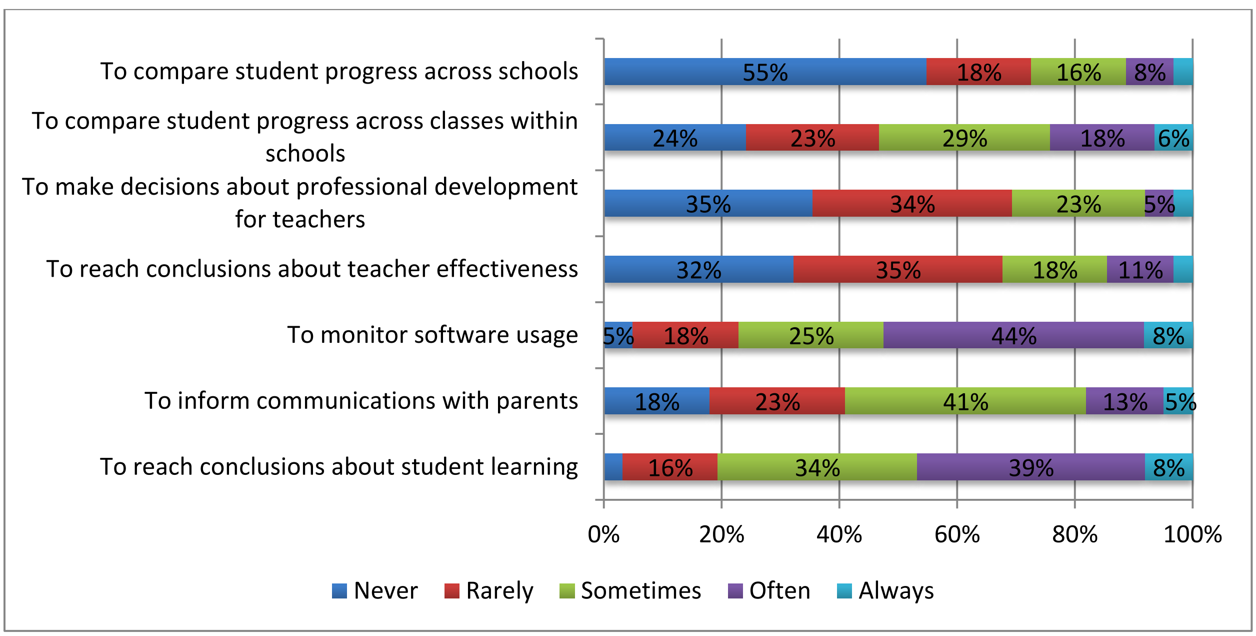
A few of the questions were unique to teachers and provided insight into the frequency with which they used the performance reports to enhance student learning opportunities or alter their instructional practices. For example, most of the teachers did not use the data from performance reports to assign additional time working with the software (33% never and 27% rarely), to modify lessons (22% never and 25% rarely), to inform content needs (27% never and 26% rarely), or to group students in learning groups (39% never and 25% rarely). In contrast, the most frequent form of use by teachers was to track the progress of students (13% always and 33% often).

**Figure 38. Teachers' Use of Information from Performance Reports**




Source: School Survey – Teachers (N=149)

**Figure 39. Administrator Use of Student Performance Reports**




Source: School Survey – Administrators (N=61+/1)

This subsection addressed the resources needed to implement the program in terms of equipment, staffing and supervision, and space and location of software. It reported that most teachers felt that the software supported student learning. Further, it added a description of software use in the schools and considered teachers' perceptions of how using the software may have affected other learning opportunities for students. Finally, it presented results from survey questions that asked teachers and administrators to document the ways in which they used the student performance reports to support student learning.

## Outcomes

This subsection reports the results of several sets of analyses that explored student learning gains. It begins with vendor reported learning gains and includes the outcome measures provided by the vendors as well as the DIBELS measures.

### Learning Gains

#### *Vendor Reported Learning Gains*

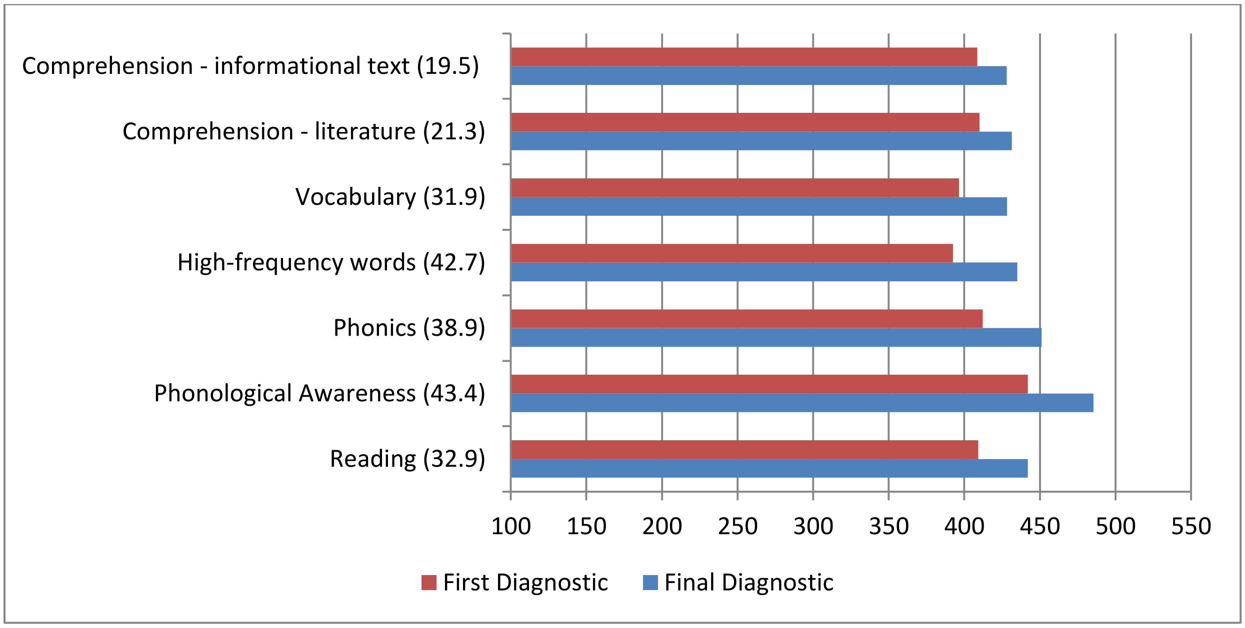
We have made every effort to present the learning gains that were reported by each of the four vendors.  Calculating learning gains requires test scores from the beginning and end of software use. One vendor provided this type of data, which allowed us to calculate and report student learning gains. Two of the vendors provided test scores that were collected at the end of the software use for the academic year and one vendor provided no test scores.

In an effort to calculate and report the learning gains of students based on the data that were available, we used the time that students spent working with the software in a set of linear regression analyses to predict growth on the standardized growth scores that we created. The methods section provided a detailed explanation of how we approached measures of student performance for each vendor. Tables of descriptive statistics and the results of the predictive analyses are available in Appendix D: Methods and Results for Statistical Analyses We begin below with student learning gains reported by Curriculum Associates, for which test scores were available for the beginning and end of student use.

##### Curriculum Associates Reading and Math

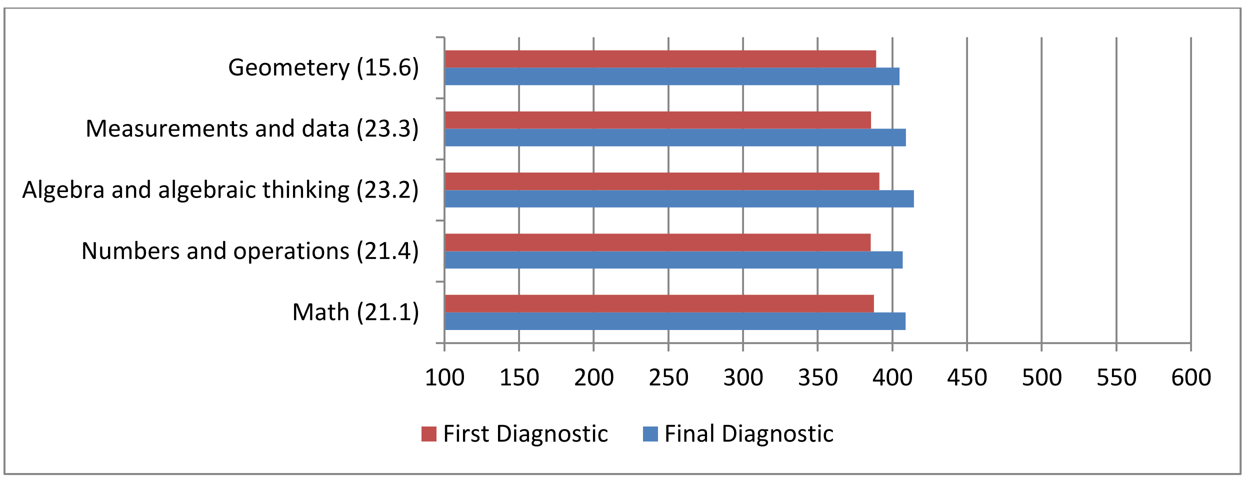
In Figure 40 and Figure 41, we report the student learning gains for Curriculum Associates (CA) reading and math software by showing the first and final diagnostic scaled scores for each strand. The difference in mean scores is included in parentheses along with each strand. Although not the case for every student, mean scores generally improved throughout the school year.

**Figure 40. Learning gains for Curriculum Associates: Reading software**




Source: Curriculum Associates vendor data (N = 2129) *The numbers in parentheses represent the difference in mean scores between the first and final diagnostic scaled scores for each strand.

**Figure 41. Learning gains for Curriculum Associates: Math software**




Source: Curriculum Associates vendor data (N = 921) *The numbers in parentheses represent the difference in mean scores between the first and final diagnostic scaled scores for each strand.

Curriculum Associates was the only vendor that offered a format of vertically scaled test scores for the beginning and ending of software use. This provided the most clear cut way to assess student learning gains. In fact, CA offers recommendations for how much those growth scores should change in one academic year. The recommended growth expectations from a student over the course of one year working with the software are:

- Reading: 42 points for kindergarteners and 40 points for first graders and
- Math: 28 points for kindergarteners and 29 points for first graders.

Table 12 shows the growth scores expected for one full year of use and the aggregated growth scores for students who used the CA software. Students in the H.B.513 Early Intervention Program used the software for approximately half of the academic year.

**Table 12. Curriculum Associates Aggregated Growth Scores for Reading and Math**

| | Reading | | | | Math | | | |
|---|---|---|---|---|---|---|---|---|
| Grade | N | Mean growth expected (1 full year) | Mean growth achieved (~1/2 year) | SD | N | Mean growth expected (1 full year) | Mean growth achieved (~1/2 year) | SD |
| Kindergarten | 1037 | 42 | 35.1 | 37.78 | 467 | 28 | 24.7 | 34.32 |
| First Grade | 1092 | 40 | 30.8 | 35.54 | 454 | 29 | 17.1 | 36.64 |

Source: Curriculum Associates vendor data

In comparing the numbers presented in Table 12 to the recommendations for expected growth, readers should consider that the implementation of the H.B. 513 Early Intervention Program occurred throughout the 2012-13 academic year such that schools were initiating implementation of the program at different dates as the school year progressed. For example, only 7% of students used the software before December and most students (60%) started working with the software in December or January, suggesting that students may have been well aligned with expected growth according to the vendor's recommendations. Student learning gains appeared largely consistent with the vendor's recommendations. We also attempted to predict growth based on software use for CA users and only four of the 12 strands were successfully predicted by software use.

### Imagine Learning

Imagine Learning did not provide a student performance measure for the beginning of software use. Therefore, for the Imagine Learning data, there were no scores available from the beginning of software use. We calculated a final student performance score based on the amount of content covered and the students' final scores. A set of regression analyses, available in Appendix D: Methods and Results for Statistical Analyses predicted the total amount of time that students spent working with the software to predict their scores.

- The amount of time that students used the software successfully predicted their overall standardized scores.
- The more a student worked with the software, the better she or he scored on Imagine Learning's final diagnostic.

### Voyager (Ticket to Read)

The Voyager Ticket to Read program does not include a measure of student performance. Therefore, there was no measure of student performance from which to report the learning gains of students who used the Ticket to Read software. The best we can do in this case is to report basic usage information in the form of the amount of material that students covered. Ticket to Read software includes two types of lessons, phonics and fluency. While completing fluency lessons, students earned *tickets* and read *passages*. We report the results of analyses of the relations between time spent working with the software, which successfully predicted all four of the usage variables. However, we also must include the caveat that this says little about actual student learning gains because the analyses essentially predicted the amount of content covered rather than a student performance measure.

### Waterford Reading and Math

For the purpose of reporting the learning gains for students who used the Waterford software, we predicted students' growth scores with the amount of time they spent logged on to the software. The amount of time that students were logged on to the software predicted growth for four of the five reading strands. For the fifth strand, fluency, there were too few scores available to warrant analysis. Results of these analyses are available in Appendix D: Methods and Results for Statistical Analyses

### Summary of Vendor Reported Learning Gains

Curriculum Associates was the only vendor to provide a valid measure of student learning gains. Without scores for the beginning and end of use, we were left with only one set of scores for Imagine Learning and Waterford, the growth scores that we calculated based on the amount of content covered and the final scores. In the absence of a true measure of student learning gains for those vendors, we used the time that students spent using the software to predict the standardized growth scores. It is not surprising that these results were positive. The more students used the software, the better they scored on the vendors' learning assessments. We conducted the same type of analyses for the Voyager Ticket to Read software, but with the caveat that Voyager offered no student scores.

## *Relationship among time and learning gains on vendor assessments, controlling for demographics*

Our ability to explore the relationship among time spent working with the software programs, demographic characteristics of students, and learning outcomes as measured by the vendors' assessments was limited by the poor match rate between vendor data and SIS data. As described in the methods section, only two of the vendors (Curriculum Associates and Imagine Learning) provided student identifiers that could be matched with SIS data. For these analyses, we didn't need to match DIBELS data to the vendor data, which improved match rates. We were able to match 59% (N = 1,777) of students who used Curriculum Associates software and 11% (N=1,939) of students who used Imagine Learning software.

Our first step in determining the Relationship among time and learning gains on vendor assessments, controlling for demographics was to consider differential use of the software by student demographic category. Use was measured as *time* (total minutes or total hours the software was used by participating students) and *sessions* (total number of sessions by participating students). The demographic categories were Gender (male or not), Family Income (qualifying for free or reduced lunch or not), English Language Learner (qualifying for English Language Learner services or not), Race (white or not), and Special Education (qualifying for special education or not).

We conducted regressions that predicted use by the demographic categories. All regressions showed that a significant proportion of variance in both *use* measures could be accounted for by demographics, however, the proportion of variance accounted for was very small. The results presented in Table 13 and Table 14 (for Curriculum Associates and Imagine Learning, respectively) report significant or non-significant relationships (and the direction of the significant relationships) between each demographic category with all other demographic categories controlled. Further description of the methods is presented in Appendix D: Methods and Results for Statistical Analyses, along with the results tables.

**Table 13. Independent relationships between demographic categories and use statistics in Curriculum Associates data**

| Demographic Category | Time | Sessions |
|---|---|---|
| **Gender** | No significant difference | No significant difference |
| **Race** | White students used the software significantly more | White students used the software significantly more |
| **ELL** | Students with low English proficiency used the software significantly more | Students with low English proficiency used the software significantly more |
| **Low Income** | Students from low income homes used the software significantly more | Students from low income homes used the software significantly more |
| **Special Education** | No significant difference | No significant difference |

**Table 14. Independent relationships between demographic categories and use statistics in Imagine Learning data**

| Demographic Category | Time | Sessions |
|---|---|---|
| **Gender** | No significant difference | No significant difference |
| **Race** | White students used the software significantly more | White students used the software significantly more |
| **ELL** | Students with low English proficiency used the software significantly more | Students with low English proficiency used the software significantly more |
| **Low Income** | No significant difference | Students from low income homes used the software significantly more |

| Special Education | No significant difference | No significant difference |
|---|---|---|

The second thing we considered when exploring the relationship among demographic characteristics, software use, and learning gains (*growth*) on vendor assessments was differential growth for students in different demographic categories. We used regressions to predict growth from the demographic categories.

- None of the regressions conducted showed significant relationships between student demographics and growth with the Curriculum Associates data.
- In the Imagine Learning data, demographic variables predicted growth in all but one of the growth measures (Basic Vocabulary) (see Table 15).

The results presented in Table 15 reflect significant or non-significant (NS) relationships between each demographic category, with all other demographic categories controlled, for each of the *growth* outcome variables. In cases where the growth was significant, we indicated whether the relationship was positive or negative by noting if the particular demographic group grew more or grew less than others. *Only the relationships within the Imagine Learning data are reported because there were no significant correlations between demographics and growth in the Curriculum Associates data.*

**Table 15. Independent relationships between demographic categories and Growth Measures in Imagine Learning data**

| Imagine Learning Strand | Gender | Race | ELL | Low Income | Special Education |
|---|---|---|---|---|---|
| **Academic Vocabulary** | NS | NS | grew more | grew more | NS |
| **Conversation** | NS | NS | grew more | NS | grew more |
| **Phonological Awareness 1** | NS | NS | grew more | grew more | grew more |
| **Phonological Awareness 2** | NS | NS | NS | grew less | grew more |
| **Read Along** | NS | NS | grew more | NS | grew more |
| **Letter Recognition** | NS | NS | NS | grew less | NS |

Table 15 shows no relationships between gender or race and growth, and inconsistent relationships between Low Income and growth for students who used Imagine Learning software. Relationships between English Language Learners and students in Special Education had consistent positive relationships with growth. **The significant relationships show that English language learners and students in special education who used the Imagine Learning software grew more than non-ELL and non-special education students, with all other variables controlled.**

The relationships between language proficiency and growth were interesting because they showed the more disadvantaged group of students to grow more. This pattern of significant correlations, between ELL and growth and between ELL and software use, may indicate that software use was a mediating variable, causing the increased growth in the ELL students. An alternative hypothesis is that ELL students would have grown more even if they had not used the software more (e.g., if other support structures for ELL students caused the growth or that the lower starting point for the ELL students afforded more potential for growth).

To test this idea that the ELL students used the software more and subsequently grew more, we needed to establish significant bivariate correlations between ELL and growth, between ELL and software use and between software use and growth. Appendix C shows detailed results of those correlations, all of which were significant. This warranted further testing of the idea, referred to as a mediation hypothesis. Table 16 shows the outcomes of the mediation hypotheses tests, one of which used the number of minutes to predict growth and one of which used the number of sessions.

**Table 16. Did ELL students who used the software more grow more than other ELL students?**

| Imagine Learning Strand | Number of Minutes | Number of Sessions |
|---|---|---|
| Academic Vocabulary | Yes | Yes |
| Phonological Awareness1 | No | No |
| Phonological Awareness 2 | No | No |
| Read Along | No | No |

Results presented in Table 16 support the mediation hypothesis for growth in Academic Vocabulary. This may indicate that specifically targeting ELL students for software use caused the ELL students to grow more than their peers, thus reducing the achievement gap typically seen in this population, with regard to Academic Vocabulary. The mediation hypothesis was not supported for growth in other learning strands.

Interestingly, the idea that certain demographic groups may have benefited more than others from using the software was also a point that appeared in an open-ended survey question that asked about success associated with software use. As the quotes below illustrate, some teachers noted that the software was particularly helpful for English Language Learners.

> *I think that my English learners showed the most benefit from the program. I saw big jumps in vocabulary, comprehension, and fluency.* (Teacher: School Survey)

> *Good progress for selected students, particularly our ELL population.* (Administrator: School Survey)

While the quotes do not necessarily represent the perspectives of all teachers and administrators, they do add additional support to the conclusion that some demographic groups of students may have benefited more than others.

## Summary of Results

- Voyager and Waterford did not provide student identifiers that could be matched with SIS data.
- Poor match rates for Curriculum Associates and Imagine Learning vendor data and SIS data limited our ability to explore relationships among software use, demographic characteristics, and vendor reported growth for users.
- When analyzed together, demographic categories predicted software use but explained little of the variance for both Curriculum Associates and Imagine Learning.
- When individual demographic categories were compared to all other demographic categories to predict time using the software and number of sessions for both vendors, students in each of the following demographic categories used the software more than other students: white, low English proficiency, low income (only number of sessions for Imagine Learning).
- Student demographics did not predict growth for Curriculum Associates.
- Student demographics predicted growth in all but one of the Imagine Learning strands (Basic Vocabulary).
- Controlling for demographics, ELL, low income, and special education students grew more than other students on several Imagine Learning strands.
- In the case of one Imagine Learning strand, Academic Vocabulary, using the software may have caused ELL students to grow more than their peers, thus reducing the achievement gap typically seen in this population.

### *Relationship among time and learning gains on DIBELS assessments, controlling for demographics*

In this subsection, we examine the relationships among time spent using the software and learning gains on DIBELS measures, controlling for demographics. We present the results from two analyses at the student level and one at the state level. The student level analyses were used to predict growth on DIBELS measures with the time spent using the software. The state level analysis compared DIBELS scores between schools that did and did not use the software.

## Student Level Analyses

Our intended method for determining the relationship among time spent working with the software, student demographic characteristics, and learning outcomes as measured by DIBELS was to predict the change in DIBELS scores over the course of the year for each student. This was to be accomplished by using the time each student spent working with the software and demographic characteristics of the students as predictors of six different DIBELS measures.

As described in the methods, we were only able to obtain student identification numbers that matched across data sets for a subset of students (22% and 2%) from two of the vendors (Curriculum Associates and Imagine Learning, respectively). We ran student level analyses for the students for whom we had data, limiting the analyses to a small and non-random proportion of students who used Curriculum Associates and Imagine Learning software. The methods for those analyses are available in Appendix D: Methods and Results for Statistical Analyses.

We used time spent using the software (software use) to predict growth on the DIBELS measures from one test administration to another, controlling for demographic differences and difference on baseline scores. As explained in the methods section, the DIBELS measures included Composite scores, Nonsense Word Frequency CLS (NWF-CLS), and Nonsense Word Frequency WWR (NWF-WWR), which were all measured three times during the academic year. DIBELS Oral Reading Fluency – Words Correct (DORF-WC), DIBELS Oral Reading Fluency-Accuracy (DORF-Accuracy), and Retelling were measured twice during the academic year.

Results are presented for Curriculum Associates users in Table 17 and for Imagine Learning users in Table 18. We present the number of students included in the analyses along with the standardized coefficients, which are necessary to show the direction of the relationship and whether or not software use successfully predicted the DIBELS measures. Tables with the coefficients and *p* values are available in Appendix D: Methods and Results for Statistical Analyses

**Table 17.Curriculum Associates: DIBELS scores predicted by software use**

| DIBELS Measure | Number of Students | Total time with software | Total number of sessions |
|---|---|---|---|
| **Composite** | 816 | **.364** | **.145** |
| **NWF-CLS** | 816 | -.097 | -.040 |
| **NWF-WWR** | 816 | **-.099** | **-.038** |
| **DORF-WC** | 539 | **.199** | **.079** |
| **DORF-Accuracy** | 539 | -.033 | -.009 |
| **Retelling** | 539 | .010 | .024 |

*Significant coefficients are in **bold**. Significance level was set to $p < .05$.

**Table 18. Imagine Learning: DIBELS scores predicted by software use**

| DIBELS Measure | Number of Students | Total time with software | Total number of sessions |
|---|---|---|---|
| **Composite** | 393 | .003 | **.062** |
| **NWF-CLS** | 393 | .001 | **.023** |
| **NWF-WWR** | 393 | .000 | **.010** |
| **DORF-WC** | 243 | **.002** | **.046** |
| **DORF-Accuracy** | 243 | .001 | .005 |
| **Retelling** | 243 | .000 | .004 |

*Significant coefficients are in **bold**. Significance level was set to $p < .05$.

Table 17 and Table 18 show significant relationships among software use, demographic characteristics, and growth on some DIBELS measures, but the direction of the relationship is relatively inconsistent. For example, there were significant negative relationships between time spent using the software and growth on Nonsense Word Fluency for Curriculum Associates users. Students using both Curriculum Associates and Imagine Learning software showed significant, positive relationships between time spent using the software and change in DIBELS Oral Reading Fluency – Words Correct scores, with students who used the software more improving more. *Because of the small and non-random sample on which these coefficients were estimated, inferring effects beyond this sample is not advised.*

### Outcomes Summary

Here we presented findings related to the ability of software use to predict vendor reported learning gains with and without accounting for demographics. Software use was also used to predict DIBELS scores, a second outcome measure that is external to the software programs. However, all of the student-level outcomes analyses were limited to a small sample of students that cannot be generalized to all software users. The analysis of relationships between time spent working with the software programs, demographics, and learning outcomes as measured by DIBELS was non-conclusive because of the small, non-random sample. The programs do not appear to hurt students and there is some evidence that students who spend more time with the software may experience slightly more increases in some measures than students who spend less time with the software.

# Conclusion

## Considerations

This section provides an overview of the findings followed by considerations for ongoing improvement.

### Context of Implementation

The schools participating in the H.B. 513 Early Intervention Program were generally similar to non-participating schools, with a few exceptions. For example, there were relatively more ELL, Latino, and low income students in the H.B. 513 schools. In terms of the professional context, teachers reported relatively positive perspectives about their own computer use and most teachers were comfortable using technology in the classroom. This suggests a generally receptive environment for implementing the new software programs.

With regard to the resources needed to implement the new program, the most common start-up needs had to do with purchasing new computers, server capacity, wireless capacity, and computer equipment. This ranged from 25-50% of survey respondents who indicated they acquired these when they began implementing the software programs.

Once the program was up and running, students accessed the software programs in computer labs slightly more frequently than in the classrooms. And while many schools may have had enough computers, they sometimes found it difficult to schedule time for students to use the software.

Despite scheduling challenges as well as some computer and software malfunctions, administrators and teachers generally reported that there were enough staff available to adequately supervise students. Further, teachers felt that the software programs were easy for students to use, that the students understood how to use the software, enjoyed using the software, and understood the content.

Rounding out the context, most teachers felt that the software was a good complement to classroom instruction, considered the software well-aligned with Utah Core Standards, and well-aligned with the content that they taught. However, few teachers and administrators felt that goals for technology integration were incorporated in school improvement plans, few teachers reported that schools had expectations about the integration of technology, and teachers were rarely included in the process of selecting of technology. Overall, administrator and teachers were largely in agreement regarding their satisfaction ratings of many aspects of the H.B. 513 Early Intervention Program. The highest satisfaction ratings were for ease of use for students, ease of use for teachers, curriculum content, individualized instruction, and contribution to student learning. IT Specialists expressed a great deal of satisfaction across a number of topics.

Based on these findings about the context of program implementation, we offer the following considerations for ongoing improvement:

- **Target Software Use**. Given the focus of the software as an early intervention strategy, schools and districts should be encouraged to continue targeting the software use in schools that have a profile of students known to be at risk of having reading or math difficulty. Identifying the demographics and academic performance of participants will continue to be an important consideration for targeting software use because it allows decision makers to determine if the program is in fact supporting the intended populations of students. This is also helpful for allocating the appropriate number of licenses per school to maximize the spread of licenses across schools in a district.
- **Capitalize on Teachers' Experience and Positive Attitudes**. Teachers' positive perspectives regarding computer use and technology in the classroom is an asset worthy of further development. Since a majority of teachers are already comfortable with computer technology and many have already used the software programs, they will likely be receptive to ongoing professional development or training to increase the quality of implementation and support for student learning.
- **Provide Guidelines for Teachers' Support of Students**. Consider establishing standards for teachers' engagement with students during computer sessions. Teachers generally reported being available to supervise students during their use of the software, but additional guidelines for how to make that time most effective could further enhance the effectiveness of the program.
- **Insure Adequate Resources**. Support schools and districts to insure that they have adequate computers, equipment, server capacity, and wireless capacity (e.g., adequate

bandwidth and IT support at the school level) to implement the software programs.  In other words, how can resources be aligned and allocated at the school or district level to insure that students and teachers can use the programs as intended, according to vendor recommendations, and with the potential to achieve the expected outcomes?

- **Clarify Use of Software for Home or in Afterschool**. Computer use outside of school occurred on a limited basis. There might also be a number of opportunities to provide additional time for students to use the software in afterschool programs. Clarification about how the software programs might be used outside of the regular school day may further enhance effectiveness of implementation.
- **Consider the inclusion of goals for technology integration within schools.** Inviting teachers into the process of selecting technology and establishing goals for technology integration within the schools may help to improve buy-in and success at the school level. Communicating expectations about the role of technology within schools will help teachers align their goals in the classrooms with the broader goals of the schools. Schools and districts might identify the ways in which the software programs align with and/or support school or district initiatives to support early reading and math learning. This would provide additional guidance for schools and teachers as they continue to implement the programs in years to come.

## Implementation

The implementation of the H.B. 513 Early Intervention Program occurred throughout the school year as individual schools began adopting the software use into their school schedules. Most of the initial implementation occurred around the middle of the 2012-13 school year.

The program start-up included training provided by the vendors and about half of the teachers and administrators participated in face-to-face trainings. Utilized to a lesser degree were additional follow-up trainings and the use of online resources. Trainings were generally considered to be helpful; however some teachers and administrators indicated that the trainings were not applicable to them. There was inadequate training to demonstrate how the software could be used to enhance student learning. District and school IT specialists also participated in trainings provided by the vendors and many felt they were adequate, but some IT specialists gave mixed responses regarding there adequacy.

District and school IT specialists contributed to program implementation by providing informal and formal trainings as well as ongoing support. Most of the teachers had access to such an IT specialist, but relatively few teachers contacted the IT personnel for support often. Teachers who did contact their school or district IT support specialist were mostly satisfied with the support provided.

Teachers, administrators, and IT specialists also had access to the vendors for ongoing support and they were mostly satisfied with the support provided by vendors. However, teachers and administrators reported moderately infrequent use of IT support and we know little about the actual number of calls for support received by vendors.

Once up and running, the program had target usage recommendations for the number of days per week and number of minutes per session that were established by the vendors. Students who used Imagine Learning software did not meet the minimum usage recommendations. Students who used the Voyager, Waterford, or Curriculum Associates software did not meet the usage recommendations for days per week, but partially met the usage requirements for minutes per session.

More than half of teachers reported that students spent equal time using the software. For the teachers who assigned students to use the software for additional time, 60% did so because the students were ELL, 57% based on DIBELS scores, and 54% based on the teachers' formative assessments. In a small sample of students we observed that students who scored lower on DIBELS measures and students in certain demographic categories used the software more than other students in the sample.

Most teachers felt that using the software supported student learning. While there were generally positive perceptions of the software programs, there was still a considerable portion of survey respondents who reported limited or no program effectiveness (i.e., not influencing student learning). Most teachers felt that using the software was time well spent, but many teachers also recognized that it came at the expense of other learning opportunities and other classroom activities.

The increased access to student performance information offered through the software programs' student performance reporting feature was available to teachers and administrators but was underutilized. This potentially useful tool can provide almost real-time information about student's progress and can be used by teachers to assign additional time working with the software or to modify classroom lessons such that areas of student need are addressed. However, few teachers and administrators reportedly took full advantage of this resource and the vendors provided incomplete documentation of the number of times that student performance reports were accessed.

Based on these findings about the implementation of the program, we offer the following considerations for ongoing improvement:

- **Provide training that helps teachers connect software content with the content they teach.** Vendors could identify the ways in which the various components of their software programs align with the new Utah Core Standards and make those explicit to teachers. A crosswalk of the software program features and content with the core curriculum would provide a useful tool for teachers and paraprofessionals to use as they plan for integrating the early intervention programs into their overall instructional strategies. Another training area on which to focus might include incorporating the software programs into regular instructional lessons. Also consider developing crosswalks of software content with strategies that would support special populations (e.g., ELL, special education, struggling readers, afterschool programs, etc.).

- **Insure that trainings are well targeted to the needs of teachers and administrators.** In addition to the recommendations noted here, teachers, administrators, and IT support personnel may know their needs better than anyone. Consider administering a focused needs assessment to round out the content for future trainings. Having completed a year in program, teachers and administrators may now have a perspective that is formed by their own experience to inform their needs for training and professional development.
- **Consider establishing standards for participation in training and professional development.** Identify the basic requirements and basic training needs for teachers, administrators, and IT personnel to implement the program. As noted above, teachers and administrators might contribute to the development of such guidelines. Work with vendors to insure that they are providing well targeted trainings.
- **Encourage teachers to meet the recommendations for student software use.** Insure that teachers know the vendor recommendations for student software use. Identify strategies to insure that students use the software according to vendor recommendations. Provide means within the school day to support students utilizing the software and benefiting from in-class instruction and instructional support from the classroom teacher.
- **Consider establishing student use guidelines beyond vendor recommendations.** Such guidelines might focus on when and why teachers should assign students additional time to work with the software. This should also include the use of student performance data from the student performance reports or from DIBELS scores to identify students who might benefit from additional time working on the software. On a broader scale, continue to develop strategies for matching or targeting the number of licenses with the number of students who will most likely use or benefit from using the software program. This will be an important topic for future studies.
- **Encourage teachers and administrators to leverage the value of the student performance report feature.** This might be accomplished through start-up and ongoing training and professional development opportunities that focus on how and why to use and maximize the reporting features and information to assess student learning progress and adjust instructional strategies in regular classroom lessons. It might also be worthwhile to include other teachers or paraprofessionals, such as afterschool staff, in order to coordinate their support for students. Encourage vendors to document the number of times that student performance reports are accessed.
- **Insure that ongoing support is in place for teachers and administrators.** Should all of the teachers have access to a district or school IT support staff member? If so, efforts should be made to insure this type of support is available to the teachers. Consider how the district and school IT personnel should be integrated as training providers. Encourage

vendors to provide documentation of the number and nature of the calls for support that they receive.

## Outcomes of Implementation

The context and implementation sections above focused on identifying considerations for program improvement. This section addresses the outcomes of implementation, namely student performance gains, and concludes with considerations that address improvement strategies to increase the ability to document future outcomes.

The measurement and reporting of student performance was problematic for a number of reasons. First, the measurement of student performance was highly inconsistent from vendor to vendor. It was difficult to make broad statements about student performance for the vendors because each software program is different in terms of function, implementation, and criteria for progression through the program. Each software program functions differently in terms of how students are routed through the curriculum and how much content constitutes a given strand, lesson, unit or organized section of the content material.

Secondly, only one vendor provided data that clearly documented student performance gains. Curriculum Associates provided diagnostic scaled scores for the beginning and ending of student use. All of the vendors provided data that documented the content that students covered and two vendors provided student scores on various assessments, but not in a way that provided distinct starting and ending point performance scores. For the students who used Curriculum Associates software, learning gains appeared largely consistent with vendor's recommendations.

The UEPC evaluation team attempted to overcome the problems identified above by using student software use to predict growth based on the amount of content students covered and their scores on final assessments. For example, for students who used Imagine Learning and Waterford software, the time that students spent using the software predicted student growth on standardized test scores. Such an approach is limited for a number of reasons. Foremost among those reasons is that the vendor outcome measures are from within the software itself, which did not allow for the effectiveness of the software to be validated externally.

The need for an external student performance measure was identified during the design of the evaluation study. The UEPC evaluation team and USOE representatives decided to use DIBELS scores as a suitable outcomes measure for first grade students. Unfortunately, very little of the data provided by the vendors included valid student identification numbers that were required to link the vendor use data with the DIBELS measures. This eliminated the opportunity to use an external measure to evaluate the effectiveness of using the software.

Due to the lack of vendor data that clearly documented student growth in terms of performance gains and the inability to link student use data from the vendors to an external outcomes measure (DIBELS), it was impossible to draw robust conclusions about the effectiveness of software use and student achievement in reading and math. The lack of valid student identifies limited the ability to account for student demographics and to utilize an external measure (DIBELS) to assess student learning gains based on software use. However, for a small sample of students we were able to account for demographic characteristics and, in that sample, ELL, low income, and special education students had more growth on vendor assessments than other students on several Imagine Learning strands.

There was insufficient data to conduct meaningful analyses on the relationship between time spent working with the software program, demographics, and learning outcomes as measured by DIBELS. This was primarily due to the very small and non-random number of students with valid student identification numbers to match the student use statistics in the vendor data with DIBELS scores.

Given this discussion related to documenting student performance gains, we offer the following considerations that address improvement strategies to increase the ability to document future outcomes:

- **Work with vendors to insure their ability to document student performance gains.** Although software vendors offer access to student performance reports for administrators and teachers, which can be helpful to track student progress during the year, the need for clear documentation of where students begin and end regarding reading and math skills is required. Perhaps the implementation of an assessment at the beginning and end of software use would facilitate the clear documentation of student progress.
- **Identify and resolve the source of the problem regarding the lack of valid student identification numbers in the vendor data.** The lack of student identifiers may have initiated at the school level when students logged in to use the software. If so, work should be done at the school level to insure that teachers, paraprofessionals, computer lab specialist, and others who provide support for implementation make certain that student identification numbers are included with every occurrence of software use.
- **Work closely with districts, schools, and vendors to insure that valid student identifiers are included in the vendor data.** Because this is the means through which student software use can be linked to external performance measures such as the DIBELS and other state data such as SIS data, it is worth the effort insure that all stakeholders are committed to this issue. The ultimate success of the program hinges on the ability to evaluate student learning gains initially and overtime. Collecting accurate and consistent student data and outcomes data should be a top priority moving forward.

## Summary

In spite of the lack of evidence for their effectiveness, computer assisted instruction programs are gaining popularity (Longberg, 2012; Pindiprolu & Forbush, 2009) and influencing the way we think about educational practices. Collins and Halversont (2010) asserted that digital technologies represent a second revolution in education and they predict that technology will continue to fundamentally reshape the relationship between education and schooling. Whereas the current model of education is considered to be an artifact of the industrial revolution, modern technology is similarly changing the ways in which we organize and deliver educational experiences. The introduction of new electronic technology into school systems creates challenges because the two are not designed for one another, rendering them somewhat incompatible.

In the present evaluation report we have presented information from the literature and from several data sources that were used to articulate how schools implemented the H.B. 513 Early Intervention Program and how that implementation influenced outcomes of student achievement. The information presented in this report is germane to how Utah's schools have implemented new computer assisted instruction programs and how schools have begun adapting to these new approaches to educational instruction for kindergarten and first grade students. Although the documentation of outcomes was limited due to the lack of adequate data, we have learned a great deal about how to support students, teachers, administrators, and IT specialists as they continue to use new learning technologies.

Finally, computer assisted instruction should be thought of as one feature of comprehensive early literacy instructional programs that include literacy rich classrooms, professional development for teachers, good children's literature, and social collaboration (Tracy & Young, 2007). Computer assisted instruction is designed to assist, not replace, teachers (Buadeng-Andoh, 2012; Larson, 2007; Longbert, 2012) and we hope that the findings from this report can be used to enhance those efforts in Utah.

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## Appendix A: Participation Table

This appendix shows two tables. The first table in this appendix shows the demographic characteristics of participating schools and students. It also includes the demographic characteristics of the small sample that could be matched with SIS data. The second table shows the numbers and percentages of student licenses purchased within H.B. 513 schools and districts.

**Table 19. Characteristics of Participating Schools and Students**

| | Participating Schools | | Non-Participating Schools | | Curriculum Associates (n=1779) | | Imagine Learning (n=1957) | |
|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % |
| **Kindergarten** | 23,396 | 50.30 | 25,520 | 49.6 | 893 | 50.2 | 772 | 39.4 |
| **First Grade** | 23,124 | 49.70 | 25,980 | 50.4 | 886 | 49.8 | 1185 | 60.6 |
| **Male** | 24,177 | 52.00 | 26,663 | 51.8 | 894 | 50.25 | 1,040 | 53.14 |
| **Female** | 22,343 | 48.00 | 24,837 | 48.2 | 885 | 49.75 | 917 | 46.86 |
| **Race/Ethnicity** | | | | | | | | |
| **White** | 35,224 | 75.70 | 40,900 | 79.4 | 1,543 | 86.73 | 1,507 | 77.01 |
| **Hispanic** | 82,46 | 17.70 | 6,884 | 13.4 | 139 | 7.81 | 346 | 17.68 |
| **Other** | 3,050 | 6.60 | 599 | 7.2 | 2568 | 5.45 | 3038 | 5.31 |
| **Not an English Language Learner** | 41,666 | 89.60 | 48,363 | 93.9 | 1,738 | 97.7 | 1,658 | 84.72 |
| **English Language Learner** | 4,841 | 10.40 | 3,127 | 6.1 | 41 | 2.3 | 298 | 15.23 |
| **Special Education** | | | | | | | | |
| **Not in Special Education** | 42,830 | 92.10 | 48,009 | 93.2 | 1,604 | 90.16 | 1,802 | 92.08 |
| **In Special Education** | 3,690 | 7.90 | 3,491 | 6.8 | 175 | 9.84 | 155 | 7.92 |
| **Not Chronically Absent** | 46,174 | 99.30 | 51,266 | 99.5 | 1,772 | 99.61 | 1,942 | 99.23 |
| **Chronically Absent** | 346 | 0.70 | 234 | 0.5 | 7 | 0.39 | 15 | 0.77 |
| **Title I Schools** | | | | | | | | |
| **Not in Title 1 School** | 23,975 | 51.50 | 35,591 | 69.1 | 124 | 6.97 | 655 | 33.47 |
| **School-wide Title 1 School** | 17,885 | 38.40 | 10,311 | 20 | 782 | 43.5 | 1,095 | 55.95 |
| **Targeted Assistance Title I School** | 4,660 | 10.00 | 5,598 | 10.9 | 873 | 49.07 | 207 | 10.58 |
| **Low Income Family** | | | | | | | | |
| **Not Low Income** | 27,378 | 58.90 | 36,380 | 70.6 | 1,100 | 61.83 | 1,056 | 53.96 |
| **Low Income** | 19,142 | 41.10 | 15,120 | 29.4 | 679 | 38.17 | 901 | 46.04 |

**Table 20. Participation Table: Student licenses purchased within H.B. 513 schools and districts**

| District/Charter Name | Total # of schools | # of HB 513 schools in the district | Total # of K & 1st grade students | # of K & 1st grade students in HB513 schools | # of HB 513 licenses purchased | % of students who had licenses within 513 schools | % of students who had licenses within each district |
|---|---|---|---|---|---|---|---|
| ALIANZA ACADEMY | 1 | 1 | 128 | 128 | 135 | 105% | 105% |
| ALPINE DISTRICT | 57 | 21 | 12082 | 5975 | 1200 | 20% | 10% |
| AMERICAN LEADERSHIP ACAD. | 1 | 1 | 230 | 230 | 100 | 43% | 43% |
| BOX ELDER DISTRICT | 13 | 9 | 1822 | 1168 | 619 | 53% | 34% |
| CACHE DISTRICT | 17 | 3 | 2545 | 583 | 164 | 28% | 6% |
| CANYONS DISTRICT | 33 | 4 | 5207 | 958 | 1035 | 108% | 20% |
| DAVIS DISTRICT | 63 | 26 | 11292 | 4395 | 4180 | 95% | 37% |
| DUAL IMMERSION ACAD. | 1 | 1 | 150 | 150 | 150 | 100% | 100% |
| DUCHESNE DISTRICT | 7 | 6 | 868 | 855 | 870 | 102% | 100% |
| EDITH BOWEN LABORATORY | 1 | 1 | 96 | 96 | 98 | 102% | 102% |
| EMERY DISTRICT | 6 | 1 | 395 | 50 | 55 | 110% | 14% |
| ENDEAVOR HALL | 1 | 1 | 157 | 157 | 310 | 197% | 197% |
| GARFIELD DISTRICT | 5 | 5 | 161 | 161 | 169 | 105% | 105% |
| GRAND DISTRICT | 1 | 1 | 181 | 181 | 400 | 221% | 221% |
| GRANITE DISTRICT | 65 | 21 | 11389 | 3675 | 2356 | 64% | 21% |
| GUADALUPE SCHOOL | 1 | 1 | 51 | 51 | 52 | 102% | 102% |
| IRON DISTRICT | 9 | 9 | 1443 | 1443 | 415 | 29% | 29% |
| JOHN HANCOCK CHARTER | 1 | 1 | 40 | 40 | 40 | 100% | 100% |
| JUAB DISTRICT | 3 | 3 | 348 | 348 | 400 | 115% | 115% |
| LAKEVIEW ACADEMY | 1 | 1 | 175 | 175 | 160 | 91% | 91% |
| LEGACY PREPARATORY | 1 | 1 | 216 | 216 | 44 | 20% | 20% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ACAD. | | | | | | | |
| LIBERTY ACADEMY | 1 | 1 | 106 | 106 | 2 | 2% | 2% |
| LINCOLN ACADEMY | 1 | 1 | 94 | 94 | 100 | 106% | 106% |
| LOGAN CITY DISTRICT | 6 | 5 | 1150 | 983 | 386 | 39% | 34% |
| MONTICELLO ACADEMY | 1 | 1 | 151 | 151 | 450 | 298% | 298% |
| MURRAY DISTRICT | 7 | 5 | 1029 | 737 | 854 | 116% | 83% |
| NEBO DISTRICT | 28 | 27 | 5082 | 5081 | 2900 | 57% | 57% |
| NOAH WEBSTER ACADEMY | 1 | 1 | 176 | 176 | 75 | 43% | 43% |
| NORTH SANPETE DISTRICT | 5 | 5 | 388 | 388 | 225 | 58% | 58% |
| ODYSSEY CHARTER SCHOOL | 1 | 1 | 202 | 202 | 229 | 113% | 113% |
| OGDEN CITY DISTRICT | 14 | 14 | 2289 | 2289 | 1839 | 80% | 80% |
| OGDEN PREPARATORY ACAD. | 1 | 1 | 209 | 209 | 58 | 28% | 28% |
| PARK CITY DISTRICT | 4 | 4 | 615 | 615 | 500 | 81% | 81% |
| PINNACLE CANYON ACAD. | 1 | 1 | 54 | 54 | 54 | 100% | 100% |
| PROMONTORY SCHOOL | 1 | 1 | 100 | 100 | 100 | 100% | 100% |
| PROVO DISTRICT | 14 | 13 | 2588 | 2553 | 818 | 32% | 32% |
| QUEST ACADEMY | 1 | 1 | 216 | 216 | 216 | 100% | 100% |
| RANCHES ACADEMY | 1 | 1 | 104 | 104 | 104 | 100% | 100% |
| SALT LAKE DISTRICT | 29 | 21 | 4386 | 3210 | 3297 | 103% | 75% |
| SEVIER DISTRICT | 4 | 3 | 759 | 529 | 754 | 143% | 99% |
| SOUTH SANPETE DISTRICT | 3 | 3 | 518 | 518 | 780 | 151% | 151% |
| SOUTH SUMMIT DISTRICT | 1 | 1 | 233 | 233 | 494 | 212% | 212% |
| SUMMIT ACADEMY | 1 | 1 | 202 | 202 | 408 | 202% | 202% |
| SYRACUSE ARTS ACADEMY | 1 | 1 | 217 | 217 | 436 | 201% | 201% |
| TOOELE DISTRICT | 16 | 16 | 2264 | 2264 | 1600 | 71% | 71% |
| WALDEN | 1 | 1 | 139 | 139 | 84 | 60% | 60% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SCHOOL | | | | | | | |
| WASATCH DISTRICT | 5 | 3 | 900 | 719 | 661 | 92% | 73% |
| WASHINGTON DISTRICT | 25 | 15 | 4264 | 2740 | 1311 | 48% | 31% |
| WAYNE DISTRICT | 2 | 1 | 79 | 3 | 7 | 233% | 9% |
| WEBER DISTRICT | 30 | 10 | 4681 | 1665 | 298 | 18% | 6% |

# Appendix B: Evaluation Methods

This appendix provides additional information about the treatment of Student Information System (SIS) data and vendor data.

## SIS data

In order to be used in the evaluation study, the initial SIS data were subjected to a number of transformations. These transformations included recoding variables, narrowing the grades to include only kindergarten and first grade students, and further narrowing that group of students to only include those with more than 20 days attendance. We also computed a percent of attendance variable by dividing the number of days students were enrolled by the number of days the student attended. Finally, we used a contact list that was provided by the state office to determine which schools participated in H.B. 513 Early Intervention Program and created a column that identified schools as participating in the program or not participating.

## Vendor data

### Data request

The request for data was organized into three sections: Identifier variables, vendor implementation variables, and outcome variables. The request for DIBELS data was also included in that data request. The final data request was made to the USOE on April 2, 2013 and consisted of an excel spreadsheet that identified each column of data requested of each vendor and a separate document that provided further explanation of the request. The USOE collected the data from the vendors and the DIBELS data from the schools and made the first versions of those data available to the UEPC evaluation team in mid-July. Preparing those data for analyses required additional collaborations with the vendors to improve the quality of the data. The Imagine Learning and Voyager required three new versions of the data sets and Waterford required two additional versions of their data set. Preparing and cleaning the data sets consisted of eliminating students that were not a part of the H.B. 513 Program (e.g., $2^{nd}$ – $6^{th}$ grade students), updating school names that were entered incorrectly, deleting rows that contained more than one school name in a single row and eliminating students with no log ins recorded.

### Usage data

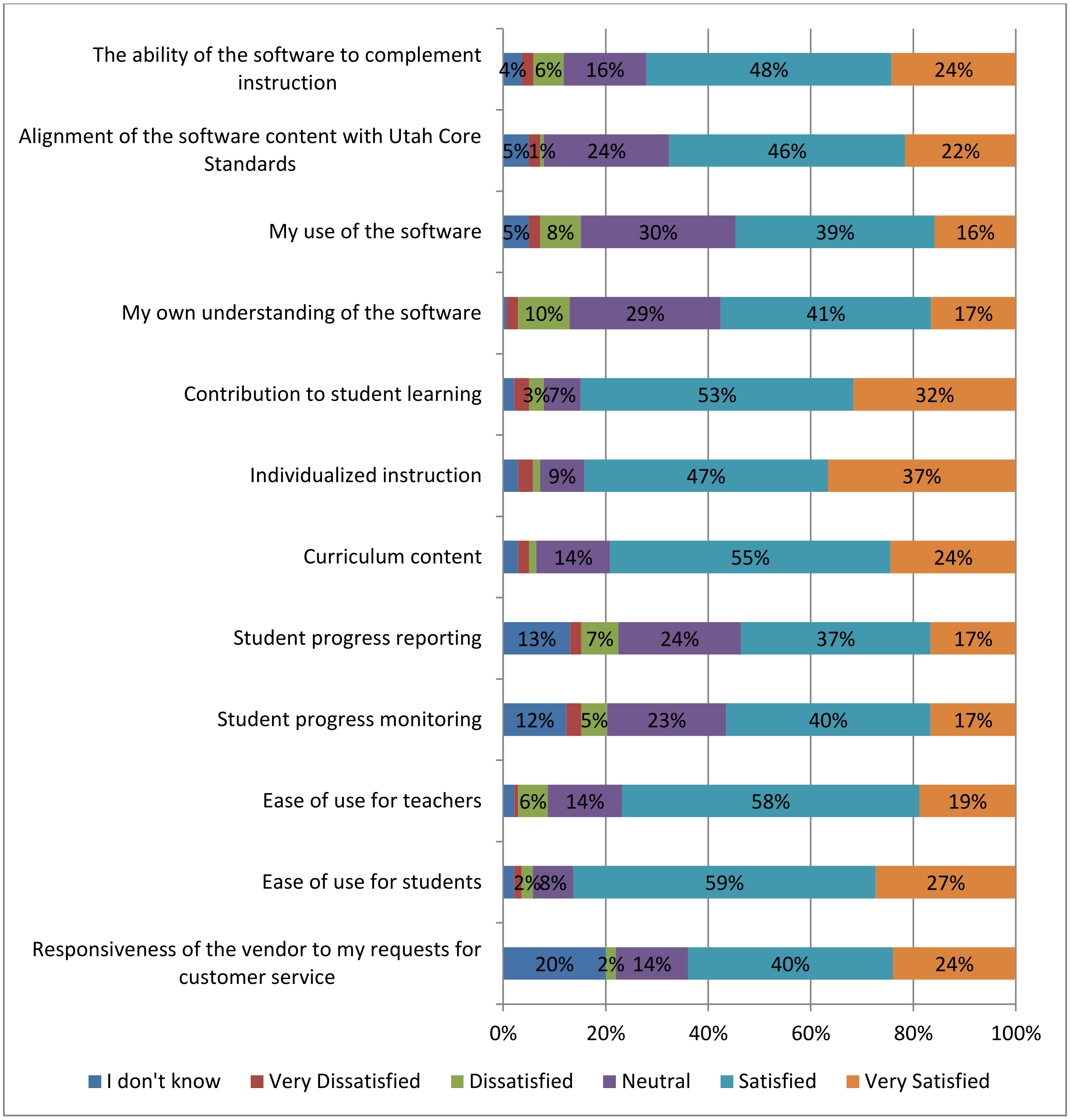
The UEPC evaluation team intended to present the days per week recommendation compared to the actual days per week that software was used. We calculated the days per week by using the total number of sessions and the dates of the first and last sessions. However, due to a number of caveats we chose not to report those findings because we could not be certain of their accuracy. One important caveat was that we subtracted the dates of the first session from the dates of the last session to arrive at the number of days each student had access to the software. We then divided the total number of days that they had access by 7 days per week. We presumed that the vendors' recommendations are based on a 5 day school week. However, there is a long list of holidays, teacher work days, snow days, and other unknowns in schedules among schools and we could not account for those.

# Appendix C: Results Tables

This appendix presents two additional results tables that show program satisfaction ratings of teachers and administrators.

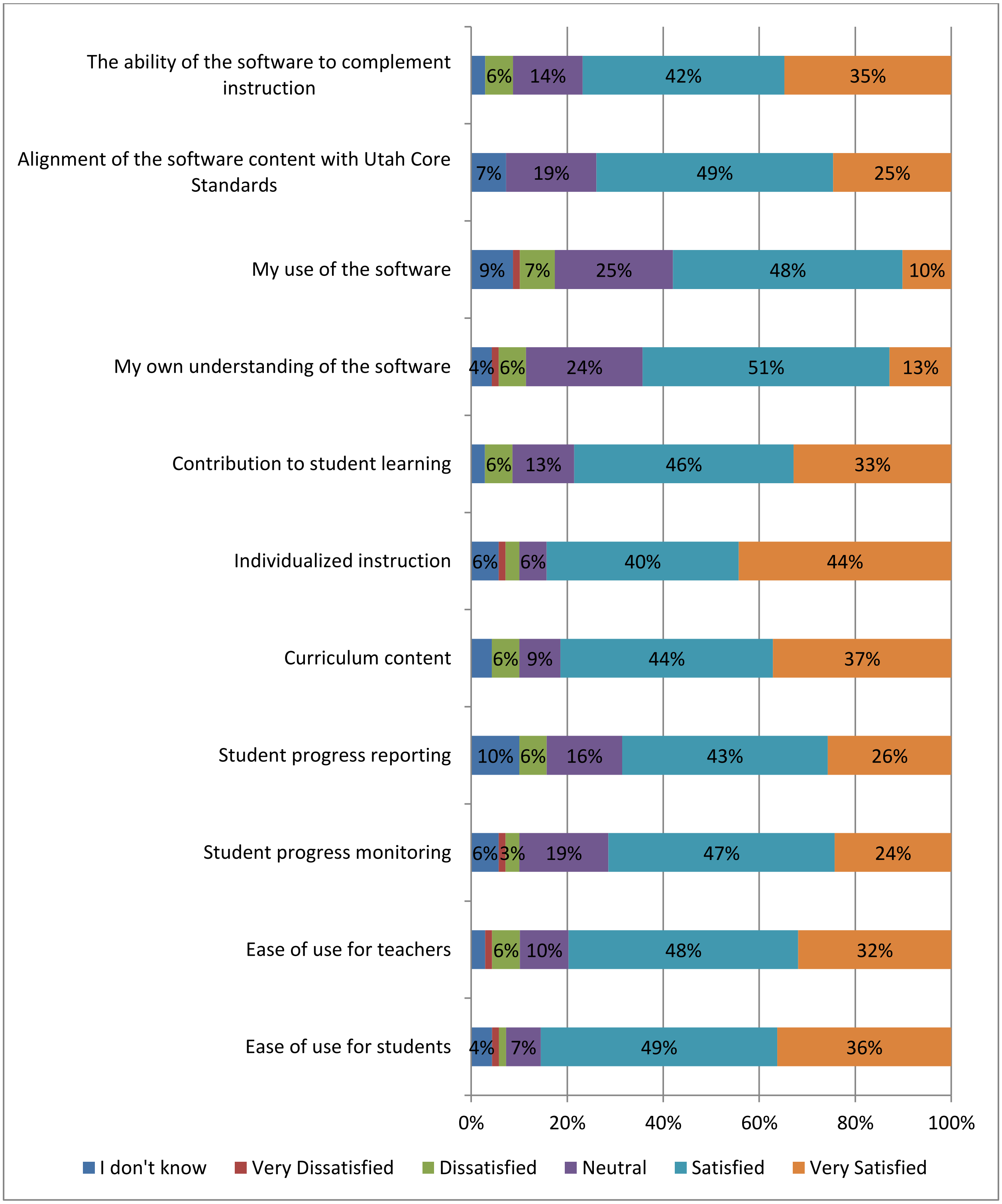
## Satisfaction with the program

**Figure 42. Teacher's Satisfaction ratings**




Source: School Survey – Teachers (N=134-137)

**Figure 43. Administrators' Satisfaction ratings**




Source: School Survey – Administrators (N=69+/1)

# Appendix D: Methods and Results for Statistical Analyses

This appendix presents the methods and results from the statistical analyses that are presented within the main report. The headings are named the same as the headings in the results section of the main report.

## Relationship between Student Needs and Software Use

The two tables below present the results of a set of analyses that were used to determine if students who needed additional time using the software received it. Curriculum Associates provided student ID numbers and data for 3,019 students. Of those students, 823 (21%) of those cases included student use statistics that could be matched with DIBELS and SIS. Imagine Learning provided student ID numbers and data for 17,463 students. Of those students, 399 cases (2.3%) could be matched with DIBELS and SIS data. Student numbers from other vendors could not be matched with the DIBELS and SIS data sets. Table 21 shows correlations between DIBELS baseline composite scores and the total number of sessions and the total number of hours the student used the software for each vendor.

**Table 21. Relationships between Baseline DIBELS Scores and Software Use**

| Vendor | Total Number of Sessions and Baseline | Total Number of Hours and Baseline |
|---|---|---|
| Curriculum Associates (N=823) | **-0.103 | -0.086 |
| Imagine Learning (N=399) | *-0.044 | -0.115 |

Note: ** reflects significances at P <.01, and * reflects significance at p<.05

A second analysis considered the relationships between baseline DIBELS scores and software use in more detail. For this analysis, we ran sequential regressions, first predicting software use from demographic variables, and then we added the baseline DIBELS scores. Table 22 shows the proportion of variance accounted for (i.e., the $R^2$ statistics) for each model, vendor, and outcome variable.

**Table 22. Statistics from Models Predicting Outcomes from Demographics and Demographics Plus Baseline DIBELS Scores**

| Vendor | Outcome | Model | $R^2$ | *p* | $R^2$ Change | *p* value change |
|---|---|---|---|---|---|---|
| **Curriculum Associates** | Number of Sessions | Only demographics | 0.023 | p = .002 | 0.023 | p = .002 |
| | | Demographics plus DIBELS baseline | 0.029 | p < .001 | 0.006 | p = .021 |
| | Number of Hours | Only demographics | 0.016 | p = .023 | 0.016 | p = .023 |
| | | Demographics plus DIBELS baseline | 0.019 | p = .013 | 0.004 | p = .082 |
| **Imagine Learning** | Number of Sessions | Only demographics | 0.027 | p= .056 | 0.027 | p = .056 |
| | | Demographics plus DIBELS baseline | 0.033 | p = .038 | 0.006 | p = .113 |
| | Number of Hours | Only demographics | 0.032 | p = .025 | 0.032 | p = .025 |
| | | Demographics plus DIBELS baseline | 0.054 | p = .010 | 0.022 | p = .003 |

Source: Vendor data, DIBLES, and SIS

## Vendor Reported Learning Gains

The following tables present descriptive statistics for Curriculum Associates outcomes measures and descriptive statistics and results from analyses that predicted student learning with time spent using the software for Imagine Learning, Voyager (predicted amount of content covered), and Waterford.

**Table 23. Descriptive statistics for Curriculum Associates student learning gains**

| Reading and Math strands | N | Min | Max | Mean | SD |
|---|---|---|---|---|---|
| Reading | 2129 | -261 | 177 | 32.9 | 36.33 |
| Phonological awareness | 2129 | -239 | 330 | 43.4 | 69.36 |
| Phonics | 2129 | -484 | 322 | 38.9 | 67.87 |
| High frequency words | 2129 | -335 | 315 | 42.6 | 62.56 |
| Vocabulary | 2129 | -402 | 269 | 31.9 | 64.23 |
| Comprehension - Literature | 2129 | -253 | 218 | 21.3 | 58.67 |
| Comprehension – Informational text | 2129 | -230 | 297 | 19.5 | 59.41 |
| Math | 921 | -197 | 159 | 21.1 | 35.85 |
| Numbers and operations | 921 | -246 | 209 | 21.4 | 53.36 |
| Algebra and algebraic thinking | 921 | -228 | 296 | 23.2 | 55.51 |
| Measurements and data | 921 | -265 | 234 | 23.3 | 51.42 |
| Geometry | 921 | -284 | 227 | 15.6 | 54.96 |

Source: Curriculum Associates vendor data.
*Note: The magnitude of the negative minimum growth scores is curious and suggests that there are outliers within the data. However, with no standard for what the distributions of growth scores should be, we are compelled to use the vendor data as it is.

**Table 24. Imagine Learning: Growth score predicted by minutes of software use**

| Imagine Learning Strands | N | Min | Max | Mean | SD | Beta | $r^2$ |
|---|---|---|---|---|---|---|---|
| Basic vocabulary | 8015 | 0 | 2.75 | 0.10 | 0.135 | **.393** | 0.154 |
| Academic vocabulary | 7433 | 0 | 1.98 | 0.21 | 0.202 | **.578** | 0.334 |
| Conversation | 5648 | 0 | 1.83 | 0.14 | 0.095 | **.336** | 0.113 |
| Phonological awareness 1 | 11774 | 0 | 0.78 | 0.14 | 0.105 | **.530** | 0.281 |
| Phonological awareness 2 | 4814 | 0 | 0.4 | 0.05 | 0.034 | **.211** | 0.045 |
| Read along | 13491 | 0 | 1.5 | 0.12 | 0.104 | **.541** | 0.293 |
| Letter Recognition | 5060 | 0 | 2.5 | 0.06 | 0.094 | **.259** | 0.067 |

Source: Imagine Learning vendor data; *Bold indicates significant coefficient

**Table 25. Voyager: Content covered predicted by minutes of software use**

| Content | N | Min | Max | Mean | Median | SD | Beta | $r^2$ |
|---|---|---|---|---|---|---|---|---|
| Tickets earned | 259 | 100 | 55425 | 7304.4 | 5020 | 7971.50 | **.905** | 0.818 |
| Passages read | 281 | 1 | 222 | 34.8 | 24 | 35.78 | **.940** | 0.883 |
| Phonics lessons completed | 927 | 1 | 95 | 18.7 | | 12.40 | **.766** | 0.587 |
| Fluency lessons completed | 281 | 1 | 222 | 34.8 | | 35.78 | **.940** | 0.883 |

Source: Voyager data; *Bold indicates significant coefficient

**Table 26. Waterford: Growth score predicted by time logged on to the software**

| Reading and Math Strands | N | Min | Max | Mean | SD | p | $r^2$ |
|---|---|---|---|---|---|---|---|
| Phonological awareness | 1891 | 0 | 0.950 | 0.49 | 0.27 | **.631** | 0.399 |
| Phonics | 2117 | -0.1274 | 2.007 | 0.33 | 0.32 | **.760** | 0.578 |
| Comprehension vocabulary | 1825 | -0.1045 | 2.141 | 0.38 | 0.34 | **.796** | 0.633 |
| Language concepts | 2128 | -0.099 | 1.89 | 0.47 | 0.35 | **.757** | 0.573 |
| Numbers and operators | 984 | -0.02 | 1.43 | 0.39 | 0.324 | **.615** | 0.378 |
| Geometry and algebraic thinking | 970 | 0.00 | 1.65 | 0.46 | 0.360 | **.754** | 0.556 |
| Measurement, time, and money | 770 | 0.00 | 1.63 | 0.37 | 0.264 | **.678** | 0.460 |
| Data analysis and problem solving strategies | 845 | -0.01 | 1.81 | 0.38 | 0.350 | **.689** | 0.475 |

Source: Waterford vendor data; *Bold indicates significant coefficient

## Relationship among time and learning gains on vendor assessments, controlling for demographics

Below we present methods and results for a set of analyses that were used to examine the relationship among time spent using the software, demographics, and vendor assessed learning gains. For the purpose of providing the broadest description of participation data, we successfully linked 1,779 students who used Curriculum Associates software and 1,957 students who used Imagine Learning software to the SIS data (See Table 27). There were not enough valid SSIDs available in the Waterford or Voyager data to link students to SIS data. Therefore, identifying specific student demographic information for the participants in the H.B. 513 Early Intervention Program was limited at best. While Table 27 shows the original number of matched students, the students included in the final analyses totaled 1,777 (59%) for Curriculum Associates software and 1,939 (11%) for Imagine Learning software.

**Table 27. Demographic statistics for SSID matched students**

| | Curriculum Associates (n=1779) | | Imagine Learning (n=1957) | |
|---|---|---|---|---|
| | N | % | N | % |
| **Grade Level** | | | | |
| Kindergarten | 893 | 50.2 | 772 | 39.4 |
| First Grade | 886 | 49.8 | 1185 | 60.6 |
| **Gender** | | | | |
| Male | 894 | 50.25 | 1,040 | 53.14 |
| Female | 885 | 49.75 | 917 | 46.86 |
| **Race/Ethnicity** | | | | |
| White | 1,543 | 86.73 | 1,507 | 77.01 |
| Hispanic | 139 | 7.81 | 346 | 17.68 |
| Other | 2568 | 5.45 | 3038 | 5.31 |
| **English Language Learner** | 41 | 2.3 | 298 | 15.23 |
| **Special Education** | 175 | 9.84 | 155 | 7.92 |
| **Chronic Absenteeism** | 7 | 0.39 | 15 | 0.77 |
| **Title I Schools** | 782 | 43.5 | 1,095 | 55.95 |
| Targeted Title I Assistance | 873 | 49.07 | 207 | 10.58 |
| **Low Income Family** | 679 | 38.17 | 901 | 46.04 |

Source: SIS and Vendor data

To determine the Relationship among time and learning gains on vendor assessments, controlling for demographics, we conducted regressions that predicted use by the demographic categories. All regressions showed that a significant proportion of variance in both *use* measures could be accounted for by demographics, however, the proportion of variance accounted for was very small. In the Curriculum Associates data about 3.5% of the variance in *time* and 3% of the variance in *sessions* could be accounted for by demographics, leaving at least 96% of the variance unaccounted for by demographics. In the Imagine Learning data, about 1% of the variance in *time* and 2.5% of the variance in *sessions* was accounted for by demographics, leaving at least 97% of the variance unaccounted for by demographics.

Typically, demographic categories such as race, English language proficiency, and family income are intercorrelated. To account for intercorrelations, we predicted *use* from all demographic categories simultaneously. Simultaneous regression estimates the relationship between each predictor and the outcome, independent of the relationships between the rest of the predictors and the outcome. For example, the data from both vendors showed that white students used the software more with all other demographics controlled. This means that if all the students were the same on other demographics (i.e., all were girls, not in special education, not low English proficiency, and not low income), then white students would have used the software more.

**Table 28. Independent relationships between demographic categories and time use statistics in Curriculum Associates data**

| Demographic Category | B | Standard Error | Standardized Coefficients | t | *p* |
|---|---|---|---|---|---|
| **Gender** | -.072 | .337 | -.005 | -.214 | .831 |
| **Race** | 2.086 | .549 | .101 | 3.798 | .000 |
| **ELL** | 5.455 | 1.385 | .104 | 3.938 | .000 |
| **Low Income** | 1.010 | .344 | .074 | 2.939 | .003 |
| **Special Education** | .825 | .559 | .038 | 1.476 | .140 |

**Table 29. Independent relationships between demographic categories and number of sessions use statistics in Curriculum Associates data**

| Demographic Category | B | Standard Error | Standardized Coefficients | t | *p* |
|---|---|---|---|---|---|
| **Gender** | .411 | .873 | .012 | .471 | .637 |
| **Race** | -4.952 | 1.367 | -.093 | -3.621 | .000 |
| **ELL** | 7.278 | 3.419 | .054 | 2.129 | .033 |
| **Low Income** | 5.374 | .891 | .146 | 6.029 | .000 |
| **Special Education** | 1.407 | 1.452 | .024 | .969 | .333 |

**Table 30. Independent relationships between demographic categories and time use statistics in Imagine Learning data**

| Demographic Category | B | Standard Error | Standardized Coefficients | t | *p* |
|---|---|---|---|---|---|
| **Gender** | 5.389 | 39.189 | .003 | .138 | .891 |
| **Race** | -136.830 | 64.120 | -.067 | -2.134 | .033 |
| **ELL** | 236.274 | 75.305 | .099 | 3.138 | .002 |
| **Low Income** | 67.516 | 42.579 | .039 | 1.586 | .113 |
| **Special Education** | 45.495 | 72.207 | .014 | .630 | .529 |

**Table 31. Independent relationships between demographic categories and number of sessions use statistics in Imagine Learning data**

| Demographic Category | B | Standard Error | Standardized Coefficients | t | *p* |
|---|---|---|---|---|---|
| **Gender** | .116 | 2.194 | .001 | .053 | .958 |
| **Race** | -7.496 | 3.590 | -.065 | -2.088 | .037 |
| **ELL** | 22.311 | 4.216 | .165 | 5.292 | .000 |
| **Low Income** | 5.914 | 2.384 | .061 | 2.481 | .013 |
| **Special Education** | 4.063 | 4.043 | .023 | 1.005 | .315 |

**Table 32. Independent relationships between demographic categories and Growth Measures in Imagine Learning data (Coefficients and p values)**

| Imagine Learning Strand | Gender | Race | ELL | Low Income | Special Education |
|---|---|---|---|---|---|
| **Academic Vocabulary** | -.029(.343) | -.069(.092) | .151(<.001) | .076(.019) | .030(.328) |
| **Conversation** | .002(.964) | -.093(.119) | .130 (.031) | .130(.031) | .185(<.001) |
| **Phonological Awareness 1** | -.022(.409) | .067(.07) | .234(<.001) | .06(.036) | .137(<.001) |
| **Phonological Awareness 2** | .037(.356) | .042(.482) | .112(.063) | -.101(.022) | .112(.005) |
| **Read Along** | .006(.797) | .002(.944) | .264(<.001) | .003(.910) | .049(.043) |
| **Letter Recognition** | -.025(.561) | -.105(.134) | -.086(.220) | -.107(.033) | .048(.265) |

*Note: The proportions of variance accounted for ranged from a low of 2.6% of the variance in growth in Academic Vocabulary accounted for by demographics to a high of 11.7% of the variance in growth in Phonological Awareness 1 accounted for by demographics.

**Before testing the mediation hypothesis that the ELL students used the software more and subsequently grew more, we tested the bivariate correlations between ELL and growth, between ELL and software use and between software use and growth. The following Table 33,**

Table 34, and Table 35 show the bivariate correlations between ELL students and growth, between ELL students and software use and between software use and growth, respectively.

**Table 33. Simple correlations between ELL and Growth categories**

| | Growth Category | | | |
|---|---|---|---|---|
| | Academic Vocabulary | Phonological Awareness 1 | Phonological Awareness 2 | Read Along |
| **ELL** | .129** | .301** | .096* | .266** |

* sig p<.05, **sig p<.01

**Table 34. Simple correlations between ELL and Use**

| | Use Category | |
|---|---|---|
| | Total Minutes | Total Sessions |
| **ELL** | .067* | .142** |

* sig p<.05, **sig p<.01

**Table 35. Simple correlations between Use and Growth**

| | Growth Category | | | |
|---|---|---|---|---|
| **Use** | Academic Vocabulary | Phonological Awareness 1 | Phonological Awareness 2 | Read Along |
| **Minutes** | .596** | .379** | .177** | .575** |
| **Sessions** | .528** | .413** | .170** | .542** |

* sig p<.05, **sig p<.01

To test the mediation hypothesis, we estimated standardized regression coefficients by ELL in a simple linear regression (the unmediated coefficient) and then estimated the same coefficient when both ELL and software use were included in a multiple regression (the mediated coefficient). The mediation hypothesis would be supported if the unmediated coefficient was non-zero and significant and the mediated coefficient was zero and not significant. Table 36 and Table 37 show the unmediated and mediated coefficients for the number of minutes of software use metric and the number of sessions of software use metric, respectively.

**Table 36. Unmediated and Mediated Coefficients when predicting Growth from number of minutes**

| | Academic Vocabulary | Phonological Awareness1 | Phonological Awareness 2 | Read Along |
|---|---|---|---|---|
| **Unmediated Coefficient (p value)** | .129 (<.001) | .301 (<.001) | .096 (.016) | .266 (<.001) |
| **Mediated Coefficient (p value)** | .026 (.297) | .283 (<.001) | .101 (.010) | .242 (<.001) |
| **Is Mediation Supported?** | Yes | No | No | No |

**Table 37. Unmediated and Mediated Coefficients when predicting Growth from number of sessions**

| | Academic Vocabulary | Phonological Awareness1 | Phonological Awareness 2 | Read Along |
|---|---|---|---|---|
| **Unmediated Coefficient (p value)** | .129 (<.001) | .301 (<.001) | .096 (.016) | .266 (<.001) |
| **Mediated Coefficient (p value)** | .013 (.633) | .248(<.001) | .078 (.049) | .201 (<.001) |
| **Is Mediation Supported?** | Yes | No | No | NO |

## Relationship among time and learning gains on DIBELS assessments, controlling for demographics

**Student Level Analyses Methods**

For the student-level analyses, we used hierarchical linear modeling (HLM) to predict student test scores from time of test administration, software use statistics, and demographic data. The time of test administration was coded as 0, 1, or 2 for beginning, middle or end of year DIBELS assessments of Composite Scores NWF-CLS and NWF-WWR and coded as 0 or 1 for middle of year and end of year DIBELS assessments of DORF-WC, DORF-Accuracy, and Retelling. The use statistics included total amount of time the student used the software and the total number of sessions in which the student participated. Student demographic data included gender, family income, special education status, race (coded as white or not white) and English language learner status (ELL).

In the HLM models, each student's score was predicted by time of test administration at the within-student level (level one). At the second level, the student's baseline scores (beginning of year Composite and New Word Frequency scores and middle of the year DORF-WC, DORF-Accuracy, and Retelling scores) were predicted by demographics and use statistics. The change in each student's score from time of test administration to time of test administration was also predicted at the second level by use statistics, this was the growth measure. Because vendors measured use statistics in different ways, and because the students who matched were not random, we ran separate analyses for each vendor. Demographic variables were included as control variables at Level 2.

The outcomes of interest were growth measures, or more technically, the coefficients of the use statistics as they predicted growth. These results can be interpreted as the influence that each unit of software use had on the average increase in test scores from one test administration to another, controlling for demographic differences and difference on baseline scores. Results are presented for Curriculum Associates users in Table 17 and for Imagine Learning users in Table 18. Coefficients for the different use statistics and for the different vendors should not be directly compared because the use statistics were measured with different metrics so the coefficients are on different scales. The direction of the relationships (plus or minus) and the significance (significant or not significant) are not relative to the scale and can be directly compared.

## Appendix E: Themes and Quotes Regarding Successes and Challenges

The following two tables present themes taken from administrator and teacher responses to two open-ended survey items from the School Survey. The survey items asked administrators and teachers to comment on the greatest success and the greatest challenges associated with using the software programs.

**Table 38. Examples of Successes with Software Implementation**

| Successes | Illustrative Quotes About Successes from Teacher & Administrator Surveys |
|---|---|
| **Student growth in reading and math skills** | "It was fun to notice that students were learning and retaining and applying information they had learned from the program. As I would teach our literacy program, students would notice a term or concept they had been introduced to through [the program] and they would get excited that they already knew what we were talking about." (Teacher Survey)<br><br>"Some kids went up on their DIBELS scores. Especially if they were here every day and absenteeism/tardies weren't an issue." (Teacher Survey)<br><br>"Definitely the gains students made in reading and math." (Teacher Survey)<br><br>"5 of my 6 low readers all passed DIBELS and scored 18 or higher on their DRA reading tests. I don't know if it was because of the extra time on the computers. More testing would need to be done to determine this as the sole reason." (Teacher Survey)<br><br>"Students progressed throughout the program and grew in understanding of math concepts and vocabulary." (Teacher Survey)<br><br>"Students learned to read. The students were able to decode a word and then read the word. Parents were pleased with the progress their student learned to read." (Teacher Survey)<br><br>"I feel my students were higher readers this year." (Teacher Survey)<br><br>"It was awesome! Looking at our data, it appears to have made a big difference. We really, really would like to have it again next year." (Administrator Survey)<br><br>"Our Optional Extended Day Kindergarten used it the most and we fell that it helped those students improve." (Administrator Survey) |

| Successes | Illustrative Quotes About Successes from Teacher & Administrator Surveys |
|---|---|
| | "Student in Kindergarten and 1st grade made great progress in reading as measured by our running records." (Administrator Survey)<br><br>"The students that used the program effectively and regularly made more significant progress than those that did it intermittently." (Administrator Survey)<br><br>"For the teachers who used the program to fidelity, the students increased their reading ability in comprehension and fluency. They did well on their CRT tests. For teachers who did not use the program, their students scored lower in the comprehension ad fluency." (Administrator Survey) |
| Support for English language learners (ELL) | "I could see the growth and confidence in the students' with language usage. ESL students used the language sooner and were more willing to risk when questions were asked in class. The verbal practice with the program encouraged them to be more verbal." (Teacher Survey)<br><br>"I think that my English learners showed the most benefit from the program. I saw big jumps in vocabulary, comprehension, and fluency." (Teacher Survey)<br><br>"My ESL students learned more English and my med/low kids came up." (Teacher Survey)<br><br>"For ESL students to gain daily engaging practice, especially with phonemic awareness. This helped my students with the ability to blend sounds into words." (Teacher Survey)<br><br>"My students loved going to do Imagine Learning. I had a little girl in my class that came in as a non-English speaker. By the end of the year, she was reading books in English with comprehension on a D level." (Teacher Survey)<br><br>"A student came with no English Background. I could not communicate with him. Through the program we had some successes." (Teacher Survey)<br><br>"Good progress for selected students, particularly our ELL population." (Administrator Survey) |
| Students engagement | "Children enjoyed interacting with the games and activities on the program." (Teacher Survey) |

| Successes | Illustrative Quotes About Successes from Teacher & Administrator Surveys |
|---|---|
| with the program (they enjoyed the activites) | "The students' enjoyment from using the program. They liked the games, songs, etc." (Teacher Survey)<br><br>"Encouraging students to stay engaged with the task was very minimal. Students seem to never get tired of the program activities." (Teacher Survey)<br><br>"The songs associated with grammar were catchy and the kids were able to learn and recall information through music." (Teacher Survey)<br><br>"It was very engaging and the students enjoyed the activities." (Teacher Survey)<br><br>"Students enjoyed using the program. Those who were not using it often requested time to participate in this program. I wish I had put my whole class on it, instead of just struggling and ELL readers." (Teacher Survey)<br><br>"Children enjoyed the sessions and were well-engaged in the learning." (Administrator Survey)<br><br>"The students loved the program and worked hard for success." (Administrator Survey)<br><br>"The students enjoyed the program and that made it rewarding for them to use the program." (Administrator Survey) |
| Supported differentiation and individualized learning | "I love that this program is a personal tutor for each child!!! I appreciate this method of differentiation!! Students can have practice at the precise levels they need it with no extra work to teachers." (Teacher Survey)<br><br>"The program allowed the bright student as well as the new learner to work at their own pace and progress at their level." (Teacher Survey)<br><br>"It was individualized and covered important phonemic awareness, phonics, and reading skills that they really need practice with. It was a great personalized daily reinforcement of skills they need in a fun way." (Teacher Survey)<br><br>"My higher level students were able to access lessons that would have otherwise not been taught whole group. It was a great extension for them. I |

| Successes | Illustrative Quotes About Successes from Teacher & Administrator Surveys |
|---|---|
| | saw great improvements from my students who were lower level readers." (Teacher Survey)<br><br>"For most teaches, once the bugs were worked out, it provided them with a good way to help enrich and further the learning of struggling students. Most struggling students who used the program improved their vocabulary and reading skills." (Teacher Survey)<br><br>"However, the reading part was good for comprehension practice. I was glad to give my better readers reading practice that asked them questions and made them think. It was a better activity than many of the usual centers activities they have done in the past." (Teacher Survey)<br><br>"I liked to be able to look at each student's progress and be able to see what I could do in my classroom to help reinforce the skill it showed they needed help in." (Teacher Survey)<br><br>"I liked how I could check and see what students were working and who was not progressing... so I knew what students to help at times." (Teacher Survey)<br><br>"It gave us a fifth group to send kids too during our intervention time when we needed something for one group to do." (Teacher Survey)<br><br>"Students were able to continue their progress and teachers were aware of individual needs of these students." (Administrator Survey)<br><br>"Individualized tracking and development." (Administrator Survey)<br><br>"My teachers greatly appreciated having this opportunity to provide specific support at the level of readiness for each of their participating students." (Administrator Survey) |

**Table 39. Examples of Challenges with Software Implementation**

| Challenges | Illustrative Quotes About Challenges from Teacher & Administrator Surveys |
|---|---|
| Start-up time | "The program also came several weeks into the new school year. It would have been nice to get it earlier and been trained so we could have started using it right at the beginning of the school year." (Teacher Survey)<br><br>"The late date of roll out precluded us from using the program due to lack of teacher training and teacher buy in for the program. By the time teachers were able to access the program their teaching plans had been formalized and it was difficult to schedule computer lab times." (Administrator Survey)<br><br>"We did not get started until late January. We were ready to go, with all teachers trained for the past 2 years. The teachers had already had their schedules going." (Administrator Survey)<br><br>"Getting the program up and running in a timely manner. We were not able to get everything through the state until December." (Administrator Survey)<br><br>"The initial set up of computers, having a technician to run the lab and working the schedule." (Administrator Survey)<br><br>"Came in the middle of the year, so it was a challenge to get it up and running." (Administrator Survey)<br><br>"We were very late getting the program started it was not until January that we were fully involved. We did not have adequate equipment to implement to the extent we would have liked." (Administrator Survey) |
| Lack of time to fit into instructional day (and being replaced with potentially less effective instructional time) | "I firmly believe that an expert teacher is the best instructor for students at all level of need, especially the struggling ones. I feel concerned when any program, including a technology program, is touted as a "fixer" of students' learning difficulties. An hour a week for this program is almost 10% of the instructional time I have with my half day kindergartners and it is an inappropriate use of that time when I am the most effective instructional tool for them, not a computer program. I would rather the funds were spent on school-level, point of need coaching for teachers to improve our practice, especially around the areas of assessment driven teaching, setting appropriate and individualized next steps in learning for students, and effective instruction for at risk students." (Teacher Survey)<br><br>"Time to do so in class time frame. I have little time to instruct and work with students and there was not enough time for me, myself, to take |

| Challenges | Illustrative Quotes About Challenges from Teacher & Administrator Surveys |
| --- | --- |
| | students to the lab to use this program. There is not web access for any computers in my room outside of my teacher computer." (Teacher Survey)<br><br>"I teach half day kindergarten. With the very limited amount of time I have to teach (2 hours and 40 minutes per day), I found it extremely difficult to integrate this into my time. I couldn't do whole group instruction when the kids were on the program because the kids using the software couldn't miss my instruction. I was instructed to use this 4 days a week for 20 minutes a day with each at-risk child. That was impossible and very, very frustrating. I would have to re-evaluate how my schedule will be if I use it again, which I hope we do." (Teacher Survey)<br><br>" Finding time to pull the students away from classroom instruction." (Teacher Survey)<br><br>"It took away time for the students to work with an aide and did note align with my weekly lessons." (Teacher Survey)<br><br>"Finding time for students to use it in the already busy schedule, especially when we use the computers for testing." (Administrator Survey)<br><br>"Time!! There is not enough time in the day to do all that we can to move students to mastery. Not enough computers for student use." (Administrator Survey)<br><br>"Finding time for students to use the technology was our greatest challenge. For the next school year, we plan to provide more time for K-1 in computer labs to allow students more time to use [the program]." (Administrator Survey)<br><br>"Getting teachers to utilize the software as part of their instructional day. They viewed the software as an 'extra' to the regular day." (Administrator Survey)<br><br>"Encouraging teachers to allow the software to replace a portion of their instruction. They wanted to do EVERYTHING they have always done AND make time for this as well." (Administrator Survey) |
| **Inadequate training on software use** | "We didn't know how it worked. There is no thing that says how much is left to do before the session ended. It would freeze at times and take longer." (Teacher Survey) "I also feel that there was not enough support. Our school |

| Challenges | Illustrative Quotes About Challenges from Teacher & Administrator Surveys |
|---|---|
| | could only send 1 or 2 teachers to the training and they didn't give those of us that didn't get to go much help or training. We were just told it was easy and to read the handout. It would have been nice for all of our teachers to have been trained together so we could be a better support to each other." (Teacher Survey)<br><br>"I didn't know what they were doing. I could not go on and preview the lessons." (Teacher Survey) |
| **Inadequate training on how to use the reports or reporting features** | "I only get a report on how many minutes each child was on weekly. And it always varied from student to student. Some students I thinks daydreamed instead of worked. Hard for me to monitor this. I was not ever trained so I am not sure I ever used the program to its fullest capability." (Teacher Survey)<br><br>"Not having enough time (or the habit) of utilizing/analyzing the reporting to guide my instruction for students." (Teacher Survey)<br><br>"I would like to use it more in the future by learning how to apply the information and tools to classroom instruction." (Teacher Survey)<br><br>"Teacher time is so precious and limited, we're having to find ways for one or more paraprofessionals to oversee the use of the program and provide reports and updates to teachers. The teachers must be involved in reviewing the results and analyzing them, but this is a challenge." (Administrator Survey)<br><br>"I need more time to review the reports and use them to the advantage they present". (Administrator Survey)<br><br>"I wish some of the reports were easier to read." (Administrator Survey) |
| **Software program problems** | "I also had quite a bit of trouble with the program freezing or unexpectedly quitting that we eventually quit using it because I didn't have time to try to fix it every few minutes. I couldn't let fixing the computer interrupt my teaching. With our schedule, I found it difficult to find the time to call the company to get tech support." (Teacher Survey)<br><br>"Often, when my students would use the software program, it would freeze and would require an adult to help get the computer shutdown and rebooted again. Because of this occurrence, I found it very frustrating to |

| Challenges | Illustrative Quotes About Challenges from Teacher & Administrator Surveys |
|---|---|
| | use on our classroom computers. We scheduled the computer lab so that all students could use the program simultaneously and in the event of freeze-ups, we would just trouble-shoot those children's computers. But the program seemed to have many glitches which caused those kinds of problems." (Teacher Survey)<br><br>"Starting off with the program was slow. We had difficulties with the program, it was slow and undependable. But, it soon became better and the students enjoyed their time on it." (Teacher Survey)<br><br>"It moves too slowly. For only a couple of sessions per week and only 30 minutes per session, it seemed to take forever for the kids to progress. They got bored and wanted to do other things and so they didn't progress. Additionally, the program seemed to freeze frequently which forced the kids to reboot. I have found other software that supports the students' levels better than this one." (Teacher Survey)<br><br>"The biggest problem was that the program would often freeze on screens and not let students log out or that the sound would disappear during some of the videos. It would often freeze on a student several days in a row. Since I was using the program as a rating group while I worked with other students it was a pain when it would not work for a student and I would have to stop to try and resolve the issue. I think we later found out it was in part due to not using latest updates- but the program does not prompt you to update and it still did not seem to completely solve the problem. So the students were not able to be fully independent in the program due to these issues." (Teacher Survey)<br><br>"Many times at the beginning it would not work correctly and getting the students logged in was a pain. However, once the glitches were fixed then it was very student-friendly. There were only a few times throughout the year where it wouldn't work." (Teacher Survey) |
| Log-in issues | "It wasn't quick and easy to get students logged in to the computer and software--a waste of already too short time." (Teacher Survey)<br><br>"I teach Kindergarten and the greatest challenge was for my students to be able to log on by themselves. We'd waste 5-8 minutes just getting my entire class logged on and ready to go." (Teacher Survey)<br><br>"Getting everybody logged in. Finding the time in a half day program to fit it |

| Challenges | Illustrative Quotes About Challenges from Teacher & Administrator Surveys |
| --- | --- |
| | in." (Teacher Survey)<br><br>"Getting the children logged in to the program. It took quite a long time in kindergarten." (Teacher Survey) |
| Computer & hardware problems (Inadequate internet, headphones, and too few computers) | "Mostly computer related. Learning to use Chrome instead of Firefox to get some of the components to move. Also my computers didn't clear the cache every time the program was used so it made the program freeze during next use." (Teacher Survey)<br><br>"We lacked headsets with microphones in the lab we were in. When the headsets were ordered and came, the cable was the wrong one for our computers. We sometimes had trouble connecting to the internet and sometimes children were kicked out of the program in the middle of a lesson." (Teacher Survey)<br><br>"Our computers had many troubles running smoothly and would freeze up often. This was frustrating for the child and the teacher. It was also time consuming to boot up the computers in the mornings before school started each day." (Teacher Survey)<br><br>"We had frequent technical difficulties that no one at the school had the ability to fix so we needed to wait for district IT people to come." (Teacher Survey)<br><br>"Some of the headset styles are not well constructed. One style was very durable but you couldn't change the volume. The other broke easily." (Teacher Survey)<br><br>"headphones not working" (Teacher Survey)<br><br>"No headphones in the open lab that had microphones. My data was skewed because of this. I didn't access reports, check progress, or test because info was skewed." (Teacher Survey)<br><br>"When the program wasn't working or our computers weren't working and finding time for all of the students to use it when the computer lab was unavailable because of testing...only 3 working computers in my classroom." (Teacher Survey)<br><br>"Time and not enough student machines in the classroom." (Teacher Survey) |

| Challenges | Illustrative Quotes About Challenges from Teacher & Administrator Surveys |
|---|---|
| | "There is not web access for any computers in my room outside of my teacher computer." (Teacher Survey)<br><br>"We still have some technology issues to resolve. These are on our end. Our testing lab does not have the capacity to use the software, so we set up a mobile lab into a more permanent lab. It worked pretty well, but we did have some difficulty with wireless signal, computers going down, and lap tops were not the ideal situation for the lab. We also had to work out setting the lab up and shutting it down to minimize time lost in transition. We had a targeted group of first graders that we wanted to be o for a half hour and all of our kindergarten students used it fifteen minutes, so we didn't want a lot of time wasted on logging on, but we worked through that pretty well." (Administrator Survey)<br><br>"Only being able to access it for one student at a time on the computer placed in the each classroom was probably the greatest frustration or challenge." (Administrator Survey)<br><br>"Finding time in the day to get all the students through various software programs for all grades in the school. Lack of space to put computers in the building." (Administrator Survey) |
| **Perceptions of limited program effectiveness (not influencing student learning)** | "I did not like the way they taught phonics. I felt that was not very useful. The students would have gotten better phonics training with me in class. And my most struggling students could not get through the phonics program because it was not helping. They would just guess again and again and again and never progress." (Teacher Survey)<br><br>"The greatest challenge was to keep the students reading and listening not just clicking on any answers, the way they do when playing a game at home." (Teacher Survey)<br><br>"The program was not engaging for the students and they continually asked when they could switch to reading. They rarely completed the assessments and often guessed to just be done and be able to move on to something else. I was frustrated with the moans and groans received every time we logged on!" (Teacher Survey)<br><br>"I found the programs to be heavy on vocabulary and not a lot of foundational skills. Where many of the kids are weak in foundational skills it |

| Challenges | Illustrative Quotes About Challenges from Teacher & Administrator Surveys |
|---|---|
| | would be great to have a program that could be used as additional intervention. [The program] worked well for my average students and really well for the higher students, but the students who needed the most support I don't feel benefitted as much as promised." (Teacher Survey)<br><br>"The kids seemed to repeat the same things over and over and over. I was frustrated at times, because they didn't seem to be moving on, even when I thought they had done everything they were supposed to. They didn't seem to progress through the program the way I was expecting them to." (Teacher Survey)<br><br>"We often did not know exactly what it was that students were being taught in this software program. We could see the content and it looked appropriate and meaningful, but we didn't know where it was taking students." (Administrator Survey)<br><br>"Keeping students on task. Students played games and guessed too much of the time. Poorest students made little or no progress and skills did not transfer back to classroom. Poor students never advanced and some of those that did advance could not perform at the levels they were supposed to have passed." (Administrator Survey) |

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