Running Head: LIFE Study

How Did the KIHd System Influence LIFE Students and Instructors?

Heidi J. Graff

Dr. Thomas E. Scruggs

December, 2005

George Mason University

Abstract

The mission of the Kellar Instructional Handheld data (KIHd) System project is to create a data collection system for teachers and parents of children with special-needs to facilitate data-driven, educational decisions. This study will describe and offer interpretations of using the KIHd system from the perspective of eight instructors with varying experience with data collection and 12 students of the George Mason University Learning into Future Environments (LIFE) Program. In addition, the secondary purpose of this research is to determine the performance problems, identify areas in need of revisions for the KIHd prototype, and to create a user profile for an on-line tutorial and manual. Conclusions will focus on implications for design modifications and recommendations for future studies.

How did the KIHd System influence LIFE Students and Instructors?

Due to the mandates of No Child Left Behind (2002), and the re-authorization of the Individuals with Disabilities Education Improvement Act (IDEIA) of 2004, the need for accountability with special education students has vastly increased. Assessments for these students should produce reliable and valid information that leads to student learning and improved instruction. Documentation of student improvement on Individualized Education Plan (IEP) goals through data collection and analysis might serve as one type of performance evidence (Heward, 2005). Therefore, efficient data collection and analysis tools are necessary to support school programs in documenting progress and making instructional decisions for students with disabilities. According to this need, the Kellar Instructional Handheld Data (KIHd) System, which provides input and output data, is currently being developed for teachers and parents to support their instructional strategies and to determine progress in learning activities. This study will describe and offer interpretations of using the system from the perspective of eight instructors with varying experience with data collection and 12 students of the George Mason University Learning into Future Environments (LIFE) Program. In addition, the secondary purpose of this research is to determine the performance problems, identify areas in need of revisions for the KIHd prototype, and to create a user profile for an on-line tutorial and manual

Technological Background

KIHd System consists of two platforms, a Personal Digital Assistant (PDA) to primarily collect data and a Personal Computer (PC), which will mainly define and analyze the data collected. The data inputted to the PDA will be transmitted to the PC and

stored into the Microsoft Access Database which can be accessed on the internet. The design team determined the use of Microsoft Access due to the availability in schools and homes. The data types that can be collected include: accuracy, duration, fluency and frequency.

When collecting data on the PDA, the teacher can "login" to the system, identify the student, select the task which reconfirms the domain, skill, data type, prompt level, and select the phase to begin the session. For example, if Jerome is learning how to e-mail his friend in communication-technology class, the instructor may want to monitor how long (duration) it takes for Jerome to complete each e-mail or how many e-mails (frequency) Jerome is able to complete during a class. Once the task and data type is decided upon, the instructor can input the task parameters into the KIHd System. Now the system is ready to collect data. The instructor utilizes the PDA's "one-touch" approach to input the student responses by touching "yes" for frequency or starting the clock for duration. Upon task completion, analysis of the student's performance can be seen by reviewing the PDA mini-graph or four different graph choices on the PC. The PDA has the ability to display the last ten sessions while the PC graph is able to display 40-50 sessions. This analysis tool is able to provide educators immediate feedback on the students' performance.

Problem/Question

The questions that need to be answered are: "What are instructor, with various level of data collection experience, perceptions of the KIHd system?"; "What are the student perceptions of the KIHd system?"; "What modifications should be made to increase the usability of the KIHd system?"; and "What are the barriers of the current

KIHd system?" The purpose of this study is to evaluate the instructor and students attitudes of KIHd system and look at some revision implication for future technological data collection research.

Literature Review

Assessment driven instruction promotes accountability at federal, state, and local levels. It is supported by the NCLB (2001), the IDEIA (2004), and the Council for Exceptional Children (Stanford & Reeves, 2005). In addition to legal requirements, assessment strengthens educational decision making by (a) promoting objective decisions, (b) revealing incremental improvements and/or stagnated progress (Janney & Snell, 2000), and (c) predicting future progress (McLean, Worley, & Bailey, 2004). Effective use of assessment data involves summaries, graphs, and rule-based decisions (McLean et al., 2004). Graphic representations assist with this process (Snell & Brown, 2006) and their visual format promotes communication between parents, teachers, and other school personnel (Deno, 2003). Data collection systems need to be simple, efficient, user-friendly (Meyer & Janney, 1989), and socially appropriate (Test & Spooner, 1996). Research has shown that on-going monitoring of student progress generates more appropriate decisions regarding instruction (Farlow & Snell, 1989; Fuchs, Fuchs, & Hamlet as cited in Deno, 2003), and consequently, greater outcomes for students (Todman & Dugard, 2001). Acquisition of learned skills leads to better outcomes for students with increased employment and enhanced quality of life for individuals with disabilities.

Despite the demonstrated importance of data collection and analysis, they are not always used appropriately to guide instruction. Farlow and Snell (1989) found teachers

were more likely to analyze raw data. Another study found teachers tended to place less emphasis on the data they graphed when making instructional decisions, focusing more on training data than probe data (Grigg, Snell, & Lloyd 1989). Teachers report that it is difficult to manage data collection (Farlow & Snell, 1994). With the emphasis on inclusion and increased student caseloads, time constraints have become more pronounced (Deno, 2003). Teachers struggle to find a balance between teaching and data collection (McLean et al., 2004). Consequently, special education teachers are relying more on paraprofessionals (Moshoyannis, Pickett, & Grancik, 1999) who have little or no training in data collection. Furthermore, special education positions are often staffed with personnel holding alternative and emergency certificates (Miller, Brownell, & Smith, 1999; Katsiyannis, Zhang, & Conroy, 2003), who may lack training in data collection and analysis. The barriers to data collection and analysis are concentrated around issues of management, time, and skill (Sandall, Schwartz, & Larcroix, 2004). Consequently, there is a need for technology based data collection alternatives to promote efficient and effective data collection and instructional decisions (Fuchs, 2004).

Advancement of Knowledge and Theory

Wireless technology, as discussed at the American Society for Engineering Education Conference of 2003, has the potential to improve analysis and feedback due to the transferring of data in real time. The use of a PDA and the "live" data allows for an interactive process that would have immediate consequences for analysis. As seen in practice at the nationally known aircraft industry, Locke Manufacturing Company, technology infused data collection improved analysis with better control and faster access to data (Taylor, 1993). A similar cost efficient result was observed at Law Engineering

Incorporated (Woods & Krasno, 1994). In the field of medicine, technology and data feedback have become an invaluable source of patient information leading to better patient care (Merbitz et al., 1992; Hart, Hawkey, & Whyte, 2002; Meadows, 2003; Young et al., 2005; Dorr, Wilcox, Donnelly, Burns, & Clayton, 2005). Following in the footsteps of this empirically-based, medical model, education has turned to the use of technology to improve student learning, particularly in the area of special education.

Advancement of Practice/Effective Strategies Contribution

Using technology with special education students, especially those diagnosed with Autism is a trend that continues to offer possible applications for great learning improvements (Russo, Koegel, & Lovaas, 1978; SungWoo, & Iwata, 1998; Ringdahl, Vollmer, Borrero, & Connell, 2001). Federal initiatives to develop technology-based single subject data collection systems are longstanding as reflected by R. Zuckerman's data procedure project and M. Snell's work on effective use of performance data by teachers in the 1980's. Similarly Hasselbring's *AimStar*, an Apple IIe software program, commercially available in the early 1980s, was designed to utilize student performance data in a Precision Teaching model. Zuckerman's program has been adapted for notebook computers and is still available, while the work of Hasselbring and Snell has fallen victim to the rapid progress of technology.

Presently, technology-based commercial data collection systems are available, such as the *Discrete Trial Trainer* by Accelerations Educational Software (www.dttrainer.com), *Learner Profile* by Sunburst (www.learnerprofile.com), the *Behavioural Evaluation Strategy and Taxonomy* (*BEST)* from Scolari (www.scolari.co.uk), *The Observer* by Noldus Systems (http://www.noldus.com/), and

HanDBase by DDH Software (http://www.ddhsoftware.com/). However, they are either so limited that they require the developer to add new skills to the curriculum content (*Discrete Trial Trainer*) (Ashton, 2001; Ashton, 2005), so complex that they are better suited to behavioral research (*BEST, The Observer, and HanDBase*) (Noldus, 1991; Sidener, Shabani, & Carr, 2004), or so cumbersome that they require an entire curriculum be entered before beginning (*Learner Profile*). As a result, teachers still do not utilize them to collect and analyze student performance data.

Data analysis programs have also emerged. However, these programs separate data collection and analysis, perpetuating the time consuming nature of data-based instructional decision making. D. McElroy (2005) developed a modified excel program, Behavior Feedback and Analysis Tool (BFAT), which displays data in graphic form. This program requires teachers to spend approximately fifty minutes a week inputting previously collected data. The big issue is finding the time to input the data. Additionally, graphing discrete trial data with Microsoft Excel requires extensive training as demonstrated by manuscripts dedicated to this topic (Cihak, Alberto, Troutman, & Flores, n.d.). The KIHd System requires no training to chart each data point as this is accomplished by the program application and each chart produced already meets many of the recommendations of publication journals. Thus, there remains a great need for a simple, yet enhanced and intensive data collection and analysis effort on behalf of students with disabilities. The KIHd System would make this problem obsolete.

Technology Tool—The KIHd System

The KIHd System provides new technology to support the innovative practice of one-touch data collection whereby the data is collected and inputted at the same time.

Maximizing data with effective analysis is critical (McIntire, 2005). The KIHd System is potentially useful for students with a variety of disabilities by utilizing a single subject design methodology. Besides being an individually appropriate form of assessment for students, single subject designs can further education research and practices. The design can be used to identify and establish additional evidence based practices (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005). Single subject design research provides an experimental approach to address causal questions, which the National Research Council reported as a critical type of question in educational research (Shavelson & Towne, 2002). Therefore, due to new developments in wireless, handheld, and database interfaces, technology is leading to broader access to efficient tools for teachers to use in determining student progress in learning activities

The KIHd Sytem is unique in its class and is an easy-to-use teacher-friendly tool. Extensive usability testing has been conducted during the 2004-05 academic year at George Mason University (GMU). Users need not enter an entire curriculum along with data collection parameters at the start. Instead, the KIHd System allows educators and other data collectors to begin collecting chosen individual student performance data. Later, they can organize the curricular content, including linking it to the general education curriculum. The KIHd System is primarily designed for collecting discrete performance data on children with disabilities for whom discrete data performance collection is appropriate.

As a tool, the KIHd System is designed so that data collectors, teachers, parents, aides, and volunteers can collect individual performance data on a handheld device. That information (data) is stored making analysis possible using commonly available database

software tool, Microsoft (MS) Access. Collectively, the system is designed for access online with data collected and stored using wireless Internet technology. Information is collected via a PDA using Internet Explorer (or another browser) interfaced with server software where MS Access stores and analyzes the data. Data collectors "touch" the data only one time. The numeric and graphic representation of the student performance is immediately available to them, either through a web browser access to the server or through a browser PDA graphic interface displaying the last 10 sessions. The browser based system is designed to be 508 accessible, but many users with disabilities will need to use the computer based system in order to access the software (e.g. using Jaws or screen enlargement software that is unavailable on PDAs).

Method

Research Design

Qualitative research was conducted to explore the instructor and student perspectives and attitudes toward technology, specially the KIHd System. Through this systematic approach of exploring a phenomenon (Brantlinger, Jiminez, Klingner, Pugach, & Richardson, 2005), the collection of single subject design data was recorded. It is important to note that the introduction of the KIHd System to collect single subject data was just a process to ascertain opinions and discover viewpoints.

System Design

The KIHd System has three levels of protection: current database configuration, system pass code and instructor's data collection identification. The LIFE database configuration allows only defined people to access the data as defined by the programmer. The system pass code permits only defined people to enter task parameters.

The teacher data collection identification allows instructors to have a password to permit data collection. All LIFE instructors were given a password. All data will be destroyed from the LIFE database configuration by the end of the school year, May of 2006.

Participants and Setting

Two groups of participants were included in this study. The first group encompassed twelve LIFE students. The George Mason University LIFE Program is designed for young adults with intellectual disabilities such as significant learning disabilities, cognitive disabilities including mental retardation and developmental disabilities such as Autism (students' intellectual disabilities might also be accompanied by physical/sensory disabilities). The program provides instruction in functional literacy skills, technology, career exploration/employment, and independent living skills. The second group consisted of eight LIFE instructors with varying experience with data collection. The LIFE students have a variety of classes including the following: communication-technology, consumer or practical math skills, independent living, social dynamics, fitness, and graphic design. The researcher collaborated with each instructor to determine which lessons were to collect which data type using the KIHd system. For instance, Herbert is learning how to estimate a grocery purchase in consumer math skills. Based upon the goals of the lesson, data might be collected on how many items Herbert gets correct over the total number of problems (accuracy) or how quickly and correctly Herbert got the answers (fluency).

Single subject data was collected on each student participant across a variety of data types. Baseline data or intervention data was collected depending upon the class. Interventions included several teaching strategies ranging from direct teaching to modeling. Data collection

was completed after a three week period and a researcher was available at all sessions to maintain consistency and fidelity of the data collection.

Procedures

There was an initial meeting to determine potential participation with the LIFE Directors. Once possible benefits for the students were established, the researcher met with the LIFE parents to present the study proposal. A follow-up letter was subsequently sent and consent forms were collected. During this time frame the researcher met with the LIFE instructors to begin KIHd training and discussion for nine weeks. This included the KIHd three week usage period.

Data Collection

At the conclusion of the KIHd three week period, all study participants were interviewed in a short video-tape using the sample questions as a basis (see Appendix A). Additional facts were collected by having the instructors complete the instructor questionnaire (see Appendix B). Sessions were randomly videotaped. Information about each session was gathered by using a research sheet (see Appendix C) and checked for reliability against videotapes. One researcher was present for all sessions across all steps of the study to ensure reliability of protocol.

Analysis Methods to be Used

Video interviews will be transcribed into manuscripts using *Microsoft Movie Maker*, *DigitByte Studio*'s audio video to WAV converter program, and *Dragon Naturally Speaking*. Transcriptions will be shown to the interview participant to verify all statements.
Once the transcriptions are completed, the data will be entered into NVIVO. The codes will be completed by all three researchers in a group coding format for inter-rater reliability.

Expected Results

Overall Findings

The interview analysis could potentially result in the formation of the following categories: educational decisions, time, navigation, mistakes, terms, training, ease of use, and graph. Participants might remark about how difficult it was to collect data at first and how much easier it got over time. The quotes may range from "…it was just right there and was very clear," to "…the system helped me focus on that task."

Discussion

Interpretations and Conclusions

While the majority of participants were positive about the system, the areas of revisions may be identified as technical difficulty in relationship to the strength of the access points. Other conclusions may show areas of the KIHd system that need to incorporate more instructor training. The results may demonstrate a picture of the range of current KIHd System users and will be a basis for creating an on-line tutorial program and manual in the spring of 2006.

Limitations

Current limitations of this study reveal the lack of researcher protocol for data input. Future research will need to be conducted with strict operational definitions for each observation and parameters of tasks. The KIHd System is designed to be used with a range of special education students; a noted restriction with this study was the cooperation of the LIFE students as other pupils may be less willing to work.

Importance

Once modifications in design have been made, the KIHd system needs to be used in a classroom or home setting to begin to look at the evaluation of single subject intervention methodologies. A future study may be to focus on a variation of the single subject design across different special populations as well as across environments. The single subject data collected in this study may be probe data to look for trends in intervention research.

References

Ashton, T. (2001). The application of ABA to technology: The Discrete Trial Trainer. *Journal of Special Education Technology*, *16*, 1-6.

Ashton, T. (2005). The application of ABA to technology: The Discrete Trial Trainer. *Journal of Special Education Technology*, *20*, 60-63.

Behrmann, M. M., & Graff, H. J. (2005). [LIFE study kellar instructional handheld data system]. Unpublished raw data.

Behrmann, M. M., & Graff, H. J. (2005). Kellar instructional handheld data system. Fairfax, Virginia: George Mason University, Helen A. Kellar Institute for Human disAbilities.

Brantlinger, E., Jiminez, R., Klingner, J., Pugach, M., & Richardson, V. (2005). Qualitative studies in special education. *Exceptional Children, 71*, 195-207.

Cihak, D. F., Alberto, P. A., Troutman, A. C., & Flores, M. M. (n.d.). *Graphing in EXCEL for the classroom: A step-by-step approach.* Retrieved October 5, 2005, from http://wps.prenhall.com/wps/media/objects/2028/2077456/Volume_medialib/BOOK.PDF

Deno, S. T. (2003). Developments in curriculum-based measurement. *The Journal of Special Education, 37,* 184-192.

Dorr, D. A., Wilcox, A., Donnelly, S. M., Burns, L., & Clayton, P. D. (2005). Impact of generalist care manager on patients with Diabetes. *Health Services Research*, *40*, 1400-1421.

Farlow, L. J., & Snell, M. E. (1989). Teacher use of student performance data to make instructional decisions: Practices in programs for students with moderate to profound disabilities. *Journal of the Association for Persons with Severe Handicaps, 14,* 13-22.

Farlow, L. J., & Snell, M. E. (1994). *Making the most of student performance data* (AAMR Research to Practice Series: Innovations). Washington, DC: American Association on Mental Retardation.

Fuchs, L. S. (2004). The past, present, and future of curriculum-based measurement research. *School Psychology Review, 33,* 188-192.

Grigg, N. C., Snell, M. E., & Loyd, B. (1989). Visual analysis of student evaluation data: A qualitative analysis of teacher decision making. *Journal of the Association for Persons with Severe Handicaps, 14,* 23-32.

Hart, T., Hawkey, K., & Whyte, J. (2002). Use of a portable voice organizer to remember therapy goals in traumatic brain injury rehabilitation: A within-subjects trial. *Journal of Head Trauma Rehabilitation*, *17*, 556-570.

Heward, W. L. (2005). *Exceptional children: An introduction to special educ*ation. *(8th edition)*. Pearson: Upper Saddle River, New Jersey.

Horner, R.H., Carr, E.G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children, 71,* 165-179.

Janney, R., & Snell, M. E. (2000). *Teachers' guides to inclusive practices: Behavioral support.* Baltimore, MD: Paulh Brookes Publishing.

Katsiyannis, A., Zhang, D., & Conroy, M. A. (2003). Availability of special education teachers: trends and issues. *Remedial and Special Education, 24*, 246-254.

McElroy, D. (2005, April). *"What to do with all those point sheets?" Data-driven behavior support.* Paper presented at the meeting of Council of Exceptional Children, Baltimore, Maryland.

McIntire, T. (2005). Data: Maximize your mining: Sustained student achievement is the ultimate goal of data mining, but efficient analysis is the key to getting there. Here, we look at stages one and two of a three-stage process for success. *Technology and Learning*, *25*, 32-38.

McLean, M., Wolery, M., & Bailey, D. B. Jr. (2004). *Assessing infants and preschoolers with special needs* (3rd. ed.). Upper Saddle River, NJ: Pearson Education

Meadows, B. J. (2003). Eliciting remote data entry system requirements for the collection of cancer clinical trial data. *CIN: Computers, Informatics, Nursing, 21,* 234-240.

Merbitz, C. T., King, R. B., Cherney, L. R., Marqui, H., Grip, J. C., & Markowitz, T. J. (1992). Computerized behavior-data collection and analysis for improved clinical outcomes in rehabilitation. *Behavior Research Methods, Instruments, & Computers, 24*, 366-372.

Meyer, L. H., & Janney, R. E. (1989). User-friendly measure of meaningful outcomes: Ealuationg behavioral interventions. *Journal of the Association for Persons with Severe Handicaps, 14,* 263-270.

Miller, D. M., Brownell, M. T., & Smith, S. W. (1999). Factors that predict teachers staying in, leaving, or transferring from the special education classroom. *Exceptional Children, 65,* 201-221.

Moshoyannis, T., Pickett, A. L., & Granick, L. (1999). *The evolving roles and education/training needs of teachers and paraprofessional teams in New York Public Schools: Results of survey and focus group research*. New York, New York: City University of New York, Center for Advanced Study in Education.

Noldus, L. P. (1991). The Observer: A software system for collection and analysis of observational data. *Behavior Research Methods, Instruments & Computers*, *23*, 415-429.

Ringdahl, J. E., Vollmer, T. R., Borrero, J. C., & Connell, J. E. (2001). Fixed-time schedule effects as a function of baseline reinforcement rate. *Journal of Applied Behavior Analysis*, *34*, 1-15.

Russo, D. C., Koegel, R. L., & Lovaas, I. O. (1978). A comparison of humans and automated instruction of autistic children. *Journal of Abnormal Child Psychology*, *6*, 189-201.

Sandall, S. R., Schwartz, I. S., & Lacroix, B. (2004). Interventionists' perspective about data collection in integrated early childhood classrooms. *Journal of Early Intervention*, *26*, 161-174.

Shavelson, R. J., & Towne, L. (Eds.). (2002). *Scientific research in education*. Washington, DC: National Academy Press.

Sidener, T. M., Shabani, D. B., & Carr, J. E. (2004). A review of the behavioral evaluation strategy and taxonomy (BEST) software application. *Behavioral Interventions*, *19*, 275-285.

Snell, M. E., & Brown, F. (2006). *Instruction of students with severe disabilities* (6th ed.). Upper Saddle River, NJ: Pearson Education.

Stanford, P., & Reeves, S. (2005). Assessment that drives instruction. *Teaching Exceptional Children, 37*, 18-22.

SungWoo, K., & Iwata, B. (1998). Computerized systems for collecting real-time observational data. *Journal of Applied Behavior Analysis*, *31*, 253-262.

Taylor, D. R. (1993). SPC program takes off. *Quality*, *32*, 39-41.

Test, D. W., & Spooner, R. (1996). *Community-based instructional support* (AAMR Research to Practice Series: Innovations). Washington, DC: American Association on Mental Retardation.

Todman, J. B., & Dugard, P. (2001). *Single-case and small-n experimental designs: A practical guide of randomization tests.* Mahwah, NJ: Lawrence.

U.S. Department of Education. (2002). No Child Left Behind. Washington, DC: Author.

U.S. Department of Special Education. (2004). Individuals with Disabilities Education Act (IDEA) data. Washington, DC: Author: http://www.ideadata.org/.

Woods, R. W., & Krasno, D. S. (1994). A thousand points of data. *Civil Engineering*, *64*, 54-57.

Young, R. J., Taylor, J., Friede, T., Hollis, S., Mason, J. M., Lee, P., et al. (2005). Pro-active call center treatment support (PACCTS) to improve glucose control in type 2 Diabetes: A randomized controlled trial. *Diabetes Care*, *28*, 278-282.

Appendix A
Sample Interview Questions

1. What surprised you about the KIHd System?

2. How comfortable were you (or having your instructor) collecting data and navigating the KIHd System?

3. What were the most enjoyable and frustrating aspects of using (or having your Instructor use) the KIHd System?

4. Any additional comments you have about the KIHd System?

For Instructor's Only

5. To what degree does the KIHd System graphs satisfy your analysis needs?

6. How would the KIHd System effect the assessment decisions you make on your students?

Appendix B
Instructor's Questionnaire

Name: _____ **Age**: _____

Number of Years with the LIFE Program: _____

Level of Education Enrolled-Please circle correct response

High School

College-Freshman

College-Sophomore

College-Junior

College-Senior

Graduate School-Masters

Graduate School-PhD

Employment Goal-Please respond

Teach Special Education

Physical Therapist

Occupational Therapist

Psychologist

Other: _____

Describe your previous experience with data collection:

_____

Appendix C
Researcher checklist

Research's Name: _____

Class: _____ **Date:** _____

Instructor's names: _____

Did you need to technically help? How many times? For how long?

Did you need to give assistance? How many times? For how long?

Did the instructors look at the PDA graphs? Which ones? For how long? Did they discuss the graph(s) among themselves?

Did you notice any secondary behaviors to track?

Did you, as the researcher, notice any other student who may be eligible for data collection?