The Impact of using Picture-to-Text Software on Writing Productivity of Young Writers

Susan H. Kenney

George Mason University

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Dr. Margaret King-Sears

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Abstract

Can picture-to-text software unleash writing potential and mitigate frustration experienced by young children with writing difficulties? Extending Slater's (2002) single subject research, a 7 year old child had access to software that paired pictures and text. Writing samples generated by hand and others with software were assessed to determine which writing tool resulted in longer, more conventional writing samples. Using an ABCD Changing Conditions Single Subject Design, Phase A, baseline writing samples were collected, Phase B, picture-to-text software was introduced, Phase C, software was used as a tool, and in Phase D, a list of words appropriate to provided picture prompts were made available to facilitate spelling. The dependent variables included correct letter sequences (CLS), a writing rubric score, spelling and number of words. The results were inconclusive and suggestions for future studies were made.

Keywords: technology; picture-to-text; writing; literacy

The Impact of using Picture-to-Text Software on Writing Productivity of Young Writers

The complex skill of writing is essential throughout a child's schooling and beyond (Beck & Fetherston, 2003; Easterbrooks & Stoner, 2006). Young children and children with learning disabilities can have difficulties and experience intense frustration with writing. When struggling with handwriting, spelling, and mechanics, often, the student's higher level thinking processes are impeded (McCutchen, 1995).

Various studies have considered the effects of technology on writing products. Beck and Featherston (2003) compared written products of seven, eight year old students that were completed using paper and pencil versus written products that were typed using a computer program. Students with learning disabilities were included in studies by Zhang (2000) involving fifth grade students, and Hetzroni and Shrieber (2004) included three junior high students using computers for written products. Cullen, Richards, and Frank (2008) studied the combination of computers with software having text-to-speech, spellcheck, and word prediction with seven fifth-graders. The first two and the last studies were done in small group settings and the third was in an inclusion setting, with typically developing peers. Whereas the students in the first study were just classified as reluctant writers, the students in three other studies had been formally diagnosed and had Individual Education Programs (IEPs). All four studies concluded that the use of technology, for students with difficulties in writing, had a positive effect including the reduction of the concerns of legibility and spelling in their writing samples when technology was used.

In the Technology for Learning Disabilities Project Evaluation Report (2007), a two year study with pretest – post test design, students?'s ability to employ accepted writing conventions and organization components was assessed when students with learning disabilities had

Comment [PKS1]: Check apa – reads odd?

Comment [PKS2]: Excellent summary and use of research!

consistent access to and use of ~~d~~ assistive technology. The group using technology scored significantly higher on all thirteen assessment areas, and the teachers reported an even more important impact: ~~,~~ the positive turn in student feelings about writing. A positive change in attitude was also noted a~~s key,~~ by Beck and Fetherston (2003) in their study. Expand on this positive change by these last authors? Just a sentence or so?

MacArthur (2000) described a variety of studies with results indicating the positive benefits of long term training in and use of word processors with special software, however, as he mentioned, research on assistive technology used for writing was limited. Slater (2002) found picture-to-text software to have a positive effect on the reading scores of twelve students who had been considered non readers and posed the premise that pictures chosen and put in a specific sequence can communicate thoughts as in writing. Would the use of word processing software that pairs a picture with typed words positively affect a young child's writing? Studies involving the use of picture-to-text software for writing with students, whose pre-writing skills are emerging, could not be found. Therefore the purpose of this research is to extend the literature by investigating the use of word processors with picture-to-text software to develop writing skills in a student for whom forming letters by hand and combining letters to spell words result in a written product that is difficult to decipher. The specific research questions to be addressed are:

- Will having access to picture-to-text software on a word processor help a child write more words compared to paper and pencil method?
- Will having access to picture-to-text software on a word processor help a child spell words more conventionally?
- Will a young child begin a writing assignment more quickly when given access to picture-to-text software than when writing with paper and pencil?

- How will pairing pictures with text in writing tasks affect a child's attitude about writing?

Method

Design

This study used an ABCD Changing Conditions Single Subject Design. Phase A represented baseline. The child produced writing samples with paper and pencil and also with the picture to text software used as a word processor without the picture pallet available. Phase B began implementation with training. The child followed a set of directions, created with the software, to use five features of the picture-to-text software (see Figure 1). Those features included button creation, choosing a word, deleting a word, adding punctuation, and listening to the words typed. In Phase C the intervention was implemented. The child used the software with a blank pallet (word bank) in the picture-to-text software. As she typed the buttons were created with the letter groups and the words she typed. When words were spelled correctly as she typed, often a picture was put on top of the word. In Phase D the pallet was filled with picture and word buttons suggested by the researcher for the computer condition and a word list with identical words but no pictures as cues was provided for the paper pencil task (see Figure 2). Writing samples generated by hand and others with software were assessed to determine whether paper and pencil or picture-to-text software resulted in longer, more conventional writing samples.

Participant

The child in this study was identified by a parent who was concerned about her child's writing progress in school. Viviana (a pseudonym) is a 7 year old, second grade Caucasian female. Her mother noticed that although her daughter's peers were writing multiple sentences on topic with many words spelled correctly, Viviana avoided writing when possible, expressed

frustration with writing assignments, and generated short and often unintelligible written products. Although she had good reading skills and her grades in most subject areas were above average, her mother reported that she had great difficulties expressing thoughts in writing. She loved to express detailed and complex ideas orally using above grade level vocabulary but spelling those words was a great challenge. When using paper and pencil, she also had trouble producing legible letters with appropriate spacing and alignment. She used capitalization throughout her writing including in the middle and at the end of words and as she tired, letter spacing, transposition of letters, letter reversals, and poor letter formation become more evident. Viviana had a tutor the previous summer to address writing issues but continued to have difficulties with written language. Viviana had not been identified as having any disability.

Comment [PKS3]: Good descriptives provided here on the student.

Setting

Viviana lived in the suburbs of a large metropolitan area on the east coast of the United States. The sessions were conducted in her home situated in a quiet, middle class neighborhood. Although other household activities were occurring simultaneously, Viviana did not appear to be distracted but focused on each writing task, rarely pausing longer than ten seconds during a four minute writing task.

Materials

McMaster, Du, and Pétursdóttir (2009) found that third graders responded to photo prompts, so calendars with a choice of photos of various topics were used to initiate a written product for each of two conditions, the traditional paper and pencil condition, and the second condition, picture-to-text software on a laptop. In both conditions, a stopwatch was used to measure how long it took the child to begin writing after being given the directions and to measure four minutes for the actual writing. For the paper and pencil condition the child was

Comment [PKS4]: Note this as latency recording. This sounds like one of your dependent variables?

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given a choice of different types of lined and unlined paper, and a variety of pencils and pens. For the picture-to-text condition the child had a laptop with picture-to-text software opened to a blank document. Before training in the baseline, Phase A, the pallet was hidden and Viviana typed letter by letter to produce each word. During training, Phase B, she was introduced to the tools and features of PixWriter, a text-to-speech software program by Slater Software. In Phase C, she was given the opportunity to type letter by letter and to using the mouse to choose words that she had added to the pallet. In Phase D, the word box and word pallet were added, the picture writing prompt was paired with a word box or pallet with 16 words that were appropriate to the picture prompt. Several calendar picture prompt choices with similar animals were chosen so that the pallet for both conditions contained the same bank of words. The words in the pallet for the software had pictures paired with text, while the word box for the paper/pencil task was typed in a similar layout but without pictures. The words reflected what was seen in the pictures and were chosen by the researcher. To provide some standardization, the words and order were as follows: four nouns, two pronouns, "they" and "them", four verbs, the words "the" and "with", and four adjectives.

Dependent Measures

The dependent variables included correct letter sequences (CLS) (Hosp, Hosp, & Howell, 2007; the University of Minnesota, 2005; Wright, 1992; McMaster, Du, and Pétursdóttir, 2009), which is described as considering the sequence of two letters as correct or not. A writing rubric score was used awarding points for inclusion of a topic sentence, detail sentences, a closing sentence, correctly spelled words, and appropriate use of end punctuation. Percentage of words spelled correctly, (Jewell & Malecki, 2005) and attitude as revealed in survey responses were the last two dependent measures. I'm not sure the attitude survey is a dependent variable. It's a one-

shot social validity aspect, right? It also sounds like although you measured latency, you're not using it as a dependent variable.

Total letter sequences (TLS) and percentage of correct letter sequence (CLS). TLS is calculated by using marks on the writing sample to indicate all possible sequences of capitalization, punctuation marks, and letters. Capitalization of the beginning word in a sentence, proper nouns, and punctuation must be correct when it is a part of a sequence. McFarland and Wallace (2008) found that, for second graders, the CBM first use of acronym – spell out that was the closest predictor of holistic rating by teachers was CLS % which is calculated by dividing the CLS, correct sequences of capitalization, punctuation marks, and letters, by the TLS. This measure is more sensitive to young children learning to write because partial credit is given. For instance, with the sentence, "The dog barkd." a student would be awarded eight points credit for the initial capital letter, the letters and spaces in "The dog," partial credit of four points for barked is given, because the e was omitted, and two points credit for the period resulting in credit of 14 points out of a possible 16 points or a CLS of 87.5%.

Writing rubric. The writing rubric gives a combination of points for the number of words, the number of words spelled correctly, the number of sentences on topic, sentences on topic that are parts of a paragraph, proper punctuation and partial credit if phrases are created rather than sentences. This also is more sensitive to small improvements in a young child's writing.

Percent of spelling accuracy. This is a production independent measure that has been found to be a reliable indication of writing quality (Jewell & Malecki, 2005). It can be calculated by dividing the number of words a child writes into the number of words that he/she spells correctly.

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Comment [PKS5]: Very useful to have this example of how scored.

Survey responses. The parent and child will complete a survey at the beginning of the study and at the end. Responses will be compared to determine if an attitude shift has occurred.

Procedure

The Human Subjects Research Board of the local university granted permission for the study. The researcher explained the study to Viviana and her mother while Viviana looked at a written form with pictures to help her understand what the study was, how it would be conducted, and help her know about her rights as a participant (see Figure 3). The researcher answered questions. When the parent and child agreed, the assent form with pictures was signed by the child and a consent form was signed by the guardian before the study began. Viviana felt uncomfortable with the idea of having the sessions recorded so she opted to not allow audio taping.

The child met with the researcher for two sessions per week. During the first session the child randomly selected a card that indicated the schedule of phase changes and at the beginning of each subsequent session she was given a set of cards to randomly select the order of the conditions. Writing tools, paper and pencil for one condition and a laptop computer with picture-to-text software for the other, were prepared for the child to use. She was shown a calendar with photographs of scenery and/or animals. After choosing each picture prompt she listened to the following scripted directions:

> "Look at this picture. Think about it, and then write four or more sentences to tell what is in the picture or tell about what could be happening. You will have four minutes, but if you would like more time, you may write until you let me know that you are finished."

Comment [PKS6]: Very good directions. I can tell that readers of your work will acquire detail of what you did and how you did it.

The stop watch was started and the student began to write or type about the picture. The second that the child began writing was recorded and four minutes later a notation was made on the word the child was writing or typing. She was allowed to finish her thoughts about the picture. The writing products were collected and analyzed for number of total correct letter sequences, spelling, and punctuation used. Three weeks after the final session, the researcher returned to Viviana's house to get maintenance probes.

Analysis

The data collected was put in a software application called Chartdog2 and graphs were created for each of six areas, percent of words spelled correctly, percent of CLS, CLS, total writing score according to the described rubric, number of words written, and number of seconds from cue to begin and the first letter written/typed. The charts were assessed for trend and variability.

The data were also compared from one phase to another as to the Percent of Non Overlapping data (PND).

Results

Because Curriculum Based Measures (CBM), have been developed as reliable, practical way to assess writing (Malecki and Jewell, 2003) and three to five minute writing probes have been shown to reveal much about the writing skills of young students (Malecki and Jewell, 2003) CBM four-minute writing probes were used to assess the writing samples.

Comment [PKS7]: Move this somewhere else, perhaps in the dependent variable or Introduction sections. You're making a case for why you used this CBM (which is a new term for readers, pretty late in manuscript) in the Results section. Make that case sooner. In Results, only report Results.

It was thought that while students with emerging reading and writing skills use the picture-to-text software, their writing skills would expand, they would be able to combine words to create sentences that are understandable by others, and that are longer and more complex than

sentences they could write by hand. I'm thinking these are not Results? Put only Results in this section.

Visual analysis. When visually analyzing the six resulting graphs it was observed that there were too few products to accurately determine trend. The expected outcomes were not realized.

For the percent of words spelled correctly (see Figure 5), in Phases A and C the spelling scores were lower with the software, where as, for three out of four sessions, including the final two sessions in Phases B and D, the picture-to-text scores were higher. The two highest scores in spelling occurred with the picture-to-text software in the first sessions of Phases B and D.

For the percent of CLS (see Figure 6), scores tended to be similar to the spelling scores. The scores of the paper/pencil products tended to remain within a 20 point range. On the other hand, there was a 50 point range in the scores from picture-to-text samples. Unfortunately the increase was not consistent. The two most positive scores for both percent of CLS and percent of spelling accuracy occurred in the first sessions of Phase B and Phase D. However, the following scores had a definite decrease from what to what? . Without more samples it is difficult to determine the true effect of either condition.

Because the CLS scores (see Figure 7) were dependent on the volume of words written, the paper/pencil products tended to have higher scores than the text-to-speech scores. Only in Phase D did that trend reverse. The CLS scores for the paper/pencil tasks tended to decline while the scores for the picture-to-text samples tended to rise. "tended" ?? Switch to using your data, and tell what the data are. Leave it to the reader to infer any "tended to" for this.

The total writing scores (see Figure 8) obtained from the rubric tended to be similar to the CLS scores in all phases. As has been found in previous studies, the number of words written

Comment [PKS8]: Avoid any subjective terms in Results. Just state the data.

Comment [PKS9]: Highest?

Comment [PKS10]: Delete this term, and tell what the decrease was.

Comment [PKS11]: This sentence could be in Discussion, but should not be in Results. Can you see why?

Only Results go in Results.

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(see Figure 9) does not tend to increase in a short period of time tell what you're calling a "short period of time". However there was an increase in the number of words produced with picture-to-text software from what to what – use your data in the Results, while the number of words in the paper/pencil products declined from what to what? Use your data in Results.

The latency score (see Figure 10), 32 seconds was the longest time it took Viviana to begin in the first session. For the rest of the sessions she took from between four and twelve seconds to begin the paper/pencil task and between four and twenty three seconds to begin the picture-to-text tasks. For all but the third and last sessions she took less time how much less time? Can you tell my pattern here – use your DATA in the Results section! to begin writing with paper/pencil.

During a majority how many? of the sessions the sample scores for the paper/pencil condition had higher scores how much higher? than did the picture-to-text samples. The trend lines for the paper/pencil conditions tended to be variable in both magnitude and direction, and the trend line for the picture to text condition tended to be in a positive direction.

Statistical analysis.

Because of the high percentage of overlapping data points throughout the data you should report these percentages, even if they are high – this is RESULTS section!, the researcher will concentrate on one graph, Percent of Words Spelled Correctly. Most data points overlap 50% or more in all but one phase. The last phase of Percent of Words Spelled Correctly had no overlapping data. The mean value of Phase C for paper/pencil was 55.1%, while the mean value of Phase D decreased to 42.6%. However, in the picture-to-text condition the mean of Phase C was 47.6% which is contrasted with the mean value of Phase D which was 82.1%. There was no

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Comment [PKS12]: OK – now I see you are using Latency as a dependent variable, right? Return to previous sections and make sure that the data you say you're going to report on is identified/described in other appropriate parts of the paper.

overlapping data between Phase C and Phase D of the Percent of Words Spelled Correctly in the picture-to-text condition.

Social Validity. McFarland and Wallace (2008); Lane, K. L., Harris, K. R., Graham, S., Weisenbach, J. L., Brindle, M., and Morphy, P. (2008); Regan, K. S., Mastropieri, M. A., and Scruggs, T. E. (2005) as well as other researchers have mentioned the concerns about writing development in students. They have also attested to the importance of writing to student academic and post academic pursuits. Although there is a pervasive need for children to be able to write coherent passages, there is a relative underrepresentation of writing interventions in recent academic research studies.

In order to ~~give~~ acquire insights on attitudes about writing and preferred tools, a short survey was given to Viviana and her mother in both the first and the last sessions. Describe survey and results? I'm not sure I'm seeking that information here? Although her mother indicated that Viviana generally likes school, does well in most academic areas, and is verbally adept; writing is difficult for her. Viviana's less developed fine motor skills make letter formation of handwriting, laborious with messy results. Spelling is an additional issue that impedes Viviana's use of the vocabulary under her command as she speaks.

At the conclusion of the study sessions, Viviana's mother indicated that the study helped her daughter through writing support and practice. One of the difficulties was doing the study at the end of the day after she had been in school all day. She thought that using assistive technology could help Viviana "express herself as a writer more clearly and completely." and resolved to "encourage her to do more writing with the computer so that she will feel more enthusiastic about writing in general." Sounds like the mother thought this beneficial!

Comment [PKS13]: Check apa

Comment [PKS14]: I'm not sure I follow this – does she need to know how to spell words in order to speak the words?

In the first session Viviana indicated that she enjoyed using computers for writing. She felt that computers help her work faster and produce more work. Although, she said she liked using the picture-to-text software, her responses tended to be more negative at the end of the study. She did mention that she liked the pictures and she thought that her friend who likes to write would enjoy trying the software.

Reliability. To address reliability, McFarland and Wallace (2008) found that, for second graders, the Curriculum Based Measurement (CBM) that was the closest predictor of holistic rating by teachers was *percent correct letter sequence*. Most of the scoring rules and directions found were designed to score writing samples from students in grades four and above. Since the students in this study are younger and/or may have learning disabilities, *percent correct letter sequence* will be one of the measures taken. Hosp, Hosp, and Howell, (2007) and the University of Minnesota presented details for scoring *correct letter sequence* for writing samples. Scoring rules were devised by combining rules from those two sets. The *correct letter sequence* was then divided by the total number of sequences possible to determine the *percent correct letter sequence.*

Inter-rater reliability. The researcher and a social worker were trained to follow the scoring protocol. Many practice sessions were held and the materials were adapted to increase accuracy of recording data. A random selection of 36% the writing samples were evaluated by two scorers. The range of point by point agreement was from 77 % to 100% with an average of over 94%. .

The writing samples were typed on the data collection sheets and the scores were uploaded on Chartdog2 after each session. Because the scoring criteria directs that except for initial letters of a sentence and proper nouns, the sporadic capital letters and reversed letters in

the hand written samples were typed correctly. Although excessive capitalization was not part of the assessed skill, it was very distracting to the scorers.

Discussion

Because there was no overlapping data between Phase C and Phase D of the Percent of Words Spelled Correctly in the picture-to-text condition, this seems to indicate that using picture-to-text software had a positive affect in the accuracy of Viviana's spelling for the last two writing samples. However, caution is advised because of there were so few data points in both of the last two phases. This should be an area to explore in future research.

Although the participant seemed to fit the criteria outlined in the proposal of this study, it seems that Viviana's strong reading skills, well developed word and story sense, and upper grade level oral vocabulary may call for a different type of intervention. Rather than needing pictures to be able to understand text, she needed something that could help her spell the words she had formed mentally yet could not put on the paper in a format that others would recognize (See Figure 11). Either the software studied would need to include more features that would cover different writing needs, such as word prediction, or the participant criteria for this picture-to-text software should focus on children who have both reading and writing deficits.

Because Viviana had limited keyboarding skills, her output with the picture-to-text software was hampered resulting in generally lower scores on production dependent scores, such as total writing score and the CLS. It was also noted that Viviana's accuracy seemed enhanced after sessions of training. You're noting some good information here!

In the first session of Phase D, Viviana used the pallet to create her writing sample. For that sample the Picture-to-text sample earned 100% in both spelling accuracy and percent of CLS. No paper/pencil product came close. The highest percent earned for a paper/pencil product

was in the first session and was 78%. In the final session Viviana did not use the pallet (see Figure 4). When asked why, she mentioned that it did not have the words she wanted to use. That shows that if the words in the pallet are student chosen, the accuracy of the resulting product can be very good.

Limitations. Some of the limitations of this study have been mentioned before. The number of participants was very small limiting the advisability of generalizing the results to other children. Allowing that single-case studies focus on a small number of participants, it would be beneficial to have several more children participate to see how the software affected other children.

Although the only participant had difficulties with writing, she was a good reader with a good sense of word and story that would limit the actual need for pictures to increase understanding. As she mentioned in the closing survey, she did enjoy the pictures so they may have provided a motivational component. Viviana's greatest deficit was spelling. The vocabulary she uses orally is much more advanced than her spelling skills can handle. Matching the software with the student need would provide more information at the conclusion of the study.

Fidelity of treatment. Although it was planned to use a tape recorder as an assessment of the fidelity of treatment with a trained observer, the child did not agree to be recorded. To provide for internal validity, fidelity of treatment should be assessed by live observation or the assessment of an audio or video recording. It is important to have a back-up plan to assess fidelity of treatment in case the planned method is not possible, such as lack of assent.

Statistical- Randomization test. Todman and Dugard (2001) strongly propose that additional statistical analysis such as randomization tests be included in single-case and small-*n*

research designs. To provide for a measure of internal validity and reduce researcher bias found in making decisions as a response to what happens during research,; randomization was included in this research through the random selection of both the length of phases and the order of conditions. Although the graphs were visually analyzed and the Percent of Non-overlapping Data (PND) were calculated but not for all data, right?, Todman and Dugard strongly recommend that randomization tests also be applied. Due to the limited number of observations and the inconclusive results, randomization tests were not used. They will be used in this researcher's future studies.

Implications

Picture-to-text software may be helpful to some students if matched carefully with the students' deficits. It would be important to repeat this study with more students who have both reading and writing deficits to find out the effect of picture-to-text software on student writing.

Although the PND of Percent of Words Spelled Correctly indicated that picture-to-text software could have a positive affect on a child's spelling, the length of this study was too short to provide conclusive evidence. To understand how this software could affect writing development, the software would have to be used on a more consistent basis for a longer period of time. With more use, the child could develop a familiarity with the software that could increase efficiency of use and accuracy in writing. With more time and more practice using the software, a student may show more positive gains in other areas as well.

You can also get beyond this study in Discussion and Implications by noting how students like this student might benefit … what needs to be considered .. That is, you do not need to stay confined to the study student in these sections.

Figure 1.

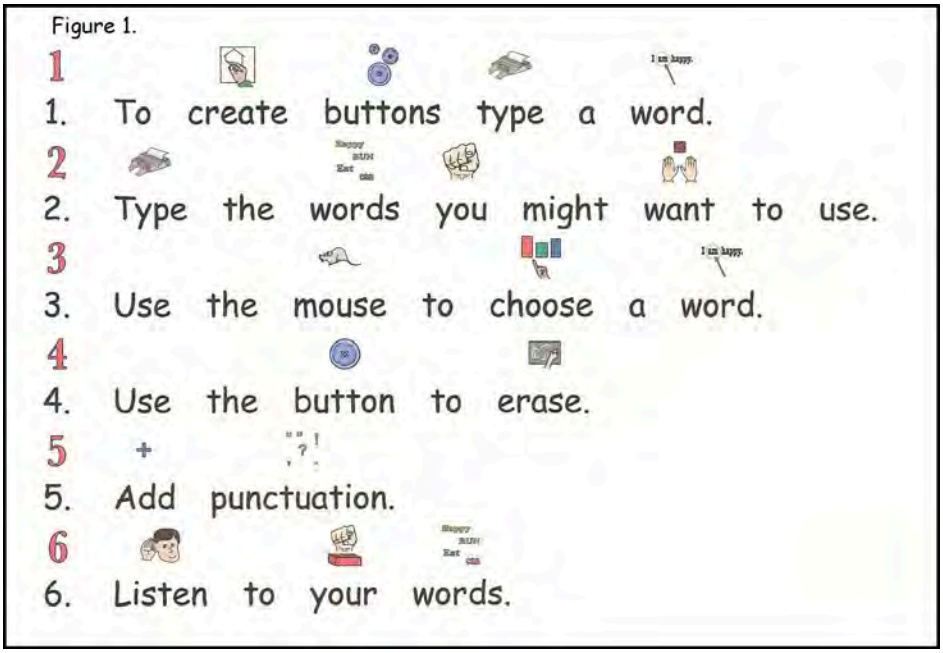

Figure 2.

Figure 3.

The Impact of Using Picture-to-Text Software on Writing Productivity of Young Writers

MINOR INFORMED ASSENT FORM - You can choose!

Yes no

WHAT WE'RE DOING.

This research study is about using technology (computers) to write. We want to find out if using pictures on a computer could help you with writing. We will get together at your house or the library for about 15 minutes at a time. I will show you pictures that you can write or type about. After we do that for a while I will teach you how to use a program on the computer that will put pictures on top of words like you see on this page. We can see if using this program and the computer helps you to be able to write more sentences than if you were using a pencil and paper. We also want to hear what you think your best way to write is.

write or computer

WHAT COULD HAPPEN?

Nothing bad could happen to you if you decide to help us with our study.

WHAT'S IN IT FOR YOU?

Unfortunately, there is nothing you will get to keep because you have helped us. You will be able to learn about this new software and to help us figure out if computers can help others like you.

prize

YOUR INFORMATION WILL BE KEPT SAFE.

Any information we get from you will be kept safe. You will choose a name that we will put on the writing you do. No one else will know what words or sentences you typed, or what you said. They will only know that a child typed it or said it.

safe

PARTICIPATION: YOU HAVE THE CHOICE.

You can choose to be in this study or you can choose to not be in this study. You can say, "No," at any time, even if you have already started working with us. We promise not to be mad.

choose Yes or no

1 OF 2

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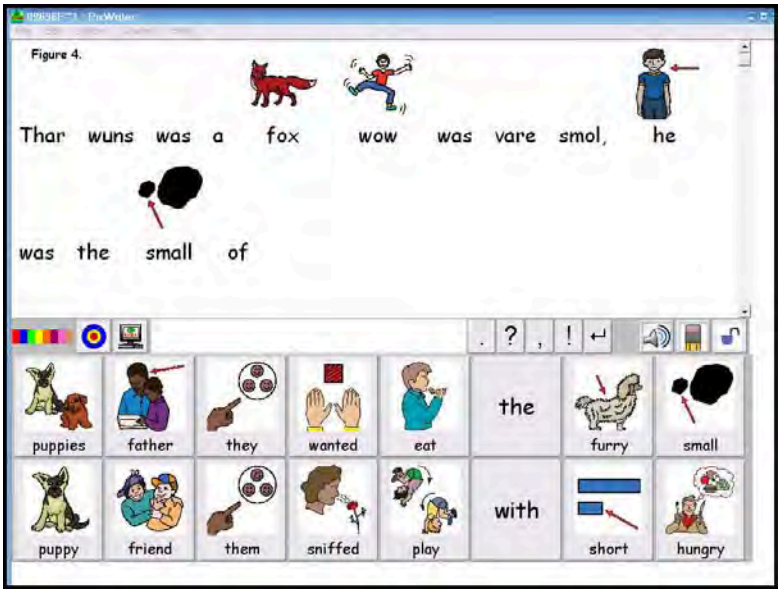
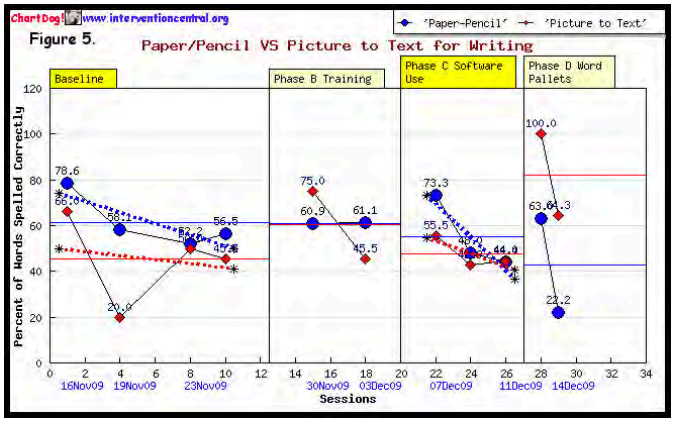
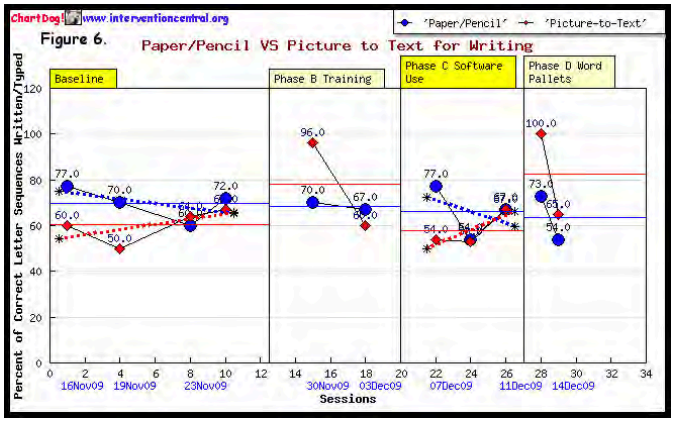



ChartDog! www.interventioncentral.org
'Paper-Pencil' 'Picture to Text'
Figure 5.
Paper/Pencil VS Picture to Text for Writing
Baseline
Phase B Training
Phase C Software Use
Phase D Word Pallets
Percent of Words Spelled Correctly
Sessions
16Nov09 19Nov09 23Nov09 30Nov09 03Dec09 07Dec09 11Dec09 14Dec09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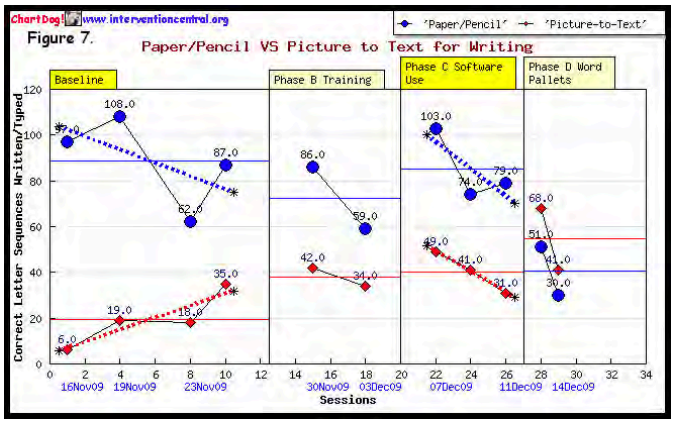
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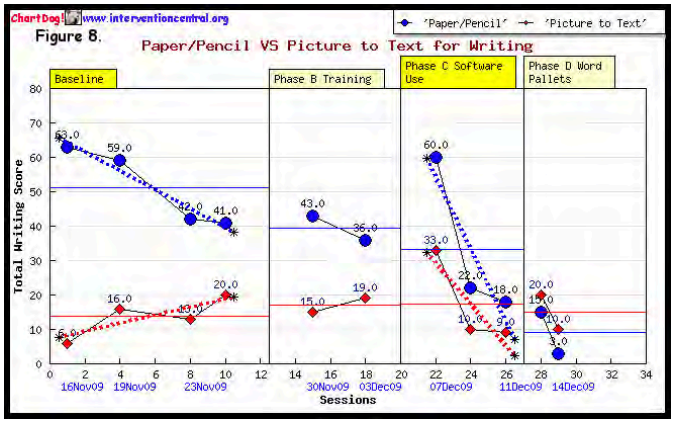
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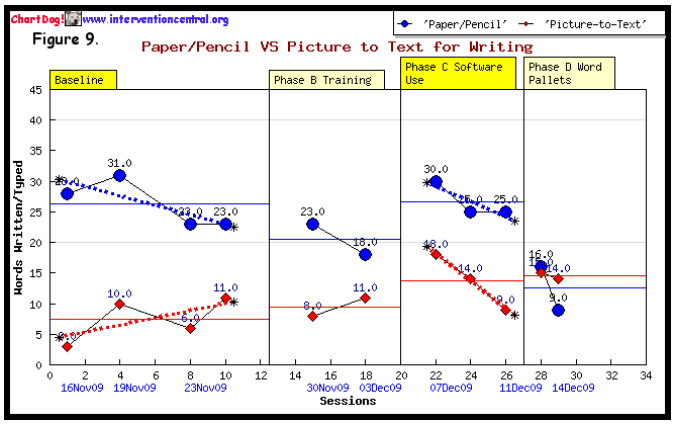
Sessions
16Nov09 19Nov09 23Nov09 30Nov09 03Dec09 07Dec09 11Dec09 14Dec09


ChartDog! www.interventioncentral.org
'Paper/Pencil' 'Picture-to-Text'
Figure 9.
Paper/Pencil VS Picture to Text for Writing
Baseline
Phase B Training
Phase C Software Use
Phase D Word Pallets
Words Written/Typed
Sessions
16Nov09 19Nov09 23Nov09 30Nov09 03Dec09 07Dec09 11Dec09 14Dec09

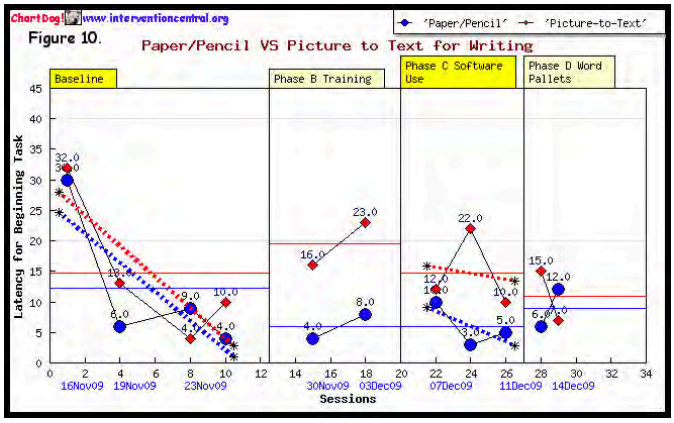
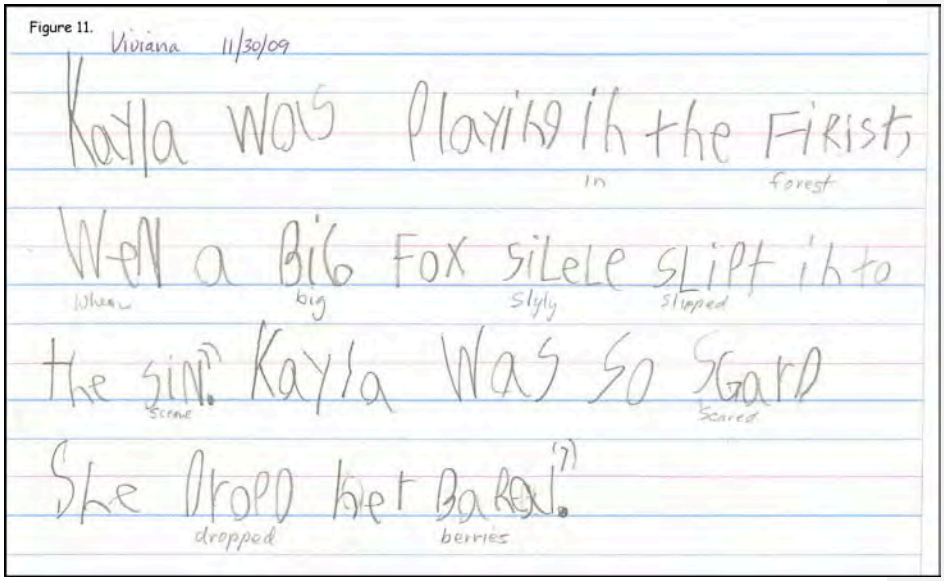

ChartDog! www.interventioncentral.org
'Paper/Pencil' 'Picture-to-Text'
Figure 10.
Paper/Pencil VS Picture to Text for Writing
Baseline
Phase B Training
Phase C Software Use
Phase D Word Pallets
Latency for Beginning Task
Sessions
16Nov09 19Nov09 23Nov09 30Nov09 03Dec09 07Dec09 11Dec09 14Dec09

Figure 11.


Viviana 11/30/09
Kayla was Playing ih the Firist
In forest
Wen a Big Fox sileLe SLipt ih to
When big slyly slipped
the sin. Kayla Was So Scard
scene Scared
She Drop her Ba Ral.
dropped berries

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