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ABSTRACT

The central focus of this research was to test the effectiveness of HyperCard in spelling achievement and to determine if HyperCard had any significant impact on student learning. Four boys and four girls were randomly selected from a second grade classroom at Clark Elementary School in Charlottesville (Virginia) to be part of the experimental group. The research design followed four steps: (1) the control and experimental groups were given a pretest on short and long "e" words, since the HyperCard program worked specifically within these words; (2) both groups were given an introductory tutorial lesson on HyperCard; (3) the experimental group worked with a program designed for the project, while the control group did word study; and (4) both groups were given a posttest at the end of the session. Conclusions drawn from the study include the following: HyperCard does not appear to be detrimental to spelling achievement; the use of HyperCard as a spelling tool may be beneficial as students learn spelling and the use of computers; HyperCard seems to promote higher levels of movement in the word study sequence; and HyperCard seems to promote beneficial student practices, such as curiosity, attention, and collaboration. The appendixes include word lists, sample computer screen displays, the word study sequence, and within word study observations. (Contains 11 references.) (JLB)

IR

UNIVERSITY OF VIRGINIA

IS THERE TOO MUCH HYPE ABOUT HYPERCARD?

A THESIS SUBMITTED TO

PAULA PIZZAT-TINNIN

IN CANDIDACY FOR THE DEGREE OF

MASTERS OF TEACHING

CURRY SCHOOL OF EDUCATION

BY

LONNIE D. MYERS AND JON C. ANDERSON

CHARLOTTESVILLE, VIRGINIA

MAY 1994

Rationale

In our society, tremendous technological advances have been made in the past quarter century. These advances have occurred in all areas of life. One of these has been the growing production and use of computers. Computers are all around us, from businesses to homes. The computer has even found its way into the educational system.

Since computers have gradually found their way into the school, research has been, and still is, a necessity for several reasons. First, we need to determine the various and most effective ways in which to use computers to enhance student learning. Computers could be in every classroom, but if used haphazardly or inappropriately, the educational purpose becomes diminished or voided. Secondly, research is needed to determine the best method with which to train teachers on computers. In order to instruct their students, teachers need some knowledge about how a computer and its particular software works. If teachers do not understand both the philosophical reasoning for having computers and the practical knowledge of manipulating a computer and software, then they most likely will encounter increasing levels of frustration and difficulty presenting the material to students. Finally, research is needed to test new software applications which are current and those being developed in the future. Sound research within these three areas may help to insure that ineffective or inappropriate software will not be introduced in schools. Additionally, administrators and teachers will have the opportunity to stay abreast of

new software applications which could enhance student learning.

Therefore, the central focus of this research was to test the effectiveness of a recent software development known as HyperCard and to determine if HyperCard had any significant impact on student learning. From this project, it was hoped that, at least, a general understanding of the benefits that HyperCard may have for students could be obtained. However, this purpose was somewhat broad, given the time constraints of the project. So, secondly, to narrow the focus, we wanted to test the effectiveness of HyperCard in the area of spelling achievement.

The hypothesis being tested was that the use of HyperCard in spelling instruction would lead to a significant increase in achievement for students in the experimental group. For the purpose of this project, achievement was measured across two variables. Raw scores in spelling achievement between two groups of 9 students each would be compared. Movement in the word study sequence would also be compared.

The purpose of this study was to show that HyperCard could be used in the lower elementary grades, since this had not been tried before. Discussion regarding the benefits of HyperCard will be presented. It is hoped that the results would indicate the ways in which more research on HyperCard is necessary to determine its most effective use in schools.

First, we took a look at previous research, both of computers in general and HyperCard and spelling, specifically. Then, we designed a means to test our hypotheses from which we gathered data to analyze. Finally, the results of the analysis were matched against our hypotheses. From there, conclusions were drawn to discuss what had been done, what was found, and what might be done in the future.

Review of the Literature

In approaching the research on this subject, there were four main areas that needed to be covered. First, the question of whether or not computer literacy was necessary had to be addressed. Second, ways in which computers had been used previously was explored. Third, HyperCard was researched and finally, spelling instruction and computer-assisted instruction past were investigated. The first two areas were researched briefly since the focus of the project is not on the general use of computers or on the history of computer use. These were mainly background and foundational blocks. As far as HyperCard and computer use in spelling achievement, these were the more important of the research areas but, unfortunately, there was scant research, due mainly to the recent development of HyperCard.

The issue of computer literacy and technology in the classroom was investigated. Several objections or problems regarding the use of computers in teaching students were evident. Murdock & Sudbury (1985), in their guide to use of computers in schools and in homes, cited two objections that were often raised about computer use in schools. First, there was the idea that most students would not have use for the computer skills they learned after they left school. Along with this was the second notion that even if students did get jobs using computers, knowledge of programming or the internal workings of a computer would be unnecessary because their jobs would be "a matter of learning which buttons to push" (p. 107). Luehrmann (1972)

brought up the problem of wrong motivation for implementing computers. The concern among some was that computers would be used, not as a part of learning and because of their effectiveness, but because of their cost efficiency. This would mean making educational decisions based on economics, not what was best for the students .

Yet, all three of these researchers believed that these objections were outweighed by the potential benefits. Luehrmann (1972) cites several reasons why computers were worthwhile. First, the cost of instruction could be reduced without being detrimental to student learning. The computer can be used to meet the needs of a variety of learning styles. Finally, the author contends that computers made learning less labor-intensive and that would lead to more people becoming better educated.

Murdock & Sudbury (1985) cite four potential benefits of using a computer in schools. First, the computer promotes active learning since the students work with the computers instead of merely receiving information. Second, concurring with Luehrmann (1972), computers allow for individual learning opportunities accommodating the learning style of a particular student. Third, the computer offers immediate feedback and students were more likely to remember correct answers if they were given immediate feedback. Fourth, computers give students the opportunity to participate in simulated life experiences that they might not have access to through any other means.

Still more benefits were listed by Lonnie Myers in his article, "Teaching with New Technology" (Myers, 1994). Computers allow for multisensory delivery, where instead of the information coming either visually or auditory, it comes from both. With further advances in technology, other senses may soon be involved. In this way, students who learned more effectively through different means could have the information presented in a manner that was appropriate for them (Barbe & Swassing, 1979; Carbo, 1980; Dunn & Dunn, 1978).

Myers advocated five other benefits of technology, including computers, in the classroom. He argues that students would experience opportunities for increased self-expression and active learning. There would also be an increase in cooperative learning, communication skills, and motivation. Finally, he contended that technology could be used to aid students in understanding different cultures. Although speaking generally about technology, the benefits and disadvantages that Myers discusses could be applied to to most computer systems and to software, such as HyperCard.

There are two main instructional programs of computers that have been used in the past, although this does not imply that many others did not exist. One of these is computer-based training or CBT. Shlechter (1991), describes four potential benefits of CBT. These generalizations are based on this author's research, but may not be true for every school or school system.

Other research suggests additional benefits for using computers. For example, computers allow for multisensory delivery. Instead of the information coming either visually or auditory, it comes from both. With further advances in technology, other senses may soon be involved. In this way, students who learned more effectively through different means could have the information presented in a manner that was appropriate for them (Carbo, 1980;).

Research advocates five other benefits of technology, including computers, in the classroom. Students are able to experience opportunities for increased self-expression and active learning. There are also increasing opportunities for developing cooperative learning, communication skills, and motivation (Schlechter, 1990). Finally, technology could be used to aid students in understanding different cultures (Salomon, 1991). Although speaking generally about technology, the benefits and disadvantages discussed could be applied to most computer systems and to software, such as HyperCard.

There are two main instructional programs of computers that have been used in the past, although this does not imply that many others did not exist. One of these is computer-based training or CBT. Shlechter (1991), describes four potential benefits of CBT. These generalizations are based on this author's research, but may not be true for every school or school system.

First, he addresses the idea that CBT would stabilize educational costs. This would happen because of the cost effective nature of computers, resulting in less of a need to expand school staffs. Second, computers would bring about increased student achievement. Third, computers may facilitate methods accommodating individual differences and needs, which had also been mentioned previously. Finally, he contends that computers, and CBT specifically, would increase student motivation.

Shlecter addresses four disadvantages of CBT. One, he said, is inadequate funding. Even though computer costs were dropping, there were still huge costs involved, including maintenance of system, teacher training, and power for the terminals. Another problem was inadequate software. A computer was only as good as the software it used, so if the software was bad, then the computer use and effectiveness was minimal. Other obstacles Shlecter included were inadequate planning and preparation and unrealistic expectations.

The other type of computer program which had been used extensively is the computer-assisted instruction or CAI. This type of program includes many of the drill and repetition programs, along with tutorials and simulations. In his book on CAI, Price (1991) listed six advantages to CAI. One was that the computer was self-pacing. Students could go through the program at a pace which was appropriate for them. Another advantage was computer flexibility. CAI could test students periodically and then take the results of those

tests and move students to the parts of the program where they needed the most work or assistance. Other advantages suggested by Price included: promotion of active learning, the variety of activities available through a computer, ability of the computer to keep records, and the availability of the computer since they were always present and ready to go.

Price, like Shlecter, examines the limitations of CAI. Price's research suggests that lack of human contact could inhibit social growth and the ability to interact with people. Another problem was the difficulty in finding software which correlates to the curriculum already in place. Still other limits include restricted text displays, the cost, and the lack of software. Hoping to continue the benefits of computer use while improving on the limitations, HyperCard was created.

HyperCard was produced by Bill Atkinson of Apple Computer in 1987. It is a piece of information processing software, a hypermedia program, which provides opportunities for educators and students to explore, organize, and access information in associative, non-linear ways. The information is stored on stacks of cards which are arranged hierarchically by association and context. These stacks of information typically combine graphics and symbolic text which the user can arrange and rearrange to produce a variety of new programs.

The metaphor used for HyperCard is a stack of index cards that could be linked together with buttons. For example, the beginning card

of an astronomy stack might contain a graphic of the solar system. There could be an invisible button for the sun and each planet that allowed the students to investigate specific information relevant to each planet or the sun. When a student clicked on the planet Mercury or any other planet, another screen card could appear with information about the planet, including number of moons revolving around the planet, surface temperature of the planet, distance from the sun, and a graphic image of the planet. Additionally, other buttons on this card might be used to play sound, animate graphics, or operate a videodisc player with supplementary information about that particular planet.

HyperCard is an excellent tool for education which does not require teachers and students to have a lot of expertise in programming. Teachers can create a variety of computer slide show presentations and educational templates. HyperCard allows the teacher to design computer based instruction. Furthermore, HyperCard is a wonderful way for students to be creative and produce their own interactive presentations and reports. Students creating their own work with HyperCard may help convert the classroom from teacher-centered to student-centered, thus allowing the teacher to more actively assume the role of facilitator.

Using HyperCard helps teachers develop project-based learning activities. HyperCard programs facilitate the students' grasp of difficult concepts while furthering their thinking skills. Barron & Orwig (1993) contended, "HyperCard applications allow users to build their own

associations between bits of information, based on their interests." (p. 170) Teachers were able to meet the needs of individual students more effectively while making learning fun and enjoyable. "Well-designed HyperCard programs can both motivate and assist students to explore topics." (p. 123) HyperCard is easy to learn. Gray (1990) suggested "By means of a powerful yet simple-to-use, programming language called Hypertalk, teachers and students can script the program. Hypertalk use plain English expressions." (p. 123) Thus, HyperCard has maintained many of the benefits of earlier computer uses but works on some of the limitations by allowing more student involvement and less teacher-centeredness. The ease of learning and using HyperCard can also cut down on the cost of training teachers. It allows for flexibility within and correlation to the curriculum.

Because the task of testing the overall effectiveness of HyperCard was beyond the ability of this project, the focus was narrowed to spelling achievement. In terms of research, there was almost none dealing with the effectiveness of HyperCard in this area and very few regarding the use of computers in spelling achievements. The results of the few which were found follow.

Houghton (1990) discussed Hall &Bialozor's research which examined the effects of computer-assisted drill and other computer practices in aided spelling instruction. The basic setup of the study was in two parts. First, they started the school year giving spelling instruction in the traditional way: pretests were given at the beginning

of each week, followed by practice during the week using textbooks, games, and oral recitation. At the end of the week, a post test was given and the scores recorded. Students were then given practice on the computer twice a week. The results showed that higher scores were achieved once the computer-assisted instruction was added to the traditional instruction.

Bollman (1991) cites McClendon's study which examined low achieving first graders. For half of the year, they were taught using traditional means. For the other half, they were taught using a mixture of computer and traditional instruction. They were given this instruction four times a week. The results were astounding. After implementing the use of a computer, 16 of 18 students scored 100% on the rest of their spelling tests.

Although this paper examines the effect of HyperCard on spelling scores, other research deserves mention. When using computers, there was often an increase in on-task behavior, along with an increase in self-confidence and self-esteem. Attitudes toward spelling were also greatly enhanced in a positive manner. Often, the computer increased motivation and provided a challenge for all students (Hall & Bialozor, 1989; McClendon, 1989; Hall, 1986; Houghton, 1990).

Design of the Study

The sample population for this study was selected from Elizabeth Crabtree's second grade class at Clark Elementary School in Charlottesville, Virginia. Four boys and four girls were randomly selected to be part of the experimental group. Within this group, there was a wide range of ability, from above grade level achievement to non-readers. Most of the students at Clark came from a lower socioeconomic background. They have all had some exposure to computers but none were familiar with the program HyperCard.

The actual design of the program followed four stages. The first step was to give both the control group and the experimental group a pretest (Appendix A) on short and long e words, since our HyperCard program worked specifically within those spelling words. Then, both groups were given an introductory, 20 minute, tutorial lesson on HyperCard. Following that, the experimental group worked with the program designed for this project (Appendix B), while the control group did word study, as they had been doing previously. Each group completed six thirty minute sessions. At the end of these sessions, both groups were given a post-test (Appendix A).

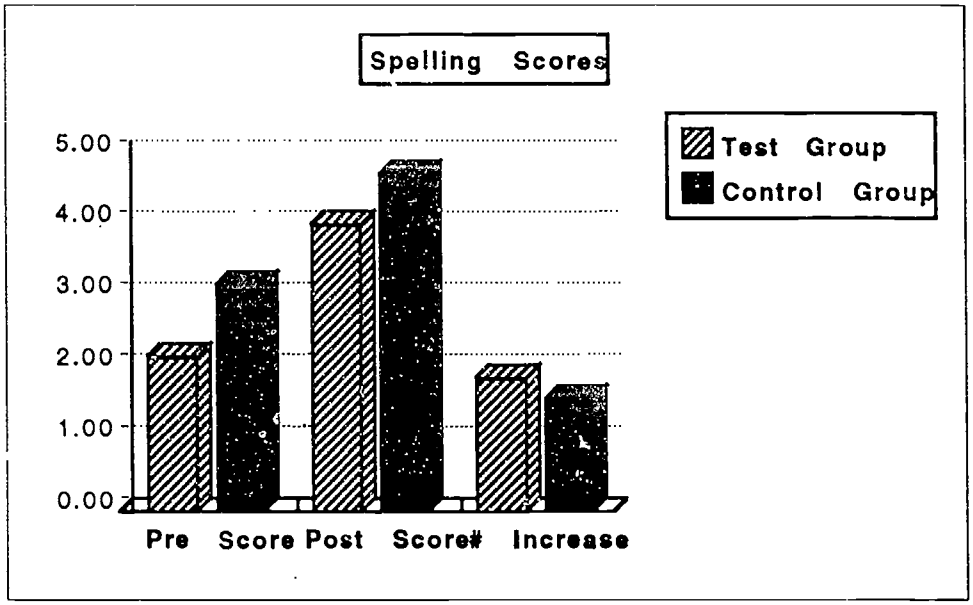
The analysis for this project came from three sources. One would be the comparison between the pretest and the post-test of both groups for achievement in raw scores. The second source of data would be developed from a comparison of the tests based on the word study sequence (Appendix C). There were videotaped sessions which

would be view in order to determine other variables that might have influenced the test. From these, the conclusions of this project were drawn.

The actual results presented in this paper were based on the three criteria mentioned above. First, there would be a comparison of the raw scores, based on several different perspectives (ie. average scores, average increase in number right). The results of checking individual students for movement in the word study sequence would be discussed. The last part of the analysis was based on videotaped sessions, which revealed several factors that may have limited the experiment and also several benefits of using the program which could not be determined from a comparison of raw scores or movement in the word study sequence.

Analysis

To analyze the results, several tests were conducted to compare the effects of HyperCard programming on spelling achievement and improvement. The first test was a comparison of the average pretest and post-test scores. For the control group, the pretest average was around 26.9% while their post-test scores averaged 47.1%. The experimental group had lower averages (pretest = 21.4%, post-test = 40%) but the percentage increase for both groups was relatively similar. The control group scores increased 20.2 points while the test group saw an increase of 18.6 points.



After looking at the scores, the average increase in the number of correct answers between the pretest and the post-test was tested. As with the average scores, the results were fairly close. On average, the

control group got 1.4 more answers correct on the post-test. The test group, on the other hand, got 1.9 more correct answers.

Because we were testing two different vowel sounds, we also broke the average increase in number correct into the two groups. This was to see if either vowel sound had benefited more from the use of HyperCard. For short e, the control group had an increase of .9 correct answers while the test group had, on average, 1 more correct answer on the post-test. For long e, the control group got .7 more answers correct and the test group got .9 more answers correct. Overall, the increases in both groups were similar.

Further data analysis of spelling errors revealed answers that were incorrect on both tests. Instead of focusing on the scores, the focus was changed to movement within the word study sequence, which could be described as a sequence of levels that students moved through in their spelling progress. What was found was that the experimental group had more positive movement in this sequence than the control group. While both answers were incorrect, improvement was seen more often in the experimental group. So while scores were similar, there seemed to be more actual spelling improvement in the test group. For example, in the case of student A, there was no increase in the raw score between the pretest and the post-test. However, if the answers were compared using the word study sequence, it was seen that the student has moved from early letter name recognition to late letter name recognition. These improvements along the word study

sequence were more pronounced in the experimental group than the control group (Appendix D).

Limitations

Before going on to discuss the implications of the study, it is important to look at some of the limitations that may have impacted our study. The first of these was the issue of time. In no way should this study be seen as conclusive evidence for the effectiveness of HyperCard. Six sessions was not enough time to determine or support any concrete conclusions. Also, the time was not enough for the students in the experimental group to explore and familiarize themselves with the material in the computer program. Attempts were made to give them the same amount of time with the material as the control group but several factors (field trips, problems in the school) made that difficult.

One of these problems was proficiency with the computer. Because the students were inexperienced with HyperCard, spelling learning was disrupted for two reasons. One was the fact that part of the learning time had to be given to teaching and learning how to manipulate the computer. The other reason for disruption was the enthusiasm of the students. They were so curious about what the program could do that keeping them on task was difficult until they had the chance to explore all of the various options and tools available through HyperCard. This limitation may decrease as students are given more time to interact with the computer.

The third limitation involved assessment issues and decisions. The basic question was whether or not the assessment used was an

accurate measure for the experimental group. If they learned on the computer, should the test be given to them in paper and pencil fashion? Or should they have been given some type of assessment on the computer? Further research will hopefully provide an answer to these questions.

Implications

There were several conclusions resulting from the research. More research is necessary. This experiment revealed several variables that could hinder HyperCard use. Therefore, these need to be studied to learn how to decrease or eliminate their impact. Also, the sample groups and the subject tested were specific; further research is needed to test HyperCard's effectiveness with other populations and in other subject areas. Our study is, hopefully, but the beginning of research into ways in which HyperCard can be most effectively used in the classroom.

On the basis of scores alone, HyperCard, at least, does not appear to be detrimental to spelling achievement. In light of this point, HyperCard could be more beneficial than the traditional classroom methods because spelling is mastered and, unlike the control group, the experimental group is further along in computer proficiency. For example, a student in the control group and a student in the experimental group may have similar spelling scores. However, the experimental group student will be more prepared to handle a computer than the control student. (Note: this point assumes similar levels of knowledge of and exposure to computers at the beginning of the test.

In terms of achievement based on movement in the word study sequence, HyperCard seems to promote higher levels of movement than the method used by the control group. Students in the

experimental group generally had greater and more defined movements than the control group. HyperCard also seems to promote several beneficial student practices, as seen on the videotape. Students appear to have a greater curiosity to learn and to be on task more often. There also seems to be an increase in cooperative learning as students who mastered the use of the computer were able to help their fellow students who may have been struggling.

Overall, HyperCard could be used in all areas of instruction to teach students. While we are not advocating total teaching by the computer, we believe that HyperCard can be used to help students learn, at least as effectively as traditional methods. On top of academic learning, there is also the gain in computer proficiency which will be beneficial in the years to come. HyperCard also is flexible enough to reach students who learn in different ways (ie. visual, auditory, tactile, etc.). In terms of spelling, HyperCard is maintains achievement and may even increase actual improvement. More research is necessary but the future looks bright for HyperCard and the teachers and students who will use it.

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APPENDIX A

PRE TEST AND POST TEST WORDS

SHORT "E" WORDS

BLED

DRESS

SHELL

WENT

WHEN

LONG "E" WORDS

TREE

SLEEP

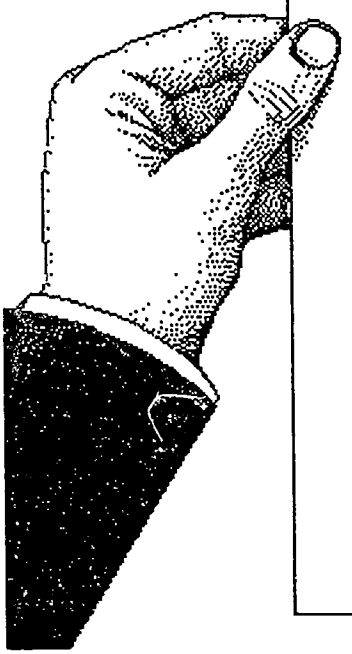
FEET

SNEEZE

SPEED

APPENDIX B

Click Here!



"HyperCard Word Study"

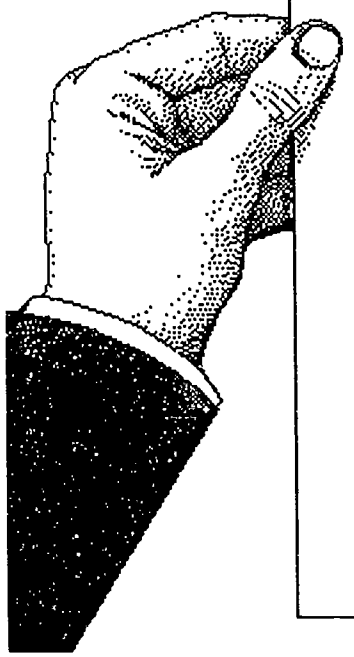
by

Mr. Myers and Mr. Anderson

March 94

Dedicated to the Second Grade Students of Mrs. Crabtree's Class.

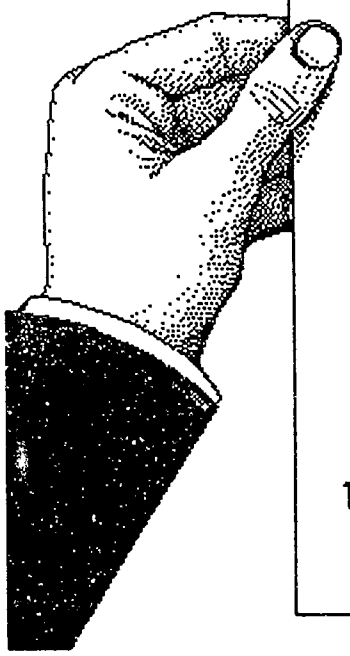
home



Directions will be provided for each word study activity.

Click Me!

home



1. Short ĕ activity.
2. Long ē activity.

3. Copy and paste short ĕ pictures.
4. Copy and paste long ē pictures.

5. Short ĕ spelling practice.
6. Long ē spelling practice.

7. Creating short ĕ words.
8. Creating long ē words.

9. Choosing short ĕ words.
10. Choosing long ē words.

home

Click your mouse on each word and picture.

short e sound

hen

index

Click your mouse on each word and picture.

short ĕ sound

sled

Click your mouse on each word and picture.

short ĕ sound

jet

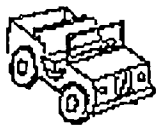
Click your mouse on each word and picture.

short $\breve{e}$ sound

bell

Click your mouse on each picture and word

long $\bar{e}$ sound



jeep

Click your mouse on each picture and word

long $\bar{e}$ sound

sheep

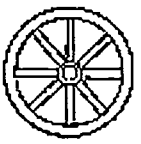
Click your mouse on each picture and word

long $\bar{e}$ sound

bee

Click your mouse on each picture and word

long $\bar{e}$ sound



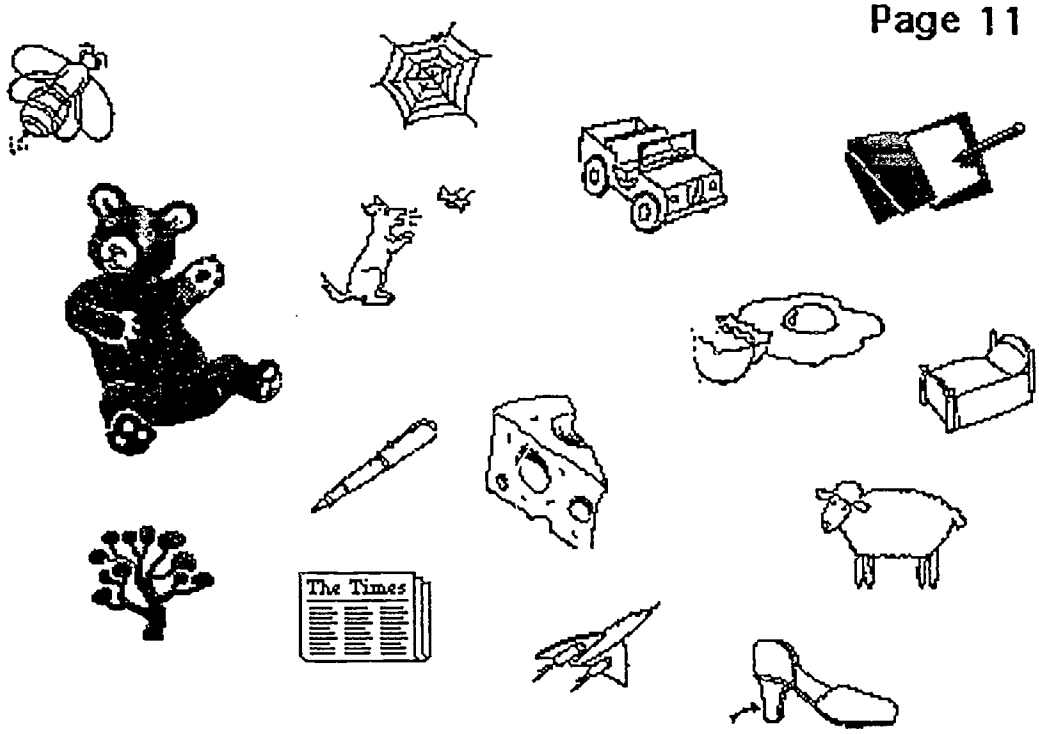
wheel

Copy and paste short $\breve{e}$ pictures.

Paste 10 pictures with a short $\breve{e}$ sound from pages 11-13 to this card.

page 11 page 12 page 13

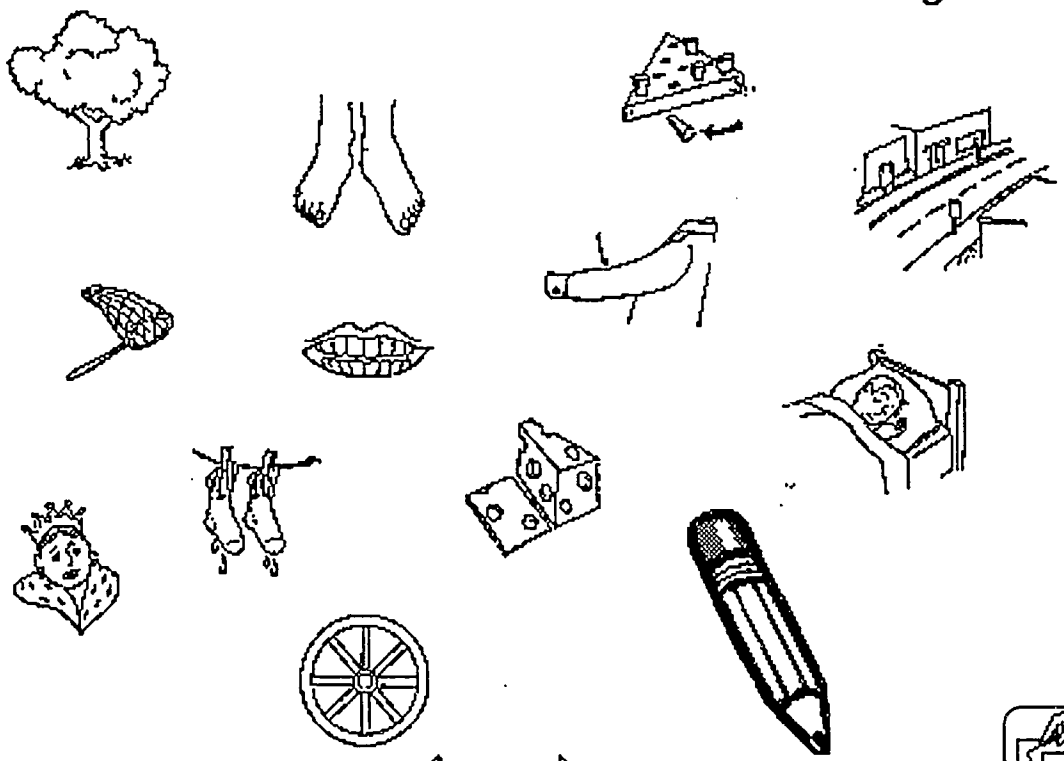
Page 11



short ĕ card ⇦ ⇨ long ē card

index

Page 12



short ĕ card ⇦ ⇨ long ē card

index

short ĕ card ⇦ ⇨ long ē card

index

Copy and paste long ē pictures.

Paste 10 pictures with a long ē sound from pages 11-13 to this card.

page 11 page 12 page 13 ⇦ ⇨

index

Short ĕ spelling practice.

Go to Tools and select the writing tool A.

Fill in the spaces to make words. You may need to look at your keyboard for a list of letters of the alphabet.

1. ☐ed 2. [t]ell 3. ☐en
4. ☐end 5. [b]est 6. ☐et
7. ☐elt 8. ☐ent 9. ☐ept 10. ☐encn
11. we☐☐ 12. the☐☐ 13. pe☐☐
14 ten☐☐ 15. ve☐☐ 16. le☐☐ 17. se☐☐
18. dre☐☐ 19. ☐est 20. ☐☐ead

Long ē spelling practice.

Go to Tools and select the writing tool A.

Fill in the spaces to make words. You may need to look at your keyboard for a list of letters of the alphabet.

1. ☐e 2. ☐eet 3. ☐eal
4. ☐eat 5. ☐each 6. ☐ea
7. ☐eep 8. ☐eam 9. ☐eel 10. ☐ee
11. fe☐☐ 12. re☐☐ 13. ☐☐eek
14 ☐☐ief 15. be☐☐ 16. le☐☐ 17. tr☐☐
18. gre☐☐ 19. ☐eed 20. ☐☐ee

Creating short ĕ words.

Go to Tools and select the writing tool A.

Type at least 15 words on this card with the short ĕ sound.

index

Creating long ē words.

Go to Tools and select the writing tool A.

Type at least 15 words on this card with the long ē sound.

index

Choosing short ĕ words.

fed few key men pie cell elm dew feet tea end elm

egg lean meat left nest he flew kept jet rent eve be

wet web vest we lend peach free peg pipe cat pen

pea said the they dog freeze desk spell bless field den

shred rest kept test screw them get hem vet beep eat

seal tend bench pest tell belt next new cell elf help she

note step fled fret gem cent dress chief dream leg head

less tent bent lie wet week chest melt shelf net yet

Choosing long ē words.

me eat ate keep sea fleet green here die color

meal read meat meet where plea seat weed rose leap

pat city sleep tea teeth help grip east peach there me

seam same team game three mere tend key feet eel

boat cream beak beat clean been pier neat plea steak

leak weave steal sweet beef stew pest end reel see he

team cake seal moon wheel speak great deep pipe treat

cheese queen beast chief dead else deed tree sled bee

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APPENDIX C

Phonics

Word in Print

	PRE-LITERATE				LETTER NAME		WITH-IN WORD PATTERN
	Pre-Phonetic		Phonetic		Early	Late	short vowels correct long vowels marked
	letter like forms	random letters	initial sound	initial + final	random vowels	logical vowels	
net	ltfl/	SMT	N	NT	NOT	NAT	NET
brave	0/196	31XO	B	BF	BAV	BRAV	BRAEV
chin		8C4X	G	HN	GIN	CHEN	CHIN
pig		4WT	9	PK	PEG	PEG	PIG
sister	€]4}		C	CR	SETR	SESTR	SISTR
job			GMRST	GB	JIB	JIB	JOBE
bump			BSLRM	BP	BAP	BOP	BUMP
slide			SMTL	SD	SID	SLID	SLIDE

Random letters

WORD STUDY: LEVEL TRANSITION

Instructional Level I

- Initial consonants, blends & diagraphs: chick, drove, prize, shade
- Preconsonantal nasals: jump, pink
- Short vowels: sled, dig
- "Silent e": prize, while, drove
- Final ck, k, x: chick, fox, take

Instructional Level II

- Variety of long vowel patterns: raised, coat, drive, break, wheels
- Inflectional doubling: running, funny, planned
- ck, k, s: stick, smoke
- d, ing, es, er

Instructional Level III

- More complex consonant & vowel patterns: coach, ghost, huge, scratch
- Ambiguous vowel patterns:
  - (1) vowel digraphs: taught, straw
  - (2) vowel diphthongs: voice, outside
  - (3) homophones: heard, herd
  - (4) r-controlled vowels: car, care, bore, born
- Vowel patterns in accented syllables: teacher, between, neighbor
- Juncture issues:
  - (1) doubling: grinned
  - (2) e-drop: liking, glazed
  - (3) closed syllables: button, lesson
- Unaccented syllables: button, lesson, neighbor, teacher

Instructional Level IV

- More variety of ambiguous vowel patterns:
  - (1) schwa + r: curve, survive
  - (2) complex consonant & vowel patterns: damage
- More juncture issues revisiting in the context of accented and unaccented syllables: parading, escaping
- More variety of unaccented final syllables: ladder, beggar, harbor / organ, siren / metal, bottle, model, devil

Instructional Levels V & VI

- Variety of vowel patterns in accented syllables: behave, repaired, proposal, masterpiece, television
- Unaccented final syllables revisited in the context of common Latin affixes:
  - pleasure, gesture
  - performance, difference
  - reduction, complexion, impression, electrician
  - proposal, preservation, discovery, despair
- Juncture issues revisited in the context of prefixes and roots:
  - account
  - immortal
  - attending
  - according

WORD STUDY SEQUENCE

(entry point determined by diagnosis of spelling errors)

Level I: Letter-Name Spellers

Using: pictures and word families (*as word bank grows*)

Focus on: beginning consonant sounds, word families and beginning consonant digraphs and blends

teach digraphs

bat
brat
chat
cat

Levels I and II: Late Letter-Name to Within-Word Pattern Spellers

Using: pictures

Focus on: short vs. long vowel sound comparisons

and

Using: known words

Focus on: short vowel family & pattern comparisons

bed best (*long vowel sounds aside*)
red rest

Levels I, II, and III: Within-Word Pattern Spellers

Using: known words

Focus on: long vowel family & pattern comparisons

bake train
lake drain (*short vowel sounds aside*)

short & long vowel comparisons
sound X pattern simultaneously

bed	best	meet	meat
men	mess	teen	weak
bet	belt	sleep	lean

(*# of patterns increases as a function of exemplars encountered and read in meaningful text. GO HUNTING!*)

Levels II, III, and IV: Within-Word Pattern & Early Syllable Juncture Spellers

Using: known words

Focus on: vowel patterns revisited through consonant doubling and other simple inflections

planned	planed
matted	mated
hopping	hoping

APPENDIX D

Within Word Study Observations

Student A

Pretest: 0

Post test: 0

Movement: Early letter name to late letter name

Comments: pretest shows use of random vowels and some absence of initial and final letter sound; post test indicates logical vowel sounds being used and lots of initial and final sounds present.

Student B

Pretest: 5

Post test: 7

Movement: within word pattern to within word pattern/early syllable juncture

Comments: high % of both long and short vowel sounds; focusing on patterns from known words.

Student C

Pretest: 3

Post test: 6

Movement: late letter name/within word pattern to within word pattern/early syllable juncture

Comments: high % of short vowels correct; using patterns for long vowels.

Student D

Pretest: 3

Post test: 7

Movement: letter name to within word pattern

Comments: clear movement for pre-level to post-level; understands both short and long vowel sounds; uses patterns.

Student E

Pretest: 2

Post test: 2

Movement: early letter name to late letter name

Comments: improvement in type of spelling errors; initially, random vowels and vowels missing; now, logical vowels and same pattern.

Student F

Pretest: 0

Post test: 1

Movement: early letter name to late letter name

Comments: same as Student D

Student G

Pretest: 2

Post test: 5

Movement: late letter name to within word pattern/early syllable juncture

Comments: clear movement from logical vowels to short and long vowels correct; not as strong with long vowels but uses vowel patterns.

Student H

No pre or post test

Student I

Dropped from study due to absences

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