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ABSTRACT

In the ninth season of the television program, "Sesame Street," new pre-reading and pre-science segments were introduced to the show. This report evaluates these segments with regard to young children's visual attention and comprehension. The intent of the evaluation was to assess the effectiveness not only of individual segments but also of the production formats designed to meet pre-reading and pre-science curriculum goals. Twenty-one 4- and 5-year-old children of low-income, ethnically mixed families viewed 30 minutes of "Sesame Street" stimulus material. While each child watched the show, the child's eye movement path across the visual presentation was recorded. The children were questioned about the content of the segments before and after viewing the program. The pre-reading formats which were most effective in attention results were ones that used the segment characters in ways to attract attention to the print and to the process of reading from left to right. The pre-reading formats that were most effective in the comprehension results were ones that clearly linked the sounds with the symbols and the symbols with meaning. The pre-science segments presented appropriate scientific content, but their format designs were not effective in teaching the material. The information was not structured enough in the presentation for the children to comprehend the message. Descriptions of "Sesame Street" pre-reading and pre-science segments and researchers' reactions prior to data collection are provided in Appendix A. A copy of the letter sent to subjects' parents, and pretest and posttest data are included in Appendices B and C respectively. (Author/MP)

PRE-READING AND PRE-SCIENCE ON SESAME STREET

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September, 1978

We are grateful to the Children's Television Workshop and the Spencer Foundation for support of this research.

Pre-Reading and Pre-Science on Sesame Street

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This report evaluates pre-reading and pre-science Sesame Street segments which were introduced during the ninth season. Twenty-one four and five year old children of low-income ethnically mixed families viewed thirty minutes of Sesame Street stimulus material. While each child watched the show, the child's eye movement path across the visual presentation was recorded. The children were questioned about the content of the segments before and after viewing the program.

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INTRODUCTION

During Sesame Street's ninth season, new pre-reading and pre-science segments were introduced. This report evaluates these segments with regard to four and five year olds' visual attention and comprehension. The intent of this report is to assess the effectiveness not only of individual segments but also of the production formats designed to meet pre-reading and pre-science curriculum goals.

The formative research methodology employed involves recording the children's eye movement responses to the television presentation.[1] This method provides direct feedback on whether particular instructional elements are attended to within the display. Viewing pattern data coupled with pre- and posttest comprehension interviews reveal to what extent the children understood the instructional material.

METHOD

Subjects

Ethnically mixed, male and female children participated -- 12 children with a mean age of 4 years, 4 months and 9 children with a mean age of 5 years, 3 months. The children were enrolled in the South Boston Neighborhood Head Start program and were recruited through letters to the parents (see Appendix B for parent permission letter).

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[1] The acquisition of detailed visual information requires that the eyes move about so that successive images of the visual scene fall upon the fovea, the small central region of the retina with the greatest visual acuity. Fast movements of the eyes from one visual element to another are called saccades, while times during which the eyes are fixed on a visual image are called fixations. The pattern of saccades and fixations on a visual scene is determined by the visual stimulus as well as by the perceptual and cognitive processes of the viewer.

Stimulus

The television stimulus consisted of Sesame Street pre-reading and pre-science segments. Appendix A describes each segment and gives the researcher's evaluations prior to data collection. The stimulus tape was divided into two shows in order to limit continuous viewing time in the eye movement recording situation. Before each show, the child watched a short specially constructed animated videotape, during which time the recording equipment was calibrated. Thus, each complete viewing was approximately 18 minutes long with a refreshment break between.

Apparatus

The Sesame Street stimulus was shown via video cassette on a 17-inch color television monitor placed approximately three feet away from the subject's eyes and slightly above eye level. A Gulf & Western Eye-View Monitor recorded the child's eye movements by employing a camera which stands about one foot away from the child's left eye and out of his direct field of view.

In order to accurately record eye movements, the child's eye must remain within the viewing range of the television camera. Seated in a comfortable adjustable chair, the child is aided in sitting still by a padded head-rest which restricts gross head movements but allows for verbalizations and small head movements.

The recording system produces a data videotape showing the Sesame Street stimulus with the subject's eye movement path superimposed on the image as a moving cross-hairs, the intersection of which indicates the child's point-of-regard.

Procedure

Pretest. The pretest was administered to our sample at the Head Start Center by one white female experimenter. The pretest was designed to assess the children's pre-reading knowledge in the goal areas addressed by the Sesame Street stimulus segments. The following tasks were used; the items in parentheses refer to segments on Tape A, the first half of the stimulus tape, and on Tape B, the second half:

I. Recognition of Lower Case Letters

(f-flower: A7; Alphabet Machine: B4; b-baseball: B6; Consonant Sound G: B7)

White index cards with one black printed lower case letter on each were presented in random order; E asks child to identify each letter.

II. Auditory Discrimination of Initial Sounds

(Consonant Sound J: A3; f-flower: A7; Consonant Sound C: A8; b-baseball: B6; Consonant Sound G: B7)

E shows child an 8½ x 11 sheet of colored paper which has at the top a drawn picture and an associated printed word and at the bottom three more pictures displayed horizontally without words. E says: "Here is a word that begins with the sound b." E gives only the sound. E has child identify the picture and juxtaposed word ball. "Say b. Now look at the other pictures. Let's say their names as you point to them. . . Which one begins with the sound b?" (Choice is one out of the bottom three drawings.) E follows the same procedure for the other letters: J, f, c, G.

III. Auditory Discrimination of Separate Sounds in Words - Blending

(Susan looking for note from Gordon: A2; Sound It Out: A4; Signmaker: A6, A9, B5, B9; Con Man: B2; Blend HUG: B3; Dummy Blending: B8)

E says: "I am going to say some sounds. Let's see if you can tell me what words these sounds make." E says the sounds with a slight pause at the point of hyphenation.

Sample: s-un c-an Test Items: m-ud c-at m-a-n m-i-l-k

IV. Use of Context and Initial Consonant

E shows child picture of Ernie and says: "Ernie is going to take a bath." E then shows child an index card with the printed words: "He wants his rubber d_____." E reads the phrase leaving the last word unfinished. Child asked what Ernie wants.

Viewing. Each child was accompanied to our viewing room at Harvard by a parent who remained in the room while the child watched television. The parent was not involved in any of the procedures but received information concerning our purposes and procedures prior to the child's pretesting session. A white female experimenter was primarily responsible for all testing and communication with the child. A second white female experimenter operated the recording equipment. Before viewing any television, every effort was made to help the child feel comfortable with both the experimenters and the experimental situation.

Posttest. After viewing Tape A, the child was questioned about the segments while taking a refreshment break. Tape B was then viewed and post-viewing questions followed. The purpose of the posttest procedures was to determine the extent to which the child comprehended the instructional message of the segments. The following tasks comprised the posttest:

After Tape A

I. Comprehension of "How a Record is Made" (A10)
Immediately following the end of Segment A10, E says: "What was that about? What were the man and little boy doing? What were the other men doing?" Probe dependent upon child's response.

II. Comprehension of "Sound of Letters" (A5)

While replaying Segment A5, E says: "What is this about? What is he holding? What is he doing?" Probe.

III. Use of Context and Initial Consonant (A2)

E holds up a white paper with the words I LOVE YOU printed on it in the same manner as the note Susan used. E says: "On Mother's Day, my little boy sent me this note. Can you read it to me?" If not, E helps the child sound out the phrase.

IV. Sight Phrases (A9)

E shows a white index card with the phrase ONE WAY printed in black letters and asks child to read the phrase. E then shows an 8½ x 11 drawing of the ONE WAY sign, giving child a visual clue. E asks child to read the phrase.

After Tape B

I. Lost Binoculars (B11)

Immediately following the end of segment B11, E asks: "What was that story about?" Probe questions based on child's response, in order to assess child's interpretation of the segment.

II. How Things Work: Faucet (B10)

E shows an 8½ x 11 drawing of the segment's faucet. E asks: "Can you tell me what this is?" How would I get a drink from this faucet? What happens when I turn the knob up here? " Probe questions.

III. Sight Phrases (B9)

E shows a drawing of a paint brush, paint bucket, half-painted wall and WET PAINT sign. E asks: "Can you read this sign?"

IV. Recognition of Lower Case Letters (A7, B4, B6)

Using the pretest index cards with individual letters, E shows cards of "j, f, c, b, g" in random order and asks for identification.

V. Auditory Discrimination of Initial Sounds (A3, A7, A8, B6, B7)

E uses the same procedure as in Pretest II except that the correct choice object is drawn from the segments viewed in Tapes A and B (i.e., bat, candle, flower, goose, jaguar)

VI. Comprehension of Signmaker's Role (A6, A9, B5, B9)

E shows a cardboard mock-up of signmaker character. "What was this fellow doing in the show?" E probes to determine whether child understands that letters go together in a certain order to make meaningful words.

VII. Auditory Dis imination of Separate Sounds in Words - Blending (A2, A4, A6, A9, B2, B3, B5, B8, B9)

E uses same procedure as in Pretest III except E writes letters on white paper as she pronounces them (m-op, b-at, f-u-n, H-E-L-P; letters written by E without hyphenation). Child sees words taking form.

Analysis

Scoring of the eye movement data videotapes was done manually by the three experimenters at slow-motion playback speeds determining where the subject fixated and how often. For example, for the Signmaker segments (HELP, ONE WAY, MILK, WET PAINT), it was determined how often each child

fixated on each letter and each extra visual element in the scene (i.e., Signmaker, other cartoon characters, objects in the scene). Also, it was determined how often each child showed sequencing eye movements from left to right across the letters of the phrases. In the discussion which follows, the eye movement data may be collapsed for purposes of interpretation; for example, we may talk about the total number of fixations on the complete phrase rather than on individual letters.

Although manual analysis is not 100% accurate, it is currently less expensive than computer analysis and allowsthe researchers to expose themselves to the richness of the data, which is essential for effective formative research. Scoring reliability was determined by having two experimenters score one subject's data independently and then comparing the resulting percentages of fixations. Agreement on segment scoring averaged 86%; this is typical of manual scoring reliability.

RESULTS AND DISCUSSION

PRE-READING

The Sesame Street stimulus segments considered in this section deal with general pre-reading principles and specific pre-reading skills including verbal blending, knowledge of sight phrases, and comprehension of letter labels and letter sounds. Appendix A describes the content and format of each of the Sesame Street segments considered and offers the researchers' reactions to them prior to collecting data from preschool children. Appendix C presents the pre- and posttest data according to age group. The few age group differences that were found are discussed under the individual segments below.

Verbal Blending

Format: Muppets

The segments discussed here use Muppets in a variety of formats to model verbal blending behavior. In Blend-hug and The Con Man, the Muppet crouches behind each letter as s/he pronounces the corresponding sound. The Muppet moves bodily from left to right in time with the verbal blending. In Sound It Out, the left to right sequencing is reinforced by hand and head movements of the Muppets directly underneath the letters. In Dummy Blending, the letter parts move together from opposite sides of the screen as Oscar and Crummy alternate in saying their part of the word. In Susan Looking for a Note from Gordon, Susan holds together two pieces of a torn note to complete the word "LOVE" in "I LOVE YOU"; Oscar then sounds out "LOVE" moving his head from left to right.

The pretest task related to the verbal blending goal involved presenting orally a one-syllable word with a separation between the initial sustaining consonant sound and the rest of the word; the child was asked to

say what word the sounds make. The posttest administration was similar with the addition of presenting the word visually. Four words from the Muppet segments were used in the pretest and four different segment words comprised the posttest. On the pretest, 55% of the children could identify 3 or 4 of the words; on the posttest, only 30% performed similarly.

Several factors may have contributed to the inadequacy of this test. The posttest words are structurally similar to the pretest words but perhaps not semantically similar; moreover, the consonants of the posttest words may be more difficult to discriminate. More likely, the different environments in which the tests were given may have affected the outcomes. The pretest task was administered at the children's Head Start center at the end of a 10-minute session, while the posttest task was given in our viewing room after 40 minutes of television and other posttest tasks.

To make the blending task data more useful, we combined the pre- and posttest scores to produce for each child an <u>overall</u> indicator of verbal blending ability. This procedure yielded an average performance of identifying 4 out of the 8 words. The good blenders, those who recognized 6 or more words, included both 4 and 5 year olds as did the poor blenders, those who recognized 3 or less words. We distinguish between these groups here because in the segment analysis below, we will observe that the good blenders attended to the visual presentations differently from the poor blenders.

The five verbal blending segments were analyzed with the following questions in mind:

* Does the format encourage the viewer to attend to the print?
* Does the format direct the viewer to sequence visually from left to right over the print?

* Does the format link sound and symbol (i.e., speech sounds and letters)?
* Does the format link symbol and meaning (i.e., words with objects or actions)?

Blend - hug

The answers to the four questions above are positive for this segment. The Muppet's movements behind the letters draws attention to the letters themselves; her direction from left to right encourages the viewer to scan along the word in a left to right sequence. The voicing of each letter - slowly, distinctly, and simultaneously with her disappearance behind it - directly links the symbol with the sound. Further, the symbol-meaning connection is supported by the unambiguous, humorously appealing dramatization of a familiar word.

The visually simple format is designed to encourage fixations on the word "hug"; 76% of all the children's fixations fell on the print area. Curiously, the poor blenders attended more to the word than the good blenders; 80% of the total fixations were on "hug" for the former group as compared with 66% for the latter group.

The segment activity directs the eye across the span of the word with the result that 83% of the children evidenced sequencing eye movements, that is, fixations and saccades traversing from left to right over the print. Again, we find that the children who exhibited the most difficulty on the blending tests are the ones who made the greatest number of sequencing responses ($r = -.49$).

It would appear that the good blenders already have mastered to some extent the principles and procedures of verbal blending. When presented

with Blend-hug, they can, with little difficulty, focus in on the essentials, interpret the instructional information, and then attend more to the irrelevant visual elements. The poor blenders, on the other hand, may need more time to comprehend the meaning of the segment. The visual activity draws them in, controls their attention, and directs their processing of the visual information. They are fully occupied by the changing scene - determining what is "noise" and what is "message." This segment format successfully presents the visual message so that a large percentage of the poor blenders can follow the blending sequence.

If the poor blenders are watching the print and sequencing activity more than the good blenders, why don't they show consistent improved blending performance on the posttest? We can only speculate on the reasons for this apparent contradiction. The good blenders already understand the concept of blending and take in the visual information with a few quick fixations. On the other hand, the poor blenders are grappling with this difficult concept, working to master it and understand it, so they pay more attention to the blending activity. They may not show positive progress on a posttest simply because blending is a complex skill and a few exposures are not enough to yield immediate competency. The point is to design a segment which will continue to entertain over repeated exposures and simultaneously will encourage attention to the instructional elements of the display (i.e., the blending sequence of letters into words).

Song: Sound It Out

In this segment, we were more lenient in defining attention to print, including in this category any fixations which fell on the Muppets' hand or head when it was directly beside or below the word. We assumed that the child would pick up the print in peripheral vision, although it is preferable for a beginning reader to fixate directly on the print as in Blend - hug. The activity of the Muppets directed the viewers' attention to the print area 62% of the time; poor blenders focused slightly more on the print than good blenders (61% vs. 56%).

In Blend - hug, the Muppet is positioned behind the word. In Sound It Out, the Muppets stand in front of the words. The latter format maintained the children's attention on print less effectively than the former because the Muppets' activities distracted from the words as much as they attracted. At times, their heads obscured the letters they were blending. Yet the use of the hand and head to point to individual letters as each is sounded proved quite successful since 95% of the subjects made appropriate left to right fixations. The action is enhanced by the rhythm, rhyme, and beat of the song; the viewers tended to move to the music and some tried to sing along. As in Blend - hug, the children who blended the least during the pre/posttests sequenced the most while viewing ($r = -.34$; the poor blenders demonstrated the most sequencing eye movements).

As noted above, the format links sound and symbol visually, but the verbal articulation is poor. Since Muppets cannot provide the support of visible articulation, the need is greater in a Muppet blending segment to clearly represent the meaning of the words. Without visual correlates

for the two words in Sound It Out, viewers may learn the correct decoding strategy but not the specific words.

The Con Man

This segment is longer and more complicated, both visually and in content, than either Blend - hug or Sound It Out. The pace of its instructional presentation is also faster. Additionally, the scene has many more elements for the children to look at and thus attention to the print is lower in this segment; 59% of the total fixations are on print. The poor blenders, again, are drawn slightly more to the print than the good blenders (63% vs. 60%).

There was no consistent relationship between blending ability and sequencing in this segment. The structure of the sequencing, though similar to Blend - hug, is not as effective in eliciting sequencing fixations. Half of the subjects sequenced, following the Con Man's movements. Although the Con Man is situated behind the print, his movements do not extend across the entire word he is displaying. Thus, sequencing eye movements on "MOP," "MUG," and "MUD" do not include the final consonants. In contrast, the little girl Muppet's movements and verbalizations in Blend - hug are distinct as she goes from letter to letter; those of Same Sound Brown and the Kid are only slightly less so.

The voice and dialect of the Con Man probably confound the segment's educational purposes by making him difficult to understand. The final sounds of the words presented are not clearly audible. The inclusion of actual objects representing the words and Big Bird's appropriate reaction to "MUD" may aid the recognition of these words. Sixty-one percent of the children focused on the mop and/or mug when they were displayed as instances of the words. However, the objects and Big Bird's response are

too little too late; each appears either after the word is no longer visible or just as it is being removed.

Dummy Blending

Here the Muppets' appeal clearly serves to distract from the print. Only 35% of the total fixations fall on the letters and words; the poor blenders again give them more attention (39%) than the good blenders (23%). Since Oscar and Crummy are situated considerably above the print, their presence does not draw attention to the print as much as it could. The eye movement data reveal that this segment evoked no sequencing instances. The pattern of fixations from print to speaker to second speaker to print breaks up any possible left to right sequence. Typically a child would scan from the letter "c" to Oscar to Crummy to the phonogram "ăt." The pace becomes so fast that at times this pattern seems to reverse so that the child looks at "at" first. This blending format definitely fails to meet the instructional goal of verbal/visual blending. Only the slight movement of the letters toward each other serves to attract the viewers' attention to the print and this tendency is easily counteracted by the Muppets' movements and sounds.

In addition, the link between sound and symbol may be weakened, even for children who look at the print, by the distance between the speakers and the printed material as well as by the fact that the letters and phonograms are voiced after their appearance rather than simultaneously. Moreover, the poor articulation and badly distorted vowel sounds convey incorrect sound-symbol information (ă as i or e).

As in Sound It Out, the words in Dummy Blending are presented in isolation with no visual or even verbal indication of their meaning. Blending in the abstract is inappropriate for this age group and the pretext of a game of "breakable words" is unconvincing and also uninvolving. None of the children smiled at the concluding activity; the consequences of the falling word must be inferred by the breaking noise. This segment's obvious and stilted didactic quality left many children bored. This was indicated by withdrawal of their attention from the visual display.

Susan Looking for a Note from Gordon

Considering the amount of non-relevant visual elements in this segment, attention to the "I LOVE YOU" note is relatively high; 68% of all fixations were concentrated on the print while the note was present on the screen. This high attention result could be a function of numerous closeups of the note and its central placement on the screen. No differences appeared between good and poor blenders. The note's placement at an angle, however, may compromise clarity and the vertical tear through the paper may also create visual interference.

Only half of the subjects showed sequencing from left to right since there was no visual support for the blending activity other than Oscar moving his head. Again, the note's placement at an angle and the vertical tear may have counteracted any left to right sequencing. Thus, the sound-symbol link is tenuous in this format.

The contextual clues for deriving the meaning of the word "LOVE" are adequate only for a child familiar with the characters of Oscar,

Susan, and Gordon. A more explicit representation of the meaning with hugs and kisses might strengthen the symbol-meaning association.

Interestingly, all of the subjects showed eye movements that traveled up and down among the vertically positioned words. Although the instructional goal of this segment is verbal blending, it appears to be more appropriately teaching a sight phrase with the use of contextual clues and an initial consonant. In fact, "LOVE" is not a good choice for a word to be decoded and blended because it does not conform to the "vowel-consonant-letter e" rule according to which the vowel should have a long vowel sound. Without situational clues, "LOVE" could well be decoded as rhyming with "cove."

Our posttest imitated the situation in this segment by presenting an "I LOVE YOU" note which the experimenter's little boy had supposedly given her on Mother's Day. Only 4 of the 21 subjects posttested showed an understanding of the process in which initial consonants and context are utilized as clues. These four were among the children who made left to right sequencing fixations.

Format: Signmaker

HELP and MILK

Signmaker decodes signs. He does this in two ways: (1) he unscrambles letters so that they then can be sounded out into recognizable words; and (2) he discovers the appropriate sounds of the letters in correctly written signs through trial and error. In both cases, he proceeds from wrong to right.

Signmaker is attractive to children. All of our subjects could identify readily our cardboard figure of him. In the four Signmaker segments tested, most eye movements were directed towards him.

In HELP, only 31% of all fixations were on the print, in MILK, 43%. MILK perhaps aroused more interest overall because it is a "concrete," image-evoking noun. It is also possible that since MILK is viewed after HELP in the stimulus videotape, viewers have an idea of what to expect and have learned that the print plays a part in the action.

Familiarity of the format may account also, to some extent, for the fact that MILK provoked more sequencing behavior than did HELP (83%; 67% respectively). In addition, the enlargement of the letters M-I-L-K from left to right seems to have encouraged left to right eye movements, and probably generated more interest than did the fixed letters of the HELP segment.

Although most of the children followed Signmaker's hands and the letters as he rearranged them, only 25% understood what he was doing and why. (These were all good blenders.) One child said that Signmaker changed the letters around to read again. This explanation clearly points up the danger of using a negative instance in which the letters of a word appear in incorrect order. Many four and five year olds simply do not have sufficient language experience to recognize that Signmaker's first "readings" are incorrect.

WET PAINT and ONE WAY

The children attended somewhat more to the print in WET PAINT than to that in ONE WAY (44%; 37%). However, WET PAINT elicited considerably more sequencing as revealed by the eye movements data. WET PAINT is the

last of the segments shown, and it also provides more opportunities for following Signmaker's model of left to right movement. Although few children could understand the final gags of these two segments, 61% could recognize the "WET PAINT" sign (in context) of the posttest. A replica of the "ONE WAY" sign was recognized on the posttest by only 35% of the subjects.

In three of the four Signmaker segments, the visual meaning correlates appear as joke endings, after the sign has been decoded. The symbol-meaning connection is therefore not stressed. In WET PAINT, however, the action builds to the presentation of the print as well as comments on it. This may contribute to this segment's apparently greater effectiveness.

The children's response to the Signmaker segments indicates that stationary print cannot compete for attention with a cartoon character. The print needs to be dramatized in some way and integrated into the action. Television can enable letters to grow, wiggle, jump, shine, etc. Such use of the medium's special features should increase its power to teach basic pre-reading skills to young children.

Letter Labels and Sounds

Format: Initial Consonants

The five Sesame Street segments that deal with initial letter labels and sounds utilize three different production formats:

(1) Consonant Sound J and Consonant Sound G present, in order, the printed initial letter and letter sound, the printed and spoken word, a visual interpretation of the word's meaning, and finally a repeat of the letter and sound followed by the complete word;

(2) The segments, f-flower-forest and b-baseball, show the lower case letter with a spoken label and sound. A short story follows which uses words with the appropriate initial letter. The words are spoken by a voice-over, printed visually, and represented pictorially.

(3) Consonant Sound C presents a visual interpretation of the word's meaning simultaneously with first, the visual letter and letter label alone and then, with the complete visual and spoken word. At the segment's end, the letter label and spoken word are repeated.

One of the pre/posttests related to these segments required the children to identify which picture-name began with the given consonant sound (e.g., bat, jaguar, goose). Overall, more children performed less well on the posttest than they did on the pre-test; four children showed gains while seven children, mostly four year olds, showed losses. If we combine the ten sub-task results of both tests to give a more comprehensive indicator of initial sound discrimination, we find that the children correctly identified an average of 4.5 out of 10 pictures.

The pre/posttest dealing with letter labels asked the subjects to identify the small printed letters -- j, g, f, b, and c. Eight children showed gains on the posttest and one child showed a loss. On the pretest, an average of 1.5 out of the 5 letters was identified correctly. On the posttest, the average increased to 2.3 letters.

The mean percentage of fixations on the print areas across all five segments was 35%. The words "JAGUAR" and "GOOSE" elicited 57% and 51% of the total fixations respectively; while the words in f-flower-forest, b-baseball and Consonant Sound C received 24%, 21% and 17%, respectively. Attention was unanimous to the initial letters J, G, f, and b, when each appeared alone on the screen.

The letter c was ignored more often than not, probably because the animated character is more salient and attractive. Thus, of the three formats defined above, the first was most effective in directing attention to the print; the second next in line, and the third least effective.

In the first format, the words "JAGUAR" and "GOOSE" continue to be available on the screen for a reasonable time period with few other visually distracting elements present. In the second format, the segment activity freezes as the "f" and "b" words appear, but the print does not remain on long enough for the slow viewer to change focus. Many children fixated the print area immediately after the word disappeared. The flashing initial letter is helpful to draw attention to the consonant, but time on the screen is the crucial factor in this format. The story is presented at such a quick pace that viewers are left behind. In the third format, the letter "c" and word "candle" are always available but never alone on the screen, and the other elements present are attractive and

active. In fact, in the presence of a cartoon man, the viewers anticipate activity and concentrate attention on him right away.

The Consonant Sound C segment has a strong point, however, in its use of the letter label and avoidance of initial consonant sound distortion. The sounds given for the letters "J," "C," and "b" have too much vowel attached to them. Authorities in reading and linguistics consider it a crucial error to add a distinct "uh" sound to a voiced isolated consonant when teaching that consonant "sound." In these segments, the immediate use of the consonant as the initial letter of a familiar word can help the viewer to discriminate and learn the sound of that consonant.

Format: Alphabet

Sound of Letters

In this segment, an animated character interacts with eight different consonants while producing the sustaining consonant sound that corresponds to each letter. The concept that letters "make" sounds is an abstract one which is difficult to teach with isolated letters; because letters do not make sounds in isolation but rather in conjunction with other letters as they form a word. It is thus not surprising that only one third of the children correctly interpreted the segment during postviewing questioning. Those who failed to comprehend offered such explanations as: "He is putting things in his mouth..." "He is picking up the letters and blowing them...."

Most of the children visually scanned the presentation in the same way whether they apprehended the meaning or not. About 58% of all fixations focused on the large and small letters. While the visual format of the segment is appropriately directive and compelling, there is not enough

visual and audio support to elucidate the message. The segment demands that the pre-reader infer a link between the free-floating consonant sounds and the particular consonant the character is manipulating. The quality of the sound track hinders such an inference because the sounds are so distorted as to not resemble speech sounds. Further, the distortion of each letter's form as it is manipulated provides additional interference.

Alphabet Machine

The machine in this animated segment consists of a Rube Goldberg type device in which letters of the alphabet are disclosed in conjunction with a voice over labelling each letter as it appears. The sequence is repeated; the second time runs at a slightly faster pace. The letters are deeply embedded in the elaborate machine-like configuration; thus, on the average, only 16 letters were perceived by the children the first time around, and only 11 letters were perceived, on the average, the second time. In each presentation, 26% of all fixations fell on the letters; consequently, during the repeat, the subjects had less processing time, made fewer fixations in general with the result being that fewer fixations fell on the letters of the alphabet.

It is interesting to note which of the letters were most easily perceived and to contrast those letters with one which none of the children fixated on - the letter "h." Fourteen of the letters received the majority of the attention, and the main features of these letters were (1) an introductory activity which results in "revealing" the letter, (2) clear framing of the letter, (3) high contrast between the letter and its context, and (4) central to upper placement within the television screen. The letter

"h" is not directly revealed by an activity, is not entirely framed, is embedded in the design of the stool, and definitely must fight for attention with the monkey who is positioned above it.

The Alphabet Machine may be effective with children who already know their alphabet letter labels, but children who are still learning will not be able to discriminate easily the figure from the ground, or to recall easily the letter shape which disappears so quickly to be replaced by another.

Summary

We have judged the effectiveness of the pre-reading segment formats according to four criteria: (1) amount of attention elicited by the print areas; (2) amount of left to right sequencing eye movements over the print, if the segment's goal is verbal blending; (3) presentation of a sound-symbol relationship; and (4) demonstration of the symbols' meaning.

The most effective Muppet format for verbal blending uses the Muppet's activity to direct the viewer's attention to the letters in a left to right sequence. A less effective format disassociates the print from any directional activity by the Muppets (e.g., Dummy Blending; Susan Looking for a Note from Gordon). Placing an attractive familiar character behind the appropriate letter (e.g., Blend-hug) will draw visual attention to that letter unless there are many other irrelevant items in the scene (e.g., The Con Man). Using the Muppets in front of the letters is also effective (e.g., Sound It Out), but care needs to be taken not to create a strong distraction with the Muppet character. Rhythmic music and/or rhyming may be used to reinforce the sequencing. This format easily shows the sound-symbol connection and with the addition of a story-line or punch line, the format deals with the symbol-meaning criterion. One warning must be given with respect to the Muppet segments, however. Because of the lack of visible articulation, the quality of the sound track must be very good and accurately present the letter sounds.

The Signmaker formats were more effective in drawing fixations to the print in a sequencing pattern than either Dummy Blending or Susan Looking for a Note from Gordon, but like these two segments, the Signmaker format suffers from the appeal of its animated character. This appeal is ob-

viously necessary and can be used in support of the instructional goal. Of the four segments, WET PAINT was the most successful. Numerous repetitions of the sequencing are presented; the sound-symbol link is clear; the symbol-meaning connection is developed both before and after the print appeared. The major criticism to be made about this format is that it introduces blending with negative instances which preschoolers do not have the knowledge to discount.

A general consideration for all of the verbal blending segments involves the choice of words presented. "LOVE YOU", "ONE WAY" and "PAINT" are really better taught as sight words rather than used as examples of blending procedures. A creative and entertaining segment may be useless educationally if inappropriate words are used.

The formats presenting letter sounds are successful in correlating sound with symbol and symbol with meaning. One format (Consonant Sound J, Consonant Sound G) is visually simpler, leaving the words on longer than the other formats, and repeating the letters and words at the finish. In Consonant Sound C , as in the Signmaker segments, the animated figure competes for attention. Again, the sound track is a critical element in the success of these segments.

Finally, neither format used in the alphabet segments achieved its goal. Both include much distracting information and present distorted sounds. The child is required to work hard to separate the "message" from the "noise."

PRE-SCIENCE

The three pre-science segments - How a Record is Made, How Things Work: Faucet, and Lost Binoculars - will be treated together because all three deal with a similar goal, introducing the child to elementary scientific content and thought processes. For each segment, we found that the majority of children were looking at the right place at the right time. In How a Record is Made, the viewers followed the activities of the people and machinery. In How Things Work: Faucet, the animation of the internal mechanism of a faucet drew attention to the visual elements moving in concert with the verbal explanation. In Lost Binoculars, the children attended to the binoculars and the images seen through them. However, what the children perceived visually and verbally was not structured enough or complete enough for them to come away with a clear understanding of the segments' contents.

Only one-third of the children understood what was shown in the Record segment. Some viewers thought that it was about "singing and washing records"; another said it was about "singing and messing the record," while another thought that it was just about "playing the n-g-o song." Similar confused statements followed the Binoculars segment which only 23% of the children understood clearly. One viewer thought that the bird was "playing being a monster and he dropped the camera." Another thought it was about "losing a camera . . . in which (you can) see birds, monsters, and snakes." In the Faucet segment, only 29% of the subjects could explain how a faucet worked after viewing the segment. Part of their confusion could be attributed to the two initial incorrect explanations of how a faucet worked. In fact, one child did mention the rain cloud theory offered by one of the

segment characters. Many did not even refer to the faucet as "faucet" but as "water" or "sink." Thus, the children viewed the segments as the producer intended them to and yet they did not understand the content that was presented.

How to Make a Record

This segment communicates its message almost entirely via the visual presentation which unfortunately is very confusing and poorly constructed. First, the segment gives no frame of reference, no way for the child to relate the content to his own environment and experience. The only concession to explicitly telling the viewer what is happening is a somewhat indistinct remark of the boy - "I thought we were going to make a record?" - to which Paul Simon replies misleadingly - "We're going to do lots of stuff." Since the sound track does not provide the interpretive structure that the preschooler needs, he must rely on the visual images. Regrettably, there is no comprehensive visual overview treatment to let the viewer know that he is first seeing a recording studio and then a factory. The presentation begins with close ups, not an overall long shot, and then proceeds with quick cuts from closeup to closeup with no connective tissue. The viewer is moved in space from studio to factory with no transitional information. How is the uninformed child supposed to integrate these images effectively? Our children could not. They simply recalled those images which were novel and salient - the singing and the "washing" of the records.

Lost Binoculars

This segment begins as the Record segment does with a close-up and no orienting visual scene. A more effective beginning which would give the

child a frame of reference would show a long shot of Thelma in the woods with binoculars, then a view of what she sees normally (i.e., birds in the distant trees), then a closeup of her bringing the binoculars to her eyes, and finally her view through the binoculars. In this segment also, most of the instructional message is carried by the visual. There are only two brief statements describing the function of binoculars - "When you look in this end, things seem big; and when you look in this end, things seem little." Unfortunately, this message is spoken by Thelma Thumb whose high-pitched voice is extremely difficult to understand. Thus, the viewer must rely on the visual presentation for interpreting the content.

The visual meaning of binoculars, making the far appear near, is confounded by the use of animation. The normal cues which a child has come to associate with distance are not easily transposed to the world of animation. It is not clear in the visual presentation that the animated owl in the tree is actually far away, so the binoculars' primary function becomes lost due to the lack of distance cues. Animation further confuses the communication of the function of binoculars by forcing the animator to distort the already distorted animated character, so that the child confronts images beyond recognition. The distorted image of Thelma Thumb through the lenses of the binoculars looks rather like that of the caterpillar and owl. If it is hard for the viewer to recognize who or what he is seeing in the lenses, then it becomes impossibly hard for him to know that that image is the very same one he saw without the aid of the binoculars.

The Binoculars segment overloads the pre-school child with irrelevant information that detracts from the central message. The primary function of binoculars is complicated by showing what happens when you look through

what is commonly termed the "improper" end of the glasses. Further, the viewer must resolve the inconsistency between Thelma Thumb changing size by magic and the rest of the world changing size by means of the binoculars. The pace of presenting so much information simultaneously is just too fast for the young child to deal with successfully. It is important to keep in mind the amount of new information that the audience must assimilate, and given that consideration, it is important to distinguish the essential facts and functions from the irrelevant and confusing.

How Things Work: Faucet

This segment would also have been enhanced by utilizing an initial long shot. Placing the faucet in a sink in a room would enable the child to see the faucet in its proper frame of reference, not disembodied from his familiar world. Also, a detail such as human hand turning the handle of the faucet would give the child further evidence connecting and locating his world of faucets with the one on the screen.

The goal of teaching the mechanism of a faucet is appropriate for Sesame Street's target audience because it is a familiar tangible object used everyday in the home. Unfortunately, the first part of the segment undermines achievement of the goal by presenting two complicated incorrect explanations of how a faucet works. This approach mistakenly assumes that the children already have some knowledge of a faucet's insides by which they can discriminate the fictional from the non-fictional tales. Our posttest interview yielded at least one five year old who accepted and recounted to us the explanation of the rain cloud named Sam. Incorrect explanations are just not appropriate for a pre-science audience.

The strongest part of this segment is the visual presentation of the internal action of a faucet. The animation is clear, simple and active when the verbal explanation requires activity. Since the eye movement data show that most of the children followed the mechanical activity visually, the weakness in the explanation must lie in the audio.

Summary

In designing pre-science segments, one should keep in mind the qualification pre. A person who has already experienced manufacturing, plumbing, and lenses would have no trouble inferring from the visual and verbal presentations what was going on in each of the segments, but children who have not experienced these things need the information structured more appropriately for their level of understanding and experience. By the term "structure" we mean

(1) presenting the information so the child can assimilate it to what he already knows, can interpret it in terms of knowledge he already has;

(2) organizing the information in a logical progression without leaps in time and space which require knowledgeable inferences to bridge;

(3) pacing and repeating the material for the child's cognitive level, avoiding an overload of information;

(4) employing both the visual and verbal modes so that one presentation could teach something without the other.

The content of each of the pre-science segments is appropriate for the preschooler but the execution of the instructional message is also a critical consideration for comprehension.

REFERENCES

Flagg, B.N., Allen, B.D., Geer, A.H., & Scinto, Jr., L.F. Children's visual responses to Sesame Street: A Formative Research Report. Unpublished manuscript, Children's Television Workshop, 1976.

INTRODUCTION

During Sesame Street's ninth season, new pre-reading and pre-science segments were introduced. This report evaluates these segments with regard to four and five year olds' visual attention and comprehension. The intent of this report is to assess the effectiveness not only of individual segments but also of the production formats designed to meet pre-reading and pre-science curriculum goals.

The formative research methodology employed involves recording the children's eye movement responses to the television presentation.[1] This method provides direct feedback on whether particular instructional elements are attended to within the display. Viewing pattern data coupled with pre- and posttest comprehension interviews reveal to what extent the children understood the instructional material.

METHOD

Subjects

Ethnically mixed, male and female children participated -- 12 children with a mean age of 4 years, 4 months and 9 children with a mean age of 5 years, 3 months. The children were enrolled in the South Boston Neighborhood Head Start program and were recruited through letters to the parents (see Appendix B for parent permission letter).

[1] The acquisition of detailed visual information requires that the eyes move about so that successive images of the visual scene fall upon the fovea, the small central region of the retina with the greatest visual acuity. Fast movements of the eyes from one visual element to another are called saccades, while times during which the eyes are fixed on a visual image are called fixations. The pattern of saccades and fixations on a visual scene is determined by the visual stimulus as well as by the perceptual and cognitive processes of the viewer.

APPENDIX A

Description of Sesame Street Pre-Reading and Pre-Science Segments and Researchers' Reactions prior to Data Collection

Stimulus Videotape A

A1. Calibration

A2. Susan Looking for Note from Gordon

Description. Verbal blending is the stated instructional goal of this segment. It begins with Susan coming out of her apartment, down the steps, to ask Oscar if he has seen her note from Gordon in the trash. Oscar finds two halves of a note with the letters "I' L" on one half and "OVE YOU" on the other. As the note is displayed for the camera, Susan coaches Oscar in the reading of the note, particularly the torn word "LOVE." The visual blending of "LOVE" is simultaneous with the oral blending as Oscar repeats the sounds of the letters "I LOVE YOU."

Reaction. Although verbal blending is cited as its primary goal, this segment more effectively demonstrates the use of context clues in conjunction with an initial consonant in ascertaining a word (i.e., "LOVE"). "LOVE" is not a good choice of a word to be decoded and blended because it does not conform to the VCe rule -- so important in primary reading. The rule to which it does conform is one generally inferred at a more advanced level of reading.

The problem-solving format of the segment should stimulate interest, and the situation permits a degree of personalization. The pace seems

appropriate and the note visually clear, although viewed at an angle.

A3. Consonant Sound J

Description. This segment focuses on an initial letter sound as well as a word meaning. At the top of the screen a highlighted "J" is presented with the corresponding oral sound. Then the remaining letters forming the word "JAGUAR" are presented in a lower tonal key while a voice pronounces the full word. A frontal face of a jaguar is presented below the word. Next, the face is momentarily framed before both the face and word disappear, leaving only the frame on the screen. Jungle noises are heard as block sections of a picture are placed inside the frame, picture-puzzle fashion. The final image is the side view of a jaguar in the jungle. The framed picture is pulled back leaving room at the top of the screen for first the letter "J" and then the remaining letters "AGUAR" to reappear as they did in the beginning of the segment. A voice accompanies the letters, repeating the sound of the letter "J" and then the sound of the word "JAGUAR."

Reaction. Ideally phonemes should be taught in relation to other letters which modify the sound a particular phoneme represents. Nevertheless, the isolation of phonemes (as in Consonant Sound J; Sound of Letters; f-flower-forest; B-Baseball; Consonant Sound G) is useful in teaching young children since it helps them to hear and discriminate separate sounds. A word that is being decoded is not a part of rapidly moving speech; yet sounds produced separately in decoding are likely to be very close to those that are then synthesized into an individual word. This is especially true of vowels. However,

consonants are subject to more distortion in isolation, a situation not helped by the absence of visible human articulation in these segments. The initial J sound presented in Consonant Sound J has too much vowel attached to it (J-uh). Many authorities in reading and linguistics consider adding the "uh" to be a crucial error in teaching a consonant sound. Although it is perhaps more difficult to articulate the consonant sounds without "uh," it is preferable.

The jaguar is not a word or animal that is familiar to most young children and thus this segment builds vocabulary. Yet "JAGUAR" may not be a good choice for the segment's goal, that is, representing the sound J, since the image is likely to be identified variously as a tiger, cat, leopard, etc. -- none of which begin with J. Some children will be attracted by the exotic novel word and recall it easily, but many will probably immediately attach a common label to the image and circumvent the instructional goal of the segment. This phenomenon has been noted in previous formative research on initial sound segments (see Flagg, Allen, Geer, & Scinto, 1976).

A4. Song: Sound It Out (Same Sound Brown)

Description. Same Sound Brown helps another muppet to sound out words, emphasizing the pre-reading goal that written words are made up of letters which are symbols of distinct speech sounds. The words "man" and "fun" are written on a blackboard behind the two muppets. The dialogue is carried out in singing verse. First, the camera zooms in on Same Sound Brown who stands in front of the word "man." Explaining how to sound out words, Same Sound Brown points to each letter of the word "man" as he makes the appropriate speech sound until he repeats

the whole word without separation. Next, the camera focuses on the second muppet who stands in front of the word "fun." He emulates Same Sound Brown's method of sounding out and blending letters, now using the letters in the word "fun." At the end he, also, reads the word "fun " without separation.

Reaction. The combination of muppets and music seems effective for teaching the left to right sequencing of reading. The rhyme, the beat and the tune should command and hold attention, while the muppets' head and hand movements should guide the viewer's focus from left to right. Further, the second muppet's imitative behavior may encourage modeling on the part of the young viewer. Unfortunately, the muppets' heads obscure the letters at times; and because of the lack of visible articulation, the m and n sound the same and the f is not distinctly audible. Without visual correlates for the two words, viewers may learn the correct decoding strategy but not the specific words.

A5. Sound of Letters

Description. In this segment an animated man produces a sustaining consonant sound which corresponds to a printed letter. The man stands next to a table covered with the consonants f-l-m-n-r-s-v-z, picks up a letter and either blows, plucks or twirls the letter creating the appropriate sound which is heard on the sound track. As he manipulates a letter, mini-versions fly out of the larger letter. The man repeats this process with each of the letters until he gets to the letter "z". Here, just as he reaches for the letter "z", the pattern shifts,

and the letter chases the man off the screen, while the corresponding sound of "z" is heard.

Reaction. Letters, of course, are symbols and do not "have" or "make" sounds. Although the term "letter sounds" is a necessary implication in teaching beginning reading, there seems little value in dramatizing an incorrect concept which is what this segment seems to be doing. The segment is abstract and confusing; it is not clear what the man is doing or why, and who or what is making the sounds. The color contrast of the letters is not sufficient to overcome the distortion resulting from the letters being used as props (e.g., m and v). Many of the sounds do not resemble speech sounds but have a wierd quality. The little man is unappealing and the letter z's pursuit of him is more scary than funny.

A6. Signmaker: Help

Description. This segment emphasizes the pre-reading goal, verbal blending. In addition, the animated character, Signmaker, focuses attention on the fact that the order in which letters appear in a written word corresponds to the order in which sounds are produced in the saying of the word. At the beginning of the segment Signmaker enters, humming, passes behind a sawhorse and stops in front of a sign which has the letters HLEP in capitals. He tries to sound the letters out, pointing to each letter in turn as he says the corresponding speech sound. Signmaker announces that the letters are mixed up and rearranges them to look like HEPL. Again, he tries to sound the letters out, and again he rearranges the letters forming the word HELP.

As he blends the letter sounds together, saying them faster without separation, he sits back on the sawhorse. Finally, saying the word faster he distinctly says the word "help." He repeats the word, louder, and falls from the sawhorse. In rushes a Saint Bernard nurse who wraps up Signmaker in an ace bandage and rocks him in her arms. The segment ends with Signmaker softly repeating the word "help." Throughout this exchange the sign HELP remains in the background over the heads of Signmaker and the Saint Bernard.

Reaction. The Signmaker figure is a memorable appealing character, and the format of this segment is good insofar as it provides a clear visual meaning correlate for the blended word. However, the use of initially scrambled letters seems a dubious approach. The difficulty of the concept of grapheme-phoneme correspondence is sufficient to preclude the introduction of deliberately confusing material. The inference or discovery that letters in words are not arranged arbitrarily is one that children make as they master reading skills; it is doubtful that it requires direct teaching. Moreover, humor that might be derived from an incorrect instance cannot be assumed here since pre-readers will not be able to recognize the "incorrectness."

A7. f-flower-forest

Description. This animated segment focuses on letter labelling (i.e., given a printed letter, the child can provide the verbal label) and on letter sounds (i.e., given a sustaining consonant sound, the child can select the corresponding printed letter). The segment begins with a picture of a lower case "f". A voice-over labels the letter and tells what sound the letter makes. The voice continues to say that "fff" is the first sound in the word "flower"; whereupon the "f"

turns into a flower, the word "flower" appears over the image, disappears, and then the sound "fff" is heard again. The narration continues describing a fast fox looking for a flower in the forest. However, the fox goes too far, missing the flower. The flower is found by a fat frog who stops to sniff it. He finds the smell of the flower to be fantastic. Throughout the narration the printed words "forest," "fox," "frog," and "fantastic" appear briefly either over, under or beside the images at the appropriate moments in the dialogue.

Reaction. This segment gives both the letter name and letter sound for comparison and differentiation. The f-sound avoids the vowel-ending distortion mentioned earlier and the series of familiar illustrative words should also encourage a deductive strategy for discriminating the f-sound. The printed words are clear but disappear quickly; in fact, the overall pace of the story seems faster than can be easily followed.

A6. Consonant Sound C

Description. The sound of the letter c is the subject of this segment. An animated male figure stands to the right of a candle. As he says the letter name "c," he points to the small letter "c" which appears in the upper left of the screen. As he says the word "candle," he points to the candle image and the printed word "candle" appears over the image with the letter "c" distinguished tonally from the remaining letters in the word. Next the figure tries to blow out the candle which, instead, blows him off the screen. A distant voice is heard saying the letter "c" while the printed word remains on the screen over the candle.

Reaction. Again, this segment demonstrates both the letter name and letter sound. The letter name is given when the printed letter is isolated, and the letter sound is given in combination with a familiar word. This format avoids the problem of consonant sound distortion. Also the image has only one possible label, unlike the JAGUAR segment. The humor may be lost on young children although they will probably enjoy the air of disaster.

A9. Signmaker: One Way

Description. This segment is built around a sight phrase. Verbal blending is modelled and some pre-reading principles are introduced (in particular that words can be identified as distinct units in writing, written words are symbols for spoken words, written words are made up of letters which are symbols for distinct speech sounds, letters combine to make written words, and words are read from left to right). The segment begins with Signmaker stopping by a ONE WAY sign. He tries to decipher what the words are by sounding out each letter, pointing to each one left to right as he sounds it out. Slowly he blends the letter sounds together, repeating the word without separation. After he clearly says "ONE WAY," traffic passes in front of both the sign and Signmaker. The traffic is moving backwards, following the direction of the arrow on the ONE WAY sign. At the end of the segment Signmaker repeats the phrase.

Reaction. Again, the Signmaker character is identifiable and his blending behavior is consistent across segments. With repeated exposures, the viewer will first model his method, then begin to anticipate his method and try to beat him at his own game. The visual

gag at the end of the Signmaker segments may not be understood by all children, but the word/phrase meaning certainly is made clear. Signmaker's success in reading the sign has consequences which underline the meaning of the printed symbols. In this case, the phrase ONE WAY is an unfortunate choice for sounding out since ONE is an exceptional word in English and is normally taught as a sight word.

A10. How a Record is Made

Description. In this segment the child's reasoning and problem-solving capacities are challenged in a different way. He is presented with a scene from the man-made environment which he must decode. The scene is of a record studio in which a guitarist and young boy are cutting a record. Except for a little bit of dialogue and one scant phrase "I thought you said we were going to do a record?', most of the sound track is taken up with the words from the song being taped, "Bingo." It is through the images of the singers, recording studio equipment, record-cutting process and packaging, that the viewer discovers both the meaning and message of the segment.

Reaction. This segment is entertaining, well-paced and likely to encourage singing/clapping participation. We found Paul Simon and the little boy delightful. The visual aspect is engrossing and should provide a general understanding of the kinds of procedures, people, and technology involved in making a record; however, the child is called upon to make a large number of inferences that are not really confirmed by the sound track or the visual presentation. The garbled one-liner that the boy gives about making a record will probably not be understood such that the viewer will interpret the visuals correctly and integrate them as the producer desired.

Stimulus Videotape B

B1. Short Calibration

B2. The Con Man

Description. In this segment verbal blending and letter sounds are being modelled. The segment begins with Big Bird mopping up a floor, singing "mop, mop, moppy...." A con man puppet appears and leaves a cutout letter "M" on the table which Big Bird discovers. The con man reappears and tries to sell Big Bird some 'm-attachments' for his newly found letter "M." With each attachment, "-OP" "-UG" and -'UD" Big Bird and the con man sound out the letter "M," blending it with the various attachments which are similarly sounded out. After the whole word is repeated without separation, Big Bird picks up an object representing the printed word. For the "MUD" word there is no corresponding visual. Big Bird decides he does not want to buy any 'm-attachments' and walks off with his letter "M." Whereupon, the con man left with all of his attachments is joined by a second con man who tries to sell the first con man a new letter "M."

Reaction. The voice and dialect of the Con Man make him difficult to understand. Since articulation is not visible with muppets, the final sounds of the words presented are not clearly audible. However, the inclusion of the actual objects represented (mop, mug) and Big Bird's reaction to "mud" aid the recognition of these words. The muppet's position behind the letters draws attention to the letters and to the left-right blending pattern. The segment format is reasonably well constructed for its instructional goals but is very long and somewhat predictable thus probably losing the viewer halfway through.

B3. Blend-hug

Description. This segment presents verbal blending and letter sounds. A female muppet enters and sees the printed word "hug" in center screen. She stands behind each letter as she carefully sounds it out, trying to find out what the word is. She repeats the sounds several times, each time moving from left to right so that she is behind the appropriate printed letter. Finally, she says the word "hug" without separation. Meanwhile, Harry Monster enters and stands behind her. He repeats the word "hug" after her, again without separation. The segment ends with Harry Monster hugging the pleased little girl.

Reaction. The letter "h" is less subject to distortion than most other consonants, and in any case, the muppets' actions leave little doubt as to the meaning of the word. As in The Con Man, the left-to-right movement of the little girl dramatizes the blending sequence.

B4. Alphabet Machine

Description. This segment focuses on the recitation of the alphabet, the labelling of letters, as well as the pre-reading principle of reading from left to right. The animated segment pans to the right an interior of a room which is a Rube Goldberg type alphabet machine. The machine is set in motion by a ball entering the room through a window. The ball triggers an event which produces the printed letter "a" and a voice over giving the letter name. This motion, then, is linked to another object and event producing the visual and verbal letter "b," and so on down through the letter "z" which produces a ball which a girl bats through a window. The segment is then repeated

at a slightly faster pace. Sound effects of machine noises occur throughout the segment.

Reaction. The embedded lower case letters are revealed in a whimsically humorous way; however, the educational objective of the segment is obviated by its fast pace and visual complexity. It is extremely difficult to perceive many of the individual letters -- h, l, g, r, t, u, in particular. Further, the faster-paced repetition has a speeded-up sound track which distorts the letter names. The format idea is intriguing but the visual execution of it obscures the instructional elements.

B5. Signmaker: Milk

Description. This segment models verbal blending and pre-reading principles. Signmaker finds the sign LIMK which he tries to sound out. He finds that he cannot form a meaningful word and so concludes that the letters are mixed up. He changes the order of the letters from LIMK to MIKL, and again tries to sound out the letters. Again, he sees that the letters are still mixed up and changes them to form MILK. This time as he sounds out the letters he is finally able to repeat the meaningful word without separation. During the segment, Signmaker only points to the letters once (when he reads the word "MIKL" for the second time). Instead, each letter becomes larger and animated as Signmaker makes its sound.

Reaction. Our comments about the Signmaker: Help segment (A6) apply here also. In this segment a different visual technique is used to emphasize the blending letters -- animating the letters rather than pointing to them; for this reason, it will be interesting to see if the segments produce different visual scanning patterns.

B6. B-Baseball

Description. Letter labelling and letter sounds are the instructional goals of this segment. The segment begins with a printed letter "b," presented in center screen. A voice over explains that this is the small letter "b" which makes the sound "buh". As the voice repeats the sound of the letter "b," the printed "b" jumps slightly. The voice continues to explain that "buh" is the first sound in the word bat. At this point the vertical line in the printed letter "b" turns into an animated bat, and the word "bat" appears above and to the left of the letter. The printed word disappears and the voice over continues, repeating the process with the word ball. This time the round circle in the printed letter "b" becomes an animated ball, and the word "ball" appears above and to the right of the letter. Again, the word ball disappears leaving a bat and a ball on the screen. They are instantly a part of a neighborhood street scene in which a little girl enters, asking if anyone is interested in playing baseball. At the mention of the word baseball, the printed word appears over the street scene. The scene next shifts to a ballpark where the little girl hits a pitched ball. As the sound of a baseball breaking a window is heard, the scene shifts back to the street and the word "break" is flashed onto the top of the screen. The voice over ends by saying that "buh" is also the first sound in the word "break."

Reaction. Again too much vowel is attached to the b-sound, but the letter b's transformation into a bat and ball is visually compelling and provides contextual cues for the sound - b. The words are visible

for only a short period and the letter "b" could be more consistently distinguished as the initial letter by color differentiation or blinking.

B7. Consonant Sound G

Description. Letter sounds and letter labelling are the focus of this segment. An image of a capital letter "G" appears in the upper left of the screen while a voice over says "Guh - GOOSE"; whereupon the remaining letters for the word "GOOSE" appear. This is quickly followed by a picture of a goose. Next, the voice over tells a story, which is illustrated by an animated storyboard, about a goose and a gander who cross the seas to get to the land of the G's. Capital G's are in the background. The segment ends with a repetition of the initial opening section.

Reaction. The goose is a more familiar animal than the jaguar in segment A3 and thus has a better chance of being retained as a concrete association. The pleasant fantasy in rhyme should help also. Here again, though, the G-sound is given with too much vowel.

B8. Dummy Blending

Description. The goals in this segment concern verbal blending and pre-reading principles. Oscar announces to Crummy that it is time for breakable words, which he goes on to explain is a game where you break up words after putting them together. Oscar begins by calling for the first letter, a printed "c," which appears on the screen in front of the muppets. He gives the sound the letter "c" makes, telling Crummy that "cuh" is the sound for the "c." The letters "at" appear from the opposite side. At this point Crummy gives the "at" sound.

Oscar repeats the "c" sound which is immediately followed by Crummy repeating the "at" sound. The pace increases as Oscar and Crummy blend the two sounds together until Crummy says the word "cat" without separation. Both Oscar and Crummy alternate repeating the word "cat" a few more times. Then, to the count of three the word drops from sight, followed by an ensuing crash sound. Oscar and Crummy repeat the process with the word "bat."

Reaction. We all found this segment boring and the pretext of a game unconvincing. The blending pace is appropriate, but Crummy's vowel sounds are badly distorted; the "short a sound" comes across as ĕ and i.

89. Signmaker: Wet Paint

Description. This segment focuses on sight phrases, verbal blending, and pre-reading principles. Signmaker enters, painting the screen. He then takes his rolled-up sign and places it over his newly painted surface. To make sure he has put up the right sign, he announces that he is going to sound it out. Pointing to each letter as he sounds out the phrase, "WET PAINT," Signmaker slowly blends the sounds together until he says each word clearly. After he says the phrase without separation, two characters enter who touch the painted wall and announce that it really is wet. The woman character wipes her fingers on Signmaker's shirt as she walks off screen. The segment ends with Signmaker repeating the phrase "WET PAINT."

Reaction. Our previous comments about the signmaker character and format apply here also. The only reaction we have specific to this segment is that "ai" is properly taught as a unit representing the

"long sound of a." Signmaker incorrectly sounds out the "i" in "PAINT" separately and implies that "ai" is a diphthong.

310. ..ow Things Work: Faucet

Description. This segment focuses on one of the prescience goals, the man-made environment. In this animated segment Heathcliff, Sheila and It (canine) stand under a faucet. About to get a drink, they discuss how the faucet works. First, Heathcliff suggests that by turning the handle you create inside the faucet a raincloud named Sam. He explains that the raincloud gets higher and higher until it starts to rain; the pipe fills up and the rainwater comes out of the faucet. Sheila disagrees saying that faucets have a giant ice-melter in them. By turning the handle you make the block of ice inside the faucet go inside the icemelter-toaster which then melts the ice, turning it to water. The water then comes out of the faucet. It, the dog offers to explain how the faucets in the bathroom, kitchen, and laundry room really work. As he explains about the pipes under the ground which bring water from the reservoir to one's house, appropriate pictures appear on the screen. As he describes the mechanism inside of a faucet, a cross section of a faucet is presented. The dog tells how the faucet handle, once turned, raises up the shaft to allow the water to come through the hole and out the spout. By turning the handle the other way, you lower the shaft plugging up the hole. The shaft, reinforced by the washer, keeps the water from leaking out, hopefully. The verbal explanation is paralleled by animated visuals.

Reactions. The pace of the explanation is faster than desirable and the speech of all characters is scarcely discernible. The child

will spend most of his energy trying to understand the words, much less the message. Further, the conveying of misinformation is extremely risky since preschoolers lack the information and background to discern the foolishness of the fanciful explanations offered by the children. The actual content of the dog's explanation is at an appropriate level, although the words "reservoir," "shaft," and "washer" are probably not in their vocabulary. The visuals for the dog's explanation are quite good -- animating or coloring the parts that correspond to the verbal explanation.

B11. Lost Binoculars

Description. The man-made and natural environments are concerns of this animated segment. A girl named Thelma explores a forest. She notes how by looking through the different ends of the binoculars the image is either magnified or reduced. She has, as a companion, a magpie named Cyrus. In the process of explaining to Cyrus how the binoculars work, the magpie manages to drop the binoculars while flying in the air with them. The calamity causes the girl to turn herself into a small elf-like character named Thelma Thumb, who is then able to retrieve the binoculars. In the process, she repeats the underlying principle of binoculars. As in the first instance when this principle was expounded, the visual image is either magnified or reduced according to the accompanying text.

Reaction. The important message about the function of binoculars is submerged in a welter of strident voices and complicated action delivered at a very rapid rate. Distance is more often than not inferred rather than shown so the operating principle of the binoculars must be

learned from the sound track alone. The use of Thelma Thumb in this segment is pointless and simply adds more noise to the story-line. If Thelma Thumb is eventually to become a character who presents pre-science concepts, then we suggest taking advantage of her size, using it appropriately, and changing the quality of her voice.

CURRICULUM GOAL

Verbal Blending	Letter Sounds	Letter Labelli	Sight Phrases	Pre-Reading Principals/Goals	Alphabet	Pre-Science
A2	A3	A7	A9	A2-p	B4	A10
A4	A5	B4	B9	A4-g		B10
A6	A7	B6		A6-g		B11
A9	A8	B7		A9-p		
B2	B2			B4-p		
B3	B3			B5-p		
B5	B6			B8-p		
B8	B7			B9-p		
B9						

HARVARD UNIVERSITY

GRADUATE SCHOOL OF EDUCATION

APPENDIX B

Center for Research in Children's Television

Roy E. Larsen Hall, Appian Way
Cambridge, Massachusetts 02138

Dear Parents:

Our Goal is to improve television for children. We have been asked by the producers of Sesame Street to study the way preschoolers respond to the show. We would like to have your child participate in this project.

The project has two parts. The first part takes place at your child's Head Start Center. There, we will question your child for fifteen minutes about the topics which are presented on Sesame Street. The second part of the project requires that you bring your child to Harvard at your convenience on one day to watch a half-hour Sesame Street show. Your visit to Harvard will last at most one hour for which your child will receive compensation of $2.00. You will also be paid for any transportation costs.

The producers of Sesame Street are interested in what parts of the show attract a child's attention for how long a time. To answer this question, we are recording children's eye movements while they watch the show. This tells us exactly where they are looking on the TV screen. In our viewing room at Harvard, a small television camera records the child's eye movements. In order for us to accurately record the part of the show that has captured their interest, the children are asked to sit as still as possible during the viewing. They are aided in this by a headrest attached to their chair.

Your cooperation and that of your child will allow us to gain information valuable to the producers of children's television programs and to psychologists interested in how children learn. All information concerning your child's participation in our study will be kept confidential. At no time will individual children be identified.

If you are willing to have your child participate in this project, please fill out the enclosed consent form and return it to your child's Head Start Center. We will then call you and set up an appointment at your convenience. You should also understand that even after giving consent you may withdraw your child from the study at any time. If you have any questions, please feel free to contact us at Harvard (495-3541; 495-3408).

Thank you for your time and consideration of our request.

Sincerely,

Barbara N. Flagg

Barbara N. Flagg, Ed.D.
Project Director

Abigail Housen
Research Assistant

Stella Lesser
Research Assistant

CONSENT FORM

Having read the letter to Parents, if you are willing to have your chi. participate in the Sesame Street project, please fill in and sign the form below and return it to your child's Head Start Center. We will contact you about a specific time.

Our viewing room is located in Harvard Square, Cambridge, in the basement of Gutman Library, Harvard Graduate School of Education, on the corner of Appian Way and Brattle Street. (See map enclosed.) Our telephone number is 495-3541 or 495-3408.

Again, thank you for your time and help.

I have read the letter to Parents, and I am aware of the purpose and nature of the Sesame Street project. I am willing to allow my child to participate. I understand that all information about my child will be kept confidential and that I may withdraw my child from the project at any time.

Signature: _____

Parent's Name:
(Please Print) _____

Address: _____

Telephone: _____

Child's Name: _____

Child's Birthdate: _____

Child's Sex: _____

Child's School: _____

Check the days during which it would be most convenient for you and your child to participate:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Morning							X
Afternoon							

APPENDIX C

Pretest and Posttest Data

Pretest

I. Recognition of Lower Case Letters

Percent of Subjects Who Identified Letter Correctly

Letter	Age Group 4 years	5 years	Total Group
a	8%	11%	9.5%
b	33	22	28.6
c	33	44	38.1
d	25	0	14.3
e	42	44	43
f	33	22	29
g	17	11	14
h	25	22	24
i	42	44	43
j	50	44	48
k	33	44	38
l	33	11	24
m	33	33	33
n	25	11	19
o	58	55	57
p	17	55	33
q	17	11	14
r	42	33	38
s	42	55	48
t	25	22	24
u	17	11	14
v	42	33	38
w	25	44	33
x	67	33	52
y	33	33	33
z	42	55	48

II. Auditory Discrimination of Initial Sounds

Percent of Subjects Who Discriminated Initial Sounds Correctly

Initial Sound	Age Group 4 years	5 years	Total Group
b	36%	66%	50%
c	73	66	70
f	45	44	45
g	36	33	35
j	64	33	50
	51	49	50

III. Auditory Discrimination of Separate Sounds in Words - Blending

Percent of Subjects Who Identified Words Correctly

Word	Age Group 4 years	5 years	Total Group
m-ud	36%	78%	55%
c-at	36	67	50
m a-n	64	44	55
m-i-l-k	91	67	80
	57	64	60

IV. Use of Context and Initial Consonant

Percent of Subjects Correctly Completing Sentence

4 years	5 years	Total Group
83%	66%	76%

Posttest/Tape A

I. Comprehension of "How a Record is Made"

In response to the question - What were the man and boy doing? - almost all of the children responded: singing, clapping, or playing the guitar.

In response to the question - What were the other men doing? - only one-third of each age group spontaneously responded: making records. Another quarter gave this response when probed about the activities of the segment. The rest of the children said that the men were washing the records, messing the records, fixing records, or playing the 'ngo' song.

II. Comprehension of "Sound of Letters"

Forty-seven percent of the children showed no understanding of what the animated character in this segment was doing. Characteristic responses included: "He's playing with them";"picking up and blowing them"; "putting things in his mouth"; "turning---biting---blowing---red and green shapes." Another 19% of the sample gave fair explanations when probed with leading questions. Thirty-four percent, including both four and five year olds, showed a clear understanding of the segment's message.

III. Use of Context and Initial Consonant

Only one five year old could read and sound out the message "I LOVE YOU." Two other five year olds added the "YOU" as the experimenter sounded out the phrase.

IV. Sight Phrases

Only one four year old and one five year old could read "ONE WAY" without the visual clue. When shown the sign with visual clues, two more four year olds and four more five year olds read the sign correctly. Thus, thirty-eight percent of the sample could read the sight phrase when given visual contextual support similar to that provided in the Sesame Street segment.

Posttest/Tape B

I. Lost Binoculars

Children who were considered to demonstrate a good understanding of this segment could recall the term "binoculars" and explain their function of letting one see things larger or smaller than normal. Thirty-three percent of the five year olds and twenty-two percent of the four year olds showed good comprehension. Another 33% recalled the binoculars as a "camera" which could see "birds, monsters, snakes." The rest of the children showed little understanding of the segment and gave answers revolving around the bird and/or Thelma.

II. How Things Work: Faucet

The four year olds demonstrated more understanding about the water faucet segment than the five year olds. Poor explanations consisted of labeling the drawing of the faucet incorrectly as "a water" or "a sink," not being able to show where the water came into the faucet and/or left it, giving segment-suggested incorrect explanations for how a faucet works. Of the fours, 33% gave poor explanations and of the fives, 56%.

III. Sight Phrases

Twenty-seven percent of the four year olds recognized the sight phrase "WET PAINT" when presented with visual clues. Eighty-nine percent of the five year olds also read the phrase correctly.

IV. Recognition of Lower Case Letters

Percent of Subjects Who Identified Letter Correctly

	Age Group		
Letter	4 years	5 years	Total Group
b	55%	44%	50%
c	64	56	60
f	45	56	50
g	27	33	30
j	55	33	45

V. Auditory Discrimination of Initial Sounds

Percent of Subjects Who Discriminated Initial Sounds Correctly

Initial Sound	Age Group 4 years	5 years	Total Group
b	27%	44%	35%
c	27	33	30
f	36	66	50
g	55	79	65
j	27	56	40
	35	56	44

VI. Comprehension of Signmaker's Role

When shown the cardboard mock-up of the Signmaker character and asked what he was doing in the show, almost all of the children answered "painting." The "WET PAINT" segment was vividly recalled. In response to probing questions concerning Signmaker's other activities, 44% of the five year olds and 18% of the four year olds demonstrated an understanding that Signmaker "reads signs," "changes the mixed-up letters" to read them "better," or "changes the letters to say different names." The rest of the children either ignored Signmaker's interaction with the letters and recounted the "story line" or gave a confused interpretation about what he was doing (e.g.,"reading with his hands"; "making wet paint," "messing up the letters."

VII. Auditory Discrimination of Separate Sounds in Words - Blending

Percent of Subjects Who Identified Words Correctly

Word	Age Group 4 years	5 years	Total Group
m-op	55%	33%	45%
b-at	9	22	15
f-u-n	36	44	40
h-e-l-p	64	56	60
	41	39	40