Assessed were the effects of verbal placeholding and full verbal rehearsal (verbalizing aloud the critical components and sequence) on the direction following behavior of 14 institutionalized retarded adolescents (mean IQ 48). A control group from the same institution participated in practice sessions without the verbal rehearsal stress. Pre- and posttest measures of correctly followed and sequenced directives indicated that both practice and rehearsal strategies facilitate direction following performance. Three appendixes provided details of testing situations. (CL)
THE DIRECTION FOLLOWING BEHAVIOR OF MENTALLY RETARDED ADOLESCENTS AS A FUNCTION OF VERBAL REHEARSAL

Casper L. Ferneti, Jennifer F. Holvoet, Dennis J. Tucker, James R. Lent, Ingo Keilitz

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These working papers are intended primarily as informal research communications to and among members of the Research staff. They may contain hypotheses, study proposals, reports of a study, critiques, etc., at any stage of refinement. Persons outside the Research staff are free to contribute to the series but distribution outside the Research staff is at the discretion of the authors.
Introduction

Following directions is a critical adaptive skill which has functional value in a variety of settings. Sokolove and Girardeau (1972) surveyed eleven employers of retarded individuals and reported that 100 percent of the employers they interviewed considered direction following an important skill. The retarded, however, do not follow directions as well as nonretarded individuals (Lent, Holvoet, Ferneti, Keitelz, and Tucker, 1972).

Attempts to ameliorate direction following deficits in the retarded have not been reported in the literature. Therefore, since direction following necessarily involves the processing of input information over short periods of time, research on the short-term memory of mentally retarded individuals seems directly related to the problem of direction following for the retarded.

It has been suggested that the short-term memory of the mentally retarded is deficient in at least two aspects: 1) the manner in which they acquire or store information, and 2) the manner in which they retrieve information from their memory stores (Butterfield, Wambold, and Belmont, 1972). Surprisingly, retention does not seem to be responsible for recall deficits in the retarded since the retarded and nonretarded alike demonstrate equal forgetting (Belmont and Butterfield, 1969; 1971a) have identified both active and passive components of information acquisition and have shown that these are associated with differential recall. This suggests two memory systems which differ in the manner in which information is acquired, retained, and retrieved. These two memory systems appear to be similar to the primary and secondary memories identified by others (Waugh and Norman, 1965; Ellis, 1970). The primary system consists of passive acquisition, short retention, and quick retrieval. In contrast, the secondary system is characterized by acquisition through active rehearsal, long retention, and systematic time consuming retrieval.
research indicates that retarded and nonretarded children and adults are somewhat comparable in the manner in which they use their primary systems. The retarded, however, presumably do not use their secondary systems nearly as well as the nonretarded (Belmont and Butterfield, 1969; 1971a; 1971b; Ellis, 1966). Belmont and Butterfield (1969) further state that the principle reason retardates are inferior to normal adults in short-term memory functioning is that the retardates use fewer active acquisition strategies. Kellas (1972) reports that third and fifth graders rehearse aloud in the same fashion as when they rehearse silently. Seventh graders, however, show differences in silent and vocal rehearsal indicating that their rehearsal activity cannot be successfully externalized. It may be that retarded and younger nonretarded individuals of comparable mental age (MA) rehearse aloud or silently in the same fashion.

The purpose of this study was to assess the effects of verbal placeholding and full verbal rehearsal (numbering aloud the position of a directive in a directive set and verbalizing aloud the critical components of each directive in the set, such as, one, show me two combs; two, find (the) hammer) on the direction following performance of retarded individuals.

**Method**

**Subjects**

The 26 subjects who participated in this study were residents of the Parsons State Hospital and Training Center in Parsons, Kansas. The subjects ranged in chronological age (CA) from 14.1 to 17.1 years (mean CA = 16.4 years). Their WISC Full Scale IQ scores ranged from 40 to 58 (mean IQ = 48.1). This data includes converting of WISC Full Scale scores into IQ's following Ogden (1960).

**Materials**

The stimulus materials consisted of 1360 directives in sentence form distributed into six sets, 154 common objects, and a bookshelf. The bookshelf, containing 146 objects, was constructed with five shelves of varying depths permitting
The visibility of objects on the shelves (see Appendix A). Only the second, third, and fourth shelves were used to hold objects. Numbered locations on the shelves allowed for the consistency and facilitation of object placement on all shelves (see Appendix B).

Of 1360 imperative sentences were constructed from a list of 154 nouns, 94 verbs, 14 adjectives, and 11 prepositions (see Appendix C). Each of these sentences, in all phases except the screening phase, had one of three basic structures:

a) verb + noun phrase + prepositional phrase;

b) verb + two noun phrases; or

c) verb + prepositional phrase.

The 1360 sentences generated were then distributed into sets: one or more sentences (directives) were presented serially to the subject as a complex stimulus unit prior to the attempt at direction following. For the pretest for training and four baselines, 125 different objects and 490 different directives in sentence form were arranged into 225 sets containing 1, 2, 3, 4, and 5 separate sentences. In each session, 20, 10, 6, 5, and 4 presentations were used respectively. Materials for the pretest and posttest for generalization consisted of different objects and directives than those used for pretest and posttest training. The 29 objects and 5 directives in sentence form were arranged into 45 sets containing 1, 2, 3, 4, and 5 separate sentences; 20, 10, 6, 5, and 4 presentations were used respectively.

The 15 training units consisted of the directives in sentence form and the 125 objects employed in the pretest for training and baseline. The sentences, however, which consisted of 870 directives, were arranged into 105 sets containing 2, 3, and 4 separate sentences; 10, 6, and 5 presentations were used respectively.

Fifty moderately retarded adolescents were initially screened to ensure correct recognition of all nouns, verbs, adjectives, and prepositions listed in Appendix C. Subjects who failed a test item were informed of the correct response. If a subject
the same item on three consecutive trials the subject was dropped. The subject reached criterion when every item was responded to correctly on two consecutive trials. Subjects were given one token for every five correct responses at the end of a session, the tokens were exchanged for pennies at the rate of 10 tokens per penny. Twenty-seven subjects met criterion and were randomly assigned to one of two treatment groups.

Training pretest and a generalization pretest were administered to all subjects individually in the presence of two experimenters: 1) an interacting experimenter (IE) and 2) a non-interacting experimenter (NE). Both experimenters simultaneously, but independently, recorded data for each subject; however, only the IE interacted verbally with the subjects.

As each subject entered the experimental room, he or she was greeted by the IE who said:

I am your teacher and he (pointing to NE) is your other teacher. We're going to play a game. I want you to sit in your chair while I ask you to do some things. Then, you do what I tell you in the right order. Do the best you can. Listen carefully.

Immediately following this introduction, each subject was instructed to respond to a directive set containing two imperative sentences. This set served as an exemplar and was not recorded. If the set was performed appropriately the IE proceeded with the experimental session. If the subject erred in the performance of the example, the IE repeated the sample directives, provided the subject with feedback concerning the appropriateness of his responses, and proceeded with the first experimental set if the subject's behavior was appropriate. If the subject erred once again, the NE modeled the desired behavior and the IE asked the subject to attempt following the sample directive once again. Regardless of the appropriateness of this final exemplar the IE proceeded to present the first experimental directive.
Directives were presented orally by the IE to each subject. Each presentation of a set was preceded by the IE saying, *This time I'm going to ask you to do \( n \) things.* The number of separate directives in a forthcoming set determined the value of \( n \). Each set was presented in its entirety before the subject was permitted to respond. The following time intervals, after the presentation of the last directive in a set, were allowed for the initiation of the subject's direction following behavior:

1) single directives \(-\) 5 seconds;
2) two directive sets \(-\) 10 seconds; and
3) five directive sets \(-\) 25 seconds.

If a subject exceeded these limits he or she was asked to begin the performance of the directive(s) at that time.

Each performance of a directive was observed and recorded by the IE and the NB. The reinforcement schedule was as follows:

a) If one directive was given and the subject responded correctly, the subject was given one token.
b) If two directives were given, the subject had to follow both directives correctly to receive two tokens.
c) If three directives were given, the subject had to follow all three correctly to receive three tokens, otherwise, he received none.
d) When four or five directives were given, the subject had to perform at least three correctly to receive tokens. Each subject was given three, four, or five tokens according to the number of correct responses.

Responses to multiple directives were reinforced when the subject followed the directives in the designated sequence regardless of omissions. Tokens were exchanged for pennies at the end of each session at the rate of five tokens per penny.


tables

Five sets of stimulus sentence materials were administered to all subjects.


tables

The 27 subjects were randomly assigned to one of two training conditions: a) training rehearsal and placeholding; b) training control. Due to illness one
subject in the training control group was lost.

With the training rehearsal and placeholder group, two E's were present and recorded data for the first two training sessions and at scheduled intervals thereafter. The IE was designated to interact with a subject during training and all subsequent phases of the program.

When the subject arrived, the IE greeted him. Then the IE set up the items of the appropriate training set on the bookshelves with the subject watching. The items were set up as shown in Appendix B. Similar items were placed together, one inside the other, where appropriate. The subject and the IE then went to their respective seats around the table. The bookcase, NE, IE, subject, and tokens were positioned as shown in Figure 1. Data sheets were placed in the laps of both E's.

The IE then said,

> Sometimes people have trouble remembering what other people tell them. But there are things you can learn to do to help you remember better. One way is to count the things you have to do, then you'll know how many things you have to remember. Another way to remember better is to repeat what I tell you to do, out loud. So every day when you come over here, we're going to practice counting and saying, out loud, what I tell you to do. Let (NE) and I show you what I want you to do.

The demonstration was given as follows: the IE said,

_(NE)_ Give me the penny.
  Show me the ashtray.
  Turn over the block.

Immediately, the NE said,

One, give you the penny.
Two, show you the ashtray.
Three, turn over the block.

The NE walked to the bookcase and performed as directed while verbalizing as above. The IE then said,

Every time you do just like (NE) did, you'll get tokens. (The IE then held up the token.)

There was a maximum number of three tokens given for each directive in a set:
Figure 1

Definitions of the Bookcase and the IE, NE, and S Tokens During Training

Bookcase
(open side)

IE

S

Tokens
for rehearsing and counting correctly, one for correct motor response, and for correct sequence (given only when directive was followed correctly). It explained to the subject exactly why he received each token in the following way:

Here are three tokens for counting and saying everything right and here are six more for doing everything right. When we get all done today, we'll count how many tokens you have and you can exchange them for pennies. O.K., listen carefully and remember to count and say it all back to me.

After a brief pause, the IE gave the following example:

Give me the penny.
Show me the ashtray.
Turn over the block.

The IE then waited for a complete rehearsal, prompting if necessary, and watched the student do the task. If the subject omitted repeating or counting, the desired behavior was again modeled by the IE and NE and the subject was given the example again. No matter what the result, the IE put the appropriate number of tokens in front of the subject and continued with the first item in Training Group.

Tokens were exchanged for pennies at the end of each session at the rate of ten tokens per penny. Each session lasted a maximum of 30 minutes. The training progressed until each subject had achieved the criterion of less than 10 percent variation in performance across similar sets for three consecutive complete training sessions or had completed 15 training sessions. All subject's failed to meet the first criterion and were tested for 15 complete training sessions.

IE's were present with the training control group and recorded data for the first two training sessions and at scheduled intervals thereafter. The IE was instructed to interact with a subject during training and all subsequent phases of the program.

When the subject arrived, the IE greeted him and set up the items of the
iate training set on the bookshelves with the subject watching. The items were set up as shown in Appendix B. Similar items were placed together, one inside the other, where appropriate, and boxes which contained items were opened so that the objects inside could be seen. The subject and IE then went to their respective seats and the table. The bookcase, NE, IE, subject, and tokens were positioned as shown in Figure 1. Data sheets were placed in the laps of both S's.

The IE then said,

*Sometimes people have trouble remembering what other people tell them. One way to remember better is to practice remembering things everyday. So when you come over here, we're going to practice remembering. I'll tell you to do some things, then you think about what you're going to do, then get up from your chair and do them.*

The IE then gave a three-part example and continued:

*Everytime you remember what I told you to do and do it in the right order, you'll get tokens.*

The IE then held up a token and said,

*When we get all done today, we'll count how many tokens you have and you can exchange them for pennies. O.K., listen carefully.*

After a brief pause, the IE gave the first set of directives. The appropriate number of tokens were placed on the table in front of the subject and he was told exactly why he received them. There was a maximum of three tokens given for each directive: two for correctness and one for exact sequence. The tokens were exchanged for pennies at the end of each session at the rate of ten tokens per penny.

Each session lasted a maximum of 30 minutes. The training progressed until each subject had achieved the criterion of less than ten percent variation in performance across similar sets for three consecutive complete training sessions, or had completed 15 training sessions. All subject's failed to meet the first criterion and were tested for 15 complete training sessions.

*Posttest*

The posttest was a replication of the pretest in procedure and use of stimulus
Results and Discussion

The data were analyzed from training and generalization performance in terms of the number of directives correctly followed and the number of directives correctly sequenced by the experimental (placeholder and rehearsal) and control (practice) groups. Since each subject was presented more than one set of directives containing the same number of separate directives in each session, the average performance of each subject on a particular set for each session was considered a single data point for convenience in recording data for both correctness and sequence. The performance data for seven subjects from eight sessions were randomly selected to assess interobserver reliability. The number of agreements divided by the total exceeded 0.90 in all eight instances.

Correctness

A 2 x 2 x 5 (groups x conditions x sets) analysis of variance revealed a statistically significant set difference within subjects (F(4, 88) = 133.43, p < .001) as well as a significant pretest and posttest difference within subjects (F(1, 22) = 5.99, p < .025). The significant difference in performance within subjects and across sets reflects the varying degree of difficulty between directives. The significant pretest and posttest differences within subjects indicate that practice and rehearsal strategies facilitate performance.

Generalization was also assessed with a 2 x 2 x 5 (groups x conditions x sets) analysis of variance. This analysis resulted in a significant set difference within subjects (F(4, 88) = 112.98, p < .001) and a significant pretest and posttest difference within subjects (F(1, 22) = 7.55, p < .025). Since the generalization performance data so closely resembles the correctness performance data, it is questionable whether these two measures reflect different dependent variables and, once
both practice and rehearsal strategies seem to facilitate performance. In addition a post hoc analysis was performed on the training and generalization data from experimental (high IQ and low IQ) and control (high IQ and low IQ) groups to bring to light more meaningful implications of the correctness results of this analysis are presented in Table 1. Once again there is a distinct similarity between the results of the training performance and the generalization performance data. Both indicate that practice with the high IQ group and rehearsal with the low IQ group facilitate performance. Significant differences were found on training performance with the high IQ practice group and on generalization performance with the high IQ practice group and the low IQ rehearsal group. These results suggest that the artificially imposed strategy of rehearsal could have interfered with the high IQ group who presumably were attempting to implement strategies of their own. Conversely, the low IQ group, seemingly lacking in a strategy, utilized rehearsal and were able to benefit from it.

The final analysis of the correctness data involved the serial position of directives correctly followed in sets of two, three, four, and five. The percentages of directives correctly followed are for the various sets presented in Figure 2. Figure 2 illustrates the similarity of serial position effects between the two groups and within the two groups before and after training. Strong primacy and recency effects can also be noted. While an extremely strong recency effect can be seen for all groups performing on sets with four directives, a comparable primacy and recency effect can be noted for all groups performing on sets with five directives. It is unclear as to why these two curves should vary so markedly. It can be hypothesized, however, that with increasing levels of difficulty recency effects are gradually replaced by primacy effects.

Sequence

The sequence in which directives were appropriately followed was scored in terms of an index reflecting the extent of deviation from the proper sequence of
Table 1

Pretest to Posttest Change in Generalization Performance

<table>
<thead>
<tr>
<th>CATEGORIES</th>
<th>TOTAL N PER GROUP</th>
<th>IMPROVED</th>
<th>WORSE</th>
<th>NO CHANGE</th>
<th>CRITICAL VALUE*</th>
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<tbody>
<tr>
<td>REHEARSAL HIGH IQ</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>0</td>
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Pretest to Posttest Change in Training Performance

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<th>TOTAL N PER GROUP</th>
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<th>WORSE</th>
<th>NO CHANGE</th>
<th>CRITICAL VALUE*</th>
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<td>3</td>
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<tr>
<td>PRACTICE HIGH IQ</td>
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<td>6</td>
<td>0</td>
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<td>.016</td>
</tr>
<tr>
<td>REHEARSAL LOW IQ</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>.062</td>
</tr>
<tr>
<td>PRACTICE LOW IQ</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>.344</td>
</tr>
</tbody>
</table>

Figure 2

Serial Position Curve

Protest exp.
Protest control
Posttest control
sequences within a set. A score was recorded for every appropriately performed directive only if it was preceded by another directive which properly belonged earlier in the sequence. For example, a three-directive set properly sequenced in the order 1, 2, 3 was scored 2 + 1 = 3 indicating that two directives (2 and 3) properly occurred later in the sequence than Directive 1, and that one directive (3) properly occurred later in the sequence than Directive 2. Similarly, a five-directive set sequenced in the proper order (1, 2, 3, 4, 5) was scored 4 + 3 + 2 + 1 = 10 reflecting the fact that four directives (2, 3, 4, 5) occurred properly sequenced later than Directive 1, three directives occurred after Directive 2, etc. An improperly sequenced set of directives, such as a four-directive set performed in the order 4, 2, 3, 1 was scored 0 + 1 + 0 = 1 indicating that only Directive 3 followed a directive which occurred earlier in the proper sequence. Omissions and incorrectly followed directives occurred quite frequently in the performance of both groups and were not scored. For example, a three-directive set performed in the order 1, 2, 3 received the same score (2 + 1 = 3) as a four-directive set performed in the order 1, 2, 4 although Directive 3 was omitted in the latter set.

A 2 x 2 x 4 (groups x conditions x sets) analysis of variance revealed a significant pretest and posttest difference within subjects (F(1,22) = 4.94, p<.05). Apparently, both practice and rehearsal strategies facilitate sequence performance.

Generalization was also assessed with a 2 x 2 x 4 (groups x conditions x sets) analysis of variance. This analysis reflected a significant pretest and posttest difference within subjects (F(1,22) = 9.68, p<.01). The similarity of results between training performance and generalization performance suggests once again, that in effect, what was once considered to be two measures on two dependent variables resulted in the possibility of two measures on one dependent variable. A post hoc analysis of the sequence data performed by dividing each group into
Table 2

Pretest to Posttest Change in Generalization Sequence

<table>
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<th>CATEGORIES</th>
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Pretest to Posttest Change in Training Sequence

<table>
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of high and low IQ resulted in a significant pretest and posttest differ-
ence in the high IQ practice group on generalization performance. The results
of analysis are presented in Table 2.

Moderately retarded apparently profit from intervention in their direction
performance. The results of this study did not confirm the expectation
strategy of placeholding and overt rehearsal would facilitate performance.
Peterson (1972) stated that memory is negatively influenced by processing deficits
in retarded and that a training procedure must be tailored to the retardates
existing mode of information processing. Similarly, the results of this investi-
gation suggest that both practice and rehearsal differentially influence performance.
It seems questionable that consideration of a single rehearsal strategy alone can
facilitate performance in retarded individuals with varying intelligence (IQ) and
modes of processing information.

If the processes underlying direction following are comparable to those related
to memory, then several components pertaining to performance must be considered.
Buttersfield, Wambold, and Helmont (1972) mention that active rehearsal along with
sequencing active and passive rehearsal strategies and appropriate retrieval stra-
tegies are all critical to performance. A better understanding of these factors
could permit the recognition of more appropriate rehearsal strategies.
References

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Bookshelf for Stimulus Objects
Numbered Locations of Arrangement of Objects on Shelves

Second Shelf

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Third Shelf

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Fourth Shelf

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<td>-------------</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.</td>
<td>2 cows</td>
<td>(black, white)</td>
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<td></td>
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</tr>
<tr>
<td>2.</td>
<td>3 elephants</td>
<td>(big, med, little)</td>
<td></td>
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</tr>
<tr>
<td>3.</td>
<td>2 watches</td>
<td>(big, little)</td>
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<td>3 balloons</td>
<td>(1 big, 2 little)</td>
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<td></td>
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<tr>
<td>5.</td>
<td>2 cups</td>
<td>(big, little)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>2 mirrors</td>
<td>(pink, yellow)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>2 angels</td>
<td>(pink, white)</td>
<td></td>
<td></td>
<td></td>
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<td>8.</td>
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<td>(big, little)</td>
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<th>Set 4</th>
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<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
</tr>
<tr>
<td>2</td>
<td>2 green, 1 yellow</td>
<td>3 green, 1 yellow</td>
<td>3 green, 1 yellow</td>
<td>3 green, 1 yellow</td>
</tr>
<tr>
<td>3</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
</tr>
<tr>
<td>4</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
</tr>
<tr>
<td>5</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
<td>1 big, 2 little</td>
</tr>
</tbody>
</table>

Second Shelf
<table>
<thead>
<tr>
<th>Set 1</th>
<th>Set 2</th>
<th>Set 3</th>
<th>Set 4</th>
<th>Set 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>eraser</td>
<td>cowboy</td>
<td>2 bandannas</td>
<td>hammer</td>
<td>2 envelopes</td>
</tr>
<tr>
<td>pipe</td>
<td>thread</td>
<td>screwdriver</td>
<td>worm</td>
<td>pen</td>
</tr>
<tr>
<td>scissors</td>
<td>scissors</td>
<td>scissors</td>
<td>eggbeater</td>
<td>stamp</td>
</tr>
<tr>
<td>spoon</td>
<td>2 envelopes</td>
<td>washing</td>
<td>shoe stringing</td>
<td>stationery</td>
</tr>
<tr>
<td>clothpin</td>
<td>carrot</td>
<td>saw</td>
<td>top</td>
<td>2 bandaids</td>
</tr>
<tr>
<td>tape</td>
<td>tractor</td>
<td>salt shaker</td>
<td>boat</td>
<td>iron</td>
</tr>
<tr>
<td>(drinking)</td>
<td>chicken</td>
<td>coat</td>
<td>house</td>
<td>cards</td>
</tr>
<tr>
<td>glass</td>
<td>2 flags (big, little)</td>
<td>perfume</td>
<td>chain</td>
<td>cards</td>
</tr>
<tr>
<td>sponge</td>
<td>flags (big, little)</td>
<td>perfume</td>
<td>iron</td>
<td>cards</td>
</tr>
<tr>
<td>16. 3 cars</td>
<td>17. worms</td>
<td>18. pencils</td>
<td>19. pencils</td>
<td>20. pencils</td>
</tr>
</tbody>
</table>

Third shelf
<table>
<thead>
<tr>
<th>Set</th>
<th>Item 1</th>
<th>Item 2</th>
<th>Item 3</th>
<th>Item 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.</td>
<td>2 pans</td>
<td>(big, little)</td>
<td>coloriwbook</td>
<td>tablet</td>
</tr>
<tr>
<td>20.</td>
<td>newspaper</td>
<td></td>
<td>toilet paper</td>
<td>record</td>
</tr>
<tr>
<td>21.</td>
<td>pencil</td>
<td>pencil</td>
<td>pencil</td>
<td>pencil</td>
</tr>
<tr>
<td>22.</td>
<td>pencil</td>
<td>pencil</td>
<td>pencil</td>
<td>pencil</td>
</tr>
<tr>
<td>23.</td>
<td>pencil</td>
<td>pencil</td>
<td>pencil</td>
<td>pencil</td>
</tr>
<tr>
<td>24.</td>
<td>paper</td>
<td>paper</td>
<td>paper</td>
<td>toothbrush</td>
</tr>
<tr>
<td>25.</td>
<td>paper</td>
<td>paper</td>
<td>pencil</td>
<td>toothbrush</td>
</tr>
</tbody>
</table>

- **Fourth Shelf**

Generalization Set

- **Set 1**
  - 19. 2 pans (big, little)
  - 20. newspaper
  - 21. pencil
  - 22. pencil
  - 23. pencil
  - 24. paper
  - 25. paper

- **Set 2**
  - 19. 2 pans (big, little)
  - 20. newspaper
  - 21. pencil
  - 22. pencil
  - 23. pencil
  - 24. paper
  - 25. paper

- **Set 3**
  - 19. 2 pans (big, little)
  - 20. newspaper
  - 21. pencil
  - 22. pencil
  - 23. pencil
  - 24. paper
  - 25. paper

- **Set 4**
  - 19. 2 pans (big, little)
  - 20. newspaper
  - 21. pencil
  - 22. pencil
  - 23. pencil
  - 24. paper
  - 25. paper

- **Set 5**
  - 19. 2 pans (big, little)
  - 20. newspaper
  - 21. pencil
  - 22. pencil
  - 23. pencil
  - 24. paper
  - 25. paper
List of Verbs, Prepositions, and Adjectives Used to Generate Experimental Sentences

<table>
<thead>
<tr>
<th>Verbs</th>
<th>Prepositions</th>
<th>Adjectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>give</td>
<td>next to</td>
<td>green</td>
</tr>
<tr>
<td>hand</td>
<td>in</td>
<td>two</td>
</tr>
<tr>
<td>go get</td>
<td>under</td>
<td>big</td>
</tr>
<tr>
<td>draw</td>
<td>beside</td>
<td>blue</td>
</tr>
<tr>
<td>fold</td>
<td>in front of</td>
<td>some</td>
</tr>
<tr>
<td>bring</td>
<td>behind</td>
<td>yellow</td>
</tr>
<tr>
<td>take</td>
<td>above</td>
<td>large</td>
</tr>
<tr>
<td>put</td>
<td>beneath</td>
<td>one</td>
</tr>
<tr>
<td>paint</td>
<td>over</td>
<td>little</td>
</tr>
<tr>
<td>cut</td>
<td>on</td>
<td>small</td>
</tr>
<tr>
<td>mix</td>
<td>inside</td>
<td>all</td>
</tr>
<tr>
<td>mix up</td>
<td></td>
<td>white</td>
</tr>
<tr>
<td>wrap up</td>
<td></td>
<td>pink</td>
</tr>
<tr>
<td>spray</td>
<td></td>
<td>black</td>
</tr>
</tbody>
</table>
List of Nouns Used to Generate Experimental Sentences

1. cow 41. chain 81. mirror 121. chalk
2. cup 42. fork 82. crown 122. paperclips
3. spoon 43. pen 83. hairbrush 123. truck
4. grapes 44. shoestring 84. zipper 124. jacks
5. key 45. scissors 85. shoe 125. frog
6. ball 46. worm 86. flashlight 126. knife
7. safety pin 47. kleenex 87. lightbulb 127. matches
8. plate 48. coloring book 88. leaves 128. soap
9. pocketknife 49. ashtray 89. ribbon 129. flower
10. tootbbrush 50. dishrag 90. flag 130. sponge
11. cards 51. door 91. coat 131. glass (drinking)
12. Indian 52. ear 92. salt shaker 132. tape
13. crayons 53. chair 93. saw 133. clothespin
14. stamp 54. bird 94. washrag 134. bib
15. ruler 55. thimble 95. thread 135. pipe
16. car 56. ring 96. bandaid 136. eraser
17. bracelet 57. padlock 97. corn 137. sock
18. pencil 58. key 98. record 138. construction paper
19. knife 59. rabbit 99. banana 139. candle
20. plate 60. dice 100. sack 140. paintbrush
21. Indian 61. boy 101. toilet paper 141. glove
22. toothbrush 62. dog 102. fan 142. newspaper
23. cards 63. boat 103. mouth 143. hair
24. crayons 64. boat 104. floor 144. doorknob
25. stamp 65. padlock 105. pliers 145. watch
26. ruler 66. key 106. chicken 146. angel
27. car 67. door 107. tractor 147. roller (hair)
28. bracelet 68. rabbit 108. carrot 148. spool
29. pencil 69. hammer 109. envelope 149. hot dog
30. knife 70. screwdriver 110. sheep 150. glasses (eye)
31. plate 71. hammer 111. cowboy 151. spider
32. Indian 72. tablet 112. purse 152. hat
33. toothbrush 73. gun 113. belt 153. girl
34. cards 74. towel 114. tool box 154. butterfly
35. crayons 75. comb 115. pear 155. butterfly
36. stamp 76. orange 116. tomato
37. ruler 77. apple 117. axe
38. car 78. eye 118. wall
39. bracelet 79. cutting 119. nose
40. pencil 80. elephant 120. balloon