OUTLINE FOR
REVIEW OF RECENT RESEARCH ON
SCHEMA AND SCRIPT LEARNING

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OUTLINE FOR

Review of Recent Schema-Learning Research

I. Introduction

A. I came from verbal learning tradition. More excitement in the inf. processing approach, led to HAM.

B. Concern with memory for facts expressed in sentences.

C. Evidence for learning of propositional units. Moving on to study of use of larger clusters of knowledge in learning--frames, scripts, generally schema.

C. I'll review experimental work on schema and scripts.

II. Schema Theory

vg 1 1. Are data structures for representing generic concepts--for objects, situations, actions or events, sequences of events or actions

2. Schema is like a stereotype, containing the network of inter-relations that hold generally among the parts of the schema.

3. Four essential characteristics of schemata that make them powerful for representing knowledge; they

a) have variables (slots) with relative constraints; also default values.

b) can embed one schema inside another; have hierarchy

c) represent generic concepts which, taken all together, vary in their level of abstraction;

d) represent world knowledge, not just linguistic definition.

4. Process of instantiation: means assigning input values to the variables of the schema. Can do by productions:

If LX GIVES LY to LZ ⟶ set up propositional graph

structure LX PTRANS LY from LX to LZ and LZ possess LY

5. One may further instantiate the subschema of the top-level verb eg. exchange ⟶ mutual give ⟶ reciprocal poss. changes

   - Perhaps "deep processing" or imaging or semantic elaboration means to be doing this unpacking into lower primitives.

   - But do not have to so unpack the event if don't desire.

B. Logically, schema could have five different effects on memory and we shall look for evidence of these.

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1. The activated schema could determine what objects are looked at, what you notice and encode about a pattern.

   E.G. For face schema, look in center for nose, above for eyes, below for mouth.

   - Neisser's view of perceptual cycle.

2. A schema can act as a framework or scaffolding within which to fit new, episodic information,

   - requires a matching or correspondence-finding mechanism.

   e.g., the contents of a Western meal, or a hotel room.

3. The schema can provide schema-based information that can become integrated with episodic information.

   e.g., clock-hands are on a clock; head has 2 ears

4. A schema can guide the retrieval process. e.g., it suggests a systematic set of category cues for prompting one's recall of the slot fillers of an episode. e.g., "Setting, characters, goals" as cues in a narrative.

5. A schema can determine what information is communicated at output. In answering question, answerer assumes the questioner has a particular concept or schema in mind, and so refers to slots in that schema using "the" ("the floor") to refer to definitely presupposed objects and "a painting" to refer to nonschema objects.

C. To study schema and their use experimentally, we have two options: first, to use pre-existing schemas; second, to build up synthetic schemas from examples as a form of "concept abstraction".

1. In working with pre-existing schemas, we first evaluate them normatively as LTM structures. Then see how they are used by typical subjects in encoding specific episodes, in transfer, RI/PI, etc.

2. In working with synthetic schemas, one can vary the nature of the schema, the examples, the training series, and examine how the final product is formed, and how its properties vary with training.

D. I will illustrate several lines of research of both kinds. First, I will talk about the "student office" room frame in LTM, and observations about its use. From a paper by Bill Brewer and James Treyens. People have certain expectations about rooms in general, and more specifically, "graduate student offices in the psychology department". (Show picture)
vg 3 The room was arranged to have a table with a typewriter, standard desk items; another table with a coffee pot and materials for making coffee; a third table held a Skinner box, tools, and electronic parts. Shelves along one wall, posters, a bulletin board. Many objects placed there were believable; some objects were inconsistent with the office schema (e.g., toys, a skull), and some expected items were missing (e.g., no books).

1. First, a normative set of Ss were taken into the room, given a rating sheet containing 130 objects (60 present, 70 absent), and asked to give two ratings:

   - (a) Rate each object (1-6 high scale) for how noticeable that object is (or would be) in this room--(done even for 70 objects not in the room)--called "saliency" measure; and also

   - (b) Rate each object for how likely it would be to appear in a room such as this. (Ignore whether it is in the room or not). Called "Expectancy" measures.

The sheet contained 61 presented objects (including the 7 room-frame items of: walls, floor, ceiling, door, door knob, light switch, and lights) plus 70 not-present objects, selected to vary along the full range of both scales.

vg 4, 5

2. These ratings are shown on the right side in the next two pictures (* means absent). In general, the room frame items--door, walls, floor, etc.--are rated as high as possible on the expectancy scale. Also, saliency tends to be negatively correlated with expectedness (about -.50.)

3. Saliency of an object seems affected both by its unexpectedness in context, and by its intrinsic interest value e.g., a gun, a skull, striking posters, large-sized things.

4. Note that Exp. ratings are sensitive to specific "grad psych student's office", since "experimental apparatus" rates high.

E. In the experiment proper, Ss meet the grad student E who told them to "wait in my office" (for 35 seconds) while he saw if other experiment was ready. So, incidental exposure. Ss' taken to another conference room, and told to recall or recognize what was in the first office. Provided with an outline of office and told to draw it; or they gave verbal recall or recognition-memory ratings. Results:

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1. Both ratings correlated with recall; partial correlation between saliency and recall was .66; and between expectancy and recall was .68 with saliency partialled out.

2. There were several inferred objects in recall such as books or paper-clips or window or filing cabinets, all of which had high expectancy.

Note: Loftus and Mackworth (1978) and Alinda Friedman (1979) showed that Ss spend more time looking at nonschema (unexpected) objects, and that may account for better learning of highly salient objects.

3. In verbal description task, Ss were asked to describe the room as though to "someone who had never seen it". Got similar output as in drawing condition; also found partial correlations of .64 between saliency and recall, and .55 between expectancy and recall (excluding room frame objects)

   - (a) Intruded, added objects were schema-expected, and placed in standard location. e.g., "books" were put on shelves, scotch-tape dispenser on desk.

F. The language of the descriptions was interesting.

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1. Writers tended to follow Grice's "maxim of Quantity", to be as informative as required by listener, but not more informative than required. This means one should mention some feature only if it differs from the default value for that object. Thus, hardly any subject "recalled" room frame items like walls and ceiling. But when recalling a child-sized chair, most Ss mentioned its small size, but didn't mention the (normal) size of the desk in the room.

2. Same mentioning of unusual materials something was made out of--a "plastic" chair. Or an upside-down road sign.

3. Thus, Ss omitted mentioning all sorts of auxiliary information a listener would be expected to have. e.g., the rectangular desk top, the height of the desk, etc.

4. Interestingly, Ss sometimes produced denials of schema expectations, such as "The room had no window" or "no blackboard", "no rug", that the desk was "not cluttered with knick-knacks". Are clear cases of schema expectations.

5. Also interesting use of a versus the articles: a is used to introduce an object into a conversation, whereas the is used for things already in shared knowledge of hearer and speaker.

   - (a) all frame-objects were usually referred to at the first mention by the; e.g., the door

   - (b) but all other nonframe objects were always introduced by a, except for a few "office frame" objects like desk, chair, typewriter.

   - (c) Thus, the Ss were acting truly as though they were describing the room for someone who'd never seen it.

G. In recognition memory: expectancy correlated .58 with recognition rating (with saliency partialled out), and saliency correlated with recognition rating at .60 (partial). (Here, frame could not be acting as a retrieval aid).

(a) Also, schema expectancy correlated +.52 with recognition rating of nonpresented items, suggesting more guessing of expected items

(b) Saliency of nonpresented items correlated -.36 with recognition rating, so S knew when a salient thing was not present in the room. Collins' "Lack-of-Knowledge" inference.

vg 8 H. Calculating Pr(Recall/"6" in Recognition) for Ss who did both, it correlated .56 with schema expectancy and not at all with saliency of the object.

(a) This suggests that recall is partly driven by use of the schema in a "generate-test for recognition" mode.

(b) For example, Pr(recall typewriter/recognition of 6) = .90 but Pr(recall skull/recognition of 6) = .50.

(c) Above stuff excludes the room-frame items, which were written in "recall" much less than they were "recognized" due to communication strategy.

(d) So percent recall given recognition is actually an inverted-U function of schema expectedness of the object. Lo end is down due to lack of retrieval cues; hi end is down due to communication suppression.

I. So, we have some evidence for several of our conjectured effects of schema.

1. Unexpected elements are looked at more and learned more.

2. More intrusions and false alarms to unpresented but expected objects.

3. Schema used to generate retrieval categories, since recall given recognition was higher for schema-consistent objects.

4. Schema definitely affected manner of referring to objects according to Grice's maxim of quantity.

III. Scripts as stereotyped action schema

vg 9 A. Scripts form by abstraction from repeated exposures to similar problem-solving situations.

B. Components of script are: place, characters, props, sequence of standard actions, results; main concepts.

C. Table of script norms from BBT:

vg 10

vg 9 again

1. Frequency of generation: is influenced by Grice's maxim of quantity causing suppression of somethings. But generation frequency correlates quite well with probability of recall of a piece of scriptal text.

2. Also, likelihood that an omitted action of a script text is intruded in recall increases with its generation frequency.

D. "Typicality of action in script" ratings collected by Graesser as were "necessity to script" ratings (correlated r = .92). These correlate somewhat with generation frequency. Typicality correlates with how quickly a person can decide whether a given action belongs to a cued script--Galambos and Rips found this. Typicality is a strong predictor of whether S will give a high recognition-memory rating to an item. Belezza and I have found this too. In fact, Graesser, Gordon and Sawyer (JVLVB, '79) found no memory discrimination for very typical events in script stories because of high false alarm rate to nonpresented typical actions.

E. There have been essentially two semi-models proposed to deal with recognition-memory for script-based texts.

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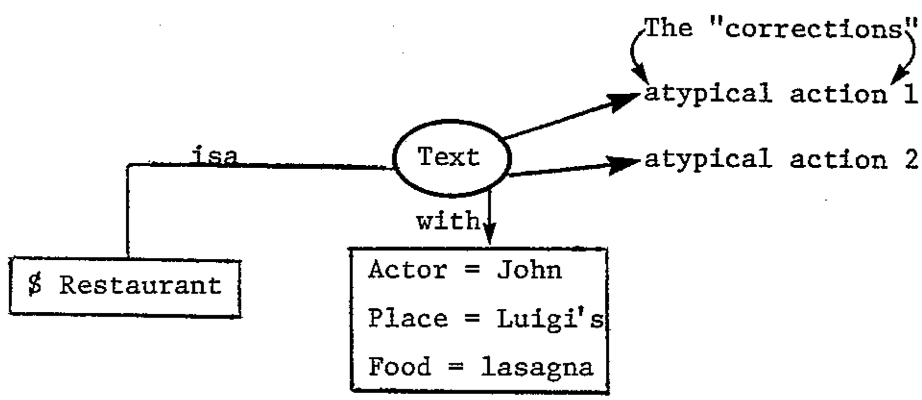
1. One is that of Graesser and it's like the old "schema plus correction" theories of Woodworth & Schlosberg

(a) It says that a text is represented by a node which points to the schema involved, to the new characters, props, etc., and to the unexpected, atypical actions ("the corrections").



(b) The likelihood that an event gets assimilated into the script is greater the more typical or necessary it is. Conversely, likelihood of separate storage and tagging increases with its unusualness or atypicality. (These new links decay with forgetting time.)

(c) Recognition-memory decision about a test sentence is computed in three stages: (1) check whether this test event is listed as a "correction"; else (2) check whether its necessity in the script exceeds a threshold; else, (3) guess.

This certainly handles their data.

2. The alternative model by BBT was proposed earlier to deal with some other matters. It assumes all presented items in text are stored in an episodic-memory block along with reference to those script actions being instantiated. Two different instantiations of the same script, or slightly varying scripts, will point to the same abstract schema. (see Figure)

   (a) The sentences of each text are stored with links to the text name and to the script-action (if any) which they instantiate. (see Figure) Recall of script-instantiating actions is better because the script can cue their retrieval when the text link fails.

   (b) A recognition-memory judgment for probes of Text A is made in several stages:

      (1) test the probe sentence against the stored acts for Text A; if fail,

      (2) check abstract script action for its level of activation caused by recent usage, and say Old if above threshold; if fail,

      (3) guess Old with some small probability.

3. There's not much to choose between the Graesser and the BBT account except for the following points:

   (a) The BBT account provides for some specific text memory. Thus, it can keep somewhat separate track of two different instantiations--with different characters, props--of the same script. For example, a dinner of John at Luigi's vs. Sam at a French restaurant. vg 12a

   (b) Similarly, subjects do keep somewhat separate track of two versions of the same story told from different perspectives--the teacher vs. student at a class, the customer vs. waiter at a restaurant. These get somewhat confused, and probably more so than separate-event instantiations. vg 12b

   (c) Also, with repetition of the same text, Ss learn it, so get more accurate at distinguishing presented vs. nonpresented actions of a script. Phil Werner's experiment gave hits and false alarms for once-presented script actions h = .73, f = .17 and slow RT = 1.85 sec.; for twice presented script actions, h = .80, f = .06, and RT = faster at 1.75.

   (d) Also, when asked to judge whether an action was "plausible to happen" in a given script activity, those script-actions presented in a prior text were judged as plausible much quicker (1.75) than non-presented actions that were just as stereotypical (RT = 2.14 sec.).

   (e) These results give preference to something like the BBT theory.

F. Other results related to script chunking.

1. People can reliably segment script actions into scenes or functional groups, such as the restaurant, being seated, ordering the
vg 13 meal, eating, paying the bill, then leaving. Each scene is named by a "subgoal" and there is one main goal ("eating") for the whole script. The "importance" ratings of scenes is determined by their connection
vg 14 to the main goal. These scenes are organized into an action hierarchy.

2. More important event names are more readily verified as belonging to the script; e.g., "wedding" includes "couple exchanging marriage vows" (hi) versus "music is played" or "pictures are taken" (low)

3. Also, in a script-based text, recognition hits and false alarms increase with importance rating of the action, in such manner that discriminability (d') is slightly better for low-importance actions. This is like the typicality effect of Graesser et al.

4. An action in a given scene will draw more "Old" recognition judgments if other actions of that scene were mentioned in the text. Data from Masling, Barsalou & Bower gives:

			Nonpresented		
		Presented	Scene Instantiated	Scene not Instantiated	
Target Action	High Imp.	.73	.54	.46	Relative rating of "oldness"
	Low Imp.	.69	.36	.33	

5. John Black found an asymmetry in generalization errors between scene-level events versus their subordinate actions. Specifically, mention
vg 15 of a subordinate action in a text led to more false recognitions of its superordinate scene name than the reverse case, where mention of the superordinate in the text led to less false alarming to its subordinate actions.

   The idea is that the script-applier mechanism has to unpack and instantiate the entire script-scene whenever a subordinate action is to be understood; but mention of just the superordinate scene does not necessitate unpacking and activating its subordinate actions.

6. One experiment I did to show the integrity of scene chunks in memory was the analogue of the "click displacement" studies in sentence-constituent processing. We inserted several irrelevant, unrelated remarks (analogous to clicks) at various points in recital of actions within a scene in a text. The hope was that Ss in reconstructive memory would mislocate the irrelevant sentence towards the scene (chunk) boundaries. Unfortunately, no such tendencies were observed.

G. Results related to serial ordering within scripts.

1. Scripts are said to have a stereotyped order.

vg 16 2. People have difficulty learning a script-based text in which several actions are stated out of their normal order. In reconstruction, Ss move the out-of-order actions back towards their conventional serial position.

3. Another result is the "symbolic distance" effect found for script-actions by Galambos and Rips: S is given two actions (verbs) from a single script and told to choose the action which comes later (or earlier) in the script. The RT is shorter the greater is the "distance" between the times of the two actions in the underlying script. This is as though Ss were retrieving the serial positions of the text actions in a temporal series (the script), and comparing these serial locations by an internal psychophysics. Alternatively, each item could be compared to two ends of the script.

4. There has been several successful demonstrations of within-script "priming" effects on reading time and on reaction-time in recognition memory. However, the evidence has not been very strong for a graded effect of distance from a priming action to the target action.

vg 17 (a) Show the design of BBT experiment here, and its RT results for comprehension time.

(b) Ed Smith thought he could get a distance effect by keeping all the sentences in the script at the same level of generality shifts between levels is jarring to the reader.

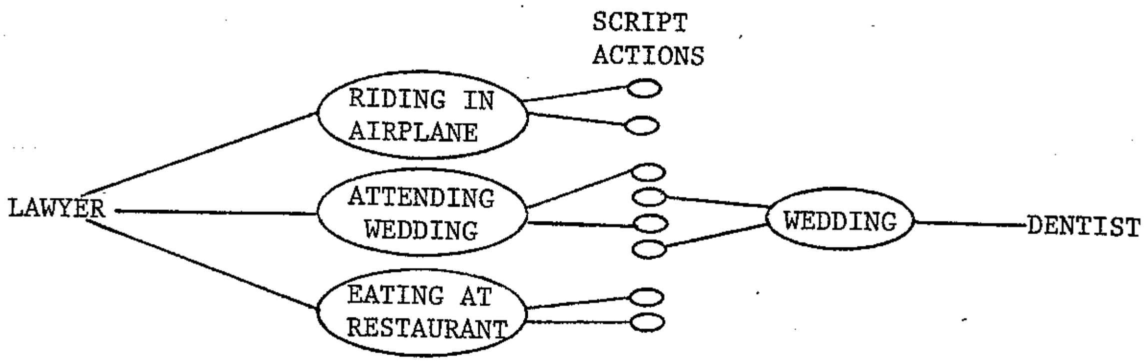
vg 18 (c) McKoon & Ratcliff (JVLVB, 1980, p. 379) reported a small (18 ms.) advantage in priming within an noun pair referring to actions that are adjacent vs. farther apart in the underlying script, using N2 (or N4)-N5 and N2 (or N6)→ N7. (Show their Table 5, p. 374). Mean RT for 2nd of close pairs was 684 msec. and was 702 msec. for the 2nd of far pairs. Unprimed items gave RT of 728 msec. So there was a priming effect but the "graded distance" effect was not impressive. This priming effect might work better in semantic memory judgments like those of Galambos & Rips.

H. Miscellaneous results with scripts.

vg 19 1. If read S a scrambled list of actions from 4 scripts in unordered mess, in free recall Ss are very likely to reconstruct the list by grouping together the actions from the same script ("clustering") and also ordering them in the conventional order. This result does not happen if scripts are interleaved in correct temporal order; Ss then just cycle through the several scripts, picking off consecutive actions.

2. In recall, script interrupting or interfering actions (needing repair) are better recalled than are errors or irrelevant distractions.

vg 20 3. Reder and Anderson found that RT to verify a scriptal fact about a person increased with the number of scriptal facts learned about him provided the falses were so arranged as to require refined memory-look up (e.g., the predicate was old and scriptal but assigned during learning to a different character). Also, time to verify a given probe sentence increases with the number of different scripted activities ("themes") that probed person has engaged in. Suggests a hierarchy established in memory. For example:



IV. Artificially Synthesized Schemas

A. The goal here is to teach the laboratory subject an artificial schema by a set of contrasting exemplars, to see how the schema is learned and what its final form is like depending on the training series, the other schemata from which it is contrasted. Also, we can examine its properties such as default values; and its use in top-down processing, and gap-filling in reconstructive memory.

B. A schema is like a concept induced and refined from exemplars, so the older literature on concept abstraction and concept learning is quite appropriate.

C. The experimental literature on schema abstraction (also know as "prototype learning") has dealt with two distinctly different classes of schema.

vg 21 -1. Schema defined as pattern examples which have enough <u>specific stimulus values</u> so that the pattern can be classified as belonging to Category X. For example, Club 1 members usually are Harvard graduates, 30 years old, and self-employed (as in Hayes-Roth's study.)

-2. An alternative, where schemata are defined by possession of clusters of abstract categories, not by specific intances. Here, the person must categorize the values of the specific patterns and note covariation of particular categories. For example, each serial recall list consists of 3 fish names, then 3 bird names, then 3 tree names, etc. Another is social stereotypes of races, occupations, personalities.

D. Examples of the first kind of schema based on correlations of particular stimulus-values of patterns:

1. Bob Solso's experiment on Identi-kit Faces varying in hair, eyes, mouth, nose-chin. Show many variations or combinations of features. If the facial features are hair (3 values, h_1, h_2, h_3), eyes (e_1, e_2, e_3), etc., a schema might be defined as (h_1, e_1, m_1, nc_1); and the subject is exposed to many variants of this basic schema. Later, he classifies a variety of test faces as Old (seen before in the learning series) or New. The typical result is that the schema is "recognized" falsely as seen before, and other test faces are recognized according to their Hamming "distance" from the prototype.

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2. Steve Reed's (1972) use of cartoon faces (show picture) for schema abstraction. Faces varied in height of mouth, length of nose, distance between eyes, and height of forehead. Subjects learned to classify faces into one of two categories. After learning, Subjects were tested with 24 new faces, including the prototypes (not seen before). Subjects classified the prototypes more accurately (92%) than new close test faces (61%), suggesting Ss extract out the central tendency of the set of studied instances.

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3. An experiment by Hayes-Roth and Hayes-Roth (1977, JVLVB) taught Ss exemplars of members of two social clubs.

   (a) A member of Club 1 might be described as:

   Joe Doaks, 30 years old, junior high education, single, plays chess.

   (b) A member of Club 2 might be described as;Rob Moore, 50 years old, college education, married, collects stamps.

   (c) The majority of members of Club 1 were 30 years old, junior-high educated, married (that's the Club 1 schema). The majority of Club 2 members were 50 years old, college educated, and single. The irrelevant attributes were name and hobby.

   (d) After studying the 102 instances in the Table, Ss were tested on many old and new combinations of features and had to indicate for each test pattern: (1) did you study this pattern?, and (2) which club would he belong to?

   (e) HRs found that on specific-memory judgments Ss recognized high-frequency old patterns better than the prototype; but in classification, the prototype was categorized more confidently (and correctly) than even the high frequency instances.

   (d) So, this experiment shows that people abstract the central tendency of a class but also seem to keep some track of specific, high-frequency instances.

E. To explain such feature-correlation schema learning, there are basically three theories.

vg 24 1. Learn only specific instances. (e.g., Medin & Shaeffer) Respond to other patterns by summated generalization from the stored instances. This doesn't explain why the prototype will be classified so accurately and remembered so much better than specific instances.

2. Learn only general average prototype. Problem here is that it doesn't explain specific memory for particular Old instances versus New category members. Also, prototype concept itself doesn't carry the idea that attributes may differ in their validity for the category (meaning the extent that cue presence correlates with this category but not other categories).

3. Learn about instances and generalizations corresponding to feature co-occurrence. Proposed by Reitman & Bower 1973 and Anderson, Kline, & Beasley '79.

- Assumes that people notice what features tend to co-occur in the same category.

- Anderson's model has rules for generalization of new productions (which other ACTIVE productions), for discrimination of overly-general productions, and for strengthening consistent productions and weakening incorrect productions.

4. The Anderson theory seems the best in the market at present for these kinds of schema.

Note use of: prototype = like a fully-filled out instance; but schema = only a few features filled out, the rest are "don't care" variables.

V. Categorical Schema: Co-occurring categories

A. Social, occupational, racial stereotypes are of this kind, relating occupation to personality trait and thence to instances of behaviors of people.

B. Simple laboratory example: serial sequence of category instances; sample 3 of 5 elements in the category per trial.

vg 25 1. LIST → (fish) → (birds) → (rocks) → . . .

2. People do learn the abstract structure of the list--the categories, the instances being used, the numbers of instances, their order.

3. If each list consists of 3 elements selected out of 5, Ss also begin to get confused about which elements occurred on the most-recent list to be recalled.

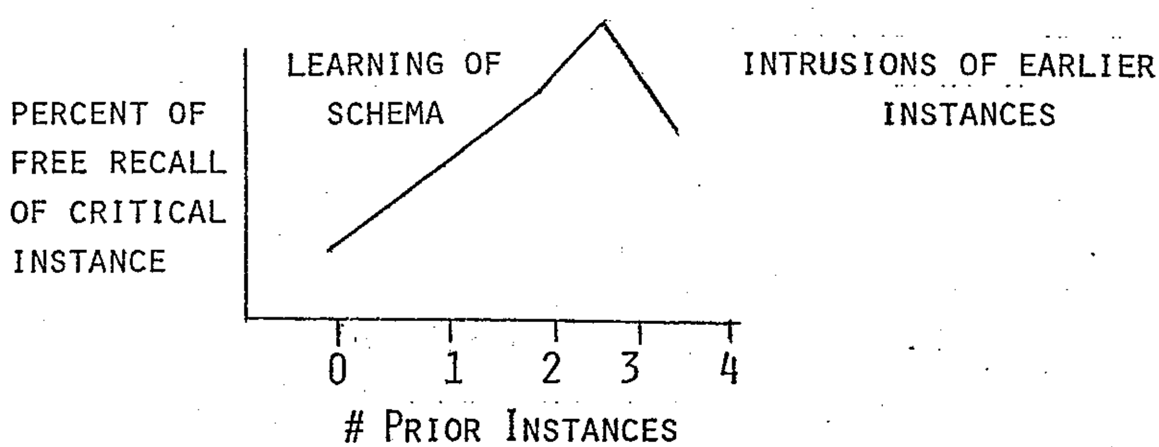
C. Before theorizing, let's look at two more examples of co-occurring categories, with Frank Belezza.

1. We constructed five instantiations of a given event frame, such as PTRANS or ATRANS, with specialized role fillers. For example, three sentences of one event frame were

Professional	PTRANS	OPTIC. INST.	West Coast	German City
– A dentist	mailed	a telescope	from Seattle	to Berlin.
– A lawyer	posted	a microscope	from Los Angeles	to Bonn.
– A teacher	shipped	binoculars	from San Francisco	to Munich.

The subject sees 30 such "frame sentences" on a critical trial. A given frame-sentence was preceded by 0, 1, 2, 3, or 4, preceding instances of its frame using other members (instantiations). See vu-graph of design.

Schema	Prior Schema Instances				Critical Study List	Free Recall
A					A_0	A_0
B				B_1	B_0	B_0
C			C_2	C_1	C_0	C_0
D		D_3	D_2	D_1	D_0	D_0
E	E_4	E_3	E_2	E_1	E_0	E_0



2. The Thorndyke & Hayes-Roth experiment used complete texts in the above design. The texts were "The Silicosis Disease", "The Apus Constellation", "The Circle Island Story", "The John Payton Biography", and "The Filicules Plant". Each story contained twelve sentences, corresponding in serial position to its mate in earlier instantiation of that frame. The relation was (4 each of): repeated exactly; frame repeated but values changed; and unrelated. e.g.,

vg 26 Exact: The constellation was charted originally at Palomar Observatory

Changed: The constellation was charted originally at Mt. Wilson Observatory

Unrelated: The constellation was found to contain hydrogen gas.

3. The design called for 0, 1, 2, 3, 4, or 8 prior training passages of a given kind before S reads the critical instance, and then recalls all 5 passages by free recall or cued recall. Cued recall used the sentence frame with the changing details missing.

vg 27 4. The expected results are shown in a vu-graph, which are figure 3a, b from Thorndyke & Hayes-Roth's experiment. Get increasing accessibility of the schema in free recall, but lessening discriminability of the most-recent of the changing details (for the change sentences).

vg 28 5. Their results are shown in another viewgraph (Fig. 4 & 5 from T & HR), which fully support their predictions.

D. Let's consider the type of theory to do these tasks. Consider the Belezza event-task, for example.

1. We assume that the person begins with generic schema for "mailing" types of PTRANS events, so that each mailing event instantiates that more abstract event schema. Moreover, activation spreads from the abstract category nodes through the specific subcategory node down to the specific concept node we've used to instantiate the general frame.

2. After the second instantiation, the situation looks like this :

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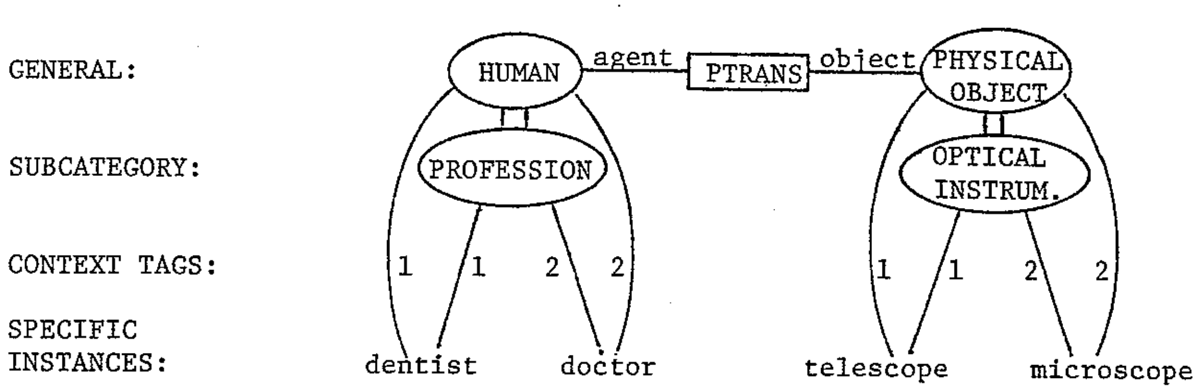


3. I have labeled each instance link with 1 or 2 to stipulate the context (Text or Time 1 or 2) when that instance was experienced.

4. By intersection of associative pathways from instances in a given slot up to the abstract slot name, we want to converge on a maximally discriminating subcategory that describes the instances of the slot. This subcategory (e.g., agent is a professional person) is strengthened each time another instance of it is used in the same event schema. Note that there are redundant connections formed, from each instance (lawyer) up to event frame, directly and via the intermediate subcategory (professional here).

5. Thus, multiple instantiations of a given event schema cause it to be strengthened in its list-context tag, and in its subcategorical structure. This makes it easier to learn a new instantiation because it also has a redundant and strong connection into its slot of the abstract PTRANS event frame.

6. The disadvantage, or cost, of this is that there is increasing interference among the instances filling a given slot, if the context-tags become nondistinguishable. The discriminability of the most recent context tag goes down with time, and with greater numbers of prior events. This lack of instantiation-discrimination creates confusions, intrusions, interference, all described as "list discrimination".

7. Cued recall gains access to the event-schema more readily than does free recall from "Most recent list".

E. What are some experiments to do with this event-frame paradigm? (Future)

vg 30 1. Have S categorize the nouns in each sentence, to enhance the speed of noticing the recurring categories.

2. Vary the instance-to-category associative strength

3. Compare schema learning with one instance repeated exactly 4 times with a schema instantiated in four different ways. Perhaps a new target instance can be learned just as well by matching it with (or putting it in correspondence to) a prior instance as to a prior generic schema. I'll bet maybe even one-example training is better because of less interference at the level of discriminating new instance from prior instances.

4. If a subcategory like professionals appears in two unrelated event frames, then that subcategory should be learned faster. It may be differentiated into sub-groups if different instances (of Professionals) belong in different event frames. If the same instances are involved, then will get certain types of confusions and intrusions across the two frames that are sharing subcategories.

5. A "default" value would be created at a slot by either the modal (most frequent) slot filler there; or, for quantitative values, perhaps by the arithmetic average (though Neumann's results say 'No' on bimodal distributions).

F. What are some properties to be expected from such synthetic schema? All are associated with expectation-driven processing. These await experimental work.

1. Faster reading of expected slot fillers, slower on unexpected ones

2. Ability to describe the subcategories of the event schema

3. Use of default value if a slot is unfilled or is forgetten

4. Faster learning of new instantiations but with some confusions.

G. The advantage of the synthetic schema-approach is that it enables us to relate schema theory back to more elementary work in experimental psychology, concerning concept formation and discrimination learning.

VII. Text Schemata

vg 31 A. General claim is that people learn abstract schema for different types of texts from multiple experiences with examples. Text types might be: Experimental Psychology Articles; Folktales; Court Legal Injunctions; Scientific Expositions; Psychiatric Case Reports, etc.

B. Example of developing schema: Harriet Waters' study of development of "Class News" write-ups (120 of them) by a single pupil in second-grade class (7 or 8 years old). Daily report done according to a particular format that got elaborated over time. (These were done every day as a
vg 32 creative-writing activity). Usually descriptions of the day, the day's activities, and events in narrative/descriptive frame.

1. Waters' divined a "grammar" (or schema) for reports from early, middle and late periods of the school year

vg 33

2. Show her three graphs of more elaboration by refinement and expansion of nodes (slots) in the schema.

C. Nancy Stein, Jean Mandler and others have been assessing children's development of narrative categories and schema as captured in systems of rewrite rules. For example, the prototypical story in Nancy Stein's grammar has--initiating event, internal reaction, attempt, consequence, final
vg 34 reaction. Jean Mandler has many other categories.

D. Such story grammars list components of a story, and relate their parts. The heart of the story grammars, however, is their analysis of actions in terms of the plans and goals of the protagonist. He has one or more goals, some complications, then acts so as to overcome his problem.

E. Therefore, the plan-goal analyses of Schank, Abelson, Wilensky (PAM) and Riesbeck become very relevant to modeling the way the reader understands an event in a human drama. Although my group has done some prior work on story understanding and memory, I will concentrate here upon our recent efforts to develop a useful method for investigating readers' use of plans and goals in understanding. This is preliminary, and you should view it as first stages in developing a technique or experimental paradigm.

F. Wilensky's PAM has an algorithm for evaluating goal statements, plans and action statements. I had the feeling that there is probably an ordering of goals-subgoals-and-actions such that some (Goal, Action) pairs would be "close" and some would be "far" apart in a planning tree or goal-subgoal hierarchy.

vg 35

1. The intuitions can be represented in a goal-reduction tree, that decomposes a goal into subgoals, and those into either actions or further subgoals.

vg 36

2. "Understanding an action in light of a goal' means finding a connecting link between the two in the network. Perhaps done by firing productions.

3. If traversal of each link takes some time, then comprehension time (or interpretation time) should take longer for action-goal pairs that are farther apart. This is expected whichever element (goal or action) is the target and which is the prior context sentence. The effect should appear in reading time.

vg 37

4. We chose pairs out of goal-subgoal-action triplets, so that the near pair was embedded within the far pair.

5. In the experiment, subjects read a number of 4 line vignettes with reading-time measured on the critical target sentence (usually third in the vignette). After each vignette, S answered a comprehension question and later had a cued recall test on each vignette.

vg 38

6. Show results in vugraph. Found reading time for the near subgoal-action pairs was considerably less than for the far pairs. Also, "goal-then-action" was understood faster than the "action-then-goal" sequence.

G. A problem with using such naturalistic materials is that one has not controlled degree of learning, degree of association between near and far goal-action pairs, and one can't be sure we've devised embedded triples. One lesson learned from the experiments on semantic-question-answering (eg., "a robin has skin") is to be cautious about possible conta ations in using naturalistic materials, e.g., familiarity, imagery, co-occurrence frequency, linguistic complexity, etc.

H. So, there are reasons to use synthetic goal trees for answering our theoretical questions. So we had Ss read a text describing an unfamiliar goal hierarchy, namely, the things one must do to qualify to become a member of "the Top-Secret Club", a fictitious organization we created for our experimental subjects to imagine.

vg 39

1. Show a vugraph of the goal hierarchy. The text did not show this hierarchy, but only described it.

2. Descending from the top goal, it is possible to say "In order to achieve Goal G, John did Action A" provided A is a descendant of G.

3. Ss memorized this procedural hierarchy for about 30 minutes, with frequent recitation of it.

I. Then the Reaction Time testing began. S was told that several novices were formulating plans to join the top secret club. We would present the S with a prospective plan ("In order to do X, John did Y") one clause at
vg 40 a time; upon presentation of the second clause, S was to decide as rapidly as possible whether the conjectured plan was well formed (proper) as opposed to improper. Improper plans include all X-Y pairs where X is not a parent of Y.

We varied the node distance from X to Y for both true and false plans.

vg 41 J. Results are that decision time for True plans increase almost linearly with the X-to-Y distance.

1. This is expected by a "downward search" model which begins at X and fires productions to activate its immediate descendants, which in turn fire productions to activate their immediate descendants, etc. If any of these descendants matches the test probe Y, then say "True" for this plan. Otherwise, if you reach the bottom of the tree and have no further expansions and Y hasn't yet been encountered, then say that the conjectured plan is False.

2. In the experiment, the False X-Y pairs were so arranged that the distance from X to the bottom of the goal tree was about the same independently
vg 42 - RTS of the X-Y distance. Consequently, we found no effect of X-Y distance
vg 43 - model in this experiment on reaction time to decide that a given X-Y pair was False.

K. Thus, this preliminary experiment yielded quite nice results in terms of a graph-searching model. Currently we're looking for two other effects:

1. Will reaction time for True decisions increase in a predictable manner with the amount of branching or "fanning" that is encountered in tracing a descending path from the goal X to the action Y?

2. Will reading time to comprehend a given action increase with the X-Y distance from a stated goal in a text? Will reading time also increase with the number of different goals the actor is supposedly trying to accomplish (X_1, X_2, X_3, . . .)?

3. If in the above situation goal X_1 is satisfied by an action, will it be purged (removed) from the search set so that the remaining goals can be more readily related to the action Y?

vg 44 (Smith data)

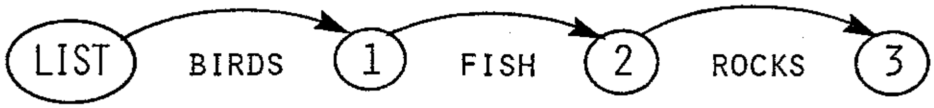
L. The point of these several experiments is to begin study of how actions in narratives are comprehended in light of expectations generated by plans, goals, and themes. It's only a beginning. But the background theory (namely, that of Schank & Abelson & Wilensky) is very general and important for understanding our comprehension of narratives.

(END)

Table 5-1 Constitution of Club 1 and Club 2 in Hayes-Roth and Hayes-Roth (1977)

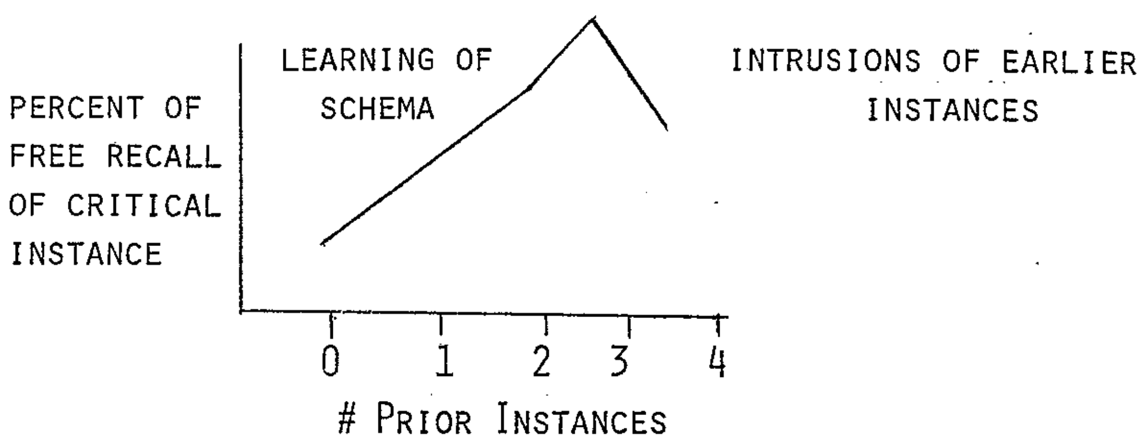
Club 1		Club 2	
A.	10 instances of 30 years, junior high, single	M.	10 instances of 50 years, college, married
B.	10 instances of 30 years, college, married	N.	10 instances of 50 years, junior high, single
C.	10 instances of 50 years, junior high, married	O.	10 instances of 30 years, college, single
D.	1 instance of 30 years, junior high, divorced	P.	1 instance of 50 years, college, divorced
E.	1 instance of 30 years, senior high, married	Q.	1 instance of 50 years, senior high, single
F.	1 instance of 40 years, junior high, married	R.	1 instance of 40 years, college, single
G.	1 instance of 30 years, senior high, divorced	S.	1 instance of 50 years, senior high, divorced
H.	1 instance of 40 years, junior high, divorced	T.	1 instance of 40 years, college, divorced
I.	1 instance of 40 years, senior high, married	U.	1 instance of 40 years, senior high, single
J.	5 instances of 30 years, senior high, single	V.	5 instances of 30 years, senior high, single
K.	5 instances of 40 years, college, married	W.	5 instances of 40 years, college, unmarried
L.	5 instances of 50 years, junior high, divorced	X.	5 instances of 50 years, junior high, divorced

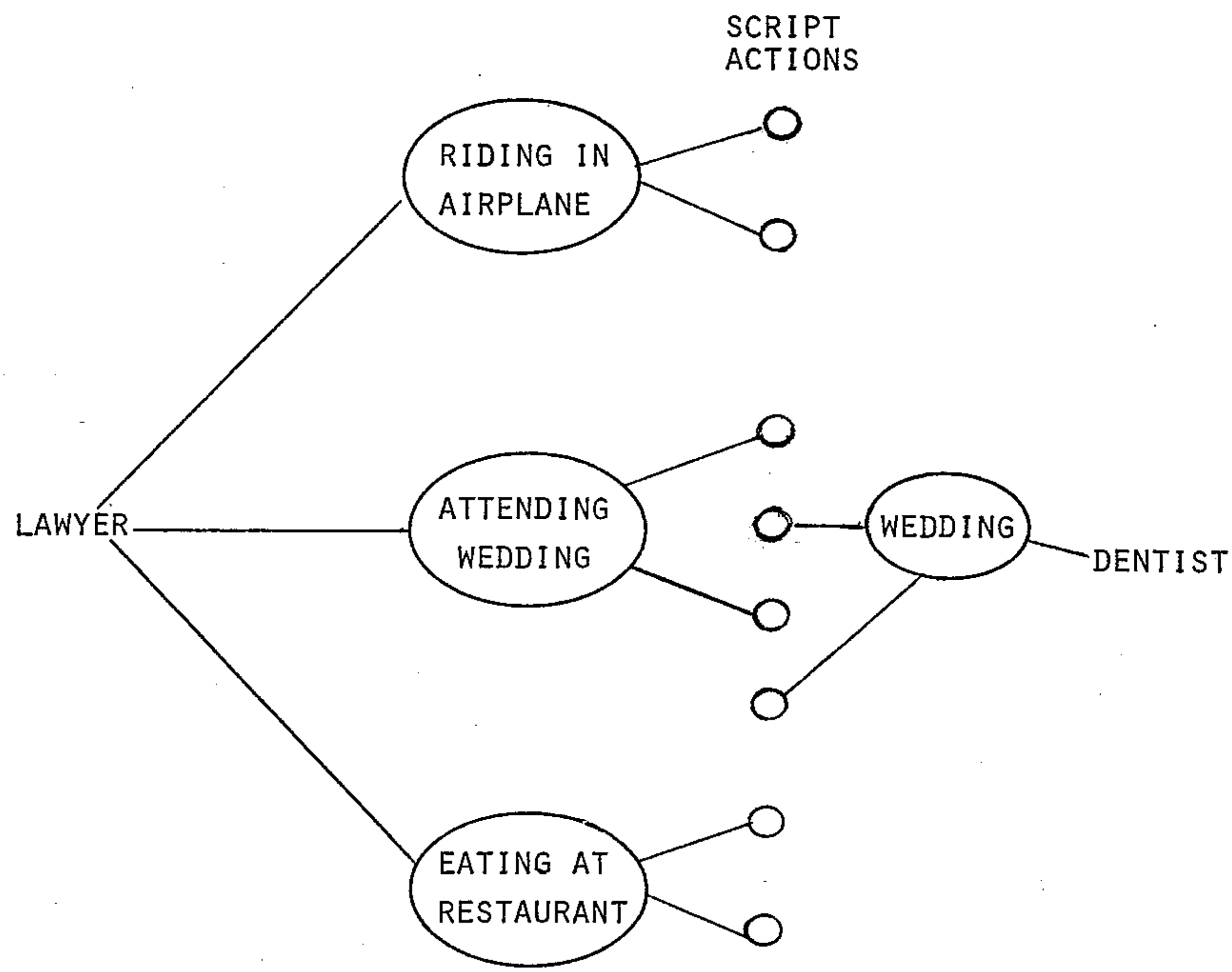
Set-up Texts e.g., The Winer Constellation		Target Text The Apus Constellation
1. This constellation was charted originally at Palomar Observatory.	Exact Repeat →	This constellation was charted originally at Palomar Observatory.
2. This constellation was charted originally at Mt. Wilson Observatory.	Change Value in Schema →	
3. This constellation was found to contain hydrogen gas.	Unrelated →	



PROFESSIONAL	PTRANS	OPTICAL INSTRUMENT	WEST COAST CITY	GERMAN CITY
A DENTIST	MAILED	A TELESCOPE	FROM SEATTLE	TO BERLIN
A LAWYER	POSTED	A MICROSCOPE	FROM LOS ANGELES	TO BONN
A TEACHER	SHIPPED	BINOCULORS	FROM PORTLAND	TO MUNICH

SCHEMA	PRIOR SCHEMA INSTANCES				CRITICAL STUDY LIST	FREE RECALL
A					A_0	A_0
B				B_1	B_0	B_0
C			C_2	C_1	C_0	C_0
D		D_3	D_2	D_1	D_0	D_0
E	E_4	E_3	E_2	E_1	E_0	E_0




SCRIPT
ACTIONS
RIDING IN
AIRPLANE
LAWYER
ATTENDING
WEDDING
WEDDING
DENTIST
EATING AT
RESTAURANT

Example Text (from McKoon & Ratcliff, '80)

The bride (N1) walked up the aisle (N2).

The bride repeated the vows (N3).

The bride kissed the groom (N4).

The bride enjoyed the reception (N5).

The bride tossed a bouquet (N6).

The bride embarked on a honeymoon (N7).

one-step priming	RT = 684 ms.
four-step priming	RT = 702 ms.
unprimed	RT = 728 ms.

Schema Experiments

--SPEED UP CATEGORY LEARNING

--VARIABILITY OF INSTANCES

--MULTI-SCHEMA USE OF CATEGORY

--CREATING DEFAULTS

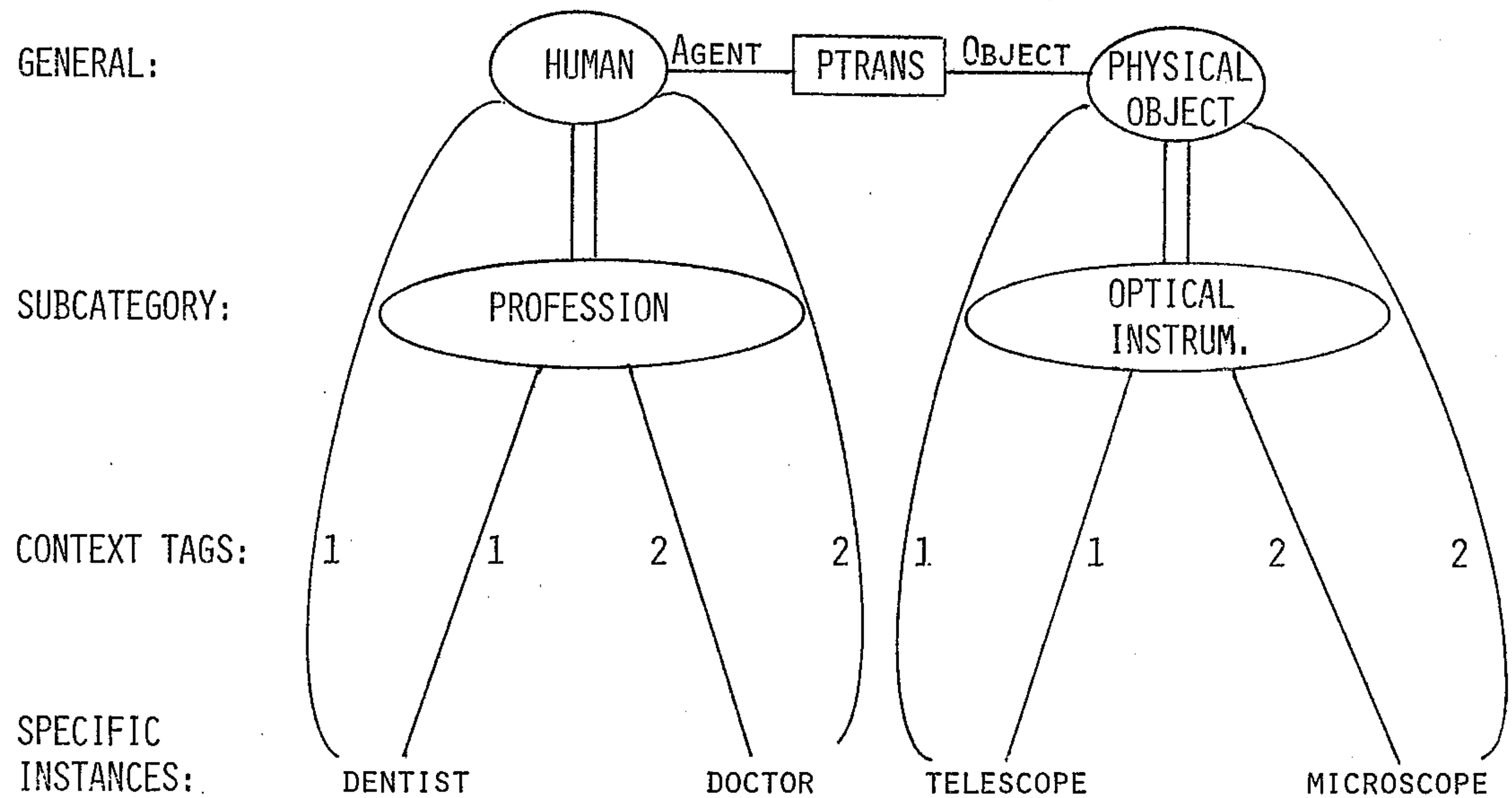
Expected Schema Effects

--PREDICT SUBCATEGORIES

--FASTER READING OF EXPECTED FILLERS

--USE DEFAULT IF EMPTY SLOT

--FASTER LEARNING OF NEW INSTANCES


GENERAL:
SUBCATEGORY:
CONTEXT TAGS:
SPECIFIC INSTANCES:
HUMAN
AGENT
PTRANS
OBJECT
PHYSICAL OBJECT
PROFESSION
OPTICAL INSTRUM.
1
1
2
2
1
1
2
2
DENTIST
DOCTOR
TELESCOPE
MICROSCOPE

RESTAURANT

Linked and Unique Typical Actions

Waitress: (1) check assigned tables, (2) place glasses of water on table, (3) take order for cocktails--L1, (4) give menu to patrons--L2, (5) give cocktail order to bartender, (6) take drinks to patrons, (7) take orders for food--L3, (8) take food orders to kitchen, (9) take soup or salad to table--L4, (10) take food to table--L5, (11) check to see if order is correct, (12) start to clear table, (13) take orders for dessert--L6, (14) take dessert orders to kitchen, (15) take dessert to table --L7, (16) tally bill for patrons--L8, (17) give bill to patrons --L9, (18) finish clearing table, (19) pick up tip--L10, (20) reset table

Patron: (1) open door of restaurant, (2) enter, (3) give reservation name, (4) wait to be seated, (5) go to table, (6) be seated, (7) order cocktails--L1, (8) place napkin on lap, (9) look at menu--L2, (10) order meal--L3, (11) talk with companions, (12) drink water, (13) eat soup or salad--L4, (14) look at meal when it arrives--L5, (15) eat food, (16) finish meal, (17) order dessert--L6, (18) eat dessert--L7, (19) ask for bill--L8, (20) check bill when it arrives--L9, (21) pay bill, (22) leave tip--L10, (23) get coats, (24) leave

Shared Atypical Experiences

(1) dessert looked good, (2) man at next table smoking a cigar, (3) restaurant not crowded, (4) no salt on table, (5) fly lands on bread, (6) more silverware is needed.

MOTHER'S BUSY MORNING

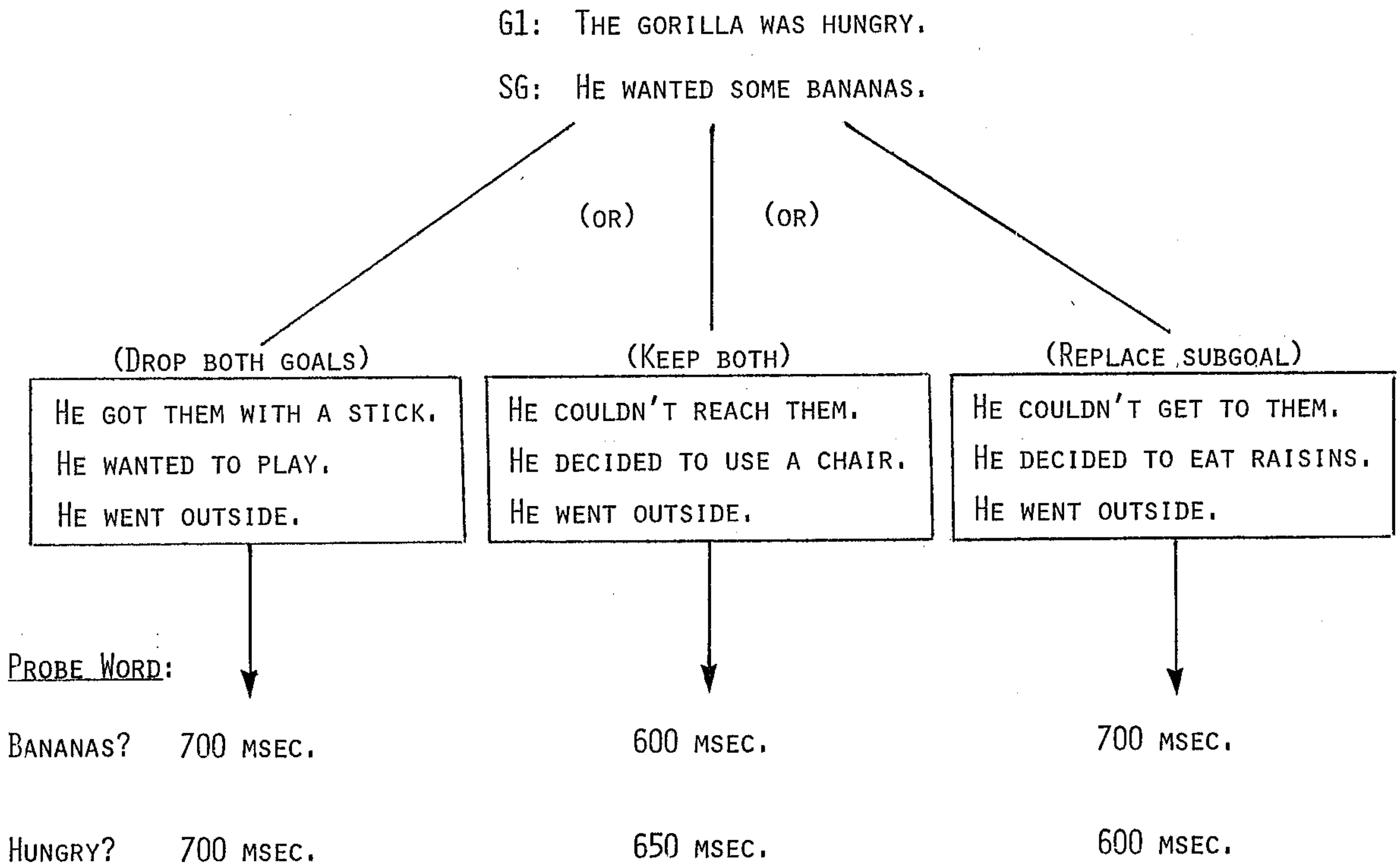
WRITING LETTER: (1) FIND PEN, (2) FIND WRITING PAPER, (3) WRITE LETTER, (4) FIND ADDRESS, (5) FIND ENVELOPE, (6) PUT STAMP ON ENVELOPE, (7) PLACE LETTER IN ENVELOPE, (8) SEAL ENVELOPE

FEEDING BABY: (1) TAKE BABY FOOD FROM REFRIGERATOR, (2) WARM-UP BABY FOOD, (3) PUT BABY FOOD IN BOWL, (4) PLACE BIB ON BABY, (5) PLACE BABY IN HIGH CHAIR, (6) SPOON FOOD INTO BABY'S MOUTH, (7) WIPE BABY'S MOUTH, (8) TAKE BABY OUT OF CHAIR

DOING LAUNDRY: (1) TAKE LAUNDRY SOAP FROM CLOSET, (2) GET LAUNDRY FROM HAMPER, (3) SORT LAUNDRY, (4) PLACE LAUNDRY IN WASHING MACHINE, (5) ADD SOAP TO WASHING MACHINE, (6) TURN ON WASHING MACHINE, (7) WAIT FOR LAUNDRY TO BE WASHED, (8) TAKE CLOTHES OUT OF WASHING MACHINE

MAKING COFFEE: (1) GET COFFEE CAN FROM PANTRY, (2) GET COFFEE POT, (3) MEASURE WATER INTO POT, (4) MEASURE COFFEE INTO POT, (5) PLACE TOP ON POT, (6) PLACE POT ON STOVE, (7) TIME PERKING OF COFFEE, (8) TURN OFF STOVE

WATCHING TV: (1) TURN ON TV, (2) WAIT UNTIL TV SET IS WARM, (3) CHECK NEWSPAPER FOR PROGRAMS, (4) SELECT CHANNEL, (5) FINE TUNE TV PICTURE, (6) GET COMFORTABLE, (7) WATCH PROGRAM, (8) TURN OFF TV SET


G1: THE GORILLA WAS HUNGRY.
SG: HE WANTED SOME BANANAS.
(OR)
(OR)
(DROP BOTH GOALS)
HE GOT THEM WITH A STICK.
HE WANTED TO PLAY.
HE WENT OUTSIDE.
(KEEP BOTH)
HE COULDN'T REACH THEM.
HE DECIDED TO USE A CHAIR.
HE WENT OUTSIDE.
(REPLACE SUBGOAL)
HE COULDN'T GET TO THEM.
HE DECIDED TO EAT RAISINS.
HE WENT OUTSIDE.
PROBE WORD:
BANANAS? 700 MSEC. 600 MSEC. 700 MSEC.
HUNGRY? 700 MSEC. 650 MSEC. 600 MSEC.

POSSIBLE EFFECTS OF SCHEMA ON MEMORY

- INFLUENCE WHAT DATA ARE SAMPLED
- FRAMEWORK ("FORMAT") FOR RECORDING NEW EPISODES
- EPISODIC INFORMATION MAY BE INTEGRATED WITH DEFAULTS
- GUIDES RETRIEVAL BY SUGGESTING CATEGORY CUES
- INFLUENCES WHAT INFORMATION IS COMMUNICATED

EXPERIMENTAL STUDIES OF SCHEMA

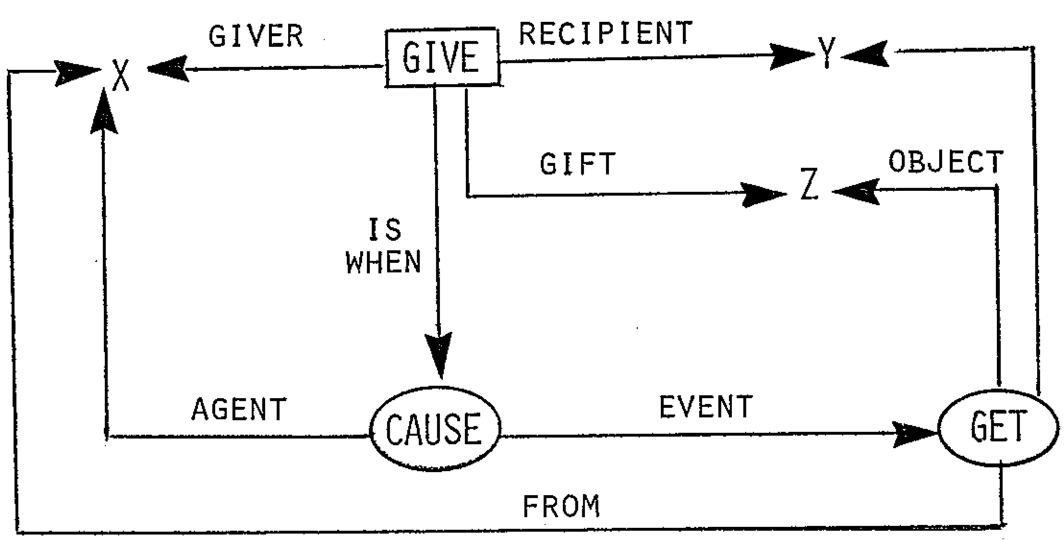
- USE PRE-EXISTING SCHEMA, EG., ROOMS; SCRIPTS
- SYNTHESIZE NEW SCHEMA IN LABORATORY, RELATE ITS PROPERTIES TO TRAINING SERIES.

SCHEMA-LEARNING EXPERIMENTS

SCHEMA - LIKE STEREOTYPE REPRESENTING GENERAL CONCEPT WITH MANY INTER-RELATED PARTS.

PROPERTIES

- HAVE VARIABLE SLOTS - CONSTRAINTS
- DEFAULT VALUES IN SLOTS
- CAN EMBED ONE SCHEMA INSIDE ANOTHER
- VARY IN ABSTRACTNESS

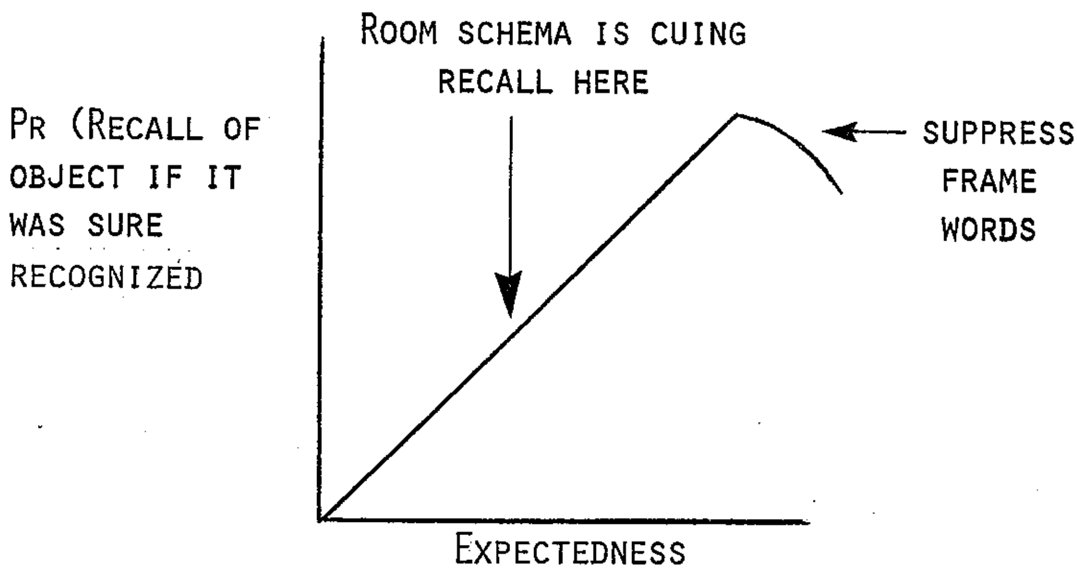


Room Descriptions Follow Grice's Maxim (Rule) of Quantity

I.E., DON'T SAY WHAT LISTENER ALREADY KNOWS.

- DON'T RECALL ROOM-FRAME PARTS LIKE CEILING, ETC.
- DESCRIBE A FEATURE OF AN OBJECT ONLY IF IT IS ATYPICAL, EG., CHILD-LIKE CHAIR, OCTOGONAL TABLE, UPSIDE-DOWN ROAD SIGN.
- DENIALS OF EXPECTED BUT MISSING OBJECTS, EG., "NO WINDOWS, NO CARPET".
- ARTICLE USAGE; THE FOR SCHEMA-EXPECTED OBJECTS (THE DOOR); A FOR MODERATE-TO-LOW EXPECTED OBJECTS (A SKULL).

Probability of Recall Conditional Upon Sure Recognition of the Object.



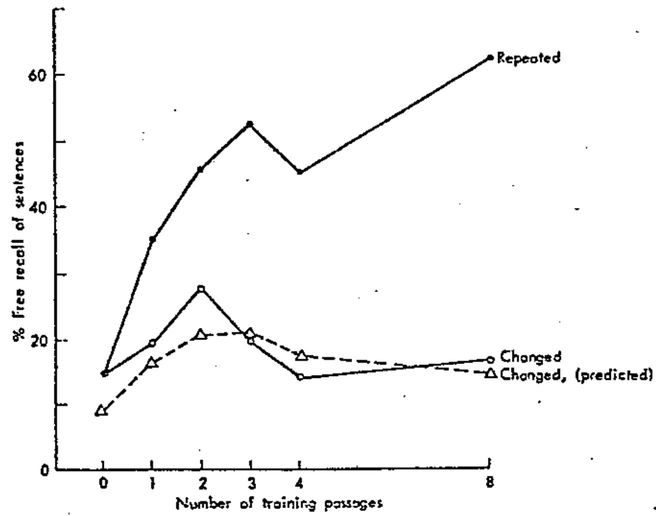


FIG. 4. Free recall of entire REPEATED and CHANGED sentences in Experiment I.

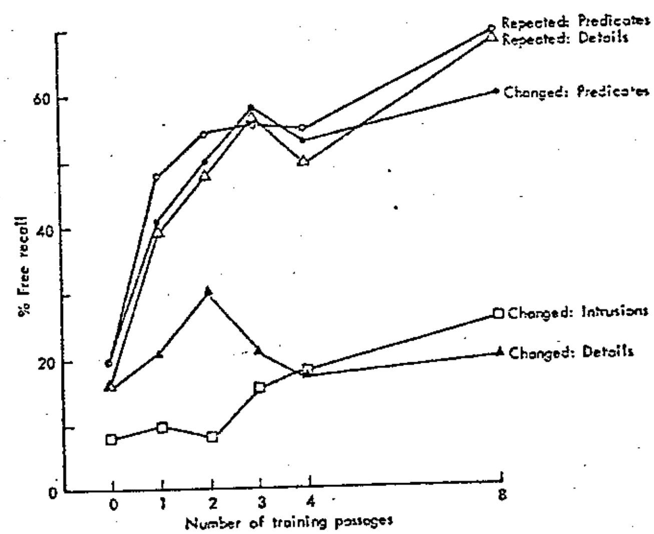


FIG. 5. Free recall of sentence constituents (predicates and details) in Experiment I.

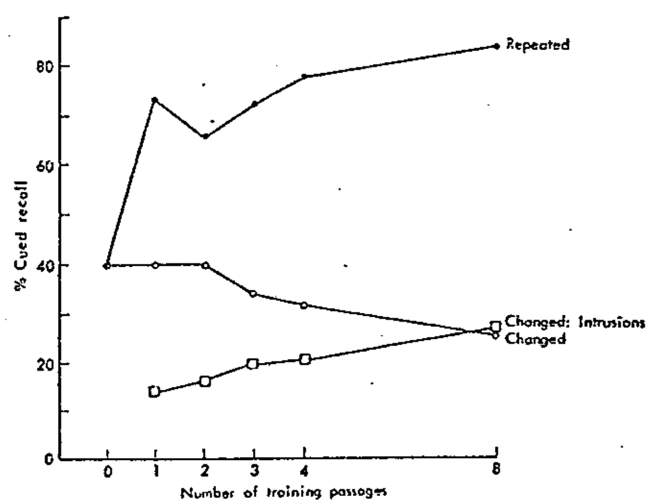


FIG. 6. Cued recall of details for REPEATED and CHANGED sentences in Experiment I.

Scene 1: Entering

Customer enters restaurant.
Customer looks for table.
Customer decides where to sit.
Customer goes to table.
Customer sits down.

Scene 2: Ordering

Customer picks up menu.
Customer looks at menu.
Customer decides on food.
Customer signals waitress.
Waitress comes to table.
Customer orders food.
Waitress goes to cook.
Waitress gives food order to cook.
Cook prepares food.

Scene 3: Eating

Cook gives food to waitress.
Waitress brings food to customer.
Customer eats food.

Scene 4: Exiting

Waitress writes bill.
Waitress goes over to customer.
Waitress gives bill to customer.
Customer gives tip to waitress.
Customer goes to cashier.
Customer gives money to cashier.
Customer leaves restaurant.

Scene 1: Entering

Customer enters restaurant.
Customer looks for table.
Customer decides where to sit.
Customer goes to table.
Customer sits down.

Scene 2: Ordering

Customer picks up menu.
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Cook gives food to waitress.
Waitress brings food to customer.
Customer eats food.

Scene 4: Exiting

Waitress writes bill.
Waitress goes over to customer.
Waitress gives bill to customer.
Customer gives tip to waitress.
Customer goes to cashier.
Customer gives money to cashier.
Customer leaves restaurant.

EXAMPLES OF "CLASS NEWS"—SEPTEMBER

September 24, 1956

Today is Monday, September 24, 1956. It is a rainy day. We hope the sun will shine.

We got new spelling books. We had our pictures taken. We sang Happy Birthday to Barbara.

September 25, 1956

Today is Tuesday, September 25, 1956. It is a sunny day. We are glad.

We went to music this morning. It was fun. Tomorrow the doctor shall look at us. We shall also have assembly.

"CLASS NEWS" GRAMMAR RULES—SEPTEMBER

1. Class News → Day + Activities
2. Day → Date + Weather
3. Weather → Description + *Response* to Description
4. Description → Description 1 + (Description 2)
5. Activities → Activity 1 + (Activity 2)[3]
6. Activity (n) → Statement of Activity + (Specific Account) + (Time of Day) + (*Response* to Activity)

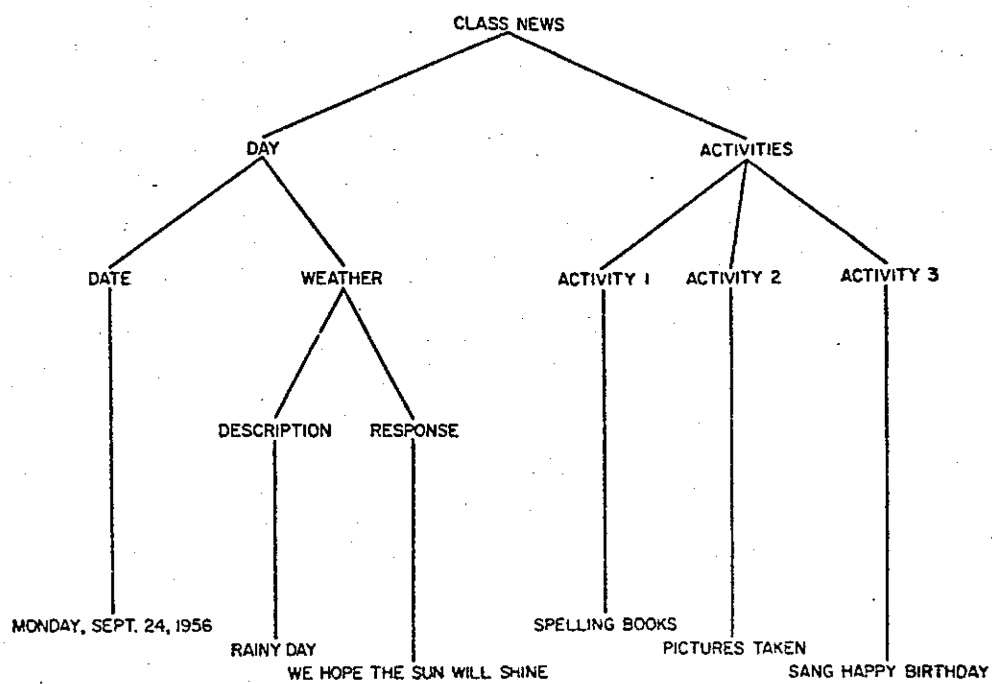


FIG. 1. Schematic representation of a "Class News" grammar—September 24, 1956.

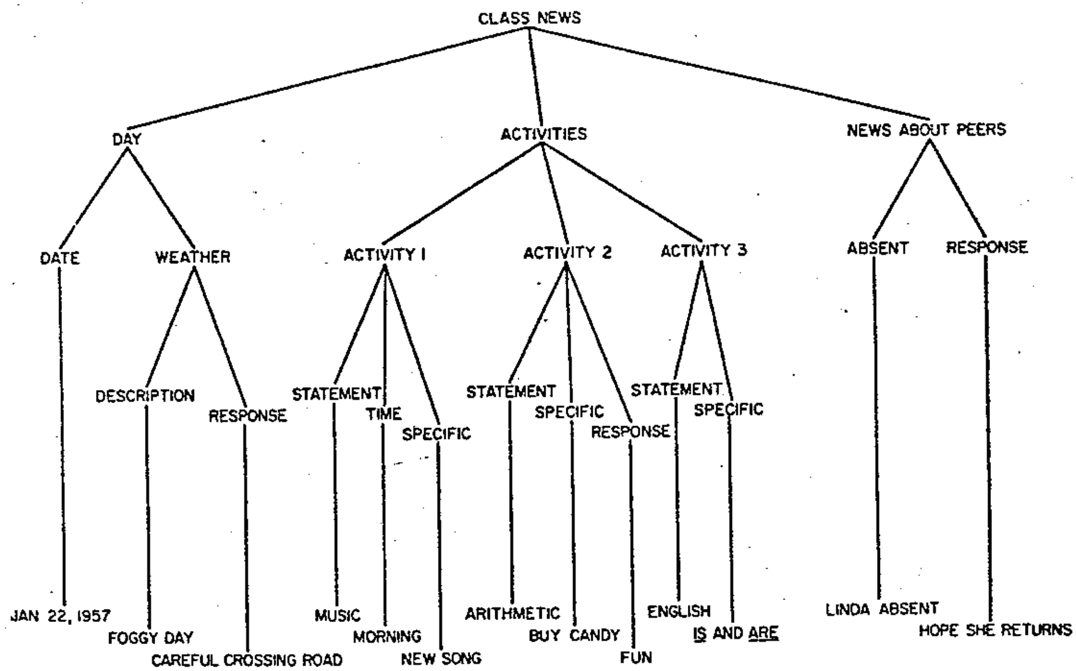


FIG. 2. Schematic representation of a "Class News" grammar—January 22, 1957.

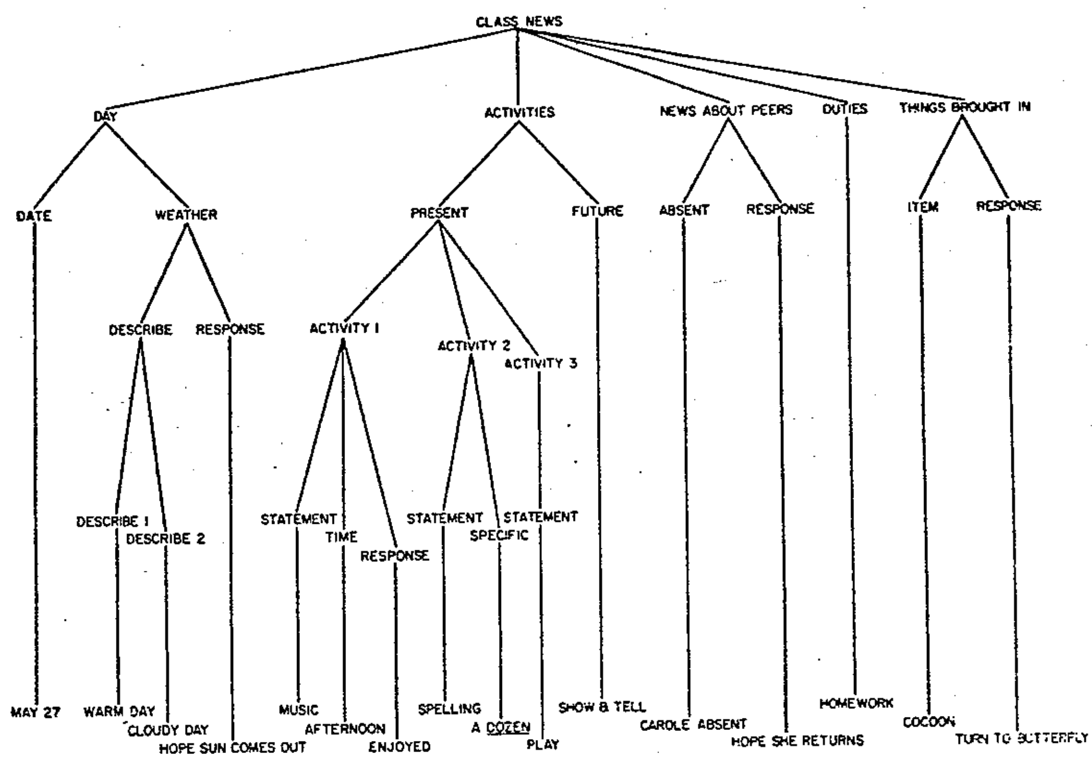
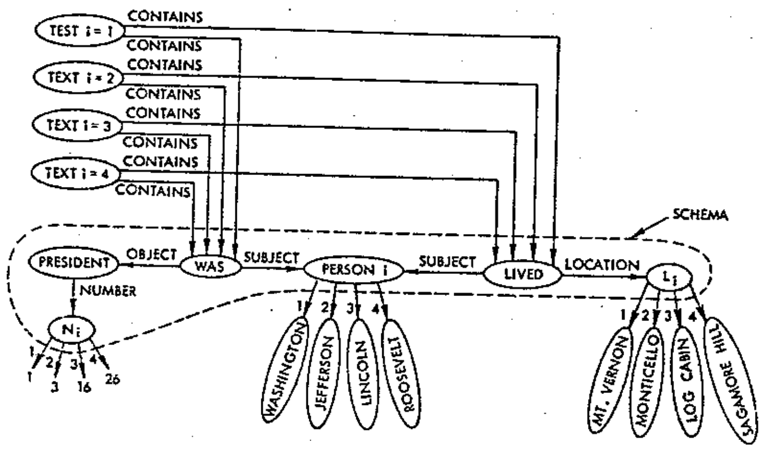
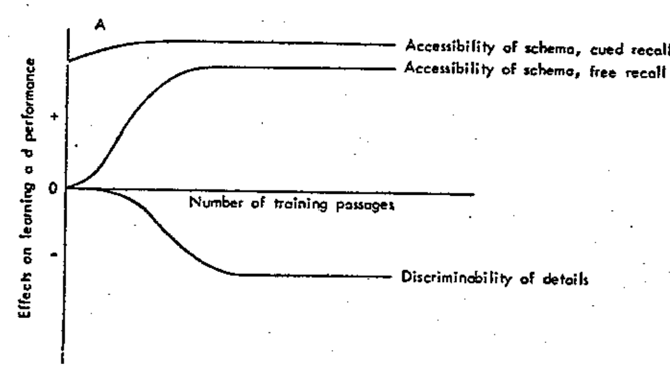
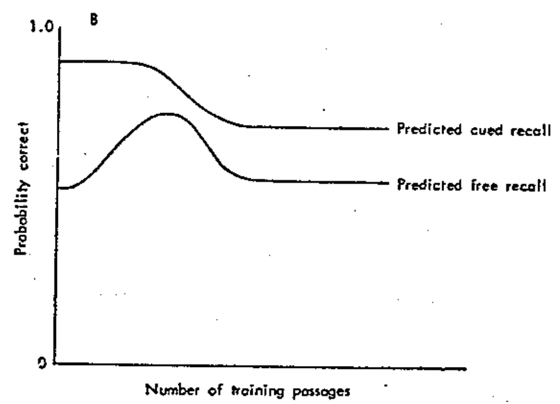


FIG. 3. Schematic representation of a "Class News" grammar—May 27, 1957.


TEST i = 1
TEXT i = 2
TEXT i = 3
TEXT i = 4
CONTAINS
SCHEMA
PRESIDENT
OBJECT
WAS
SUBJECT
PERSON i
SUBJECT
LIVED
LOCATION
NUMBER
WASHINGTON
JEFFERSON
LINCOLN
ROOSEVELT
MT. VERNON
MONTICELLO
LOG CABIN
SAGAMORE HILL
1
3
16
26


A
Effects on learning a d performance
+
0
-
Accessibility of schema, cued recall
Accessibility of schema, free recall
Number of training passages
Discriminability of details


B
1.0
0
Probability correct
Predicted cued recall
Predicted free recall
Number of training passages

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Customer leaves restaurant.

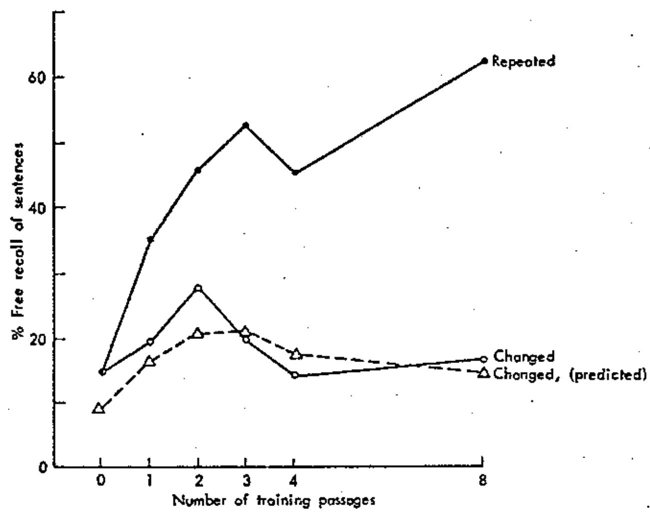


FIG. 4. Free recall of entire REPEATED and CHANGED sentences in Experiment 1.

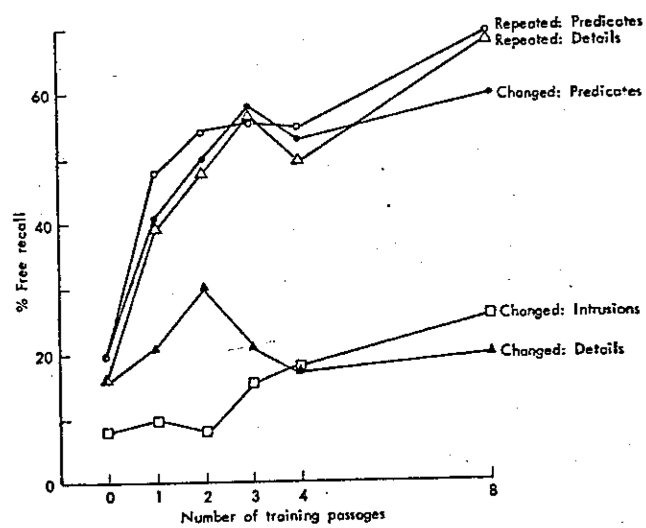


FIG. 5. Free recall of sentence constituents (predicates and details) in Experiment 1.

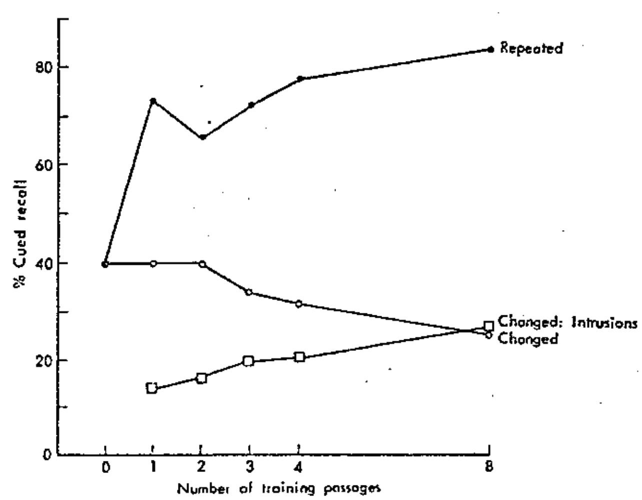


FIG. 6. Cued recall of details for REPEATED and CHANGED sentences in Experiment 1.

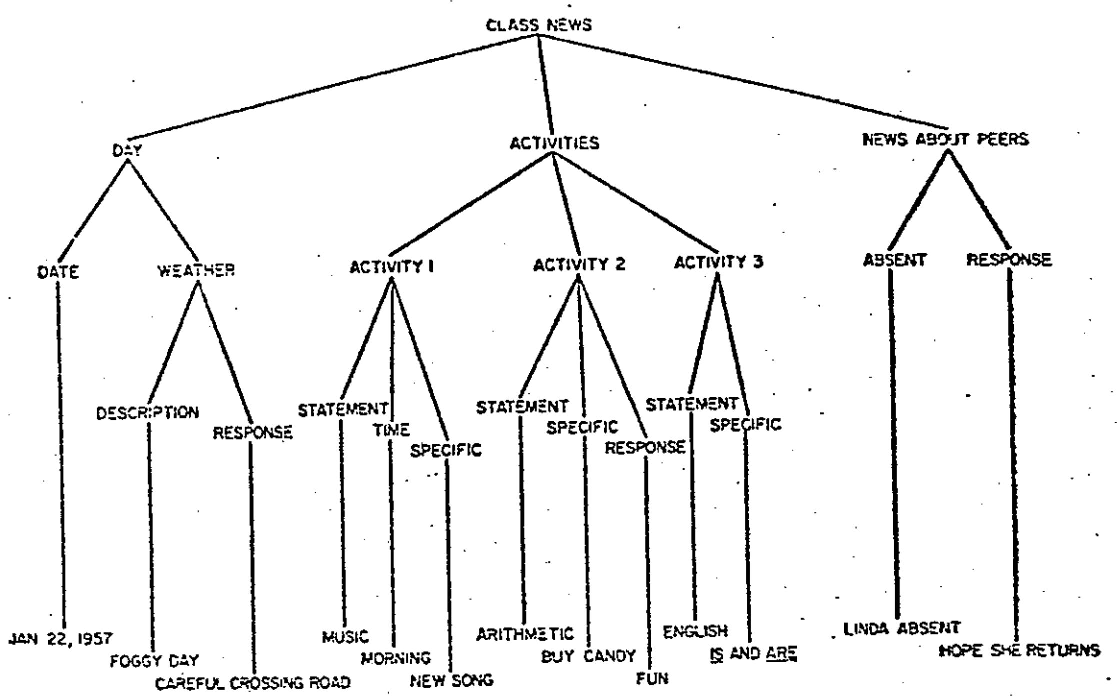


FIG. 2. Schematic representation of a "Class News" grammar—January 22, 1957.

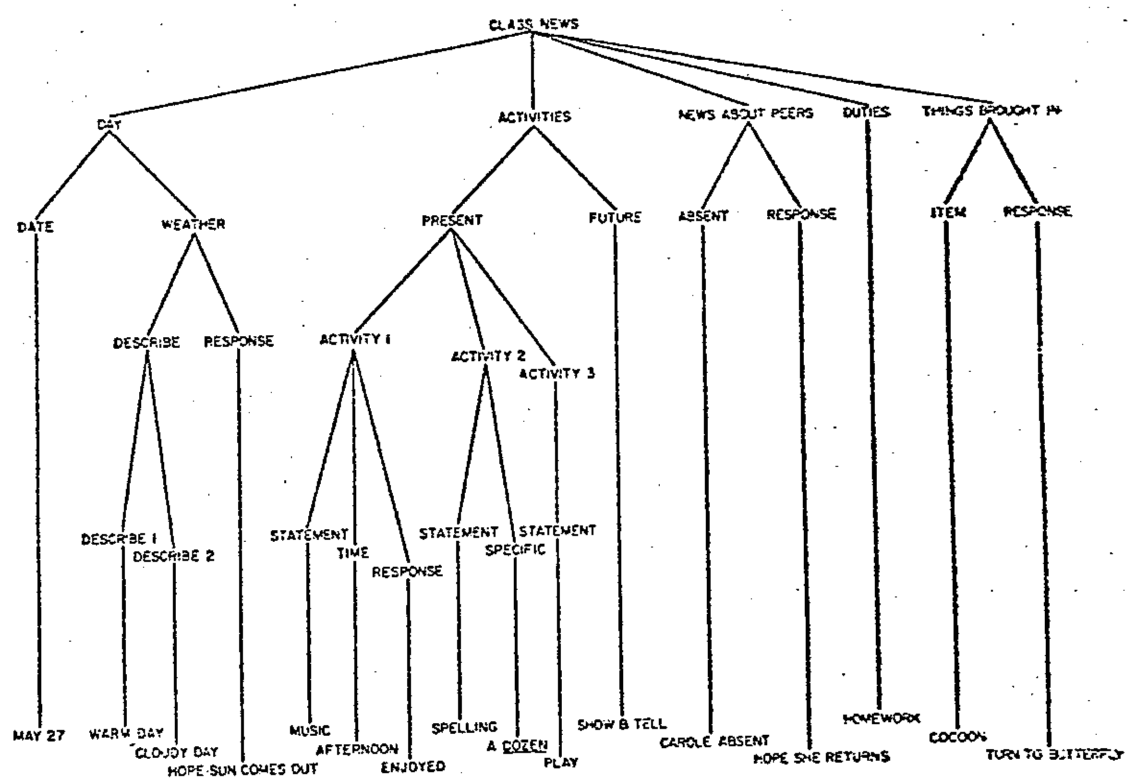
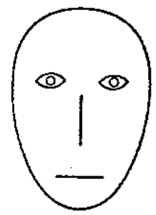
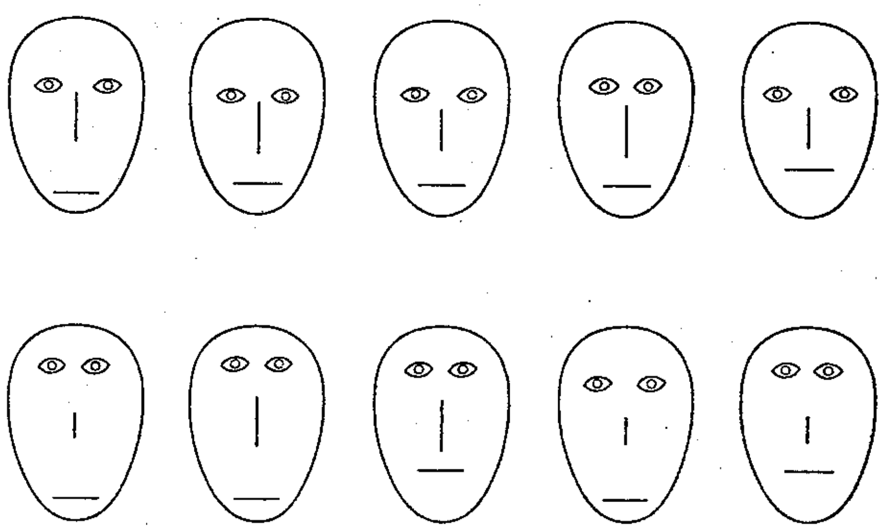


FIG. 3. Schematic representation of a "Class News" grammar—May 27, 1957.

Prototype 1





Prototype 2

SAMPLE EPISODES

O: AGNES IS A HOUSEWIFE.

G: SHE WANTED TO HAVE HER LEAKY FAUCET FIXED.

S: SHE DECIDED TO HIRE A PLUMBER.

A: SHE LOOKED IN THE YELLOW PAGES.

R: NOW HER FAUCET WORKS LIKE NEW.

NEAR (S–A) FAR (G–A)

O: MARGE WAS CONCERNED ABOUT ECOLOGY.

-G: SHE WANTED TO STOP CONSTRUCTION OF A NUCLEAR POWER PLANT.

S: SHE PARTICIPATED IN AN ANTI-NUCLEAR RALLY.

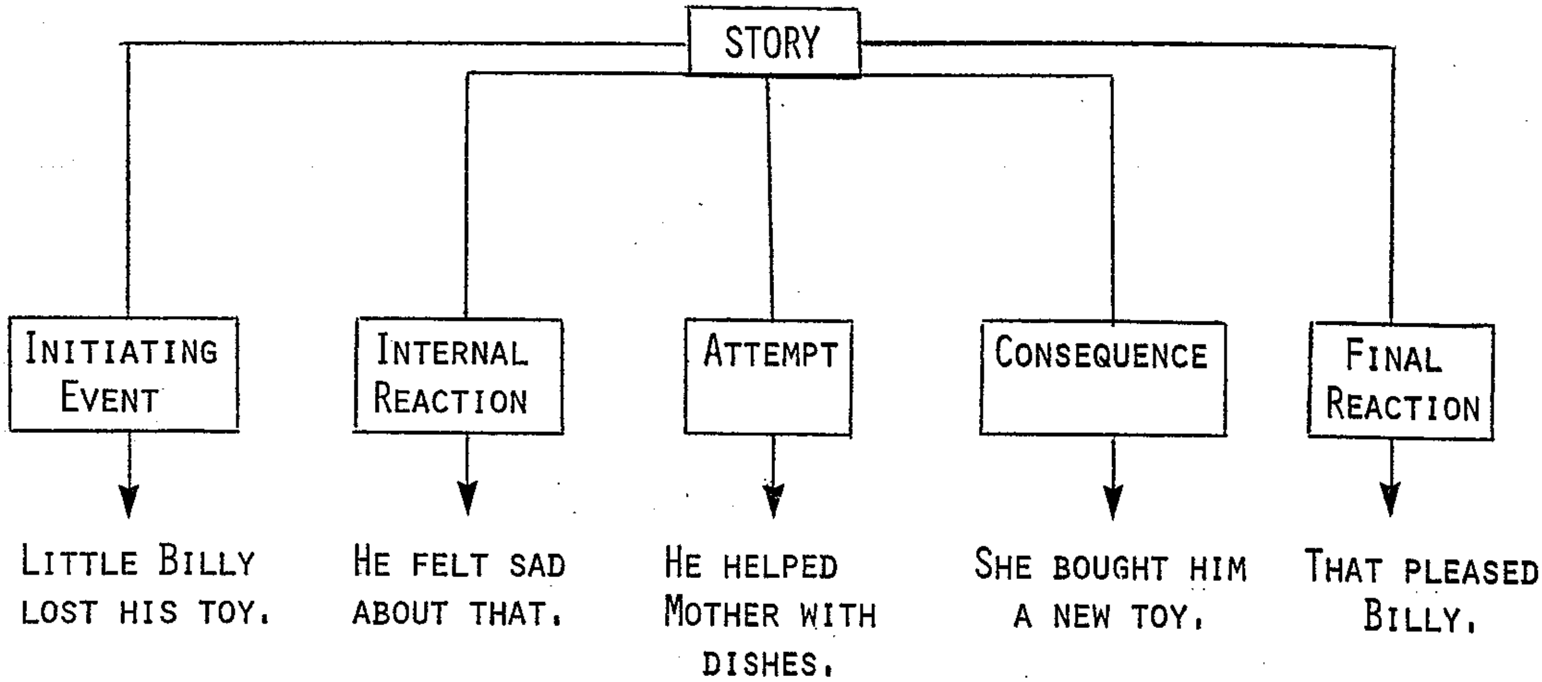
A: SHE MADE A PROTEST SIGN.

R: MARGE THOUGHT NUCLEAR POWER WAS HARMFUL.

NEAR (S–A) FAR (G–A)

TEXT SCHEMA

- FORMAT : PARTS, ORGANIZATION
- MANY TYPES : FOLKTALES, SCIENTIFIC ARTICLES
  LEGAL BRIEFS, CASE REPORTS
- DEVELOPMENTAL ELABORATIONS
  - "CLASS NEWS"


STORY
INITIATING EVENT
INTERNAL REACTION
ATTEMPT
CONSEQUENCE
FINAL REACTION
LITTLE BILLY LOST HIS TOY.
HE FELT SAD ABOUT THAT.
HE HELPED MOTHER WITH DISHES.
SHE BOUGHT HIM A NEW TOY.
THAT PLEASED BILLY.

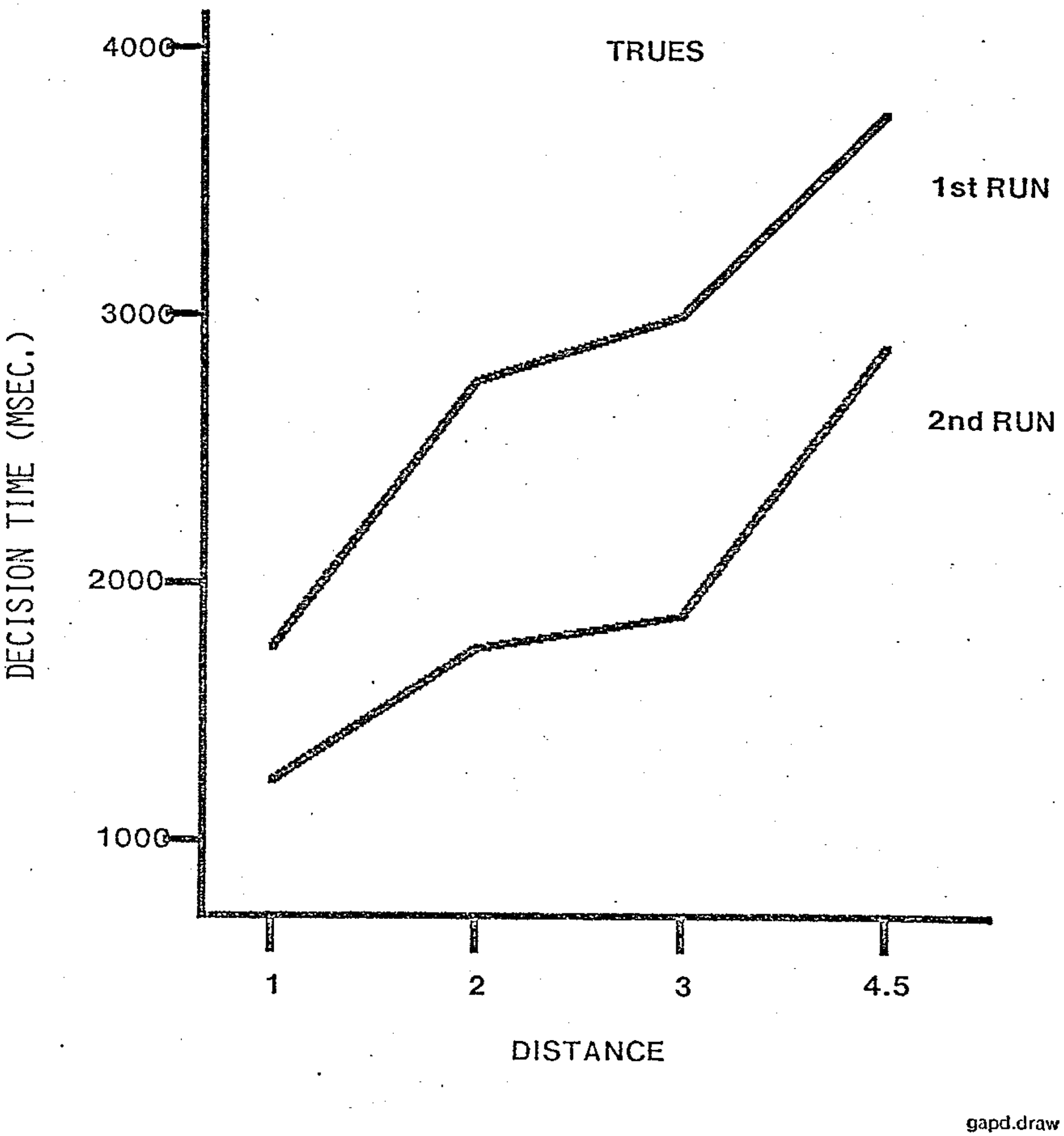
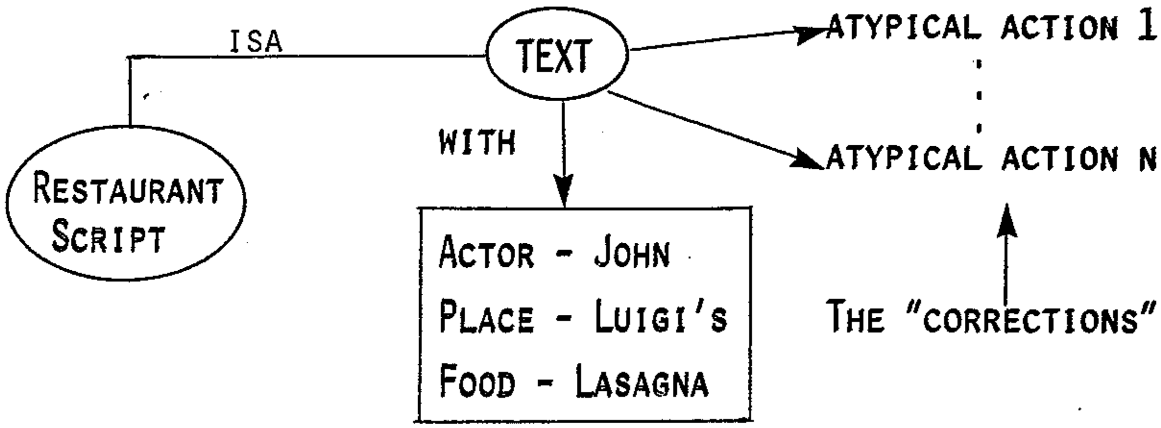
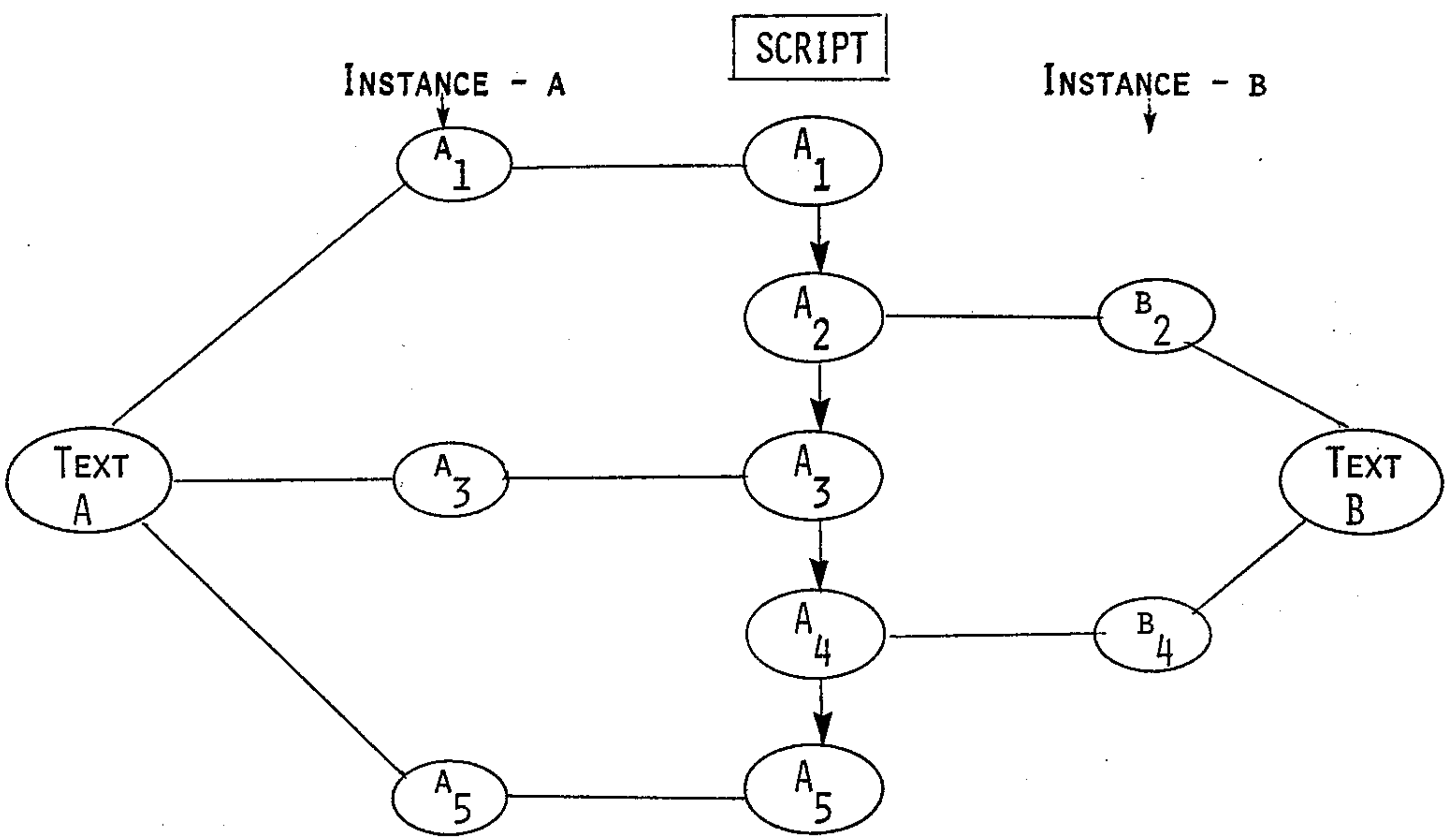


FIGURE 5
GRADED DECISION TIME FOR
TRUE QUESTIONS: EXPERIMENT 2

GRAESSER'S MODEL (1980)



BOWER, BLACK & TURNER (1979)



SCHEMA ESTABLISHED BY

- COMMON SPECIFIC VALUES
- CO-OCCURRING CATEGORIES

SPECIFIC-VALUE-SCHEMA

- FACES (REAL OR CARTOON)
- CLUB-MEMBERSHIP CHARACTERISTICS

ALTERNATIVE THEORIES OF "PROTOTYPE" LEARNING

1. LEARN ONLY SPECIFIC INSTANCES: MEDIN & SCHAFFER

2. LEARN ONLY GENERAL PROTOTYPE: FRANKS & BRANSFORD

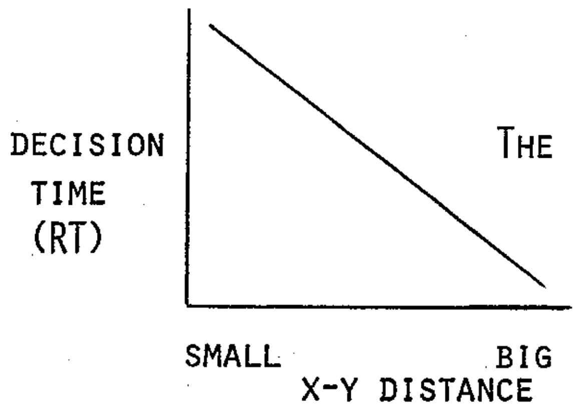
3. LEARN INSTANCES AND ABSTRACT FEATURE CO-OCCURRENCES
   REITMAN & BOWER; J. ANDERSON _ET AL._, ('79)
   - FORM PRODUCTIONS; SEEK GENERALIZATIONS ABOUT CO-OCCURRING FEATURES; DISCRIMINATE OVER-GENERALIZATIONS; STRENGTHEN GOOD GENERALIZATIONS BY REINFORCEMENT.

1. Learning

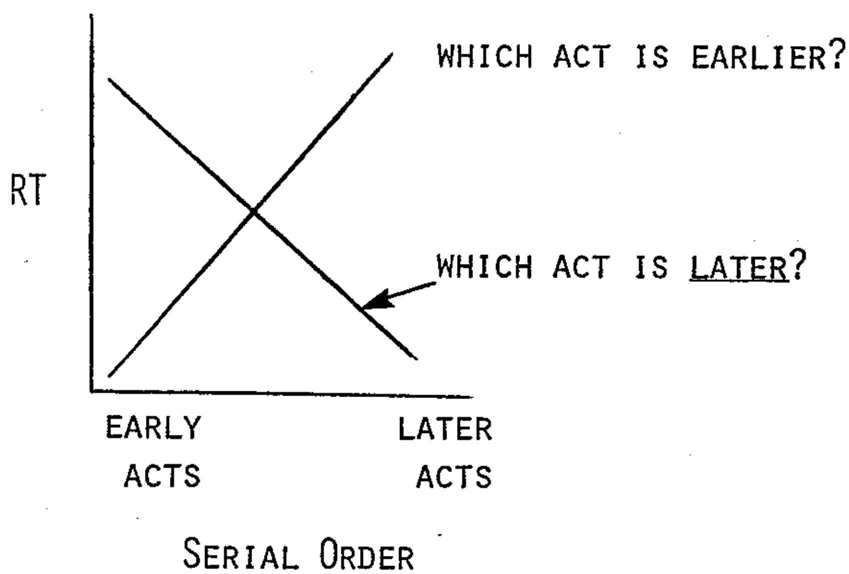
True Script Order: A B C D E F G H I J

Order to Learn in Text : A B G D I F C H E J

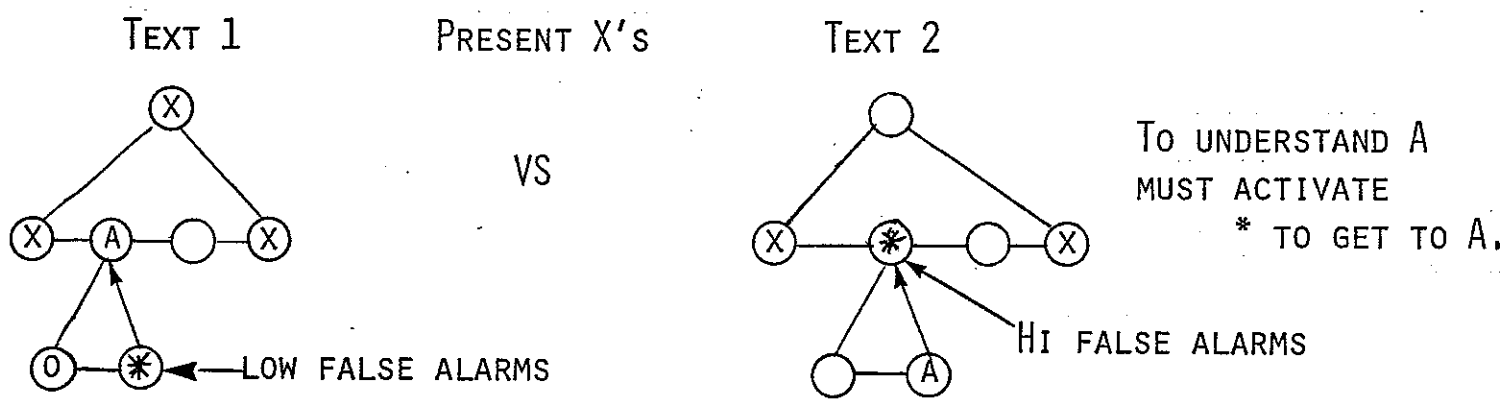
2. Which occurs earlier in script, B or D?

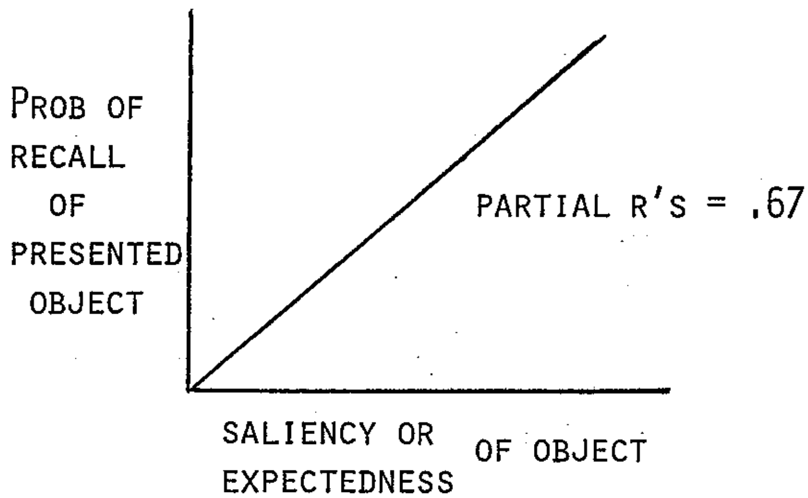


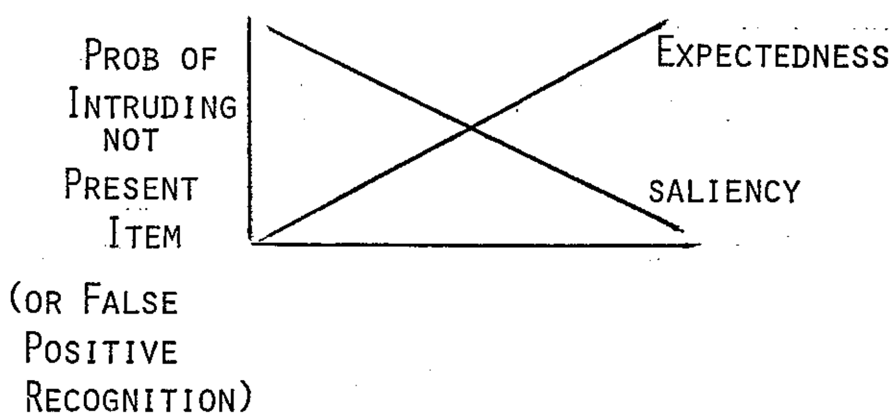
The "symbolic distance" effect



The "semantic congruity" effect


TEXT 1
PRESENT X'S
VS
TEXT 2
X
X
A
X
O
*
LOW FALSE ALARMS
X
*
X
A
HI FALSE ALARMS
TO UNDERSTAND A
MUST ACTIVATE
* TO GET TO A.

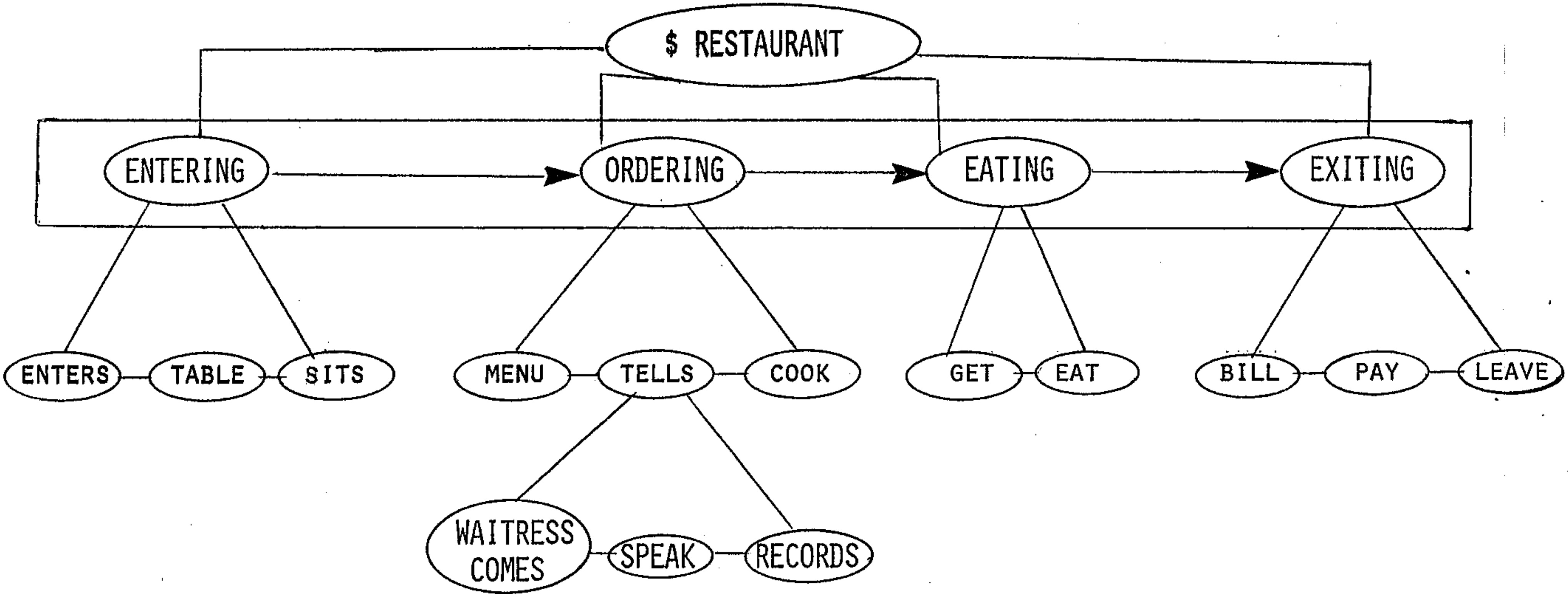

PROB OF RECALL OF PRESENTED OBJECT
PARTIAL R'S = .67
SALIENCY OR EXPECTEDNESS
OF OBJECT


PROB OF INTRUDING NOT PRESENT ITEM
(OR FALSE POSITIVE RECOGNITION)
EXPECTEDNESS
SALIENCY

SCRIPTS

- STEREOTYPIC EVENT SERIES
- CHARACTERS, PROPS, EVENTS, ACTIVATION CONDITIONS

SCRIPT NORMS FOR ACTIONS	STRONGLY AFFECTS
PRODUCTION FREQUENCY	RECALL; INTRUSIONS
TYPICALITY RATING	RECOGNITION; FALSE POSITIVES
NECESSITY RATING	(SAME)
IMPORTANCE RATING	(SAME)



Target Action's Importance	Presented	Nonpresented: Scene Instanced	Nonpresented: Scene Not Instanced
High	.73	.54	.46 ← Relative Rating of "Old" Item
Low	.69	.36	.33