

Planning Within a Virtual Environment

Travis L. Seymour

Andrea L. Patalano

Colleen M. Seifert

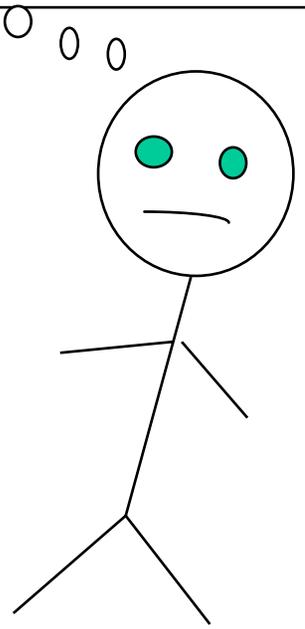
Department of Psychology
University of Michigan

Predictive Encoding

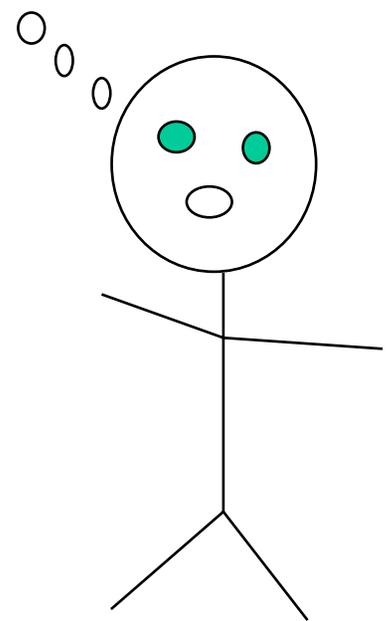
Imagine that you decide to hang a particular poster one morning. However, you are certain that you have nothing in your home with which to affix it to the wall. You decide to mentally put aside this goal and go about your day with the hope that you will stumble across something you can use to hang the poster or will be reminded to purchase something later. Later, during your lunch break, while at the post-office you are licking a stamp for a letter and are reminded that you need something to hang your poster. You go into a nearby store and purchase some tape.

How does this happen? What strategies influence whether or not people notice cues relevant to deferred or suspended goals? Patalano, Seifert & Hammond (1993) show that predictive encoding -- predicting at time of suspension what resources are needed to solve a pending goal -- serves to facilitate later recognition of opportunities.

Goal#4: Hang Poster
Plan: ?????
“There’s some tape”



Goal#4: Hang Poster
Plan: Find Tape
“There’s some tape - Hey, I could use it to hang that poster”

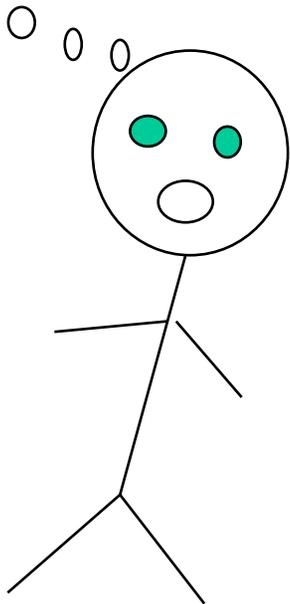


Moreover, by encoding a functional description of the plan rather than a more specific one, people may maximize the likelihood that they will retrieve a particular goal when a cue relevant to its resolution appears (Patalano & Seifert, 1996).

Goal#4: Hang Poster

Plan: Find something Sticky

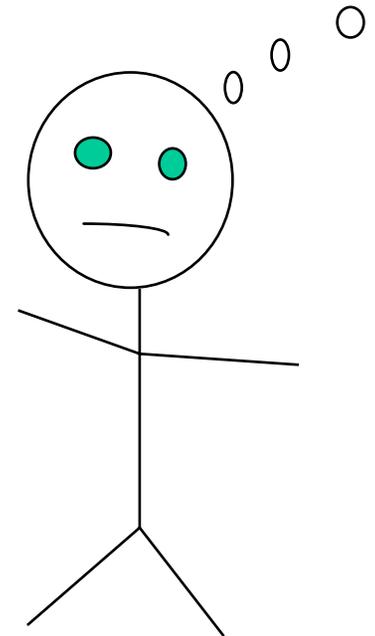
“There’s some gum, Hey, I can use that to hang the poster”



Goal#4: Hang Poster

Plan: Find Tape

“That sure is an odd assortment of items”



Effects of cue context

The Hypothesis:

Being reminded of a poster-hanging goal when you encounter tape is somewhat straightforward. Not only is tape a highly familiar solution to this goal, but tape's most salient feature, 'sticky', is directly applicable to the poster goal. Other possible solutions (albeit messy ones) like gum may not be as easily noticed since its most salient feature might be its food or candy qualities. It is possible that the context -- the objects surrounding the target item -- influences which features are salient and determines whether the object reminds one of the relevant suspended goal. For example, a piece of gum surrounded by other candy may make one think of candy and chewing type properties of gum. However, a piece of gum surrounded by a couple of postage stamps (presumably they are too small and weak to themselves be used to hang the poster) may bring to mind the sticky-when-wet properties of gum and thereby remind one of the poster-hanging goal.

The Experiment:

Experimental sessions were designed around a cued-recall paradigm. Subjects were presented with a collection of 12 text-based goals pertaining to a fictional scenario. Then subjects were presented with a series of object descriptions. Subjects were instructed to write down any goal that they were reminded of by the cue object and quickly move on to the next.

Beforehand, subjects were randomly assigned to one of three conditions:

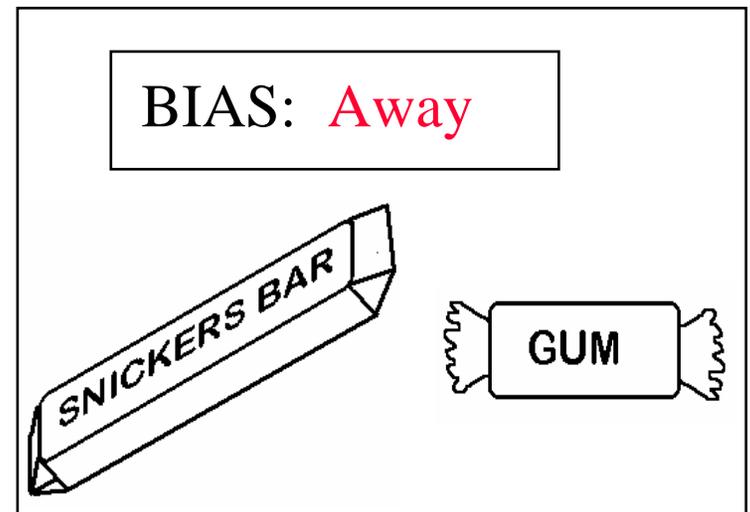
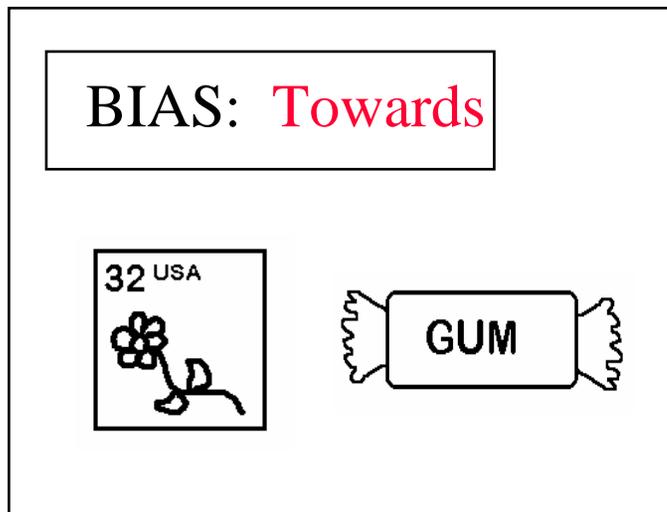
NoMemory: Subjects had the complete list of goal descriptions available for reference throughout the session and were merely required to match the appropriate cue objects with the corresponding goal.

Memory: After reading the goal descriptions once carefully, subjects in this condition had no further access to the written goal descriptions.

Plan: This condition was similar to the ‘Memory’ condition except that the goal descriptions included reference to abstract plans which could successfully be used to identify potential solutions.

Instead of the isolated cue items used in previous studies, subjects in this experiment saw descriptions of the target cue item along with a ‘context’ item. For each subject, half of the target cue items were accompanied by a context object designed to highlight those features most likely to lead to a successful reminding. The other half were accompanied by a context object designed to make salient features that would not likely lead to a successful reminding. In this way objects were biased *towards* or *away* from reminding subjects of the corresponding goal.

GOAL: Re-hang fallen poster



The Results:

The following were significant patterns in the data:

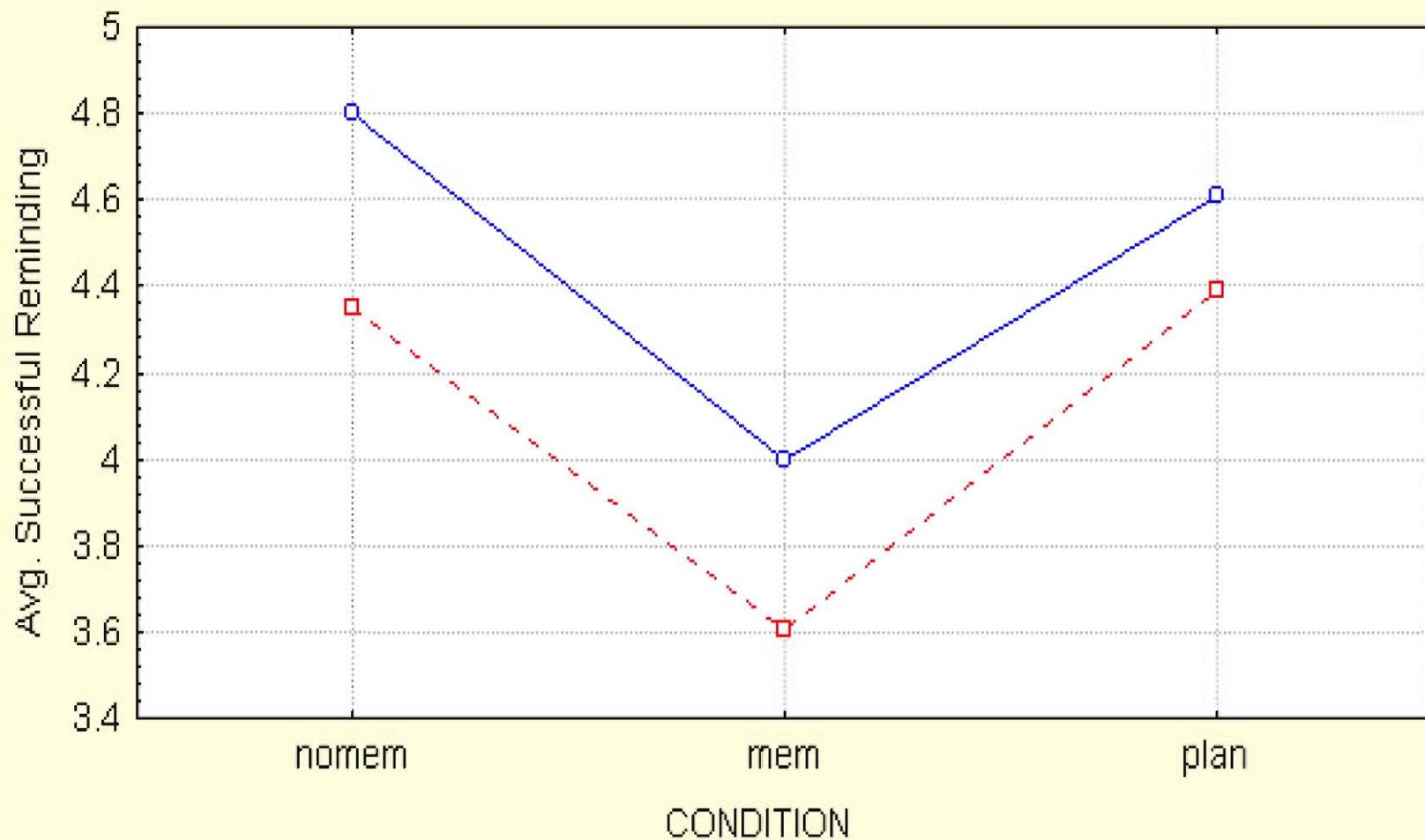
Memory Effect: Subjects in the ‘Memory’ condition were reminded less often than subjects in the ‘NoMemory’ condition. This was expected since goals that cannot be remembered cannot typically be cued by potential solutions.

Planning Effect: Subjects in the ‘Plan’ condition were reminded more often than subjects in the ‘Memory’ condition. This result replicates the predictive encoding effect shown in previous studies.

Context Effect: Subjects were reminded more often by a cue when relevant features were highlighted by the context object than when the context object highlighted features irrelevant to the associated goal.

Average Number of Successful Reminders by Condition

Solid Line = BIAS Towards, Dashed Line = BIAS Away

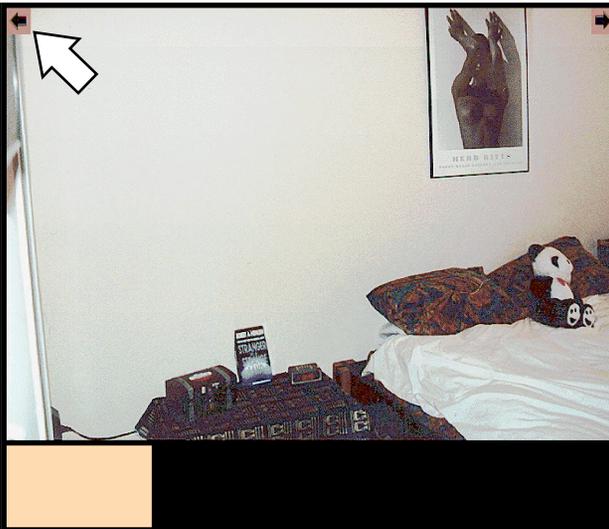
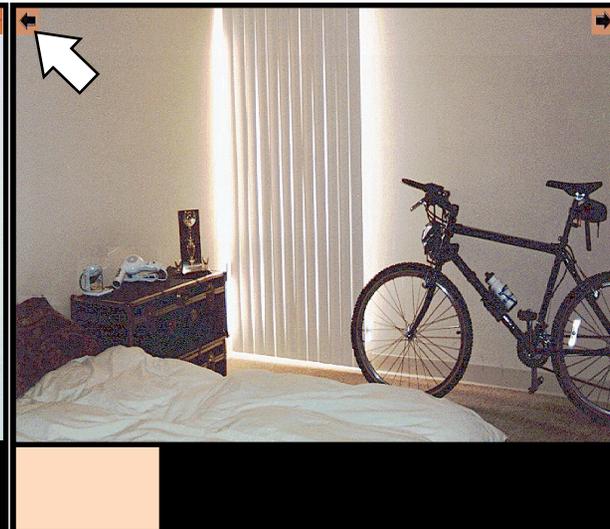
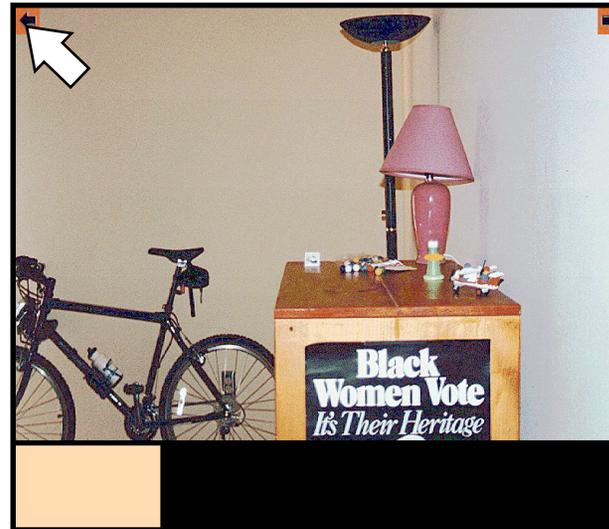


Reminding in a Virtual Environment

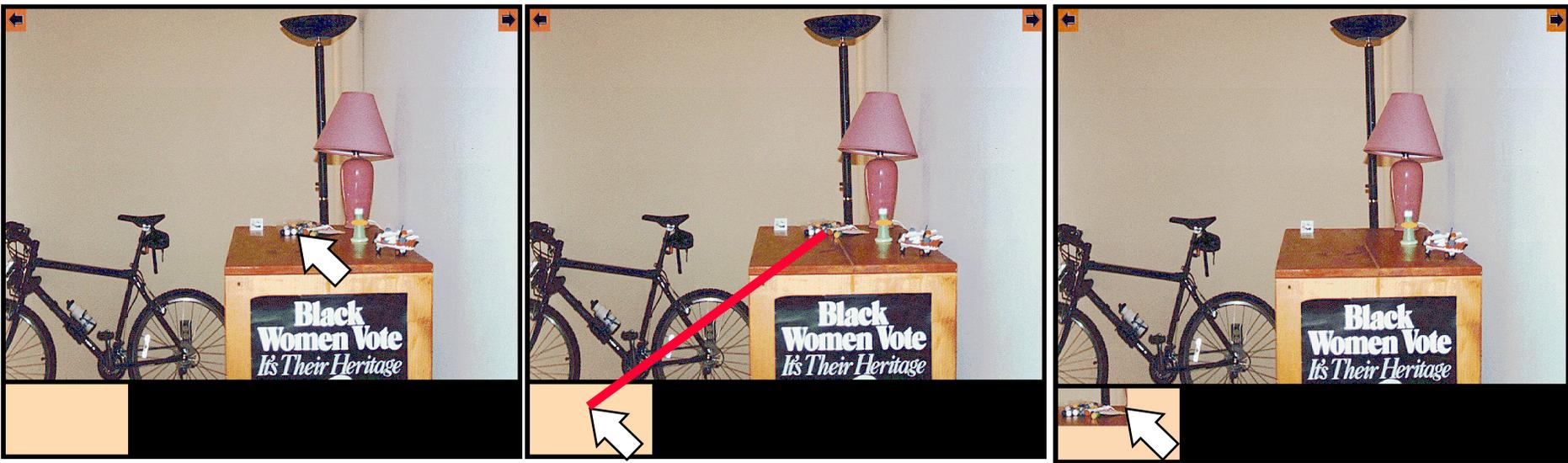
One interesting next step for research on reminders is to see whether similar patterns of reminders occur in richer environments. To facilitate this type of inquiry, the Graphical Environment Management System (**GEMS**) was developed. GEMS allows the presentation of full-color interactive graphical environments in which subjects can be presented with goals and objects. In this environment subjects have the opportunity to freely explore and spontaneously be reminded of goals by navigating and manipulating objects with the computer's mouse. This software was programmed to be easy to use, intuitive, and allow the ability to quickly build environments without the need for programming or scripting. The software further provides a complete record of each action the subject performs along with response times. Because the makeup of an environment is entirely dependent on the images used, the utility of GEMS goes beyond the study of planning.



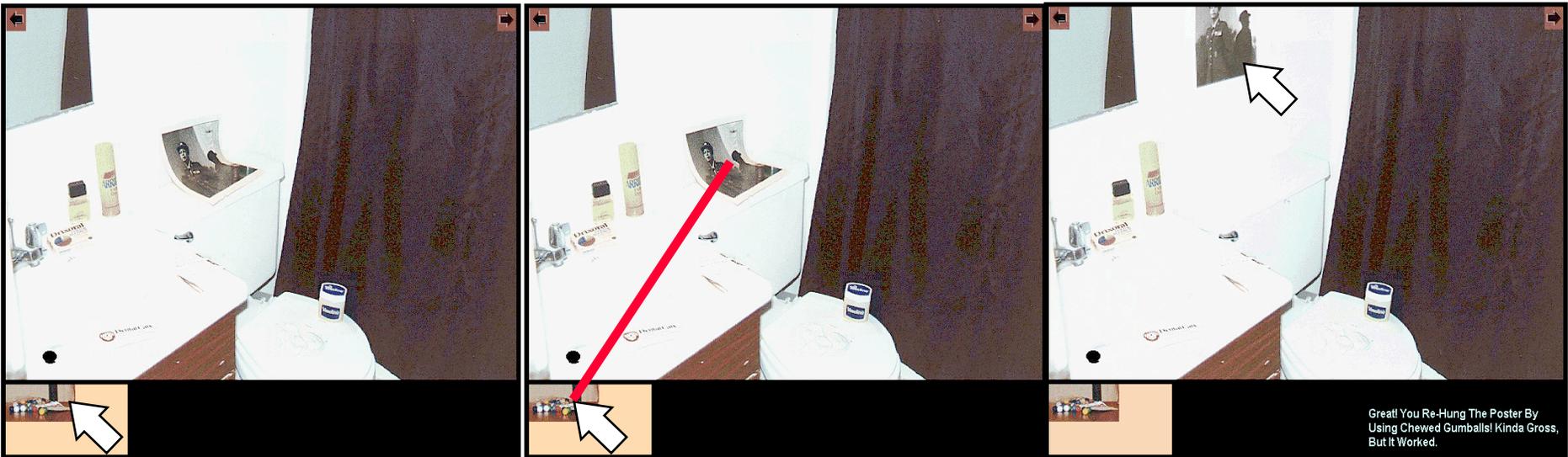
To navigate the environment, the subject clicks on doorways and passages with the mouse.



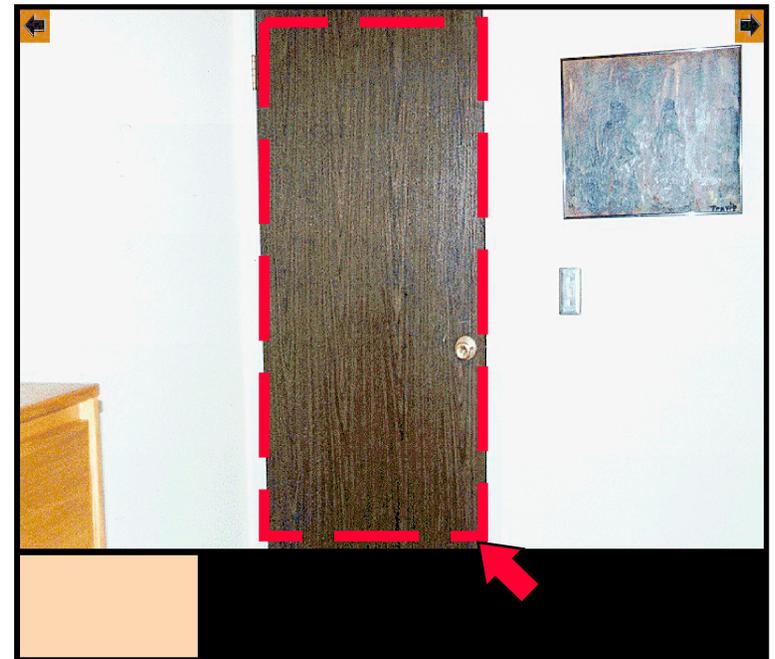
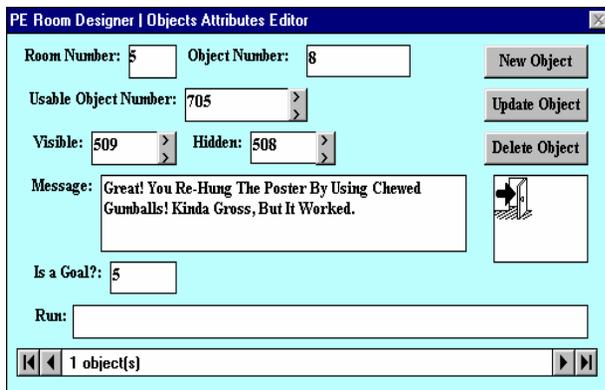
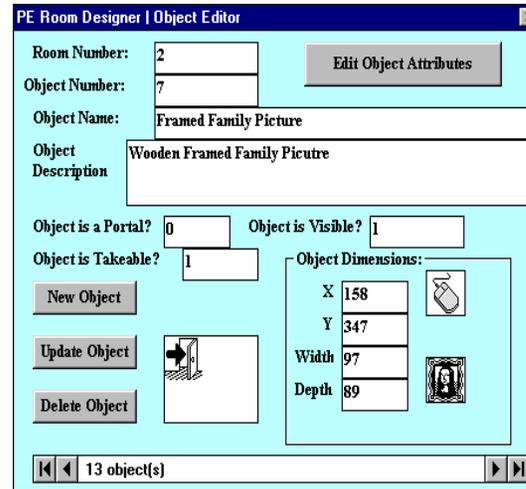
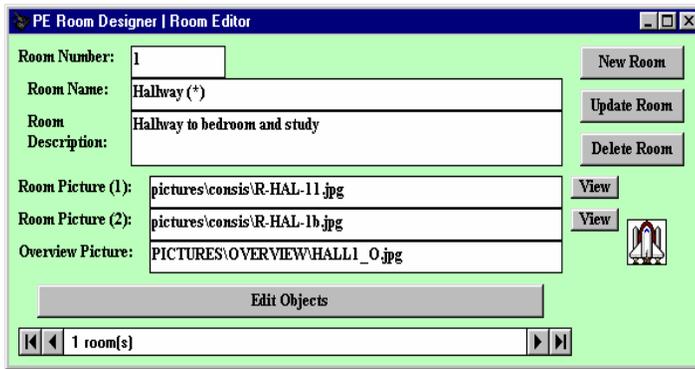
By clicking on 'turn arrows', subjects can turn to see different parts of a single room in the environment.



Subjects can drag objects from any room to a virtual pocket which allows them to move objects between rooms.



Subjects can use objects from the room or from their virtual pocket to cause changes in the environment.



objects & doors are selected with the mouse in the object editor

Constructing an environment includes specifying pictures in the **Room Designer**, selecting objects and doors in the **Object Editor** and defining interactions between objects with the **Object Attribute Editor**.

Future Directions

GEMS is currently being used to replicate the predictive encoding (Patalano, Seifert & Hammond, 1993; Patalano and Seifert, 1996) and cue context findings (Seymour Patalano & Seifert, 1996 unpublished data). Future projects will involve detailed plans and strategies to enhance subjects ability to manage multiple suspended goals as well as further inquiry into factors which influence successful reminders.