The Effect of the Major and Minor Mode in Music as a Mood Induction Procedure

by

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(ABSTRACT)

The effect of major or minor mode in music on the free recall of materials presented in a multimedia setting was investigated. Seventy-seven students from Virginia Polytechnic Institute and State University voluntarily participated in the experiment. The experiment consisted of three *Hypercard* stacks, identical except for the introduction where participants heard either a major or a minor melody line or no music. Participants read an identical text passage and recalled as much information as they could about the passage afterwards. The results showed no significant difference between groups.

Dedication

To Diane, Laura and Rachel --

May we never forget where we have been
so we never lose sight of where we are going.

What might have been is an abstraction
Remaining a perpetual possibility
Only in a world of speculation.
What might have been and what has been
Point to one end, which is always present.
Footfalls echo in the memory
Down the passage which we did not take
Towards the door we never opened
Into the rose-garden. My words echo
Thus, in your mind.
But to what purpose
Disturbing the dust on a bowl of rose-leaves
I do not know.

-- From *Burnt Norton*
by T.S. Eliot

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To the gang at The Emporium -- Get out!

To Mu Alpha Sigma -- Don't be afraid to get out! All hail to the revolution!

I suppose that a normal person would have gotten emotional over this part of the thesis.

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Introduction

> *Theoretically, it is possible that the right kind of music, employed in the proper manner, appropriate to both subject matter and audience, may facilitate learning. If music makes any contribution to learning from the film medium (and this is a hypothesis to be tested), then the problem becomes one of establishing what is right and appropriate...*
>
> -- from Zuckerman (1949, p. 1)

In the fields of advertising and media, there has been a rapidly growing interest in studying the effects of music in commercials, films and television. In the advertising field alone, millions of dollars are being spent on background music research with the belief that proper music choice helps reinforce commercial messages (Kellaris, Cox, & Cox, 1993). A content analysis (Stewart & Furse, 1986) of commercials, found that music had a positive relationship with recall as well as comprehension. Hunt (1988) found that radio ads with music backgrounds achieved higher recall scores than ads with straight announcement format.

Seidman (as cited in Bruner, 1990) reviewed music's contribution in the film industry (both box-office features and educational films) and found that "cognitive and affective comprehension...[could] be influenced." Boltz, Schulkind, and Kantra (1991) concluded that background music was able to influence recall for film events and that music mood congruency with film mood was also able to have an effect.

With today's "Nintendo" generation, educators are challenged to present new ideas to students in a way that will "draw them into the excitement of learning," (p.35) not only to reach those most at risk of dropping out but also high-achieving students (Gates, 1993). The result has been the development of multimedia teaching aids in the hope of capturing

the attention of students who are drawn to the dynamic electronic formats of computer games, movies, music videos and television (Peterson, 1990). Multimedia projects have been emerging rapidly in the education field. Educators, desperate to add some excitement to traditional pedagogy, have found that multimedia seems to create "proactive learners...[versus] passive receptors" and that students who were previously bored by certain subjects have become "...avid compilers of multimedia information (McCarthy, 1989, p. 30)."

Research on the effectiveness of the various components of multimedia applications on learning has only emerged recently, focusing almost entirely in the video realm. Part of the reason, according to Robert Kozma (1991), is that much of the emphasis in the still evolving field is on development. In addition, there is also the notion that studies which manipulate these individual technologies have limited applicability on the grand scale (Carlson, 1991). On the other hand, music, one of the sound components of multimedia has been shown to influence mood, which is regarded as having an effect on learning and recall.

Despite this, there seems to be little research on music's effect in the field of purposive multimedia presentations, despite the fact that is considered by some to be the "alpha and omega" in instructional audio-visual materials such as film (Jaspers, 1991). The norm of choice of music appears to be up to the instructional designer without regard to its effects. Hlynka (1980) in his review of educational film music, pointed out: "To educators, more often than not, music is an extra, a frill, an unnecessary embellishment" (p. 3). Kanner (1992), however, suggested that music can be a "poison" if it is used incorrectly and that when it is added arbitrarily, it can distract. Further, Zuckerman (1949) suggests that music can be used in educational media as memory reinforcement, either to

establish associations among the familiar and unfamiliar or to aid recall. All of this gives rise to the axiom: “In education, we know better than we do.”

The following literature review will focus on the existing research in advertising, marketing, cinema and television to help answer the questions: Does music have an effect on recall when combined with multimedia presentations at it’s simplest level? Do different musical structures, specifically music mode, have an effect on learning as measured by free recall?

Review of the Literature

Mood and Emotion

Any discussion of affective states requires an objective differentiation between the definition of mood and the definition of emotion. One school of thought amongst affective theorists states that moods are less intense than emotions. However, this point remains controversial as a defining characteristic. Morris (1989) notes that clinical mood disorders are only differentiated from ambulatory mood in quantitative measures versus qualitative. It has also been suggested that there is a corresponding facial expression for emotion states whereas there are none for mood states (Ekman, 1984). However, in a later article, Ekman (1992) suggested that this distinction is also problematic, finding that some emotion states did not have distinctive facial expressions.

Duration has also been suggested as a distinction between mood and emotion. Ekman (1984) proposed that moods encompass longer time spans than emotions. He stated that it would be "...bizarre to speak of being in an irritable mood for a fraction of a second" (p. 333). Emotions typically last between a few seconds to a few minutes - emotions which seem to last longer are considered to be recurrent (Ekman, 1994). Davidson (1994) invites caution with this interpretation as this distinction is descriptive versus quantitatively measured and therefore does not rule out the possibility that there might be "...instances of short-lived mood and longer-lived emotion..." (p. 52).

It is suggested that perhaps the most defining characteristic of mood is its lack of specificity, or globality (Frijda, 1993; Isen, 1984). It is suggested that emotion is "about" something, that by almost general consent emotions have an object. For example, an

emotion state is linked to its referent cause (i.e., “I am angry at my brother” or “That movie made me sad”) and often has accompanying sets of behavior (i.e., crying, hitting). The antecedent cause can be either conscious or unconscious (Davidson, 1994; Frijda, 1994). Further, it is suggested that moods are “affective states without an object or without a specific object,” (p. 381) as the environment as a whole has been suggested as a factor to induce mood states (Frijda, 1994). Mood, on the other hand, can be associated with emotion such as the feeling of irritability that may follow an emotion state but is considered to be more global and does not have the same subject-object relationship of emotion states. Frijda goes on to suggest that the objects of affective states are different from the cause. Moods may originate as the consequence of an emotional event which originated from an object. Emotion states turn into mood states when the focus on object becomes blurred and feelings associated with the emotion state become unstable and fleeting (Davidson, 1994, Frijda, 1993).

Functionally, emotion is used to modulate action and usually arises in situations where adaptive behavior is needed. Mood serves to modulate cognition and serves to alter and/or accentuate the accessibility of information. It is theorized that moods may be continually present and it follows from this that cognitive processes may be constantly biased or manipulated (Davidson, 1994). Isen (1984) suggests that mood states “...do not interrupt our thoughts and behavior, rather, they gently color and redirect ongoing thoughts and actions, influencing what will happen next but almost without notice and certainly without ostensibly changing the context or basic activity” (p. 179).

For the purpose of this paper, mood is defined as a fleeting transient state which is not tied to a specific behavior (Eagle, 1971, as cited in Radocy & Boyle, 1988; Gardner, 1985). It is that which is considered “positive” or “negative,” “happy” or “sad.” Mood is considered to have the capability to influence a fairly global range of thought processes and

behavior. It is thought to influence affective, cognitive and behavioral responses to a wide variety of stimuli. It is differentiated from the term "emotion," for example "rage" or "fear," which is considered to be a specific response behavior (Clark & Isen, 1982; Morris, 1989).

Mood and Learning

Of particular interest to this study is the role of mood in learning. A study by Hettena & Baliff (1981) indicated that elated mood may facilitate memory for sentences whereas depressed mood may lead to greater instance of zero recall. In addition, they found that unpleasant material was not learned better by people in depressed moods and pleasant material was not learned better by those in elated moods, suggesting that mood congruency may not have an impact on recall. Interestingly, Nasby and Yando (1982) found only one dimensional mood congruency: positive mood states facilitated the encoding and retrieval of positive adjectives whereas negative mood states failed to facilitate the encoding and retrieval of negative adjectives. This research is consistent with a study by Infante & Berg (1979) which concluded that positive moods induced by the major mode in music had the greatest impact on the perception of sad and neutral facial expressions whereas it had the least impact on the perception of happy facial expressions.

It has been argued that happy mood states enhance information processing whereas sad mood states inhibit information processing. Isen (1984) has suggested that the more efficient information processing brought forth by positive mood states influences cognitive organization which in turn can help facilitate retrieval. Bryan & Bryan (1991) found that students with learning disabilities accurately solved significantly more problems when induced into a positive mood than children assigned to the no-treatment control group.

Isen & Daubman (1984) in their study on the influence of positive affect on categorization, found that people who had been induced into a happy mood tended to view provided categories as more inclusive than those who were not induced into a happy mood. They suggested that positive affect allows access to a wider range of concepts than negative affect which serves to facilitate the ability to see relationships between ideas and objects. Isen, Johnson, Mertz, and Robinson (1985) suggested that positive mood may also facilitate creative problem solving. A supporting study by Isen, Daubman, and Nowicki (1987) on affect and creativity, concluded that people in a positive emotional state performed better than those in a neutral mood on a task requiring the participants to find remote word associations.

A study on delayed retrieval of information in advertisements found that participants induced into positive mood states recalled significantly more information about both the advertisement and the brand than those induced into a negative mood (Knowles, Grove, & Burroughs, 1993). In a related study, Mathur and Chattopadhyay (1991) found that moods induced by watching happy versus sad television programs also resulted in greater commercial message recall.

On the other hand, it has been suggested that chronically depressed patients may have learning difficulties (Beck, 1967). Likewise, those induced into a depressed mood experimentally have shown a reduction in recall compared to neutral mood state control groups (Ellis, Thomas, McFarland, & Lane, 1985). In addition, experiments by Ellis, Thomas, and Rodriguez (1984) and Leight and Ellis (1981) concluded that learning in an experimentally induced negative mood was at least 30% less efficient than learning in both positive and neutral moods. Principle findings in the aforementioned study by Leight and Ellis (1981) showed that simple recall, as well as coding techniques such as chunking, were hindered by depressed mood states indicating possible deficits in learning strategy

and organizational processes. In addition, a study by Dobson and Dobson (1981) tested the effect of natural mood, as tested by participant scores on the Beck Depression Inventory, on problem solving and found that depressives are less efficient than nondepressives in solving difficult strategy problems.

Mood Induction Procedures

Although there have been attempts to induce mood through procedures such as success versus failure in games, memory elicitation and physical posturing, there are three mood manipulation procedures commonly cited in the literature: hypnosis, the Velten Mood Induction Procedure (VMIP), and the Musical Mood Induction Procedure (MMIP).

The procedure for mood inductions through hypnosis requires the participants, after being hypnotized, to imagine personally relevant scenes in which they were either happy (i.e., an event of personal success) or sad (i.e., an event of personal failure or loss) to get themselves into the corresponding mood state. Mood states are thereby induced by remembering emotional events. Participants are then told to "adjust" their mood states until the mood was intense but not unbearable and were then told to maintain the mood state (Bower, 1981; Forgas, Bower & Krantz, 1984).

The main advantage of mood induction by hypnosis is that mood states can be quickly produced and can be maintained for several minutes while the participant performs other tasks (Bower, 1981). However, hypnosis has been criticized as being able to affect only a small percentage (20 - 25% of the population are highly hypnotizable -- the main criterion for mood induction by hypnosis) of the participants, making any conclusions limited in their generality to the population. It has also been found to be susceptible to demand effects (see discussion below) (Bower, 1981; Morris, 1989).

The procedure for the VMIP (Velten, 1968) begins with a set of instructions informing the participants that they are to read statements printed on a set of cards while trying to feel the mood that is suggested by the statements. The participants then read self-referent statements starting from mildly depressed mood statements (i.e., “Things aren’t quite like I would like them to be.”) moving through more depressing statements (i.e., “I feel so tired and gloomy that I would rather just sit than do anything.”) and starting from mildly elated mood statements (i.e., “All in all, I’m pretty pleased with the way things are going.”) moving through more elated statements (i.e., “It feels great to be alive!”) for depressed and elated mood induction, respectively. Neutral mood induction is also elicited by statements such as “Utah is the Beehive State.”

Morris (1989) cites three major problems with the VMIP. The first is role demand. Due to the transparent purpose of the procedure, it has been suggested that any differences in behavior may be due to motivation to comply with perceived expectation of the experimenter. For example the participants are informed that they will be undergoing a mood induction procedure and since the procedure alone cannot sufficiently induce mood, they are to work on “feeling” the mood that they have been requested to maintain. Given this, assuming that a particular mood state has been induced, the behavior of the participants may be due to instructions to adopt and maintain the requested mood versus being due to the actual mood induction procedure (Blaney, 1986; Kenealy, 1988). Experiments designed to control for demand characteristics have failed to reject the hypothesis that observed mood induction is due to role demand (Buchwald, Strack, & Coyne, 1981; Polivy & Doyle, 1980).

The second major problem is that the VMIP is fairly weak as well as time-limited. A study by Isen and Gorgoglione (1983) suggested that the mood induced by the VMIP might not last beyond an initial mood manipulation measure, seriously affecting the

mood's influence on an experiment's dependent measure(s). Lastly, the VMIP has been criticized for its ineffectiveness on males. Many experimenters, including Velten himself, therefore, limited the study of the VMIP to female subjects because of this.

An alternative mood induction technique is the Musical Mood Induction Procedure (MMIP), which was originally developed to overcome flaws such as demand effects and gender bias of techniques such as the VMIP (Sutherland, Newman, & Rachman, 1982). In addition, the large number of people that failed to respond to VMIP prompted Rachman and Sutherland to develop the original MMIP.

The procedure of the MMIP is as follows: Prior to mood induction, participants are told that they would be listening to music that would help them develop a happy/sad mood. However, they are also told that the music alone could not create the desired mood and were encouraged to think happy/sad thoughts, concentrating on personally experienced happy/sad events. Although subsequent induction procedures have used pieces chosen by the experimenter, the original study allowed the participants to choose between several different musical selections, selected for their particular mood qualities (i.e., depressed or elated) to enable them to find a piece that was personally relevant. The results suggested that musical mood induction can produce more sustained changes than the Velten Mood Induction Procedure and produces larger mood changes especially for depressed mood state inductions (Sutherland, Newman & Rachman, 1982).

There are several advantages of the MMIP. Despite the transparency of the procedure, Seta, Hayes and Seta (1994) found that only ten percent of the participants in their study correctly reported the actual purpose of the study. Further analysis of the study, indicated that the results with and without the biased participant pool had no difference in the outcome of the study, supporting the power of the MMIP. Albersnagel (1988) found that people reported feeling more dedicated to the task and found that their concentration

increased. Early findings concluded that mood induction through music caused greater and more sustained changes in mood than the Velten Technique (Sutherland, Newman, & Rachman, 1982). Clark (1983) examined existing research using both techniques and found that the main advantage musical-mood induction held over the Velten technique is that almost all of the participants responded to it. However, the results presented by the MMIP have been criticized as being more due to mood demand instructions than the musical selections (Lenton & Martin, 1991).

To test participant compliance, Parrott (1991) used a variation on the MMIP which traditionally involves instructing the subjects to get into the requested mood and maintain the mood while listening to the musical selections. In the modified MMIP, subjects were told after the induction procedure that the mood modification portion was complete and that they were allowed to stop maintaining the requested mood. Despite the fact that they no longer were required to concentrate on their mood, after a period of respite the subjects were given a recall test and showed mood congruent recall. Kenealy (1988) compared the mood effects of the MMIP with and without the demand effects of instructions and found no substantial differences between groups suggesting that music alone is a powerful mood inductor.

A nonverbal, musical-mood induction procedure was introduced by Pignatiello, Camp, and Rasar (1986). The induction procedure, which used nonlyrical selections from classical, popular and musical soundtrack recording chosen on the basis of the structural characteristics of pitch, rhythm, mode, loudness, melody and tempo, was successful in inducing depressed and elated effect. Furthermore, the induction procedure achieved these effects without informing the participants of the purpose of the music (demand effects) and demonstrated that the effects were not gender specific.

Music Mode and Mood

On a structural level, music mode has been examined as a possible explanation for the effectiveness of musical mood induction. Hevner (1935) suggested that mode has a greater influence on mood than other structural aspects such as rhythm or tempo. Modality refers to the placement of an octave's eight diatonic tones (Hevner, 1935, 1936; Talabi, 1986). The primary distinction between the major and minor modes is the placement of the mediant, or third. In the major mode, the third is comprised of four semitones whereas the minor third is comprised of only three (Radocy & Boyle, 1988).

Traditionally, the minor mode has been attributed to feelings of grief and melancholy whereas the major mode has been attributed to feelings of joy and happiness (Lundin, 1967; Schoen, 1940). Hevner's (1935) study on mood associations and major and minor mode, supported the aforementioned attributes of mode affect. People presented with an adjective checklist and music in the major and minor mode characterized melodies in the minor mode as "gloomy" and "depressing" whereas melodies in the major mode were characterized as "happy," "cheerful" and "joyous."

In support of Hevner's finding is Meyer's (1956) theory of deviations from expectations. He suggests that the major mode contains expectations of more regular and normative melodic and harmonic progressions which serve to mimic the human affective states of joy and happiness. On the other hand, music in the minor mode contain deviation from the expectations presented by the major mode and these complex and forceful departures result in associations with feelings of sadness.

A study by Stout, Leckenby, and Hecker (1990) on viewer reactions to music in television commercials found that commercials with music in the major mode had more positive reactions than commercials with music in the minor mode. The commercials with

music in the minor mode were rated as more irritating whereas the commercials with music in the major mode were rated as relevant and newsworthy. In addition, the products introduced with major mode music were viewed as more purchase worthy than products introduced with minor mode music. Thaut and de l'Etoile (1993) found that people induced into a happy mood state through musical mood induction using a piece composed in the major mode showed a significant increase in recall compared to people who had not been induced into an experimental mood state.

A survey by Carpuso (1952), where college and high school music instructors were asked to rate musical selections according to corresponding adjectives, showed at least fifty percent agreement of the affect of 61 pieces. The pieces selected as happy and sad were predominantly in the major and minor modes, respectively. Carpuso further suggested that the agreement amongst the rating of the musical selections may indicate the creation of "desired emotional effect" and could be used in similar mood settings in television and radio programs as background music. Today, two of the more common strategies in music use in film involves foreshadowing and accompaniment (Boltz, Schulkind, & Kantra, 1991). The present study involves the use of foreshadowing music which is used by filmmakers to signal a critical, upcoming event. The main purpose of this use of music is to command the viewers attention and invite expectancies.

The purpose of the following experiment was to attempt to answer the basic research question of whether or not major or minor mode has an impact on the recall of neutral materials. It was hypothesized that music in the major mode would have a positive impact on recall and music in the minor mode would have a negative impact on recall as determined by a test of free recall.

Methods

Participants

The participants were all volunteers who received extra credit for their participation from either Music Appreciation, Music in America, or Music for Classroom Teachers at Virginia Polytechnic Institute and State University. All participants were undergraduates, ranging in age from 17 to 38. Forty-seven participants were female and thirty were male. The students were told that the purpose of the study was to look at various multimedia applications at their most simple level.

In addition, there were three raters chosen to analyze the experiment's results. Of this group, there was one graduate student, one senior-level undergraduate and one sophomore-level undergraduate. The raters were not told of the true purpose of the experiment until all results had been analyzed.

Apparatus

The software application for the study was Apple Computer's *Hypercard 2.2* (1993). The experimental stack consisted of a passage about job design (Appendix 1) taken from a management science textbook entitled *Production/Operations Management* (Stevenson, 1990), presented in a linear, non-interactive manner. Among the raters, there was unanimous agreement as to the mood neutrality of the passage.

The music for the stack, consisted of a single melody line, chosen from a prior experiment on the impact of music mode (Berg & Infante, 1976), and was manipulated using *Performer 4.2* (Mark of the Unicorn, 1993). The composition, which emphasized the mediant, the primary determinant of modality, was identical in pitch, tempo and

volume and differed only in mode. The music was converted to a resource file for use in the *Hypercard* (Apple Computer, 1993) stacks using *SoundEdit 16* (Macromedia, 1995).

The stacks were presented on three Macintosh PowerPC 6100 computers to control for processor differences. All participants were required to wear headphones throughout the entire experiment to help reduce any excess noise that may have been present in the testing site. The headphones used in the experiment were the Sennheiser *HD 250 linear II*, a dynamic stereo headphone designed with a sealed ear chamber to help control for outside noise to allow the participants to concentrate fully on the music. The headphones had a frequency response of 10 to 25000 Hz at a +/- 3db level, which exceeds both the upper and lower limits of the response of the human ear (20 to 20,000 Hz). The experiment took place in the Computer-aided Learning/Creativity (Cal/C) music lab in Squires student center on the Virginia Tech campus.

Procedure

The participants were divided into three groups: a control (no music) group, a major-mode group, and a minor-mode group. Assignment to the groups was through systematic sampling, with the first student assigned to the control group, the second to the major mode group, and so forth. This was to ensure that the groups were as evenly distributed as possible in case of low participation in the study.

Upon arrival, the students were seated in front of one of the computers and asked to provide the information requested at the top of their recall testing sheet to determine sex, age, and major. It was explained that they would move through the test stack by clicking once with the mouse on each button that read “next.” In addition, they were told that they would view a short set of instructions after the introduction page which would remind

them once again what their task would be. They were also told that after they viewed the text on the screen, they would encounter a card telling them that the program was complete and that they should quit the program by clicking once on the mouse button which read "quit." The students were told that upon quitting the program, they were to try and recall any sentences or phrases that they could remember pertaining to the text on job design which had been displayed on the screen. In addition, the participants were asked to wear the headphones during the entire experiment in order to reduce any excess noise that might have been present in the testing room.

Each stack began with a brief set of instructions to remind the participants of the task at hand. After the set of instructions was introduced, the students were guided to begin the program by hitting the designated button. Upon pressing this button, the major and minor groups heard either the major or minor melody, respectively, before viewing the text that was to be recalled at the end of the experiment. The control (no music) group moved directly to the text after pressing the designated on-screen button. The text on the final screen in the stack guided the participants to quit the program by pressing the quit button and write down any information on their "recall test" sheet that they could recall from the information that was presented to them in the stack.

The aforementioned panel of raters, after having broken the text down into idea units present in the passage, judged the responses individually on a correct or incorrect basis. Idea units were defined as portions of the text that were deemed as an integral point of recall (see Appendix 1).

Results

Seventy-seven students participated in the experiment. The results of two of the participants had to be discarded due to an unavoidable disturbance in the testing area.

Interrater reliability was calculated using a one-tailed, Pearson r, correlation coefficient. Three correlations were calculated ($r_{1,2}$, $r_{1,3}$, and $r_{2,3}$) and averaged, yielding a reliability coefficient of .81. This was considered an adequate measurement for the agreement between judges for the measurement of free recall.

An analysis of variance (ANOVA) was computed to determine if there was a difference between the means of recall scores for the groups that was greater than would be expected by chance alone (see Table 1). The analysis failed to reject the null hypothesis at the .05 level, suggesting that any differences between groups were merely due to chance. Table 2 illustrates the ANOVA for this study.

Table 1

Mean Recall Scores and Standard Deviation by Treatment Group

Group	M	SD	N
Major	3.295	2.429	26
Minor	3.106	3.758	25
No Music	2.708	3.688	24

Table 2

Analysis of Variance

Source	SS	df	MS	F
Between Groups	4.442	2	2.221	.635
Within Groups	251.605	72	3.495	
Total	256.047	74		

Discussion

The results of this experiment suggest that music mode may not have an effect on the free recall of neutral subject matter. This is inconsistent with the research on the effect of positive music on neutral material (Hettena & Ballif, 1981; Infante & Berg, 1979). However, caution is advised when interpreting these results. Interference, in the form of instructions to quit the program, may have been introduced prior to the recall portion of the experiment. It is hypothesized that this interference may in turn suggest mood-state dependent mechanisms, meaning that the participant's accessibility to the retrieval of the recall materials may have been affected by their mood at the time of retrieval (Bower, 1981; Rholes, Riskind, & Lane, 1987). That is, materials encoded into memory while in a positive or negative mood will be recalled better when a person is in that corresponding mood-state. Therefore, the possibility of interference taking the participants out of an induced mood-state warrants a suggestion for further study.

An additional confounding variable may have existed when the participants were permitted to control the length of their exposure to each screen of information. Although they were not permitted to return to prior screens, the results of the experiment may have been due to attentional versus memorial processes due to an introduced bias from the knowledge that the program would be followed by recall measure (Bower, Gilligan, & Monteiro, 1981; Morris, 1989). Further study on the comparison of the use of materials with and without time constraint is urged.

In addition, further study is recommended to examine music placement. The use of foreshadowing music in this case, may not have been enough to maintain mood effects. It may be hypothesized that music played throughout a program or at various intervals may

be more apt to mood maintenance (Clark, 1983) and may be more in line with the global definition of mood.

Appendix A

Recall passage was examined by the three raters and 25 possible idea units (equivalent to 29 points) were determined. Unless otherwise noted, all idea units were worth 1 point. Idea unit worth 2 points were deemed so due to complexity. Slashes (/) represent the beginning of a new idea unit.

Job design is concerned with specifying the content and method of jobs. (2 points) / In general, the goal of job design is to create a work system that is productive and efficient (2 points) / taking into consideration costs and benefits of various alternatives. (2 points) / Practically speaking, job designer are concerned with / **who** will do a job, / **how** the job will be done, / and **where** the job will be done. /

In order for job design to be successful, it must be: /

• Carried out by experienced personnel who have the necessary training and background /

• Consistent with the goals of the organization /

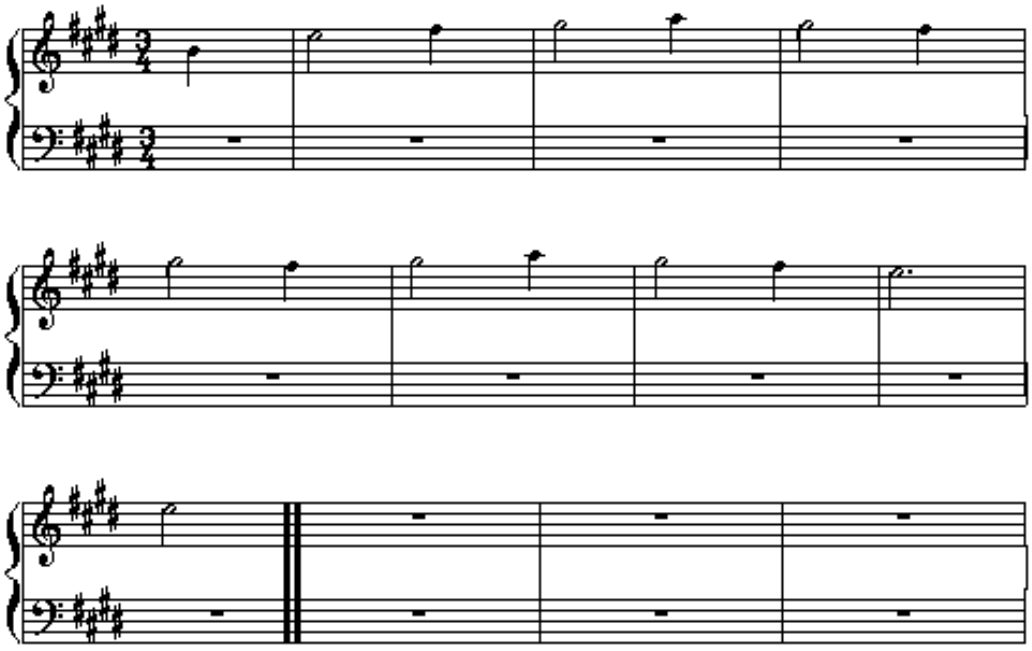
• In written form /

• Understood and agreed to by both management and employees. /

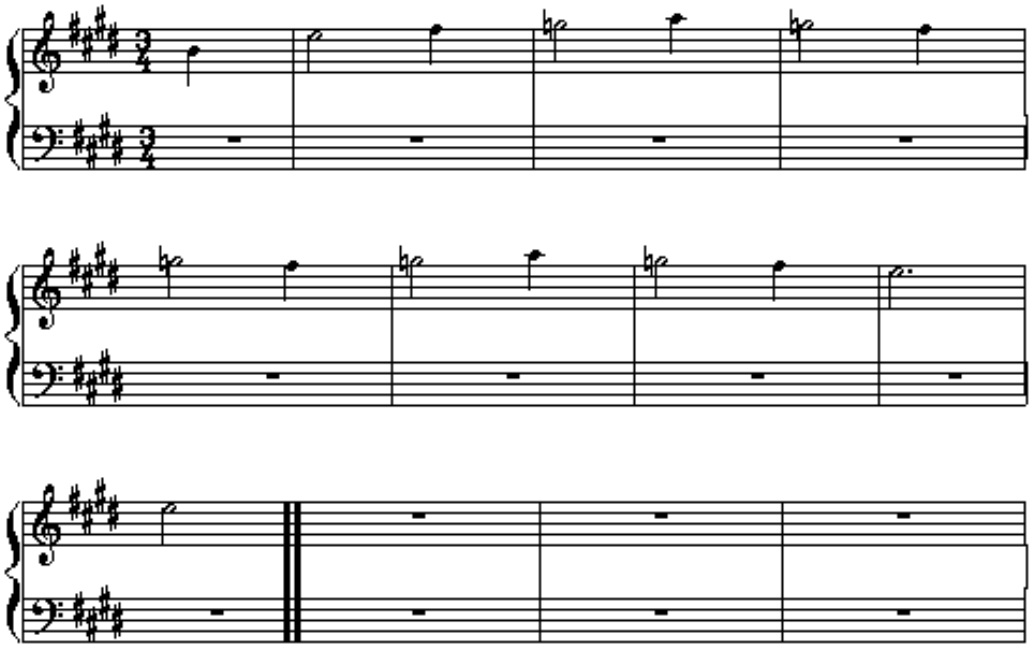
The factors that affect job design / and the implications of various alternatives / are often so complex / that a person without a good background in job design is likely to overlook important aspects of it. / Workers and managers alike should be consulted / in order to take advantage of their knowledge / as well as to keep them informed. / Because they are intimately involved with the work, / employees are frequent sources of valuable suggestions relative to job improvements. / Managerial support depends on the commitment and involvement of managers in job design. (2 points) / It is usually easier to sell a design / to these two groups if they have been included in the process. / Finally, establishing a written record of the job design can serve as a basis for referral if questions arise about it. /

Appendix B - Scores for the melodies

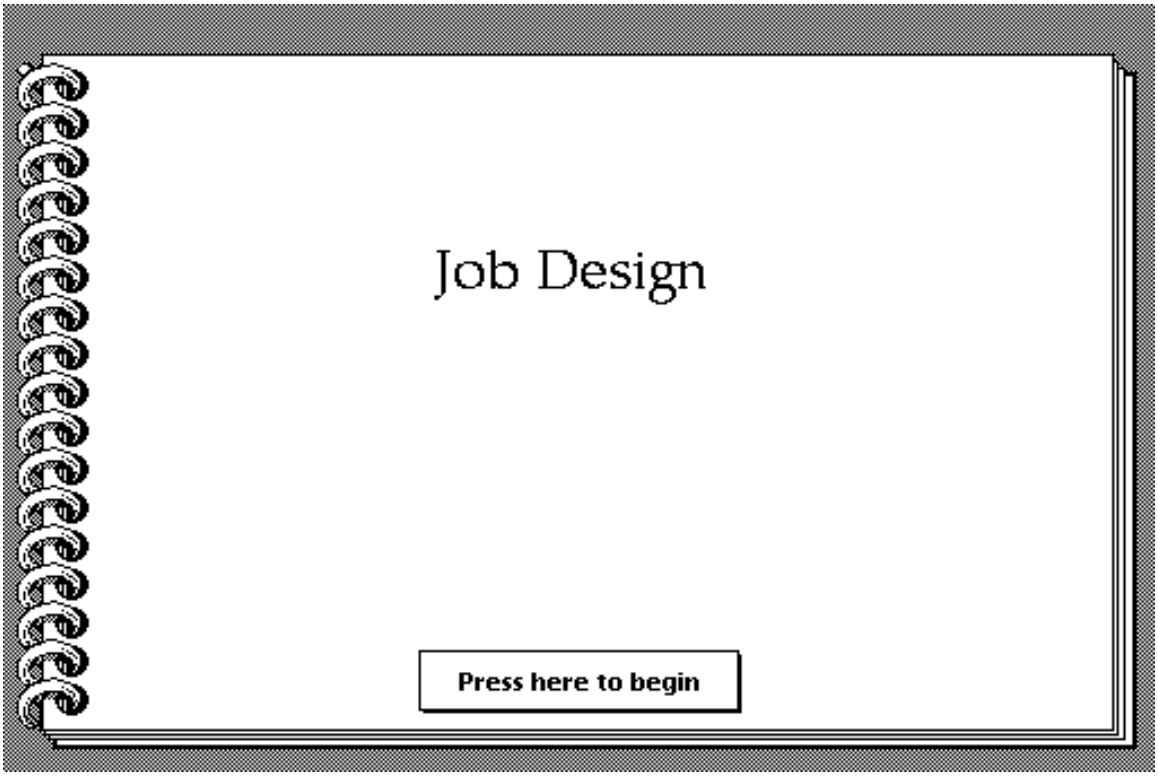
Major Mode



Minor Mode

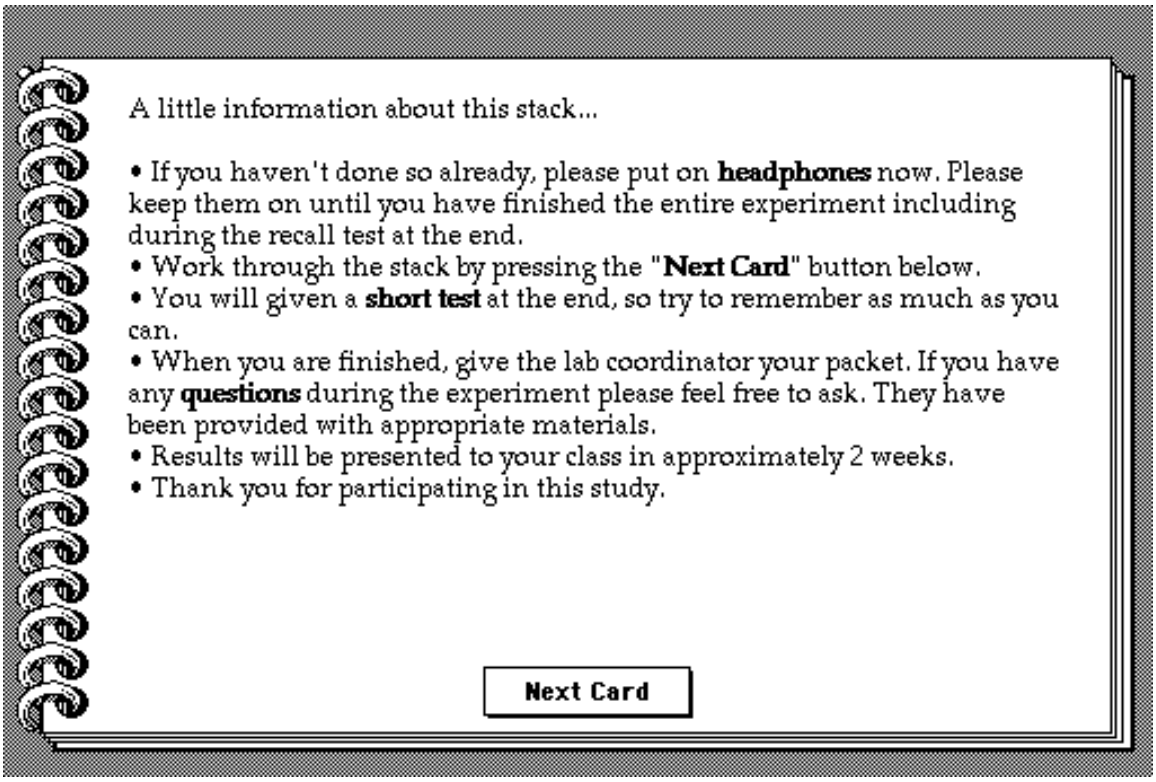


Appendix C - Screen Design Examples

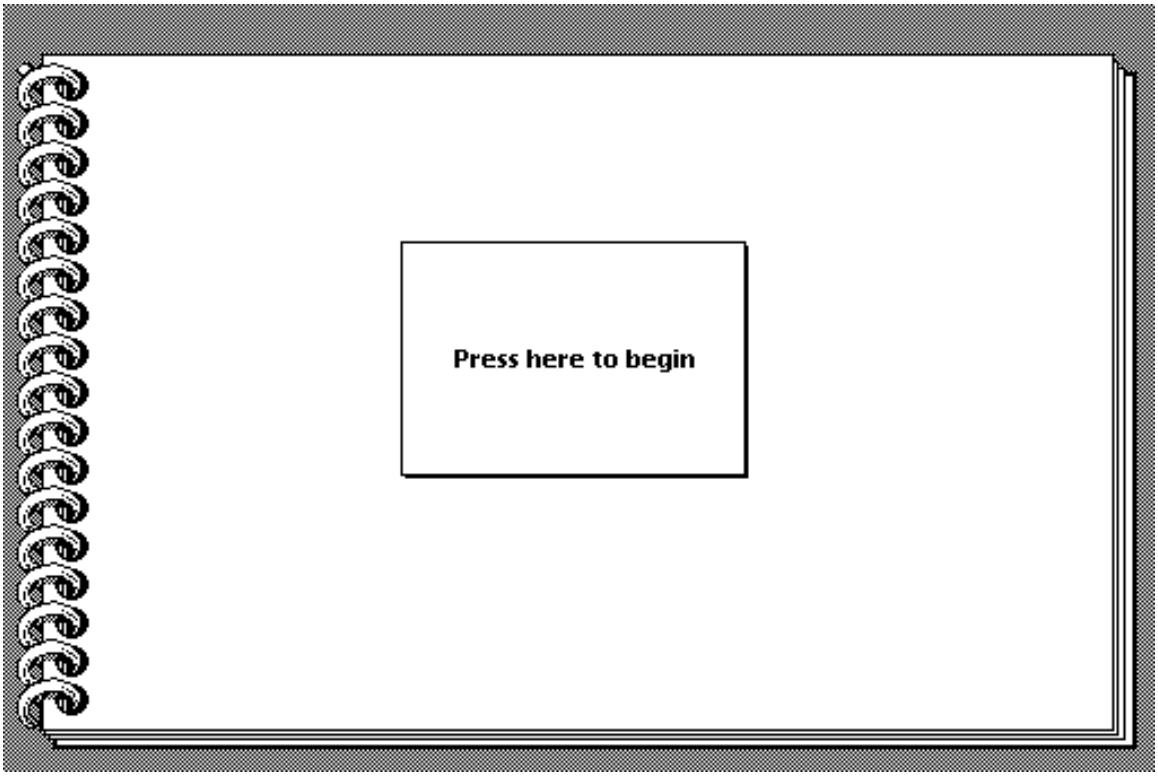


Opening screen design

Title screen design

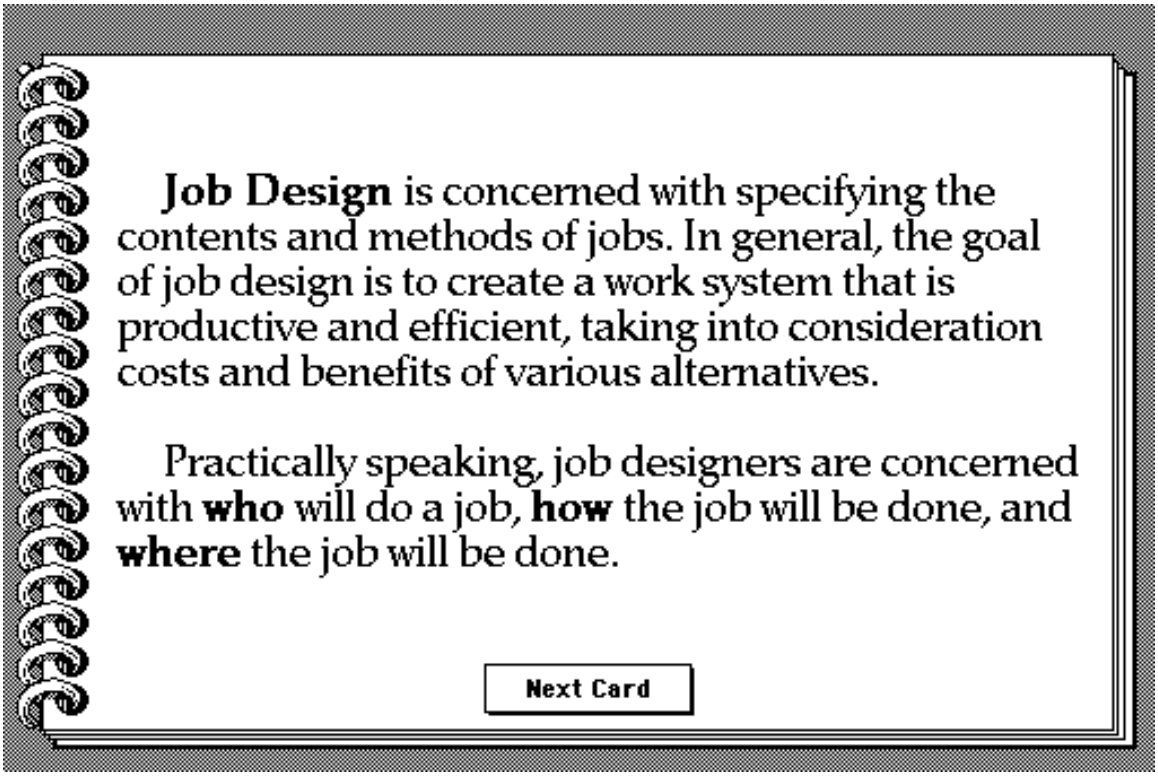


Instructions screen

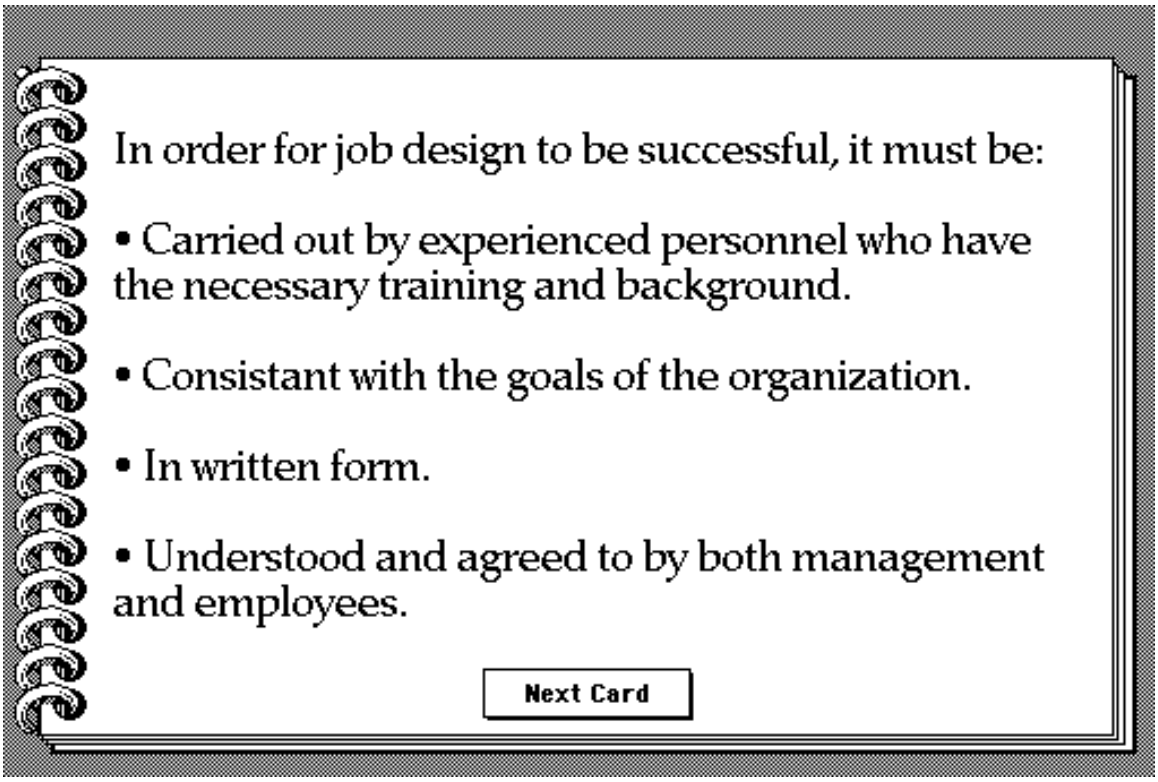


Music selection presented here in mode groups.

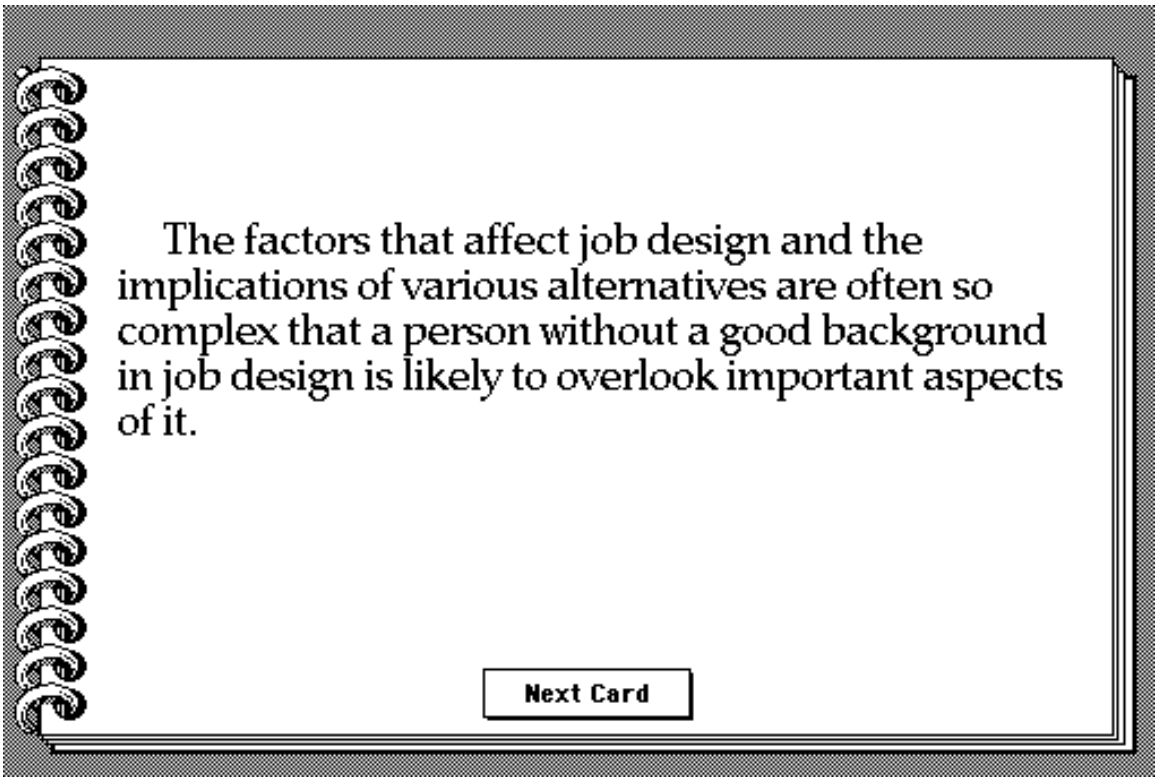
Control group advanced to next screen.



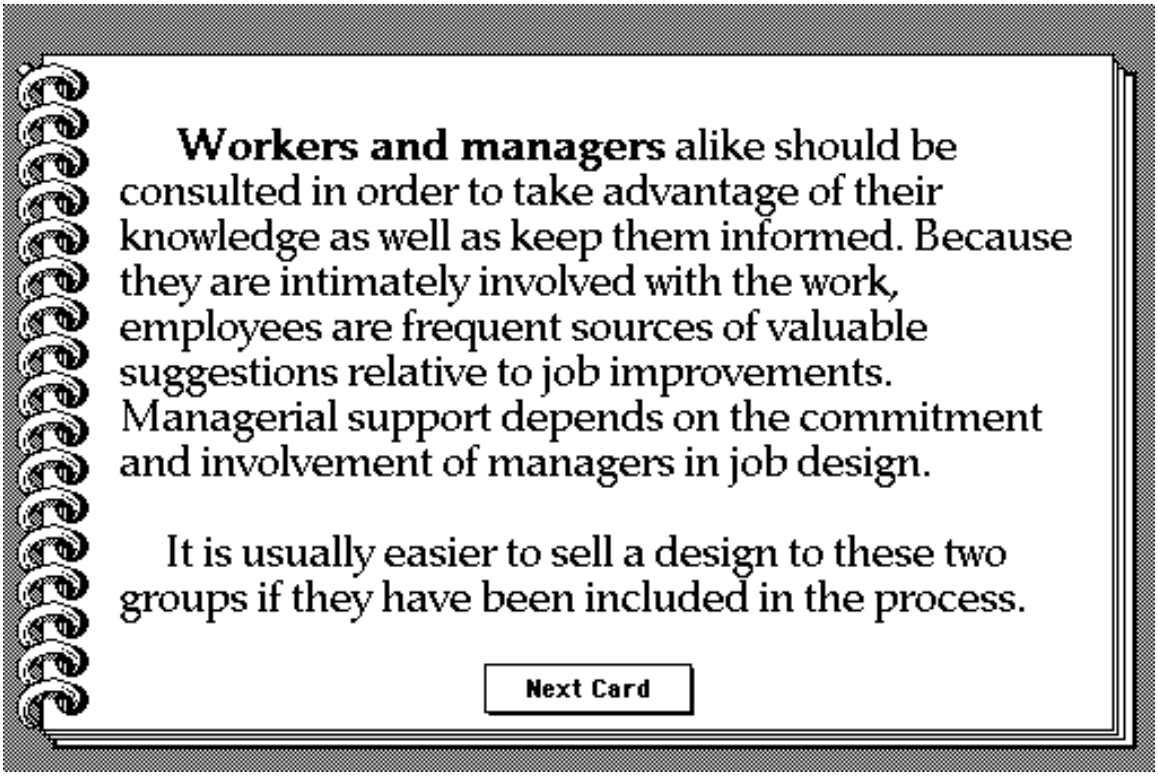
Text presentation



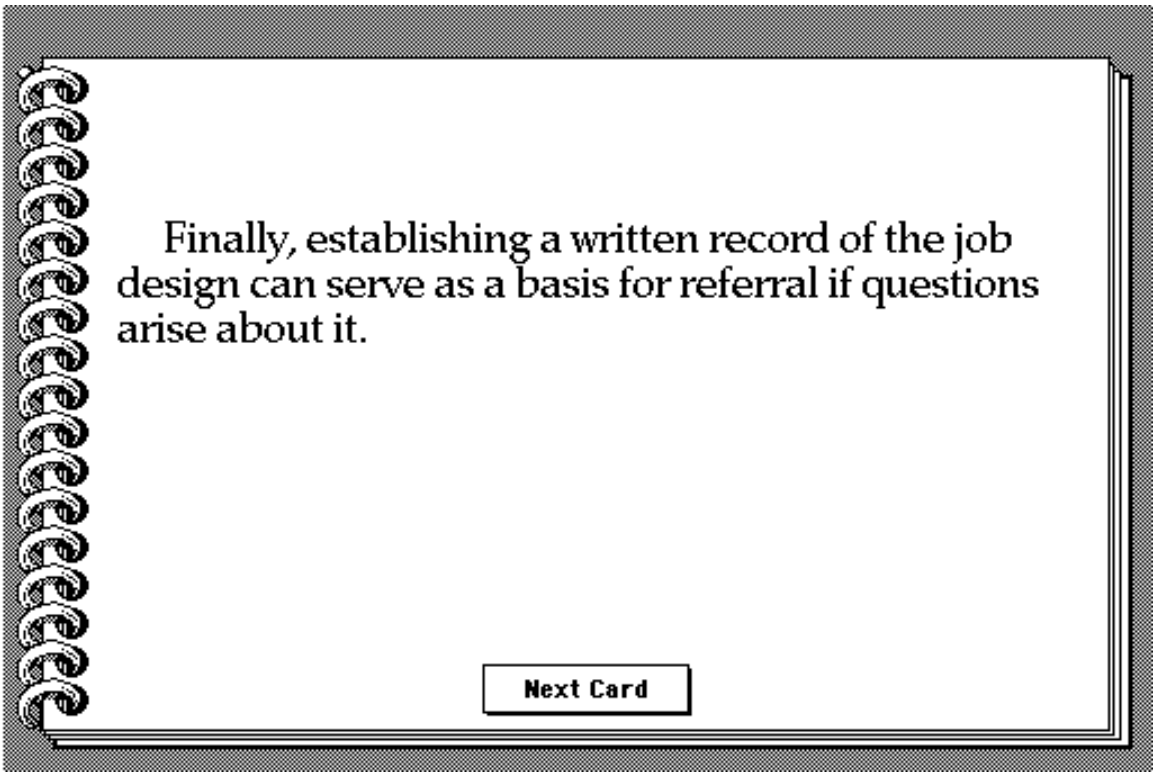
Text presentation continued



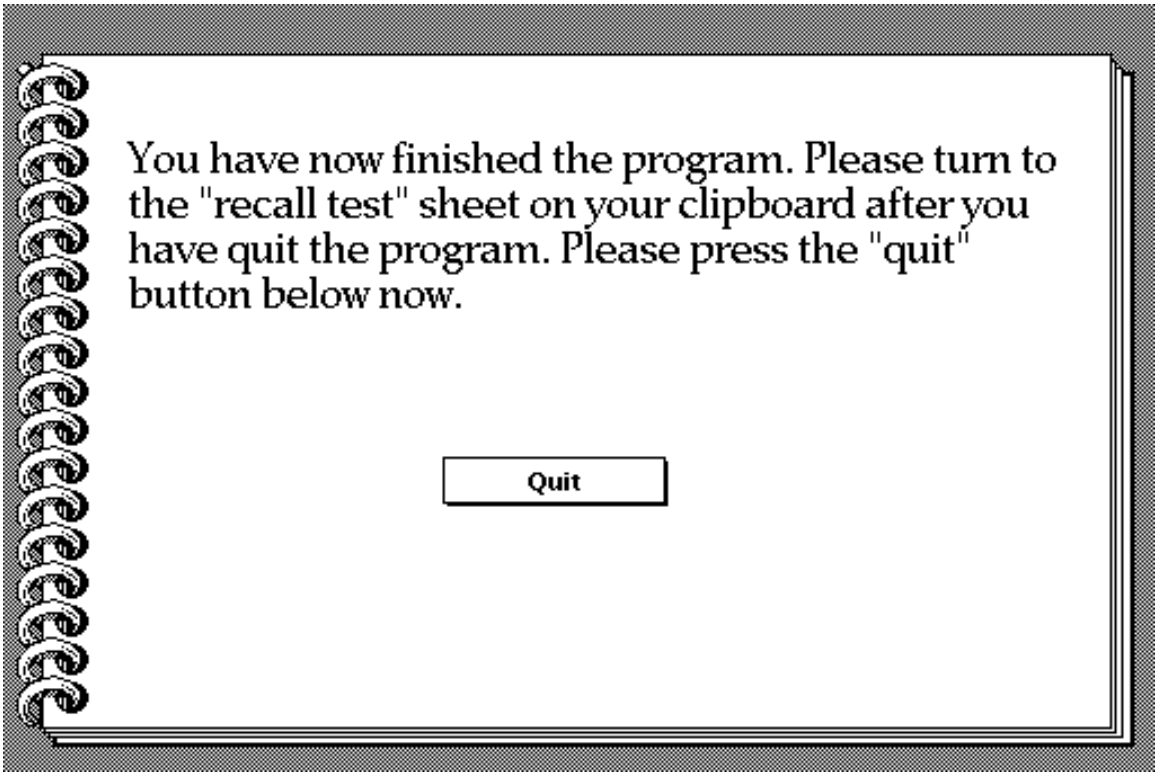
Text presentation continued



Text presentation continued



Text presentation continued



Closing screen

Appendix D - Recall Sheet

Major_____ Subject_____ Experiment Type_____

Age_____ Sex_____ Year in School_____

In the space provided below, please write down any phrases or facts that you can recall. When you are finished, please hand this form back to the lab coordinator.

Please indicate your social security #_____

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Vita

D. Michelle Hinn is a native of the Washington D.C. area. She completed her undergraduate degrees in Music Performance and Psychology at Virginia Tech in 1993. After working for a year as a manager of an Eddie Bauer store (R-167), she began graduate studies in Instructional Systems Development at Virginia Tech in the fall of 1994.

She is a member of Delta Omicron Music Fraternity, Kappa Delta Pi education honorary, Mensa, Phi Kappa Phi academic honorary and Phi Mu sorority. Professional associations include (but is not limited to): the American Educational Research Association, the Association for Computing Machinery, the Eastern Educational Research Association and the International Visual Literacy Association.

Michelle is an avid t-shirt marketer as well as internet programmer. She is also a collector of books she someday intends to read that she stores, untouched, on her bookshelf. In her spare time, she likes to examine the role of computer programming as adaptive technologies for persons with disabilities. This is the area that she would like to go into next.

And because she swore that she would put this somewhere in her thesis: “We hold these truths to be self evident.”