
Adolescents' Memories of Career Information Videotapes

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Abstract

The theory of memory-mediated learning proposed by Martin (1989; 1990; 1991, in press), following Tulving (1983, 1985), and Paivio (1986), emphasizes the role of learners' experiential, episodic memories as mediators between psycho-educational interventions and learners' everyday application of what they have learned from such interventions. We used this theory as a basis for examining what adolescents remember from viewing videotapes intended to provide information about specific careers to high school students. We compared two videotaped career presentations to find out whether students differed in their memories of, and responses to the information presented. One tape was produced with the explicit intent of enhancing visual and experiential content. The other is widely used in counselling centres across Canada. Findings were that although students expressed a reliable preference for the former, there were no reliable differences in number of visual or verbal memories reported for each tape, or in accuracy of content recalled. An anticipated link between affective information and a visually enhanced medium was supported, but other predictions of the theory of memory mediation were not. A practical implication is that either videotape was equally effective in promoting students' learning of facts about a career, despite their expressed preferences for one videotaped presentation over the other.

Résumé

La théorie de l'apprentissage de la mémoire interposée proposée par Martin (1989, 1990, 1991, sous-presse), suivant Tulving (1983, 1985), et Paivio (1986), met l'accent sur le rôle des mémoires expérientielles, épisodiques comme médiateurs entre les interventions psycho-éducatives et les applications journalières de l'apprenant de ce qu'ils ont appris de ce type d'interventions. Nous avons utilisé cette théorie comme base pour examiner l'information retenue par des adolescents après avoir visionné des vidéo-cassettes présentant des carrières spécifiques à des étudiants du deuxième cycle. Nous avons comparé deux présentations de vidéo-cassettes en carriéologie pour identifier si les étudiants différaient dans leur façon de mémoriser et de répondre à l'information présentée. Une cassette était produite avec l'intention explicite de mettre en valeur un contenu visuel et expérientiel. L'autre est utilisé régulièrement à travers le Canada. Les résultats sont que même si les étudiants expriment une préférence certaine pour le premier vidéo, qu'il n'y a pas de différence significative dans le nombre de mémorisations visuelles ou verbales rapportées pour chaque vidéos, ou encore une exactitude du contenu rappelé. Un lien anticipé entre l'information affective et un médium stressant l'aspect visuel était supporté, mais d'autres prédictions de la théorie de la mémorisation interposée n'existaient pas. Une implication pratique est que chacun des vidéos était également efficace dans la promotion de l'apprentissage par les étudiants de faits sur les carrières, malgré leur préférence pour une présentation vidéo-cassette plutôt que l'autre.

For students likely to make an early transition from high school to work, videotape and videodisc presentations, such as those currently being developed by the Canadian Guidance and Counselling Foundation, are important sources of career information. Evaluation of such media-

assisted career information sources indicates whether they are effective in informing students and guiding their career decision-making, and points to ways to design more effective media for career development. Analysis of links between media characteristics and student learning outcomes within a strong theoretical framework also tests our current theories about how students learn from media-assisted psycho-educational interventions.

Martin's theory of memory-mediated learning from psycho-educational interventions emphasizes the role of learners' experiential, episodic memories in mediating between interventions, such as career videotapes, and the use of understanding and information from such interventions in everyday contexts, such as when making decisions about possible occupations (1989; 1990; 1991, in press). Content that is not remembered will not be used. Therefore, enhancing learners' memory for important psycho-educational content is an important consideration in designing career information media.

Specifically, Martin (1991) argues that for psycho-educational interventions to be effective, important aspects of the intervention must be encoded and stored as experiential, episodic memories by the recipients. The notion of episodic memory comes from Tulving's (1983, 1985) ternary theory of memory. Tulving (1983) proposes three separate memory systems, with procedural memory as the foundation which contains semantic memory as a specialized subsystem. Semantic memory, in turn, contains episodic memory as a specialized subsystem. Tulving describes the unique contributions of episodic memory as the "capacity of acquisition and retention of knowledge about personally experienced events and their temporal relations in subjective time and the ability to mentally 'travel back' in time" (1985, p. 387). In short, the episodic memory system is subjective in nature. It is the mental vehicle that contains idiosyncratic personal meanings and affective information about past events. In the context of learning from career information videotapes, episodic memories include specific personally meaningful images or phrases used in the career videotape. Martin (1991) theorizes that these experiential, episodic memories interact with and lead to alterations in learners' personal theories and knowledge structures, in this case, with respect to the careers profiled in the video presentations. Such revision to personal theories and knowledge structures constitutes an elaborated basis for students' performance in related life tasks, such as career decision-making.

Whether students will remember particular career information presented in a videotape depends on both characteristics of individual learners and on characteristics of the instructional medium. Characteristics of learners that differ across individuals and that might influence the subjective episodic memories they retain include, for example, preferred

style of learning, previous experience with and interest in that career, or gender-related differences in career objectives. Videotaped career presentations can differ along verbal/imaginal dimensions. For example, particular information about a career can be presented primarily verbally, and at various levels of verbal complexity, or primarily imaginally (via images), at various levels of imaginal complexity. Paivio (1986), in formulating his dual coding theory of mental representations, argues that information that becomes represented in the minds of learners in both verbal and imaginal forms is more complete, affectively-laden and memorable, than is information represented solely in verbal formats. Clearly, viewers' episodic memories for videotape material might be expected to differ in the manner of their mental representation, depending on individual viewers' preferences for verbal, imaginal, or cross-referential (verbal and imaginal) mental processing of material seen and heard.

This study had four main purposes. First, we wanted to determine if particular production differences in career information videotapes are perceptible to the high school audience. In particular, we wondered whether such production differences would be associated with differences in the number of verbal or visual memories students reported, the helpfulness ratings students assigned to the videotapes, or the students' accuracy in recalling factual content from the videotapes. These findings could have practical implications for how to improve audiovisual presentations of career information to students.

A second purpose was to gather descriptive information about students who exhibit a proclivity to recall either information presented verbally or information presented visually. What students ultimately learn about a career from a videotape is mediated by their memories of that viewing. Are tendencies to report visual or verbal memories associated with sex or grade, or the order in which the videotaped material is presented?

Students' affective responses to any career presentation can influence the likelihood that they will learn from that presentation or use the information presented. Affective responses might also influence students' impressions of careers depicted, and whether or not they will pursue information about other careers via that modality of presentation. Thus, our third purpose was to examine how students' ratings of videotapes as "positive" or not were associated with the visual, verbal, and accuracy scores taken in our study, as well as with various characteristics of the students themselves.

Finally, an explicit purpose for having students view career information videotapes is so that they will learn the careers depicted (and then use this knowledge to make career decisions). We wanted to know if certain types of students were more likely to learn factual information

presented, or whether any such relationships depended on characteristics of the particular tape being viewed.

METHOD

Data Collection

The subjects were 16 male and 27 female students in grades 9 to 12 attending career-planning classes in two high schools in the Toronto metropolitan area. The 24 students attending "V.A.," an urban school, included eleven grade 9, two grade 10, six grade 11, and five grade 12 students. The 19 students attending "S.U.," a suburban school, were all in grade 9.

The two classes each viewed two short videotapes ("STM" and "LIMI") about the career of auto technicians (auto mechanic), and immediately after each tape completed a brief questionnaire. The screenings and questionnaires were administered by counsellors from the York Region Education/Industry Foundation and Career Centre. The students at V.A. viewed LIMI first, followed by STM. The S.U. students viewed the tapes in the reverse order.

STM refers to the *Motor Vehicle Mechanic* videotape produced by STM Systems Corporation. It provides information about automobile mechanics as a career, with the intent of helping students make an informed career choice. It is part of the Video Career Library, a set of career information tapes widely used in career centres across Canada. The tape begins with a close-up of a man and a woman, seated in a counselling office setting, who deliver introductory remarks about the career. Then, scenes of garages and mechanics at work are presented, alternating with screens of written information in point form (for example, a list of six types of careers in mechanics). The male and female voices alternate in the commentary.

LIMI refers to a *Careers "Auto Technician"* videotape produced by Light-house Island Productions in 1990 under the auspices of the York Region Education/Industry Foundation and Career Centre. This videotape presents similar career information content as the STM videotape and also alternates between scenes of auto technicians at work and screens of written information. The producers aimed to improve the production quality, update the information, improve the delivery and appeal of the verbal information, use stronger, more cohesive visual images and sequences, and, particularly, to make the affective components of the videotape more appealing. The intent was to enhance memorability of the career information by manipulating visual, verbal, and affective aspects of the videotaped presentation, in ways that can be construed as consistent with Martin's theory of memory-mediated learning (1990, 1991).

The questionnaire included three types of questions. The first set of questions were memory probes (Experiential Memory Questionnaires, or EMQs) that prompted students to think back to the videotape they had just reviewed, to identify parts, words, and pictures from the videotape that they remembered most, and to explain why they recalled each of these parts.¹ Then, students answered a series of questions probing their opinions about the videotape they had just viewed, and whether it had changed their impressions and interest about the career of auto technician. Last, students answered a set of questions that tested the accuracy of their recall for specific factual information presented in the videotape. This same questionnaire was completed twice by all participating students, once after viewing each of the two short videotapes.

Data Coding

Responses to the three types of questions were coded by the first author for quantitative analysis.² The memory-probe questions were coded by locating in the videotape each event, image, or phrase that students reported as standing out in their memories, and categorizing these as "visual" (imaginal), "verbal" or "visual-verbal." Reported events were coded "visual" if the information had been presented on the videotape only through visual images or sequences of images. For example, a brief sequence on one videotape showed a garage owner's dog beside the owner in the service bay, although the dog was not mentioned verbally. Reports recalling the dog were coded as "visual." Reported events were coded as verbal if the information had been presented on the videotape in verbal form only, either by being spoken about in the commentary or by one of the characters filmed, or if the information had appeared in written form on screens of point-form facts, which were read aloud by the commentator. Reported events were coded as "visual-verbal" if they referred to information that had been presented both visually and verbally. For example, in one videotape a verbal description of using computers for wheel alignment accompanied a filmed visual segment of an auto technician using the computer as described.

The set of questions inquiring about the students' impressions of each tape was judged as a unit and coded dichotomously. If students reported in their own words that they found the videotape helpful for career planning, or interesting, or both, their impressions were coded as positive. If they reported that the videotape was not helpful, or they did not like it, or they made no response, their impressions were coded as negative.

The portion of the questionnaire's testing accuracy of recall of factual information included four questions: (1) What education level do you need for this job? (2) How much does this job pay? (3) Are there any openings in this trade? (4) How would you get more information on this

career? The accuracy-scoring protocol was developed by transcribing for each videotape all of the information presented that pertained to each question. (Although each of these issues was addressed thoroughly in each videotape, the exact content and qualitative aspects of the information presented differed between tapes.) Student responses to each question were scored as follows: responses that were correct and moderately complete scored two, responses that were correct but vague or partial scored one, and responses that were incorrect, indecipherable, or absent scored zero. Question 3, as a yes-no question, was an exception. Here, responses were scored as correct or incorrect (1 or 0). Thus, seven was the total score possible for accuracy of recall.

Coding reliability was checked for each of the three types of questions for both the first and second administration of the questionnaire. A coder blind to the purposes of the study recorded both questionnaires for 15 randomly selected students. A kappa statistic (per cent agreement adjusted for chance agreement) was then calculated for the two coders' judgments of types of reported memories, and for the videotape ratings. Coding reliability for type of memory reported, calculated on 93 coding judgments for each coder, produced a kappa statistic of .82. Coding reliability for students' ratings of the videotapes, calculated on 30 coding judgments, produced a kappa equal to .79. A Pearson correlation was computed to check scoring reliability for accuracy of recall. Coding reliability for accuracy of content recalled, calculated on total accuracy scores for 30 questionnaires, produced an r of .96.

Analyses

The quantitative approach to analysis taken in this study was supplemented with qualitative information. Information from the questionnaires, coded as described above, was used quantitatively to answer questions about relationships among the proclivity to recall visual or verbal events, accuracy of recall, and students' stated opinions of the videotapes viewed, as well as relationships among these variables and sex, grade, school, and order of viewing. The written responses given in the questionnaires were examined qualitatively to aid the interpretation of the quantitative results by filling in additional detail about what these students thought and remembered, and why. In addition, the two videotapes were qualitatively evaluated and rated on a seven-point scale by an audiovisual technician blind to the particulars of the study.

RESULTS

Responses to the Two Videotapes

The 43 students' responses to the two videotapes, as measured by the questionnaires, were as follows. Students reported, on average, 1.42

($SD=1.05$) visual memories from the LIMI tape and 1.26 ($SD=1.22$) visual memories from the STM tape. They reported, on average, 1.12 ($SD=1.05$) verbal memories from the LIMI tape, and 1.28 ($SD=1.49$) verbal memories from the STM tape. Mean number of visual-verbal memories reported for the LIMI tape was 0.51 ($SD=0.67$), and 0.42 ($SD=0.70$) for the STM tape. Accuracy of recall of content presented in each videotape was 4.19 ($SD=1.99$) for the LIMI tape and 3.47 ($SD=2.65$) for the STM tape. None of the comparisons between the two videotapes were statistically reliable (paired samples t -tests, $p<.05$).

However, the students' rating of the helpfulness of the two videotapes differed. While 33 of the 43 students described LIMI positively (e.g., helpful, interesting), only 11 students described STM positively. The chi-square statistic calculated using Fisher's Exact Test was statistically reliable ($p<.001$). These student ratings were consistent with ratings assigned independently by an audiovisual technician blind to the study. She rated the quality of production and presentation of information for LIMI as 7 (excellent) on a 7-point scale ranging from very poor to excellent, and she rated the quality of STM as 2 on the same scale. Students' comments about whether and in what way they felt a videotape was helpful were specific on occasion: "It was very informative about this career. . . . All the info on the training, salary, length of training, and where you can get the training [was helpful]." More often, students' comments were terse. For example, one typical response to the question "How helpful was this video to you in learning about this career?" was "It wasn't." When prompted to specify "What was helpful in finding out about this career," the student responded, "Nothing."

Types of Memories Reported

There were effects for sex and order/school, but not for grade, in the types of memories reported. There were no reliable differences between boys and girls in proclivity to report verbal memories from either tape, or proclivity to report visual memories from the LIMI tape, although the trend was for girls to score higher. However, girls recalled reliably more visual memories from the STM tape than did boys ($M=1.59$ and 0.69 respectively; $t=2.68$; $p=.01$).

In these data, the order of viewing the tapes was confounded with school, as the students at V.A. viewed LIMI first, then STM, whereas the students from S.U. viewed the tapes in the opposite order. There were no reliable differences for order (school) in proclivity to recall visual information from either tape, or to recall verbal information from the LIMI tape. However, students who viewed the STM tape first (that is, the students from S.U.) recalled significantly more verbal memories from the STM tape than did students from V.A. who watched STM second ($M=1.84$ and 0.83 respectively; $t=2.18$; $p<.05$).

A total visual memory score and a total verbal memory score were then calculated by adding the visual and verbal memories respectively reported by each subject for each tape. These scores would be expected to reflect each student's overall proclivity for recalling visual or verbal information regardless of the tape viewed. Multiple regression was then used to determine what combination of variables might predict the total visual memory score, and what combination of variables might predict the total verbal memory score. The findings were that no combination of sex, order/school, total verbal memories, and total rating reliably predicted the total visual score or accounted for more than 22% of the variance in the total visual memories score. No combination of sex, order/school, total visual memories, and total rating reliably predicted total verbal memories, or accounted for more than 26% of the variance in the total verbal memories score.

Affective Responses

As noted above, students were more likely to describe the LIM1 videotape as more interesting and helpful than the STM videotape. Twenty-four students described LIM1 positively and STM negatively, 9 described both tapes positively, 8 described both tapes negatively, and 2 students described STM positively and LIM1 negatively. There were no sex, grade, or order/school effects for students' ratings of either videotape. There were also no reliable relationships between ratings that the students assigned and their proclivity to report verbal or visual memories for either videotape.

Learning Outcomes

The verbal and visual memories reported by students can reflect both actual characteristics of the medium in which information is presented and students' cognitive processing of the information presented. Students' helpfulness ratings tap an affective or motivational component of their overall response to the videotapes. On the other hand, the content accuracy score is a learning outcome measure. These data were analysed using multiple regression to determine which subject and instructional variables best predicted learning outcome, as measured by the content accuracy score. The first two models reported below included data from all 43 subjects; the final model included data from the subset of the 30 grade 9 subjects only.

First, a regression for LIM1 content accuracy as the outcome variable was run using the following independent variables: sex, grade, order/school, visual memories reported for LIM1, verbal memories reported for LIM1, and student ratings of LIM1. Of these, only grade reliably predicted the LIM1 accuracy score, accounting for 23% of the variance ($R = .48$; $R^2 = .23$; $F = 12.40$; $p = .001$). Students in grades 10-12 recalled

content of the LIMI videotape more accurately than did grade 9 students ($\underline{M}=5.54$ and 3.60 respectively). With sex left in the equation, an additional 5% of the variance was accounted for ($\underline{R}=.53$; $\underline{R}^2=.28$; $\underline{F}=7.74$; $p=.001$). The contribution of sex, however, was not statistically reliable ($t=1.61$; $p=.11$). The tendency was for girls to recall LIMI content more accurately than did boys.

Next, a regression was run to identify predictors of STM content accuracy. Variables entered included sex, grade, order/school, visual memories reported for STM, verbal memories reported for STM, and student rating of STM. Grade ($t=5.58$; $p<.001$), order/school ($t=3.56$; $p=.001$), verbal memories of STM ($t=2.03$; $p<.05$), and visual memories of STM ($t=1.87$; $p<.07$) all remained in the equation, and accounted for 53% of the variance in the STM accuracy score ($\underline{R}=.73$; $\underline{R}^2=.53$; $\underline{F}=10.72$; $p<.001$). The betas were .77, .52, .25 and .21 respectively. As with the LIMI tape, grade was the strongest predictor of STM content accuracy, with students in upper grades remembering more facts ($\underline{M}=4.92$ and 2.98 respectively). In addition, students at S.U. school who saw STM first, students who reported more verbal memories, and students who reported more visual memories, recalled the content of the STM videotape more accurately than did their counterparts.

Values were then computed for total visual memories, total verbal memories, and total rating, by adding LIMI and STM accuracy, visual, verbal, and rating scores respectively. These combined scores were expected to reflect subjects' general tendencies towards accuracy of recall, proclivity for remembering visual information, proclivity for remembering verbal information, and tendency to rate generously or critically irrespective of videotape viewed. As the previous regression equations for LIMI content accuracy and STM content accuracy showed grade to be the strongest predictor for each, this final regression equation was developed using only the subset of the 30 grade 9 students.

The following variables were entered as possible predictors of total accuracy: total visual memories, total verbal memories, total rating, order/school, and sex for the subset of grade 9 subjects. Using the regressive method, total rating, then sex were dropped from the equation, leaving total visual memories ($t=2.54$; $p<.05$), total verbal memories ($t=2.40$; $p<.05$) and order/school ($t=2.32$; $p<.05$) accounting for 40% of the variance of total accuracy ($\underline{R}=.63$; $\underline{R}^2=.40$; $\underline{F}=5.66$; $p<.01$). The beta co-efficients were .41, .39 and .38 respectively.

DISCUSSION

The first of the four main purposes of this study is seen in a relatively clear way by the findings. Production differences of the two videotapes were clearly perceptible to the students, and they expressed a reliable preference for the LIMI presentation of career information over the

STM presentation. Thus, Lighthouse Island Productions was successful in improving the production quality and appeal of the LIMl career presentation.

However, the production differences between the two tapes were not associated with differences in the number of visual or verbal memories the students reported. There were tendencies for students to report more visual memories from LIMl than STM and more verbal memories from STM than LIMl, but these differences were not statistically reliable. Furthermore, the differences between the two videotapes did not produce reliable differences in students' learning abilities; the content accuracy scores. While students recalled, on average, more facts from LIMl than STM, these differences were not statistically reliable. It is possible that these tendencies were not statistically reliable as measured due to the small sample size in this study, data collection imprecisions, and the relatively large number of subject variables included (which might have added error and decreased statistical power).

The second purpose, to gather information about students who exhibit a proclivity to recall either information presented verbally or information presented visually, yielded equivocal findings. While regression analysis showed that no combination of subject variables reliably predicted overall proclivity for recalling visual or verbal information, some interesting results were found when the scores for each videotape were analysed separately. Girls tended to report more memories, both visual and verbal, than boys, and this tendency reached statistical reliability for girls' recall of visual memories from the STM videotape. Also, viewing STM first rather than second was reliably associated with higher recall of verbal information from this tape, although it is not clear if this finding is due to an order effect or to a difference between schools, as the two were confounded in the design. Finally, although this was not analysed quantitatively, the investigators noted, in reading the students' written protocols, that few students were considering automobile mechanics as a career prior to this intervention, and those who were seemed to respond in qualitatively different ways. Thus, students' prior knowledge about and interest in a career might be important student variables to consider in a further study, and one might also expect that these would have different relationships with visual or verbal proclivities depending on the career information presented.

As discussed above, students reliably rated LIMl positively and STM negatively, generally describing LIMl as helpful and interesting, and rather bluntly describing STM as not so. As we expected that students' affective responses to a videotaped presentation can influence the likelihood that they will learn from that presentation or go on to use the presented information in making career choices, we examined relationships between students' ratings of videotapes and their visual, verbal, and

content accuracy scores, as well as with other subject variables. However, there were no reliable relationships between students' affective ratings and any of the other measures. This lack of a relationship is both interesting and unexpected. It does not support Paivio's (1986) hypothesis about imaginal (visual) coding of affect-laden content (also see Martin, 1991). It also seems counter to "common sense" that students' perception of a presentation as helpful is unrelated to how much they learn from that presentation. Our failure to obtain such a finding may be due to inadequacies of the theory or to peculiarities in this study. This cannot be determined here, and requires further tests of the sort we have conducted.

The final purpose of this study was to find out whether certain types of students were more likely to learn factual information about the career presented. For both LIMI and STM, grade was strongly predictive of the content accuracy score, and in fact, for LIMI, grade was the only reliable predictor of content accuracy. This finding is as one would expect: students in higher grades remember more facts from a factual presentation. Implications for producers of career-information videos might include the need to present the information differently depending on that age group to which the videotape is targeted. Career class teachers and counsellors might choose to use videotapes such as STM and LIMI with older students, as perhaps the younger students remembered less because specific planning and decision-making about potential careers might be seen as less relevant to their current lives.

For the STM videotape, content accuracy was also reliably predicted by seeing STM first (at S.U. school), reporting more verbal memories, and reporting more visual memories. It could be that prior viewing of LIMI, the preferred tape, led students to discount information they later received from STM. It might also be that students who took care to write down several visual and verbal memories were also more likely to take care in answering the content accuracy questions. It is not clear, however, why this would be so for the STM tape and not the LIMI tape.

To summarize, there were mixed results from this study. Some of these might have arisen from limitations in the study, as discussed above. Students' preferences for the LIMI videotape over the STM videotape were not reflected in the proclivity to report visual over verbal memories nor to recall more facts from LIMI than from STM. This might suggest that application of a theory of learning mediated by experiential memories is not straightforward. In any case, students did retain factual information about the career presented in the two videotapes, and their recall was not greatly compromised by the quality of the videotaped presentations. On the other hand, students held strong opinions about the helpfulness of videotaped presentations that appeared related to differences in the production quality of those presentations. Thus, while

moderate differences in production quality of career-information videotapes do not seem to reduce students' fact retention, they do influence students' perceptions of the usefulness of the videotapes, and perhaps their impression of the utility of career-information videotapes in general. The LIM1 videotape, produced in association with the Canadian Guidance and Counselling Foundation, clearly was perceived by students who participated in the study as more helpful and interesting than the currently widely-used STM videotape.

Notes

- 1 For a conceptual description of EMQs and examples of research employing them, the interested reader may refer to Martin (1990); Martin, Cummings & Hallberg (in press); Martin, Paivio & Labadie (1990); and Martin & Stelmaczonek (1988). Copies of the specific EMQs used in this study are available from the first author.
- 2 The questionnaire and the accuracy-scoring protocol are available from the first author on request.

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