DOCUMENT RESUME

ED 437 023 IR 019 833

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TITLE Emerging Information Technologies, Psychological Type, and Learning Styles: Evaluating Competing Methodologies for Teaching Television Lighting.
PUB DATE 1998-00-00
NOTE 26p.; Paper presented to the Annual Convention of the Research Division of the Broadcast Education Association (44th, Las Vegas, NV, April 15-18, 1999).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Style; *Educational Technology; Higher Education; Instructional Effectiveness; *Instructional Materials; *Optical Data Disks; Student Attitudes; Television; Videotape Recordings
IDENTIFIERS Myers Briggs Type Indicator

ABSTRACT

Finding the right match between a particular instructional technology and a learning style can be just as important for students as finding the right match between their instructors' teaching styles and their own learning styles. This study examines the effectiveness of three instructional methodologies for teaching television lighting methods when compared to individual learning styles. The methodologies included an illustrated text, an interactive CD-ROM, and a non-interactive, linear videotape. Learning styles were determined with the Myers-Briggs psychological type questionnaire. Results lend support for the choice of instructional materials appropriate to students' learning styles, based on Myers-Briggs psychological types, but they do not make very clear distinctions between the latest instructional methodology, the CD-ROM, and a more traditional one, the videotape, as to which is more appealing to a particular learning style. Six tables and figures present findings. (AEF)

EMERGING INFORMATION TECHNOLOGIES, PSYCHOLOGICAL TYPE, AND LEARNING STYLES: EVALUATING COMPETING METHODOLOGIES FOR TEACHING TELEVISION LIGHTING

A paper submitted to the Research Division of
the Broadcast Education Association
44th Annual Convention
Second Place Winner, Debut Category

by

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Introduction to the Problem

The history of pedagogy, going back as far as Socrates and the development of the Socratic Method, is replete with attempts to understand the nature of learning. Although learning is essentially an unconscious and natural process, teachers and philosophers alike have wondered what physiological developments, mental abilities, and sensory skills are necessary to facilitate learning. The old adage of "people remember 25% of what they hear, 50% of what they see, and 90% of what they hear and see" certainly can provide some clues to preferred methods of learning.

The method or style of learning "can be understood as a person's preferred approach to information processing, idea formation and decision making" (Kalsbeek, 1989, p. 1). This study was based on the affective or temperament learning styles, as measured by the Myers-Briggs Type Indicator, an instrument that determines psychological types. Knowing these learning styles can have many benefits for a student, from using the most suitable methods of receiving information to working on the best ways to

internalize and retain this new-found knowledge (Brownfield, 1993).

Students who understand their sensory preferences and recognize that they are better at receiving information visually can be more successful with an instructor who emphasizes the use of visual materials. Conversely, students more comfortable working with abstract concepts would be at a disadvantage trying to learn from an instructor who emphasized factual information.

When portions of the instruction become mediated, an entirely new set of problems related to instructional efficacy is introduced. It is no longer just a question of learning styles, but also the sophistication of the instructional design used to create the mediated instruction, the effectiveness of the mechanism used to deliver the instruction, and whether or not a student has a preference for, or an interest in, the particular instructional technology being used.

Statement of the Problem

Finding the right match between a particular instructional technology and a learning style can be just as important for students as finding the right match between their instructors' teaching styles and their own learning styles. The infusion of instructional technology into the college classroom has given rise to a number of studies that have examined the effectiveness of one form or another of mediated instruction compared to traditional classroom lectures (e.g., Moore & Thompson, 1990). As

newer instructional technologies like the CD-ROM (compact disc-read only memory--a replacement for the videodisc) emerge, their efficacy must be evaluated in the same manner as were earlier technologies like the filmstrip, motion pictures, instructional television, and distance learning.

In this study, a comparison was made among three instructional methodologies, text, CD-ROM, and videotape, with the instructional content, lighting methods for television interviews, being controlled. Thus the research problem was to identify which instructional methodology--text, CD-ROM, or video--was most effective in teaching television lighting methods, with the MBTI being used as an indicator of learning style and media preferences.

Significance of the Study

The findings of this study could have significance in several areas. First, considering the psychological types most attracted to the study of journalism and mass communication, if the findings suggest significant incompatibilities between learning styles and classroom instruction, changes in presentation methods or curricula could be warranted.

Gaining a better understanding of the link between psychological type, learning style and instructional design would certainly improve the efficacy of the CD-ROM. Especially in the visually dependent fields such as television lighting, developers of CD-ROMs could be encouraged to create new material if the

findings suggest that CD-ROMs are the most effective instructional methodology for a number of learning styles.

Finally, there is a potential for gender bias when instructional technologies like the CD-ROM are used. Gender differences in attitudes toward computers, usage, and exploratory behaviors continue to be reported in the literature. If communication majors are predominately female, extensive CD-ROM use in the curriculum could inhibit academic performance.

The Myers-Briggs Type Indicator

The Myers-Briggs Type Indicator, based on the psychological theories of Carl Jung, seeks to understand and determine how people relate to their world, where they direct their energy, how they make decisions, and whether they prefer a more or less structured style of life. This process is called personality or psychological typing. Initially, Jung (1923) had proposed three scales or dimensions for psychological typing. Jung first classified people by the manner in which they drew energy, either from the outer world of people, activities, and things (extroversion), or from their own inner world of ideas, emotions, and impressions (introversion). Then Jung classified people by their conscious mental activities for perceiving (describing the processes as sensing and intuition). Lastly, he categorized people by judging (the processes of thinking and feeling) (Noring, 1993).

When Myers and Briggs developed the MBTI, first published by the Educational Testing Service in 1962, they added a fourth scale, the judgment-perception dichotomy (Nuby, 1995). This scale defines a particular lifestyle that an individual may prefer, based on inclinations to live a planned and organized life (called judgment) or a spontaneous and flexible life (called perception). These four preference scales coalesce into 16 combinations, each one of which defines a particular and unique personality archetype (Noring, 1993).

The first scale uses the letters E and I to represent the energizing dimensions of extroversion and introversion, while the second scale uses the letters S and N for sensing and intuition, the perceiving dimensions. The third scale, described as judgment, uses the letters T and F for the elements of the decision-making process, thinking and feeling. The final scale, termed either attitude, closure, or life-style, uses the letters J and P for the judgment and perception dimensions. These letter combinations form the 16 four-letter Myers-Briggs types, from ESFP to INTJ (Myers & McCaulley, 1985).

Learning Styles and the MBTI

Individuals armed with the knowledge of their psychological types based on one of the MBTI's categories can develop a better understanding of and deeper insights into their behavior (Foster & Horner, 1988). This self-knowledge is particularly useful because it addresses the conscious aspects of one's personality

(McCaulley, 1976), rather than the unconscious typically encountered in Freudian psychology. As an indicator of the conscious, the MBTI has found many applications in career counseling and career choice suitability.

The motivation to learn, assumed to be equal in all types, takes on different meanings in terms of the knowledge acquired. The IN pairing, the "academic," values knowledge as important for its own sake, while the IS pairing, the "careful compiler," sees knowledge as the key to establishing truth. Extroversion paired with sensing, the ES or "pragmatist," sees knowledge as important for practical use, while the EN pairing, the "innovator," sees knowledge as important for innovation (Lawrence, 1984). Of equal importance as the knowledge is the manner in which it is acquired. The intuitor prefers principles and theories, whereas the sensor likes facts, data, and experimentation; the intuitor likes symbols and words, whereas the sensor is less comfortable with them (Felder & Silverman, 1988).

Based on these preferences, it could be assumed that in a particular field of study, in a certain type of course (e.g., lecture vs. lab), the sensor may do better than the intuitor or vice versa because of differences in the preferred method of acquiring information. Although most college students are considered visual learners (Barbe & Milone, 1981), most of their classes are taught by lecture (auditory) or with some visual representations of symbols like mathematics, resulting in a

sensory preference mismatch (Felder & Silverman, 1988). The methods by which students learn further strengthen the relationship between psychological type and learning styles.

Although the Myers-Briggs type is not a perfect indicator of learning style, it can be used to "predict what environments, instructional tools, and behaviors [will] hinder or encourage learning for a particular student" (Provost, 1984). The Myers-Briggs types also establish an atmosphere in which students can feel comfortable learning, interact with other students, and understand their thought processes and problem-solving approaches (Brownfield, 1993).

Instructional Content

In most college-level texts used in basic television production courses, the principles of lighting in the studio or on location are typically taught using explanations of the lighting instruments, diagrams of lighting instrument placement, and photographs of how a subject may appear under different lighting conditions (cf. Burrows, Gross, & Wood, 1998; Medoff & Tanquary, 1998; Whittaker, 1993; Zettl, 1997a). Whereas this method of instruction may appeal to the intuitive learner, the visual learner may not be able to gain sufficient information from a text presentation. The question must be asked as to what is the most effective method of teaching lighting. Is this an area where the latest technology can be of the greatest benefit, or are the traditional methods still best?

It could be argued that television or stage lighting is not something that easily springs from the pages of a textbook. The four functions of light, that of creating visibility, mood, composition, and naturalism (McCandless, 1932), seem basic enough, but understanding how "the manner in which the light illuminates an object shapes our impressions and understanding of what we're seeing" (Gillette, 1998, p. 2) is much more complex. Lighting for television could be described as a high-level techno-artistic skill, something that has both sensory and intellectual components, so learning proper lighting techniques may present a variety of challenges to the student.

Research Hypotheses

The existence of a relationship between learning styles, psychological type, and instructional methodologies was the basis for this study. Do students with different learning styles have any preference for learning technical information delivered by either a traditional illustrated text, a linear instructional videotape, or an interactive CD-ROM? To answer these questions, several hypotheses have been formulated:

H1. There are significant differences in student performance by gender by MBTI quadrants by experimental condition on a posttest of lighting theory, principles, and practices.

H2. There is a significant relationship between MBTI quadrants and sensory preferences, classroom preferences, and choice of instructional methodology.

Methodology

The four MBTI quadrants--ES, EN, IS, and IN, derived from the 16 Myers-Briggs types by means of those dimensions of personality type that have been most closely linked with learning styles: the extrovert/introvert characteristics and the sensor/intuitor characteristics--were examined in a 4 x 4 x 2 factorial design with the control group, CD-ROM, text, and video instructional conditions, and gender. All three conditions (text, video, CD-ROM) were exposed to the experimental materials. Then, along with the control group, they were given a posttest that consisted of 25 questions, with 19 about lighting methods and techniques. The remaining 6 questions were about learning interest and motivation, ease of receiving lighting information, preferred method of receiving lighting information, preferred classroom situation, and sensory preferences when learning new information.

The experimental materials consisted of an illustrated text, a videotape, and a portion of an interactive CD-ROM that contained information on the basics of television lighting using the triangle method of lighting instrument placement. The text and the videotape were prepared by the researcher, based explicitly on information contained in the CD-ROM, Zettl's Video Lab 2.0 (Zettl, 1997b), and the companion textbook from which it was derived, the sixth edition of Zettl's (1997a) Television Production Handbook. The research participants were randomly

assigned to one of the three conditions and the control group, with a total of 32 sessions being conducted. Because of the limited seating capacity in the CD-ROM condition, 13 separate CD-ROM sessions were conducted, whereas the other 19 sessions were divided among the remaining conditions and the control.

Findings

The raw scores from the performance data were examined for factors of Myers-Briggs psychological type quadrant, gender, and instructional treatment (see Table 1). The factorial analysis of variation yielded statistically significant main effects for MBTI quadrant $F(3, 134) = 6.84$, $p < .05$, gender $F(1, 134) = 5.47$, $p < .05$, and instructional condition, $F(3, 134) = 8.65$, $p < .05$. However, the potential for two-way interactions among any of the pairings (quadrant by gender, quadrant by instructional condition, or gender by instructional condition) failed to achieve acceptable levels of statistical significance, as did the three-way interaction of quadrant by gender by instructional condition, with $F(9, 134) = 1.58$, $p > .05$. Thus hypothesis H1 was accepted.

Post hoc comparisons of the quadrants using the Student-Neumann-Keuls test showed Quadrant 4 (IN group) was significantly different from Quadrant 1 (ES), Quadrant 2 (EN), and Quadrant 3 (IS). The same test for instructional conditions showed that the control group was significantly different from the other

conditions, however, no instructional condition was significantly different from another.

Although a plot of the data showed the potential for interactions (see Figure 1), the relatively small cell sizes may have accounted for the fact that the interactions failed to achieve statistical significance. Because three of the four quadrants in the control group had approximately similar scores, whereas the IN quadrant score was much higher and remained so in the other conditions as well, a tendency was revealed for differences in performance for research participants in the IN quadrant, although not significantly so.

Using a one-way analysis of variance with student performance scores as the dependent variable and the 16 individual Myers-Briggs psychological types (see Table 2) as the independent variable, rather than the collapsed quadrants used in previous ANOVAs, support was found for significant differences between INFPs and INTPs, and all the extroverted sensing types (ESTJ, ESTP, ESFJ, ESFP), as well as ENTPs and ISFJs at the $p < .05$ level. The ENFP types were also significantly different from ISFJs and ESTPs at the $p < .05$ level. Thus three of the eight intuitive types were found to be significantly different on student performance scores.

Regarding hypothesis H2, analyses of variance revealed no statistically significant differences which suggest the hypothesis should be rejected. However, the support found for

differences in the IN quadrant in terms of performance scores suggested there should be differences as well in some of the factors that constitute learning style preferences. The student performance scores were analyzed by the factors of sensory preference and MBTI quadrant in an analysis of variance that yielded a more robust finding (see Table 3). The main effect for quadrant was significant, with $F(3, 150) = 5.28$, $p < .05$, but the interaction failed to achieve a level of statistical significant, with $F(9, 150) = 1.66$, $p > .05$. A plot of the mean scores by sensory preference and MBTI quadrant (see Figure 2) showed the potential for interaction, but again the relatively small sizes of several cells may have accounted for the fact that the interactions failed to achieve significance.

A plot of student performance score means by preferred instructional methodology and MBTI quadrant (see Figure 3) showed the IS types had a distinct preference for the CD-ROM condition, while the IN types were equally comfortable with the CD-ROM or text. The EN types were equally comfortable with hands-on or CD-ROM. The ES types had a slight preference for videotape.

Discussion

The results of this study lend support for the choice of instructional materials appropriate to students' learning styles, based on Myers-Briggs psychological types, but they do not make very clear distinctions between the latest instructional methodology, the CD-ROM, and a more traditional one, videotape,

as to which is more appealing to a particular learning style. The IS types definitely preferred the CD-ROM, while the IN types appeared to be comfortable with CD-ROM, text and hands-on methodologies. The ES types preferred videotape, whereas the EN types preferred hands-on instruction. In the findings, the introverted intuitives (IN types) scored the highest in all of the instructional conditions, although the differences were not significant except for the video condition. Even in the control group, their scores were higher, possibly because the IN types have been found to have better test-taking skills, especially when the tests were timed.

The clustering of high scores for most of those who preferred the CD-ROM condition suggests that the CD-ROM instructional methodology may be more versatile, providing a variety of learning styles with the necessary information in an appealing format. This also supports the findings of Lawrence for the learning style preferences of IS types, as the CD-ROM has to be recognized as the latest iteration of computer-aided instruction. Also, the IN types appeared equally comfortable with either text, hands-on, or CD-ROM, again supporting Lawrence's findings for reading, tutorials and self-study. The ES types preferred videotape, while the EN types favored hands-on and CD-ROM methodologies, which would support self-instruction and small-group work. The preferences for hands-on instruction for

all the learning styles, albeit somewhat atypical for some groups, may be a reflection of the nature of television lighting.

Summary

Of all the findings in this study, the fact that CD-ROMs may not necessarily be better than videotape to teach the subject of television lighting should not be taken as a blanket disparagement of emerging instructional technologies. A positive relationship was found between MBTI quadrant learning styles and instructional methodology preferences. The responses by quadrant were significant in identifying CD-ROMs as the preferred choice of IS types, and videotape as the preferred choice of ES types. Even the EN preference for a hands-on learning experience could be construed as a small-group learning experience. The versatility of IN types in preferring text, CD-ROM or hands-on experiences would be consistent with other findings.

As new instructional technologies emerge, the urge to adopt them immediately is strong, as the oft-stated logic that newer must be better usually prevails. The speed with which they emerge is increasing, yet the end-users, the people who must learn the information conveyed by a cornucopia of instructional delivery systems, have not changed their learning styles significantly for decades. Understanding how people learn from mediated methodologies, when issues like locus of control, navigational ease, remediation, and personal instruction on the desktop arise is critical to widespread adoption.

It is important to make the process of learning from CD-ROMs as comfortable as learning from a book, yet faster and more in-depth. Targeting a user's specific MBTI characteristics could result in one version of a CD-ROM for sensors, another for intuitives, each designed to capitalize on their individual learning style strengths. The technology exists; we have to use it effectively.

Conclusion

The advantages in learning from CD-ROMs have been demonstrated. Finding what makes a CD-ROM appealing to all learning styles may be more of a challenge, as the interactive instructional methodology has certain disadvantages for some learning styles. Refinement of the instructional design process so that all learning styles can be accommodated would improve the efficacy of a CD-ROM. Understanding what makes it counter-intuitive to some learning styles, then identifying and overcoming those obstacles would enable the CD-ROM to become a more universal teaching tool.

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Table 1

Analysis of Variance for Student Performance Scores by MBTI Quadrant, Sex, and Condition

Source	SS	df	MS	F	p
Main Effects	452.54	7	64.65	7.42	.000
QUAD	178.71	3	59.57	6.84	.000
SEX	47.65	1	47.65	5.47	.021
CONDITION	226.18	3	75.40	8.65	.000
2-Way Interactions	140.69	15	9.38	1.08	.384
QUAD SEX	21.55	3	7.18	.82	.483
QUAD CONDITION	82.07	9	9.12	1.05	.407
SEX CONDITION	29.27	3	9.76	1.12	.344
3-Way Interactions	123.93	9	13.78	1.58	.127
QUAD SEX CONDITION	123.93	9	13.78	1.58	.127
Explained	717.16	31	23.13	2.66	.000
Residual	1167.62	134	8.71		
Total	1884.78	165	11.42		

Table 2

Analysis of Variance for MBTI Types by Student Performance Scores

Source	df	SS	MS	F	p
Between Groups	15	294.33	19.62	1.85	.033
Within Groups	150	1590.45	10.60		
Total	165	1884.77			

LSD test with significance level .05
(*) Indicates significant differences

	11	02	13	01	12	06	04	03	10	05	07	09	08	15	16	14
M MBTI																
7.67 11																
8.67 02																
9.00 13																
9.95 01																
10.00 12																
10.06 06																
10.20 04																
10.25 03																
10.67 10																
10.70 05																
11.00 07																
11.13 09																
11.41 08	*	*														
12.00 15																
13.00 16	*	*		*			*					*	*	*		
13.27 14	*	*		*			*					*	*	*		

Cell counts of 2 or less in groups 12, 13 and 15 prevented further significant differences.

MBTI Type

01 = ESTJ	05 = ENTJ	09 = ISTJ	13 = INTJ
02 = ESTP	06 = ENTP	10 = ISTP	14 = INTP
03 = ESFJ	07 = ENFJ	11 = ISFJ	15 = INFJ
04 = ESFP	08 = ENFP	12 = ISFP	16 = INFP

Table 3

Analysis of Variance for Student Performance Scores by Sensory Preference and MBTI Quadrant

Source	SS	df	MS	F	p
Main Effects	219.28	6	36.55	3.62	.002
SENPREF	59.47	3	19.82	1.96	.122
QUADRANT	159.80	3	53.27	5.28	.002
2-Way Interactions	150.68	9	16.74	1.66	.104
SENPREF QUAD	150.68	9	16.74	1.66	.104
Explained	369.96	15	24.66	2.44	.003
Residual	1514.82	150	10.10		
Total	1884.78	165	11.42		

Figure 1

Means of Student Performance Scores by MBTI Quadrant and Condition

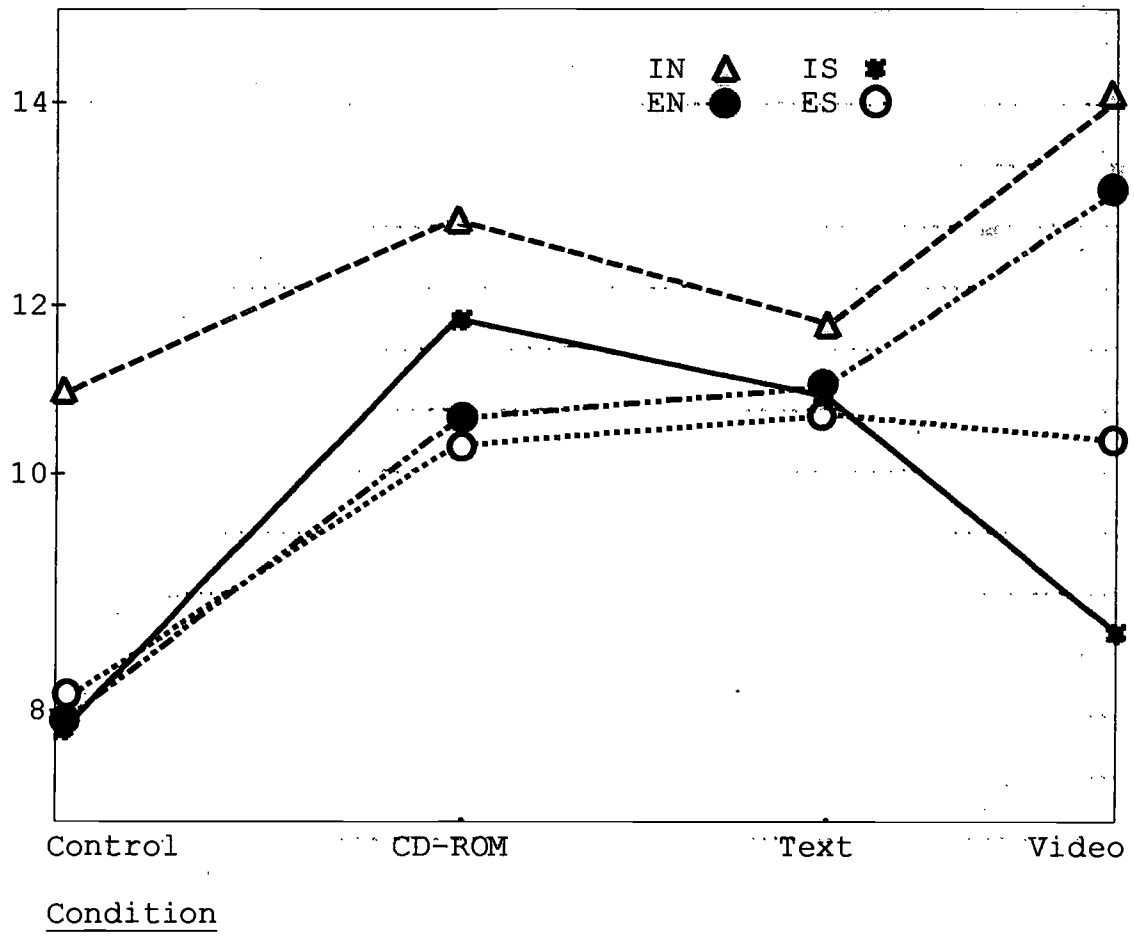


Figure 2

Means of Student Performance Scores by Sensory Preferences and MBTI Quadrant

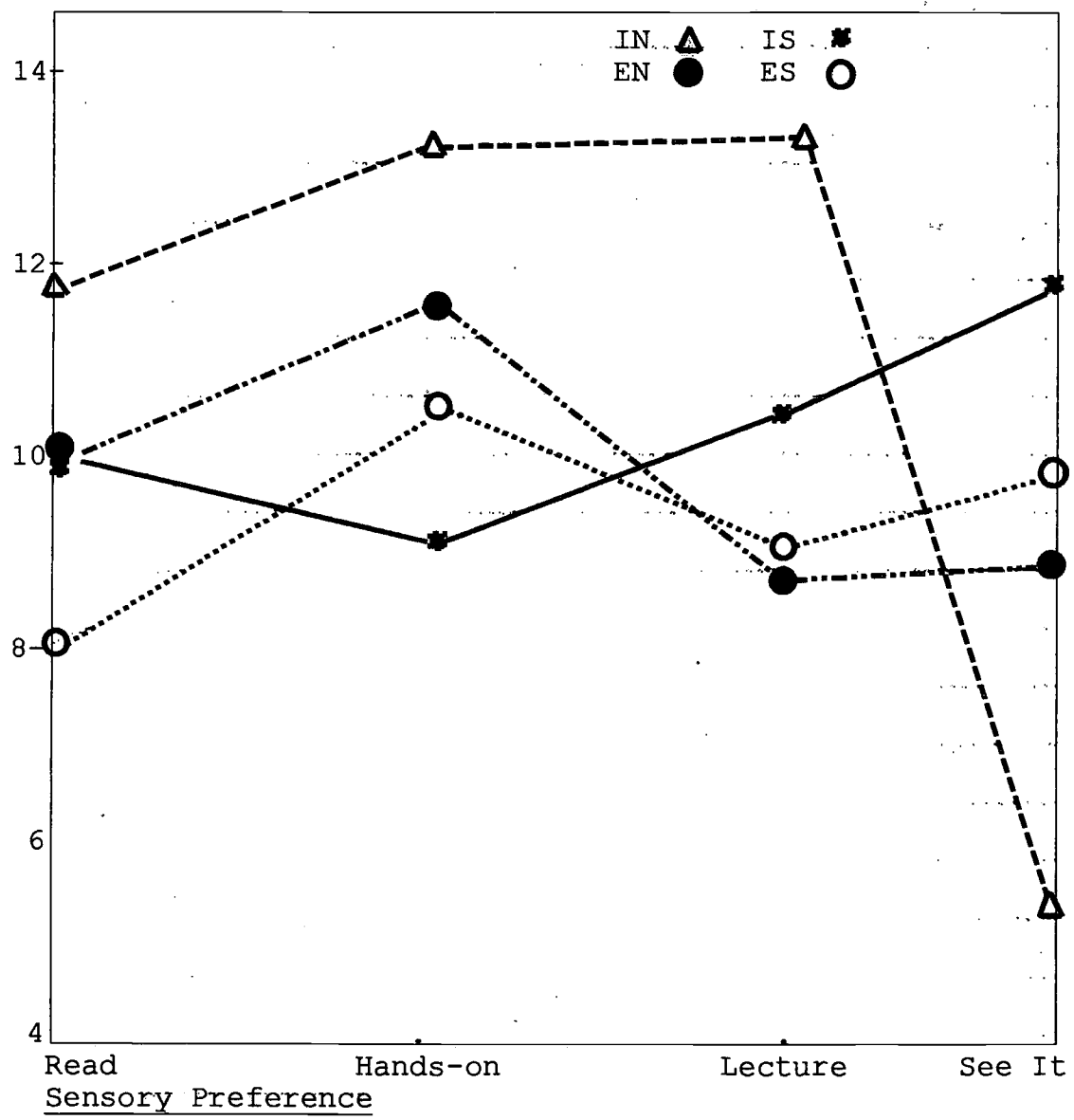
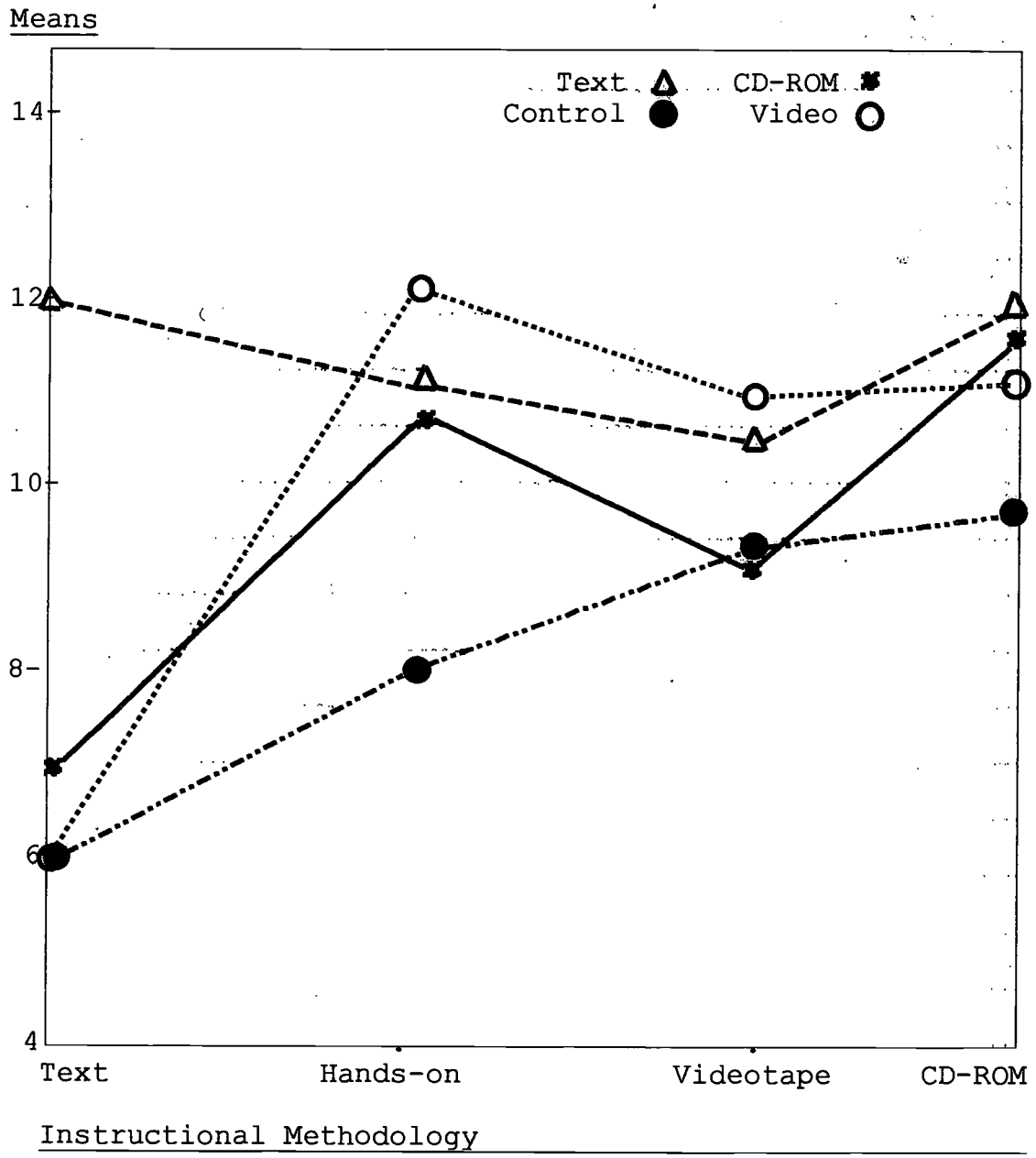


Figure 3

Means of Student Performance Scores by Instructional Methodology and Instructional Treatment



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