Use of Computer Assisted Career Guidance With Prior Cognitive Structuring

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Abstract

Cognitive structuring was implemented by showing 30 subjects a 10-minute videotape that presented Holland's (1985) model of the world of work before they used an interactive computer assisted guidance system (DISCOVER). The effect of prior structuring was assessed in terms of a subject's representation of the world of work, occupational certainty and vocational identity. The subjects were volunteer clients who came to a university career resource center for vocational counseling. Two treatment groups and a control group were used: pretest, cognitive structuring, and DISCOVER; pretest and DISCOVER; and DISCOVER only. The results indicated that subjects who assimilated the Holland model prior to using DISCOVER were more homogeneous in sorting 36 randomly selected occupations into related clusters, and were more homogeneous in the number of occupational alternatives they listed on a posttest. Subjects who used DISCOVER without cognitive structuring became significantly more assured of their vocational identity (i.e., goals, interests, personality), while the cognitive structuring group did not become so assured. Occupational certainty was unaffected by any treatment. The cognitive structuring experience prior to subject's use of DISCOVER encouraged them to add occupations to consider when they had few alternatives and to eliminate occupations to consider when they had many.

Use of Computer Assisted Career Guidance

With Prior Cognitive Structuring[1]

In using computer assisted career guidance (CACG) systems to facilitate career decision-making, system developers, and ultimately practitioners, make assumptions about the nature of clients and the medium. For example, it is assumed that: clients possess insufficient information about self or about the world of work in order to formulate plausible career options; the systems can provide information necessary to identify viable alternatives; and, clients can select features and process information contained in the software package appropriately. Thus, computer guidance systems may be used as a resource to better understand the world of work, to generate career alternatives, or to instill reassurance in ones chosen array of alternatives. However, in spite of continued growth projections for the use of the medium (Harris-Bowlsbey, 1983; Walz & Benjamin, 1984), little is known about either the total impact of the medium (Cairo, 1983; Shahnasarian, 1985) or how to best use it (e.g., Dungy, 1984; Garis, 1982; Glaize & Myrick, 1984; Marin, 1984; Sampson & Stripling, 1979).

Theoretical perspectives drawn from cognitive psychology provide a viable approach for investigating the impact of CACG systems. Interacting with a CACG system is essentially a learning event: the systems presumably expand users' self and world-of-work knowledge and promote effective decision making. Gagne' (1970) suggested that optimal conditions for learning may be attained by first examining the capabilities of the learner, and second by adapting the instructional stimulus accordingly. Further, Gagne' and White (1978) maintained that learning will be enhanced by the extent to which (a) a greater variety of types of preexisting relevant memory structures are stored, and (b) these memory structures (i.e., contents of memory and their organization) become mutually supported by the development of linkages among them. Anderson (1977; 1984) referred to such structures as "schemata." According to Mayer (1983), "a schema is a general knowledge structure used in comprehension. A schema serves to select and organize incoming information into an integrated, meaningful framework" (p. 209).

In applying schema theory to CACG system use, it follows that acquiring relevant schema prior to using a system could promote users' learning and effective decision making. Anderson (1984) asserted that "without a schema to which an event can be assimilated, learning is slow and uncertain" (p. 3). Perhaps the amount of learning from a CACG system is a function of individuals' pre-existing schemata of the world of work.

This study examined the hypothesis that individuals with prior cognitive structuring of the world of work, in the form of an

integrated model, would be more homogeneous in representing the world of work than those who did not receive such structuring. A second hypothesis pertained to more traditional domains of vocational behavior: since the inculcation of a model should foster a coherent assimilation of information, consequent changes in both occupational certainty and vocational identity would be more likely.

Method

Subjects. Ninety subjects were selected from 95 volunteer clients who came to a career resource center for career guidance services at a major southeastern university. Five volunteers were excluded because they failed to meet performance criterion standards for participation in one of the treatment groups. The center's counselors referred these clients to DISCOVER, a CACG system developed by the American College Testing Program (1983). Subjects' mean age was 23; 67% were female; 83% were white, 11% black, and 6% hispanic; 10% were freshmen, 21% sophomores, 19% juniors, 20% seniors, and 20% graduate students and adults.

Instrumentation. The Occupational Grouping Task (OGT; Shahnasarian, 1985), based on Miller's (1977) work on lexical memory structure, was used to assess subjects' representation of the world of work. Here, subjects sorted 36 cards randomly selected by educational strata from Jones' (1981) Occ-U-Sort according to groups they perceived as meaningfully related. No restrictions were placed on the number of groups subjects could form. Scores were the number of occupational clusters subjects formed in sorting the cards.

The Occupational Alternatives Question (OAQ; Zener & Schnuelle, 1972; Slaney, 1978, 1980) was used to assess occupational certainty. It directs subjects to list occupations they are currently considering, and to identify their first choice only. Four categories of responses -specified by Slaney, Stafford and Russell (1981) - were used to assess certainty: 1 = a first choice, no alternatives; 2 = a first choice with alternatives; 3 = no first choice, just alternatives; and 4 = no first choice, no alternatives.

Vocational identity was assessed by the Vocational Identity Scale of the My Vocational Situation (MVS; Holland, Daiger, & Power, 1980), an 18-item true-false inventory in which high scores are in the positive direction. This scale measures the clarity and stability of individuals' self-perceived goals, interests, personality and talents.

Procedures. Subjects were randomly assigned to two treatment groups and a control group: Group I, card sort, plus cognitive structuring, and computer assisted guidance; Group II, card sort and computer assisted guidance; and a control group, computer assisted

guidance only. All three groups took the Occupational Alternatives Question (OAQ) and the My Vocational Situation (MVS) as both a pretest and a posttest.

Subjects in Group I, the cognitive structuring group, first took a pretest battery which included the OAQ, MVS, and the Occupational Grouping Task (OGT). Next, they viewed a 10-minute videotape presenting Holland's (1978; 1979; 1985) scheme for organizing occupations in the world of work [2]. The Holland paradigm was chosen because of its compatibility with the world-of-work map (Prediger, 1976; 1981), an occupational classification scheme used in the DISCOVER program. The exposition of content in the tape was based on Gagne's (1970) critical events of instruction, while the development of the video instruction was based on formative evaluation guidelines prescribed by Dick and Carey (1978). Here, an actress presented Holland's six occupational environments in a lecture format while periodically referring to a schematic diagram popularly used to illustrate the hexagonal theory. Following the videotape, Group I subjects took a 20-item test to determine if they could classify occupations according to the model. Only those subjects (30 of 35) who correctly classified 16 of 20 occupations into Holland's six categories were included in the experiment[3]. The subjects then used DISCOVER. Finally, after completing DISCOVER, they took the posttest battery.

Subjects in the second treatment group, Group II, followed the same procedures as Group I with the exception of viewing the videotape and taking the occupational classification test. Control Group subjects used DISCOVER and took the OAQ and MVS only; they did not participate in the OGT.

No time restrictions were imposed on subjects' use of DISCOVER. Subjects interacted with DISCOVER from 1.5 hours to 4.8 hours with a mean of 2.2 hours. There were no differences among groups in terms of the amount of time spent on the computer, nor were there systematic differences in the amount of time groups used the respective modules within DISCOVER.

Results

Representational system. There were no significant differences between pretest and posttest means with respect to the number of occupational groups constructed in the OGT for either Group I (cognitive structuring) or Group II. There was, however, a significant difference between Group I and Group II with respect to the variance in the number of nodes between pretest and posttest: the Group I variance for the pretest was 9.57 while the posttest was 3.61, $F(29,29) = 2.65$, $p < .05$. There was no significant pretest-posttest difference in variances in Group II (σ^2 pretest = 6.19, σ^2 posttest = 6.60).

Shifts in the respective variances are portrayed in Figures 1 and 2, indicating that Group I adopted and retained the six factor model for sorting the occupational titles on the posttest.

Occupational certainty. A Kruskal-Wallis One-Way ANOVA testing pretest-posttest differences in occupational certainty among the four OAQ categories revealed that group membership was not significantly related to occupational certainty ($X^2 = 3.68$, df = 2, $p = .16$). Further, a repeated measure ANOVA was used to test for pretest-posttest differences among the treatment groups in terms of the number of alternatives listed on the OAQ. Again, there were no significant main effects on the pretest-posttest factor, $F(1,174) = .28$, $p = .60$, nor was there a significant interaction effect between Group and Test, $F(5,174) = 1.65$, $p = .15$. There were, however, significant differences in changes in the variances among the groups (See Table 1). Group I, the cognitive structuring group, demonstrated a significant decrease in the variance between the pretest ($\sigma^2 = 4.71$) and the posttest ($\sigma^2 = 1.96$), $F(29,29) = 2.40$, $p < .05$. Thus, subjects who assimilated the Holland scheme became more homogeneous by adding alternatives to the OAQ when they had few, and eliminating alternatives when they had many. There were no significant differences between pretest and posttest variances in the number of occupational alternatives listed by Groups II and III.

Vocational Identity. Analyses of data from the vocational identity scale (MVS) revealed significant pretest-posttest gains among the groups in aggregate, but there was no interaction effect among groups. There were also no significant pretest-posttest differences in variances among the groups. However, a post hoc analysis revealed significant pretest-posttest differences only for Groups II and III (See Table 1). It appears that DISCOVER alone bolstered subjects' confidence in their interests, abilities and goals.

Discussion

This study investigated if teaching subjects a scheme for structuring the world of work prior to their use of a CACG system would (a) influence how they classify occupations, (b) alter their occupational certainty, and/or (c) affect their vocational identity. Our rationale was that learning a representational system of the world of work would affect subjects' processing of information from a CACG system. The results indicated that teaching the Holland model had the effect of homogenizing subjects' classification of 36 randomly selected occupations. This prior cognitive structuring also fostered greater homogeneity with respect to the number of viable occupational

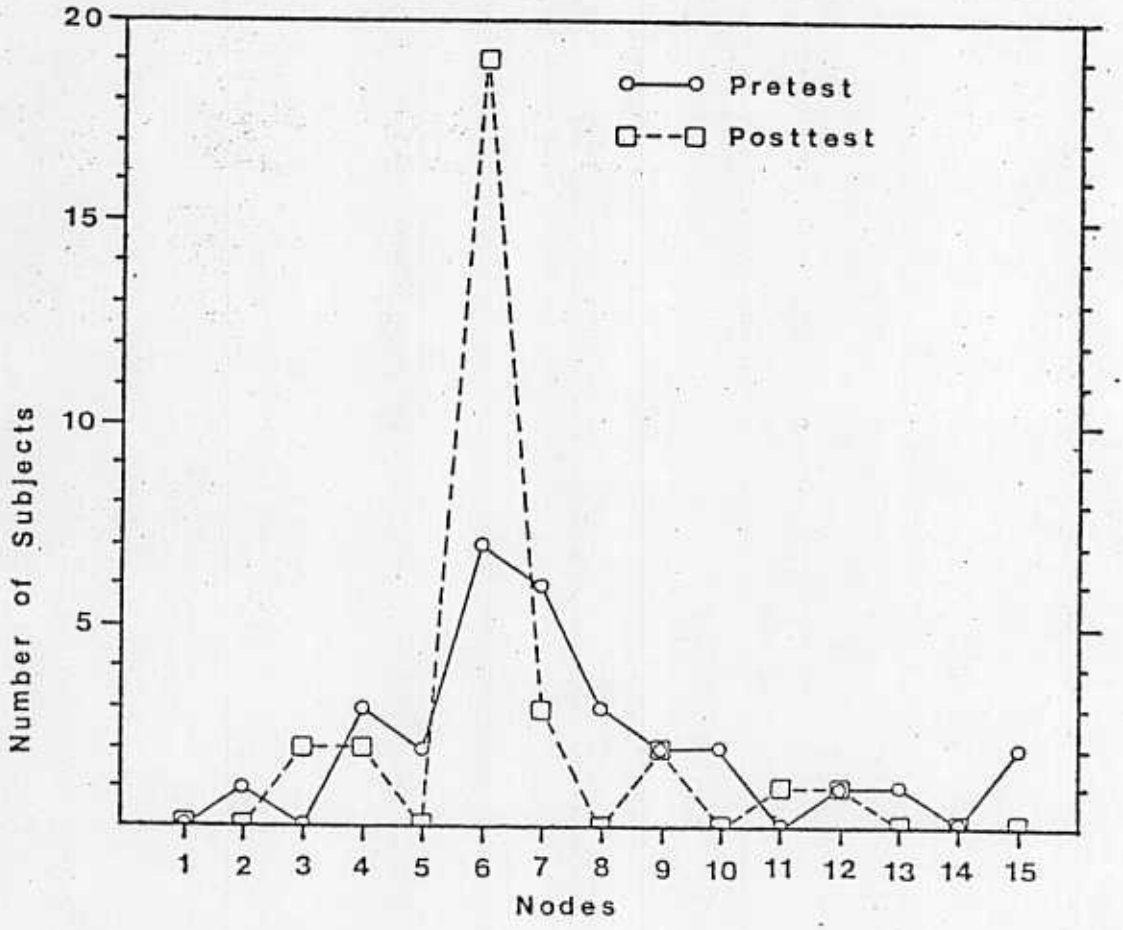

Figure 1. Number of occupational groups (nodes) formed on Pretest and Posttest for Group I, cognitive structuring.

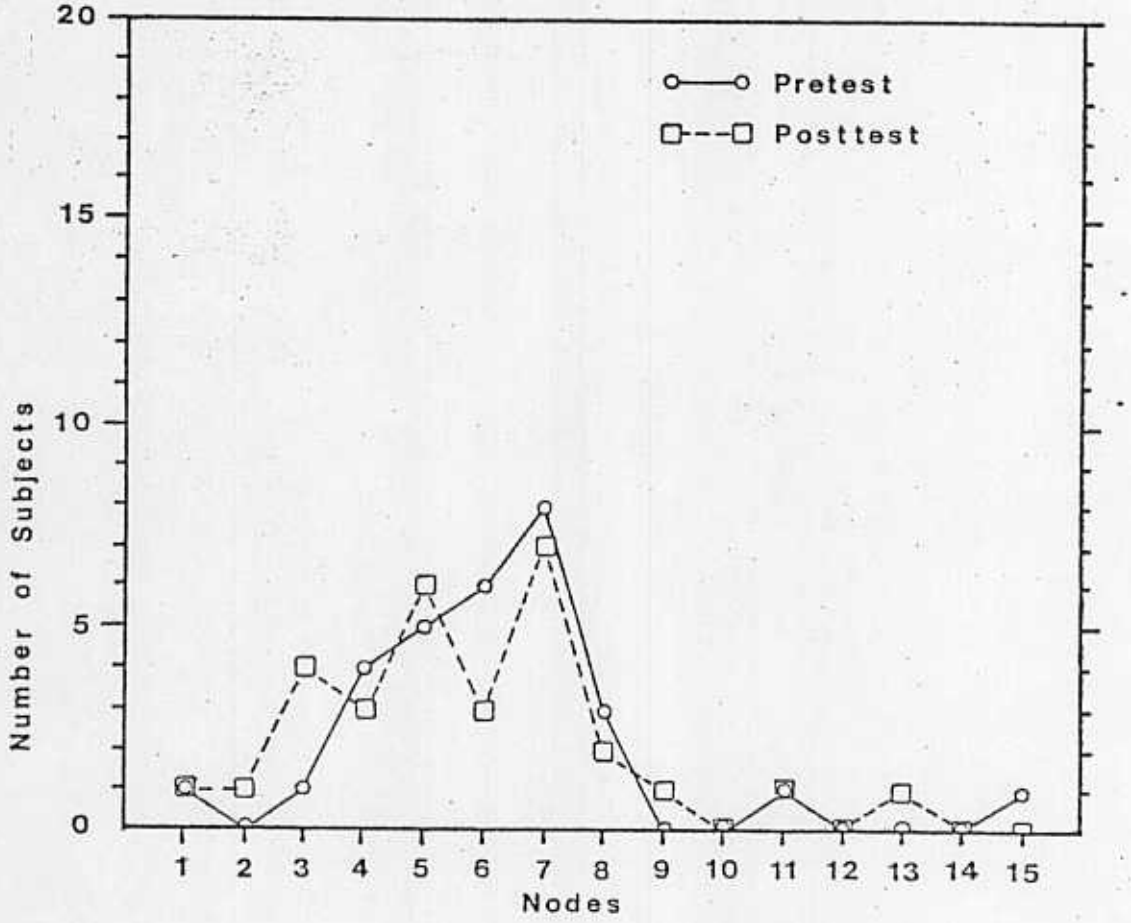

Figure 2. Number of occupational groups (nodes) formed on Pretest and Posttest for Group II, no cognitive structuring.

Table 1

Pretest-Posttest Differences Among Treatment Groups For Dependent Variables

Variables	Group 1: OGT, Cognitive Structuring, DISCOVER		Group 2: OGT, DISCOVER		Group 3: DISCOVER Only	
	M	SD	M	SD	M	SD
Nodes in Occupational Grouping Task (OGT)						
Pretest	7.5	3.1	6.2	2.5	---	---
Posttest	6.3	1.1*	5.8	2.6	---	---
Occupational Alternatives Listed (OAQ)						
Pretest	4.5	2.2	3.9	2.5	3.2	2.1
Posttest	4.1	1.4*	2.5	2.5	3.4	1.8
Vocational Identity Scores (MVS)						
Pretest	7.5	4.1	8.6	3.6	8.6	4.1
Posttest	9.3	4.7	10.8*	3.9	11.6*	4.4

*Pretest/Posttest difference, $p < .05$.

alternatives subjects were considering. It did not influence subjects' confidence in their interests, abilities and goals (i.e., vocational identity). Subjects in the computer only group (control) did, however, become more assured of their vocational identities.

Knowledge of the Holland model appeared to help subjects add alternatives when they had few (i.e., less than three) and eliminate alternatives when they had many (i.e., more than five). Like other CACG systems, DISCOVER generates lists of occupational alternatives (often copious lists) which may overload clients with occupations to consider. Perhaps cognitive structuring helps clients process information overload through selective attention, evaluation and synthesis. If so, this information reduction and association process may help clients either add meaningful alternatives when they have few choices, or eliminate unlikely choices when they have too many. While the optimal number of alternatives that individuals can consider (i.e., hold in working memory) at any one time appears to be between three and five, the degree of certainty about the first choice appeared to be unaffected by prior structuring. Changes in occupational certainty may require an additional intervention such as some form of reality testing, for example, personal interviews, or on-the-job experience (Super, 1983).

Finally, subjects in the cognitive structuring group were less affected than subjects in the other groups in terms of becoming more assured of their personalities, interests, talents and goals (i.e., vocational identity). As a speculation, the structuring experience, with consequent changes in the way individuals consider alternatives, left subjects somewhat more cautious and less confident regarding the MVS identity dimensions. Our interpretation is that the structuring experience provided individuals with a new way of perceiving themselves and their alternative choices, while the computer alone more or less confirmed the way individuals already perceived their identity and their alternative occupational choices.

In conclusion, the results suggest that prior cognitive structuring appears to help individuals when they possess only a limited array of alternatives or individuals who possess many alternatives. For individuals who can articulate three to five options, DISCOVER alone may provide reassurance that they are on the right track. Furthermore, application of the findings might be that a 10-minute video tape of the Holland taxonomy along with practice test would be a valuable supplement to computer guidance interventions for clients who might be frustrated by too few or too many occupational alternatives. Nevertheless, this study suggests that in order to understand the total impact of CACG systems, cognitive mediators such as schema structure should be observed in addition to outcome effects.

Implications for Career Guidance Services for Adults. In regard to CACG services for adults, this study's primary implications pertain to service design and provision. Adults who are considering an occupational change or who are new to the labor market often share one of two problems: 1) they either discern a limited set of occupational alternatives and become discouraged with their career prospects; or, 2) conversely, they are attracted to numbers options and become overwhelmed by the magnitude of the decision-making task. Career guidance practitioners may be able to assist these clients by first using an intake procedure, such as administering the OAQ or conducting an assessment interview to examine their array of occupational alternatives, and second by prescribing a cognitive structuring intervention (similar to the videotape used in this study) to clients with less than three or more then five alternatives before assigning them to a CACG system. Additional research with cognitive structuring interventions and the use of CACG systems by adults is needed.

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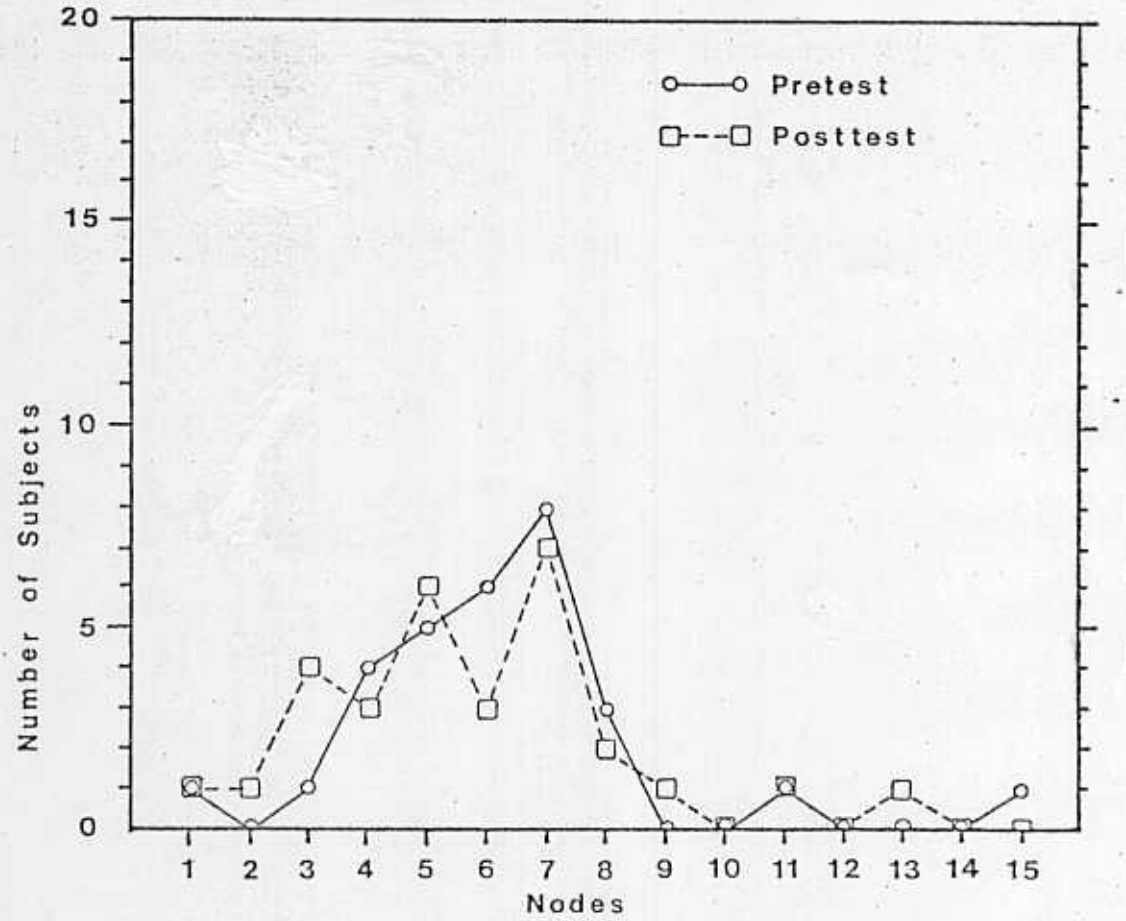

Figure 2. Number of occupational groups (nodes) formed on Pretest and Posttest for Group II, no cognitive structuring.

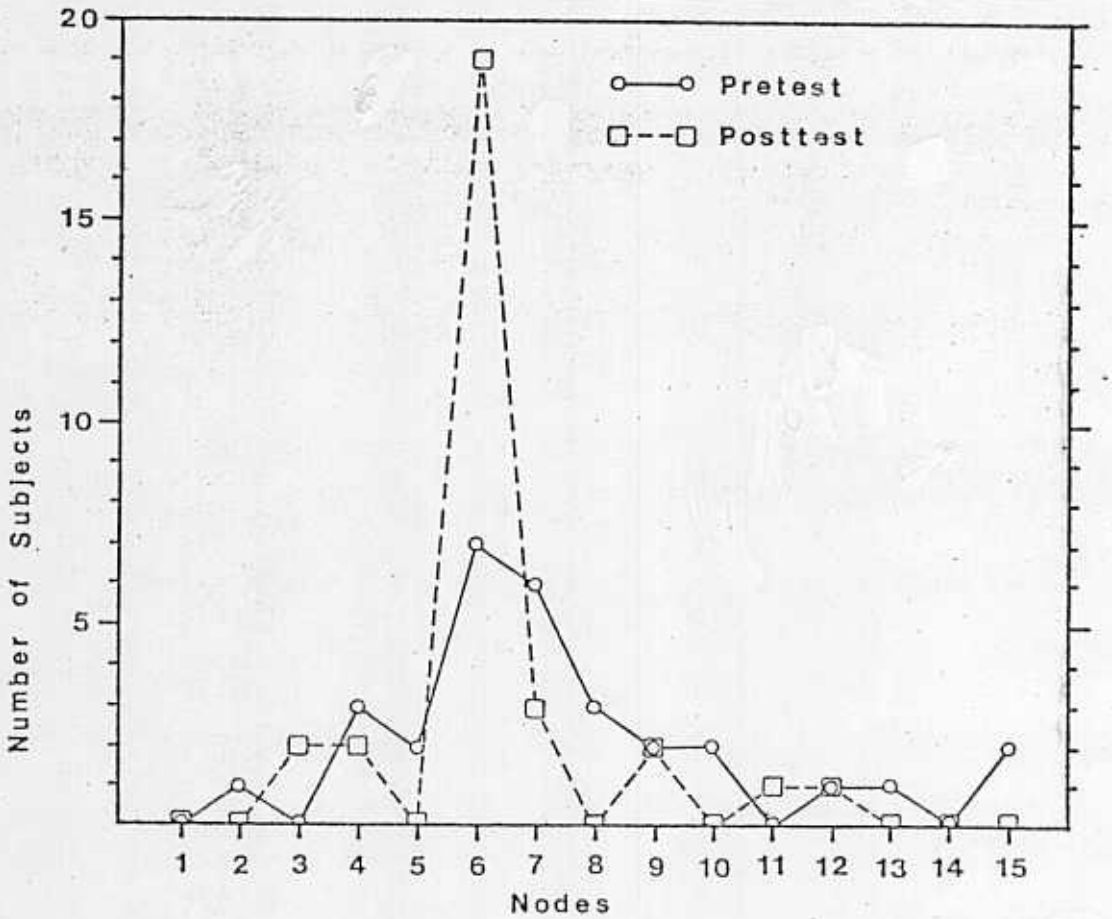

Figure 1. Number of occupational groups (nodes) formed on Pretest and Posttest for Group I, cognitive structuring.

Footnotes

1. This paper was drawn from a portion of a doctoral dissertation by the first author under the supervision of the second author, Department of Counseling Psychology and Human Systems, Florida State University.

2. A copy of the videotape script may be obtained from the second author.

3. A copy of the occupational classification test may be obtained from the second author.