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Designing ODL for Cognitive Styles : Review and Design Issues

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ABSTRACT :

Cognitive style is a major dimension of individual differences. It has been described as a fairly fixed characteristic of an individual, which is static and a relatively in- built feature of the individual. Since Open and Distance Learning (ODL) is a relatively new and important force in higher education system, it becomes necessary that we know the characteristics of the distance learners and how to design distance education to suit the cognitive styles of the distance learners. This paper has looked at some research findings and literature in order to identify different aspects of cognitive styles, assessment/review of five major cognitive styles, the concept of Open and Distance Learning, characteristics of distance learners, designing instructions to suit the cognitive styles and characteristics of learners and designing suitable evaluation administration in ODL.

1. INTRODUCTION :

When we look at the subject of cognitive psychology, individual differences come to mind. According to Robertson (1985), a review of researches in cognitive psychology shows that people exhibit significant individual differences in the cognitive processing styles which they use when solving problems and in decision-making activities. So many researches have been conducted from different perspectives on individual differences. Riding and Cheema (1991), Dunn, Debello, Brennan, Krimsky and Murrain (1981), report that findings from both qualitative and quantitative researches show several consistent major dimensions of individual differences. Cognitive style is a major dimension of individual differences. Allport (1937), originally proposed the construct of cognitive styles, describing it as an individual's habitual or typical way of perceiving, remembering, thinking and problem- solving. So many researches have been undertaken in this area by psychologists. These include Messick (1976), who identified 19 cognitive styles, and Smith (1984), who identified at least 17 learning styles inventories.

In defining cognitive style, Liu and Ginther (1999: 1) say that "cognitive/ learning styles refer to the individual's consistent and characteristic predispositions of perceiving, remembering, organizing, processing, thinking and problem-solving". While Tennant (1988), sees cognitive styles as an individual's characteristic and consistent approach to organizing and processing information. Cognitive styles can also be described as "a fairly fixed characteristic of an individual. These characteristics are static and are relatively in-built features of the individual". (Riding, Glass and Douglas (1993: 268).

Most of the times, cognitive styles and learning styles are used interchangeably. It is the same in this discourse. However, cognitive styles are slightly different from learning styles. This is because, cognitive styles focus more on theoretical or academic research, and are more related to a bipolar dimension. Where as, learning styles relate to practical applications and are not necessarily extremes. According to Liu and Ginther (1999), a major difference between these two terms is the number of style elements involved, but their measures conventionally lie somewhere between aptitude measures and personality measures. In literature, they are viewed in three major respects such as structure, process or both structure and process (Wilson,1981; Tennant, 1988; Riding and Cheema 1991; and Squires,1981).

Schmeck (1988), sub-divided learning styles into two broad types. These are:- global—holist/field dependent/right brained, and focused—detailed/field independent/left brained. According to him, although both styles are equally good for problem solving, each style is likely to be associated with greater efficiency in specific tasks. But the most effective problem solvers should use strategies connected with both styles.

For cognitive styles, Ausburn and Ausburn (1978) have proposed that they are characterized by three important properties. These properties are:-

(a) The generality and stability across tasks and over time. These are resistant to training and change.

(b) The relative independence of cognitive styles from traditional measures of general ability.

(c) Cognitive styles' relationships with some specific abilities, characteristics and learning tasks.

These imply that cognitive styles have either positive or negative relationships with some motivation and academic achievement, depending on the nature of the learning task. (Liu and Ginther, 1999). Research findings and literature have identified different aspects and terms related to cognitive styles.

These terms, according to Liu and Ginther (1999), include:

- Breadth of categorizing (Kogan and Wallach, 1964)
- Cognitive complexity vs cognitive simplicity (Kelly, 1955).
- Deep- elaborative vs. shallow- reiterative (Schmeck, 1983).
- Divergent vs. convergent (Hudson, 1966).
- Field dependence vs. field independence (Witkin, 1962).
- Global vs. analytical (Kirby).
- Impulsive vs. reflectivity (Kagan, 1965).
- Leveler vs. sharpener (Holzman and Klein, 1954).
- Need for cognition (Tanaka, Panter and Winborn, 1986-87).
- Objective vs. nonobjective (Leithwood and Montgomery, 1982).
- Organizer vs. nonorganizer (Atman, 1988).
- Right—vs. left—brained (Torrance and Rockensten, 1988).
- Risk-taking vs. cautiousness (Kogan and Wallach, 1964).
- Scanning vs. focusing (Gardner, 1961).
- Sensitizers vs. repressors (Bergouist, Lloyd and Johansson, 1973).
- Sensory modality preferences (Bartlett, 1932; Galton1883)
- Simultaneous vs. successive (Das, 1988).
- Verbalizer vs. imager (Riding and Taylor, 1976).
- Verbalizer vs. visualizer (Richardson, 1977)
- Visual vs. haptic perceptual type (Lewenfold, 1945).
- Holist vs. analytic (Peters, 1977).
- Holist—analytic vs. verbal—imagery (Riding and Cheema,1991).
- Holist vs. serialist (Pask, 1972).
- Kolb's learning style model (Kolb, 1984), and
- The MBTI learning style model (Lawrence, 1984).

The rest of this paper takes a look at five major aspects of cognitive styles, the concept of ODL, characteristics of distance learners, designing distance education to

suit the cognitive styles and the characteristics of the distance learners and designing suitable evaluation administration in ODL.

2. ASSESSMENT/ REVIEW OF FIVE MAJOR COGNITIVE STYLES

(a) *Holist—Analytic*: Riding and Cheema (1991), the proponents of this cognitive style say it has two basic types of independent dimensions. These are the holist—analytic and verbal—imagery dimensions. Students who are holists look at a situation as a whole. Those who are analytics view situations as a collection of parts. They stress only one or two aspects at a time. Between the holists and the analytics, there are the intermediates. These have the advantage of both styles. The verbal-imagery dimension has two basic effects. These are; - how information is represented like verbally, imagery or both; and internal/ external attentions focus. Imagers are internal and passive, but verbalizers are external and stimulating. These findings have been supported by the results of Sadler-Smith's (1997) study. According to Peters (1977), holist- analytical style develops even in young children when they learn their first language. In this case a child can employ the analytic style which goes from the parts to the whole or the Gestalt style which is from the whole to the parts.

In the ODL situation, holist- analytical styles should have relationships with the type of instructional materials and learning performance. This is because, according to Riding and Sadler- Smith (1992), the type of instructional materials treatment, such as abstract or pictorial presentation, has very important influences on students learning performance. Definitely, students on the analytic- imager dimension improve most in learning due to the inclusion of more pictorial presentations about certain types of contents. This is in support of the findings of Holliday (1976) and Winn (1982).

It is therefore appropriate for ODL course writers and developers to employ more of this dimension in the self-learning materials development.

(b) *Field Independence vs. Field Dependence*: This dimension was proposed by Witkin (1962, 1979). It is described as value- neutral which is characterized by the ability of a person to distinguish between key elements and distracting or confusing background. This type of cognitive style has some important implications for some people's cognitive behaviour and also for their interpersonal behaviour. For instance, field independent individuals are more autonomous in relation to the development restructuring skills, but are less autonomous in relation to the development of interpersonal skills. On the other hand, field dependent individuals are more autonomous when it comes to the development of high interpersonal skills, but less autonomous when it comes to the development cognitive restructuring skills.

For the ODL practitioners, they have to note the result or findings of Witkin, Moore, Goodenough and Cox (1977) that field independent persons tend to be more intrinsically motivated and enjoy individualized learning, while field dependent persons tend to be more extrinsically motivated and enjoy cooperative learning. Again the findings of Antonietti and Gioletta (1995), that males tend to be of field independent and more analogical in problem solving or tend to use analogical solutions more frequently than females, should also be noted.

(c) *Sensory Preference*: The sensory modality preference is a system that interacts with the environment through one of the basic senses. The major sensory modalities are:- visual, auditory and kinesthetic. This cognitive style was proposed by Galton (1883) and supported later by Bartlett (1932). It is noted that verbal thinking and intelligence testing are overemphasized more than spatial or visual thinking in

researches. It is also noted that masculinity is related to visual thinking while femininity is related to verbal thinking. But Antoniette and Gioletta (1996) are not in support of this gender distinction.

Other cognitive styles that are related or similar to sensory modality preference are verbalizer vs. visualizer, and verbalizer vs. imager. Riding and Buckle (1990) proposed the verbalizer vs, imager cognitive stile. They were supported by Riding and Cheema (1991), and Riding and Douglas (1993). To these researchers, the individuals who are imagers perform better than those who are verbalizers when it comes to text-plus- picture conditions. But when it comes to text- plus- text conditions, the verbalizers are better. The imagers very often use diagrams to make illustration of their answers more than the verbalizers. Course material developers and curriculum planners in ODL should try to incorporate these aspects of the cognitive styles in the production of self- learning materials for the use of distance learners.

(d) *Kolb's Learning Style Model*:
According to Tennant (1988), this is one of the dominant approach in categorizing cognitive styles. This model is very effective in some language teaching activities, and according to Kolb (1984), it has four basic learning modes described as :
(i)Active Experimentation (AE)
(ii) Reflective Observation (RO)
(iii) Concrete Experiment (CE) and
(iv) Abstract Conceptualization (AC).

This means that learning process can be active or passive, concrete or abstract. The model can also be considered as a- four stage model which includes:

1. Concrete experience,
2. Observation and reflection,
3. Formation of abstract concepts and generalizations and
4. Hypothesis tested by active experimentation leading to new concrete experience.

Based on these models Kolb (1984) proposed four basic learning styles. These are :

(1) *Converger*: This is a convergent learning style which is dependent upon the dominant learning capacities of active experimentation and abstract conceptualization. It has great advantages in decision- making, problem solving, traditional intelligent tests and practical applications of theories. In this case, knowledge is organized in hypothetical-deductive reasoning manner. This makes the individuals with this style to be more superior in technical tasks and problems, but inferior in social and interpersonal matters. They tend to specialize or choose the physical sciences.

(2) *Diverger*: This is a divergent learning style which is dependent upon concrete experience and reflective observation. It has great advantages in imaginative abilities and awareness of meanings and values. This makes the individuals with this style to organize concrete situations from different perspectives and to structure their relationships into a meaningful whole. They focus on adaptation by observation instead of by action. They are superior in generating alternative hypothesis and ideas. They are imaginative people, and are feeling- oriented. They specialize or choose the liberal arts and humanities.

(3) *Assimilator*: This is an assimilative learning style which is dependent on abstract conceptualization and reflective observation. It has great advantages in inductive reasoning, creating theoretical models and assimilating different observations into an integrative entity. The individuals with this style are more concerned with abstract concepts and ideas. They are less concerned about people. They focus more on logical soundness and precision of ideas, rather than their practical values. They tend to choose to work in research and planning units.

(4) *Accommodator*: This is the accommodative learning. It has the opposite learning advantages over assimilators. It is dependent upon active experimentation and concrete experience. Its advantages lie in doing things , implementing plans, and engaging in new tasks. The individuals with this style focus on risk- taking,

opportunity- seeking and action. They tend to be more superior in adapting themselves to changing immediate situations in which they plan when theory does not fit the facts. They also tend to be intuitive in problem-solving using trial- and –error, and depending on other people for information rather than depending on their own thinking. They therefore deal with people quite easily. They tend to specialize or choose action- oriented jobs like marketing and sales.

Part of Kolb's cognitive styles such as concrete experience (CE) and abstract conceptualization (ac) are quite similar to the perspective vs. judging dimension measured by Myers Briggs Type Indicator (MBTI). Here perspective individuals prefer rich media as in the integrative use of pictures, tables and diagrams. This model has proved to be of rich practical use. This is why Tennant (1988 :105) said, "As a rule of thumb the model provides an excellent framework for planning teaching and learning activities and it can be usefully employed as a guide for understanding learning difficulties, vocational counseling, academic advising and so on". This model may have very wide implications for ODL practices as it can be integrated in the production of self – learning materials.

(e) *Hemispheric Preferences*: Some studies have been conducted from different perspectives of this cognitive style. These include psychological, physiological and neurological. Sonnier (1991) reported that this hemispheric preference could be a major contributing factor to individual differences. It has two dimensions. These are left-hemispheric and right- hemispheric.

(1) Left- hemispheric: Students who are left- hemispheric can be stronger in analytical thought processing. They tend to process information logically and sequentially. According to Gadzella (1995) these students achieve higher grades in tests based on the objective tests.

(2) Right- hemispheric: Students who are right- hemispheric are visual processors. They can process information non-linearly and holistically.

Hemispheric preferences play significant role in cognition and achievement. Hemispheric asymmetry, which can be seen in the degree of dominance, direction of dominance, characteristic arousal level and complementarity of functioning, play an important role in individual differences in cognition. (O' Boyle and Hellige, 1989).

A look at these cognitive at these cognitive styles will show that individual differences play significant role in the way people learn. It is implied therefore that ODL practitioners must not loose sight of individual differences and the different cognitive styles. ODL teacher should employ the use of eclectic and multiple methods of teaching, and multi-media approaches in producing self- learning materials to improve students' learning.

3. THE CONCEPT OF OPEN AND DISTANCE LEARNING (ODL)

Open and Distance Learning (ODL), according to Alaezi (2005), refers to educational patterns, approaches and strategies that permit people to learn with no barriers in respect of time and space, age and previous educational qualification – no entry qualification, no age limit, no regard to sex, race, tribe, state of origin etc. It has developed from a modest and inconsequential beginning through correspondence courses to a full- fledged modern day technology- facilitated, flexible and learner- driven, self- directed learning, which involves learners who are often in locations remote from the institutions and / or the instructional or tutorial facilitators (Jegede, 2005). The concept of ODL is a composite one. This is because it is made up of two components. These are Open Learning and Distance Education.

Today, we are witnessing a strong trend towards a philosophy of "more open" learning, even though in practice no educational institution is completely open. Open Learning is one the most recent manifestations of a gradual trend towards the democratization of education.

It is not in doubt that education and learning are traditionally 'closed' by various barriers ranging from entrance requirements, time constraints, financial demands, geographical locations, rigid evaluation system, social and cultural barriers to higher education. The concern in this discourse is the openness to education in order to provide enhanced access to, and success in university education to all those previously denied of such opportunities. Openness has removed many barriers to learning, making education more learners centred, using a wild range of teaching strategies and media. It has such advantages as:-

- Accessibility: Students may enroll and start at any time of the year.
- Study: Students may choose any course or courses at any level. There are often choices of activities and topics within courses. There are also choices of media to be used in course delivery.
- Place: Learning comes to the students. They can only study where it is convenient—at home, at work, or elsewhere.
- Time: Students can study at any time to suit themselves and their circumstances. Full- time school age students are encouraged to work out a daily and weekly timetable so as to complete their programmes satisfactorily.
- Pace: Students can at a pace appropriate to their ability and achievement.
- Cost: As a result of multi-media application and number of learners involved, it is cost effective and affordable.

On the other hand, Distance education lays emphasis on the physical distance which does not permit the direct interaction between the teacher and the learner. A striking feature of distance education is the apartness of the teachers and the learners. According to Keegan (1988) and Otto-Peters (1993), it lays emphasis on independent studies as a way of liberating the students from the fetters of school or college routine.

It does not imply simple self study. Because of a two- way communication, this means that the separation of students from the teacher does not imply communication cut- off altogether. It is referred to as industrialized form of instruction. This implies that it is carefully pre-planned, prepared and organized to have both technical equipment and quality teachers to work with. It is a form of formalized education system.

Open learning and Distance education combine to give a composite picture in the context of the Open and Distance Learning (ODL). To Otto-Peters (1993), this composite picture can be viewed when we take ODL as a special form of education in which:-

- Teachers and students work apart from each other, i.e. at a distance.
- Teachers and students do not communicate 'eye ball to eye ball' with each other.
- Learning usually takes place in the students' home.
- Teaching and learning process assumes the form of self- study but guided by the teacher.
- Learning and teaching process allows a degree of openness with regards to access, age, goals, methods duration, location, pace etc.
- The student does not cease to work for a living as it is a study alongside work.

ODL provides affordable, cost effective and flexible educational opportunities for all. It accommodates diverse learning. It provides access to remote and normally inaccessible and under- represented groups. It meets the specific and special educational needs of varieties of learners.

4. CHARACTERISTICS OF DISTANCE LEARNERS

The definitive characteristic of distance education is the separation between the learner and the teacher. Most of the distances learners in higher education are adults, even though more and more teenagers are coming into it.

The learners tend to be more intrinsically motivated than the students in a face- to – face institution. They rely more on deep-level approach in learning. They have family and other social responsibilities to take care of. Most of them are married, employed and most of the times study on part time basis. Sometimes they neglect their courses because of their personal or professional circumstances. But having a compelling reason for taking the course helps to motivated them to stick with the course. Some prefer the independence of distance learning while others find it uncomfortable as they miss being part of the classroom experience. Distance learning courses give students greater freedom of scheduling but they require more self-discipline than on- campus classes. Knowing the characteristics of the learners in ODL will lead to designing instructions to suit the cognitive styles and characteristics of these learners.

4.1 DESIGNING INSTRUCTIONS TO SUIT THE COGNITIVE STYLES AND CHARACTERISTICS OF LEARNERS IN ODL

In planning and designing for instructions in ODL, the cognitive styles and characteristics of all learners must be put into consideration. According to Liu and Gintter (1999), these should be done under the following:

(1) *Instructional Planning*: This should be considered under

- Audience Analysis: Appropriate cognitive style instrument should be used by the ODL practitioners to measure and identify the learners cognitive styles. If the learners' preferred cognitive styles are identified, they become the basis for preparing the ODL instructions.
- Terminal Objectives: These should be made comprehensive enough to meet the learners' cognitive styles characteristics in order to maximize their potential performance.
- Instructional Preparations: Instructions should be planned and prepared to have a match between the learners' cognitive styles and the instructional contents, methods and styles.

(2) *Learning Environment Construction*: If the learning environment is supportive physically or psychologically, it can facilitate individual's innovative achievement. According to Liu and Gintter (1999), there are two important aspects of supportive learning environments in ODL. These include :-

- Online- Contact: In ODL system face to face interaction between the students and the teacher and among the students themselves is limited. It becomes necessary for the teacher to attempt to construct a supportive environment by providing timely online contact and assistance to all students. This can be in two major types. These are peer contact between students and students, and online contact between the teacher and the students. This can be achieved through the use of e- mail, list server mailing list to all students, and the use of various media.
- Diversified Learning Styles: In designing ODL instructions to suit the students' cognitive styles, diversified learning styles should be adapted to meet all students' characteristics. This will provide theory- based learning to the assimilators and application- based learning to the accommodators. Again, it may provide individualized learning to the field-independents and co-operative learning to the field- dependent ones among others.

(3) *Teaching Method Selection*: To effectively match the teaching styles with the students' cognitive styles the ODL practitioners should consider the following two major aspects :

- *Matching the instructional materials with the cognitive styles*: According to Jegede, Taylor and Okebukola (1991), it is very important to provide high quality instructional materials to match the students' cognitive styles and to fully accommodate the richness and complexity of the subject matter. The matching includes :-

✓Matching the type of content with verbal- visual style.
✓Matching the type of content with Kolb's abstract- concrete style.
✓Matching the type of content with Kolb's career preferences.

- *Matching the teaching style with the cognitive styles*: Teaching styles refer to the implementation of the match between cognitive styles and the instructional materials (Liu and Gintter 1999). This type of matching includes:

✓Matching the instructional strategy with field dependence—independence style.
✓Matching the layout of materials with holist- analytic style.
✓Matching the conceptual structure with holist- analytic style.
✓Matching the choice of presentation mode with sensory preference.
✓Matching social preferences with verbal- imagery style.
✓Matching the teaching aids with hemispheric preference.

5. DESIGNING SUITABLE EVALUATION ADMINISTRATION IN ODL

Evaluation is an integral and a major aspect of instructional strategy. Therefore, in designing for suitable cognitive styles in ODL, the practitioners should also design appropriate evaluation administration that can suit the cognitive styles in ODL. The administration of evaluation in ODL has two main aspects. These are:

(1) Assessment: This is used for the measurement of 'the how' and 'the what' of students' learning in ODL. Students grading in ODL should be based on such tools as regular assignments which are called Tutor-Marked Assignments, individual or group projects, online or in- class quizzes, take-home examinations and end of semester examinations, These types of tests should have maximum validity, feasibility and objectivity in order to meet the cognitive characteristics of all the students (Jegede, Taylor and Okebukola 1991). In this case we look at :

a) *Contents of assessment*: The assessment content should be comprehensive and cover the entire course. In addition, it should cover the six cognitive domains of knowledge, comprehension, application, analysis, synthesis and evaluation. Such an assessment will be especially helpful to the holists, convergers and assimilators.

b) *Formats of assessment*: The formats of the assessment tools should be appropriate to the cognitive styles. It may include filling in the blanks, multiple choice questions, identification of terms, a variety of short and long assay questions and written papers. Appropriate hints such as diagrams, tables, verbose descriptions, etc, for different assessment instruments should be provided where necessary.

(2) Feedback: Appropriate and timely feedback in respect of the results of the assessment or the outcome of the assessments like examinations, assignments, especially the tutor- marked assignment, projects and papers should be provided. The feedback should be primarily the positive and teaching type. The comments on the tutor- marked assignments should be encouraging rather than discouraging and demoralizing.

6. CONCLUSION

Having looked at some of the cognitive styles as they apply to ODL, the concept of ODL and learners' characteristics, and having looked at the various ways of designing ODL instructions to suit the learners' cognitive styles, it becomes necessary to say that ODL practitioners should not loose sight of the different cognitive styles when designing instructions for distance learners. They should allow both cooperative and individualized learning in the whole class. In terms of learning material, holist view as well as diagrammatic materials like tables and charts should be provided. They should use a combination of various instructional designs, teaching techniques, and modes of presentation like computer based multimedia presentations, drawings, transparencies, video tapes, lectures and discussions. These will help the students overcome the problems associated with distance education and improve on their deep processing skills.

REFERENCES :

Alaezi, O.A. (2005). *National Open University Plan: Enhancing Higher Education in Nigeria Through Open and Distance Learning Delivery System*. Lagos. NOUN.

Allport, G.W. (1937). *Personality: A psychological interpretation*. New York; Holt & Co.

Antonietti, A. and Gioletta, M. (1995). Individual differences in analogical problem Solving. *Personality and Individual Differences*, 18 (5), 611-619.

Atman, K.S. (1988). Psychological type elements and goal accomplishment style: Implications for distance education. *The American Journal of Distance Education*, 2 (3), 36- 44.

Ausburn, L.J. and Ausburn, F.B. (1978).Cognitive styles: Some information and implications for instructional design. *Educational Communication and Technology*, 26 (4), 337-354.

Bartlett, F.C. (1932). *Remembering*, Cambridge, Mass: Harvard University Press.

Bergouist, W.H. Lloyd, J.T. and Johansson, S.L. (1973). Individual differences among Repressors and sensitizers in conceptual skills. *Social Behaviour and Personality*, 1 (2), 144- 152.

Das, J.P. (1988). Simultaneous- successive processing and planning: Implications for School learning. In R. Schmeck (Ed), *Learning strategies and learning styles* (pp. 101-130), New York: Plenum Press.

Dunn, R., DeBello, T,, Brennan, P., Krimsky, J.,and Murrain, P. (1981). Learning style Researchers define differences differently. *Educational Leadership*, 38, 327-374.

Gadzella, B.M. (1995). Differences in academic achievement as a function of scores on Hemisphericity. *Perceptual and Motor Skills*, 70, 783-786.

Galton, F. (1883). *Human faculty and development.* London: Macmillan.

Gardner, R.W. (1961). Cognitive controls of attention deployment as determinants of Visual illusion. *Journal of Abnormal and Social Psychology*, 62, 120-129.

Holliday, W,G. (1976). Teaching verbal chains using flow diagrams and text. *AV Communication Review*, 24 (1),63-78.

Holzman, P.S. and Klein G.S. (1954). Cognitive system- principles of leveling and Sharpening: Individual differences in visual time –error assimilation effects. *Journal of Psychology*, 37, 105- 122.

Hudson, L. (1966). *Contrary Imaginations*. Harmondsworth; Penguin.

Jegede, O. (2005). Inaugural speech at the Induction Workshop for NOUN Staff, facilitated by Commonwealth of Learning (COL). Victoria- Island, Lagos 26-30 July.

Jegede, O, Taylor, J.C. and Okebukola, P.A. (1991).Knowledge engineering: An alternative approach to curriculum design for science education at a Distance. *Research in Higher Education*,21, 198-207.

Kagan, J (1965). Impulsive and reflective children: Significance of conceptual tempo, in J. D.Krumboltz (Ed), *Learning and the educational process* (pp. 133-161). Chicago: Rand Mc Nally.

Keegan, D. (1988). Problems of defining the field of distance education. *American Journal of Distance Education* 2, 2:4-11.

Kelly, G.A. (1955). *The psychology of personal constructs* (vol. 1). New York: Norton.

Kirby, J. R.(1988). Style, strategy, and skills in reading. In R. R. Schmeck. (Ed), *Learning strategies and learning styles* (pp.229-274). New York: Plenum press.

Kogan, N., and Wallach, M.A. (1964). *Risk-taking: A study in cognition and personality*. New York: Holt, Rinehart, and Winston.

Kolb, D.A. (1984).*Experiential learning: Experience as the source of learning and Development*. Engle wood Cliffs, N.J. Prentice Hall.

Lawrence, G.(1984). A synthesis of learning style research involving MBTI. *Journal of Psychological Type* 8,2-15.

Leithwood, K.A.and Montgomery, D.J.(1982).The role of elementary school principal in Program improvement. *Review of Educational Research*, 52, 309-339.

Lewenfeld, V. (1945).Tests for visual and haptical aptitudes. *American Journal of Psychology*, 58, 100- 112.

Liu, Y. and Gintter, D. (1999). Cognitive styles and distance education. *Online Journal of Distance Learning Administration*, vol 11, No. 111, 1- 19.

Messick, S. (1976). Individuality in learning. San Francisco: Jossey- Bass.

O' Boyle, M.W.and Hellige, J.B. (1989). Cerebral hemisphere asymmetry and individual Differences in cognition. *Learning and Individual Differences*, 1(1), 7-35.

Otto- Peters (1993). Understanding distance education. *American Journal of Distance Education*, 27, 3, 11-21.

Pask, G. (1972). A fresh look at cognition and the individual. *International Journal of Man- Machine Studies*, 4, 211-216.

Peters, A.M.(1977). Languages learning strategies: Does the whole equal the sum of the Parts? Language, 53,560-573.

Richardson, A. (1977). Verbalizer- visualizer: A cognitive style dimension. *Journal of Mental Imagery*, 1(1), 109- 126.

Riding, R.J.and Buckle, C.F.(1990). Learning styles and training performance. Sheffield: Training Agency.

Riding, R.J. and Sadler-Smith, E. (1992). Types of instructional material, cognitive style and learning performance. *Educational Studies* (England), 18 (3), 323- 340.

Riding, R.J. and Taylor, E,M, (1976). Imagery performance and prose comprehension in 7-year- old children. *Educational Studies* (England). 2, 21-27.

Riding, R.J. and Cheema, I. (1991).Cognitive styles—an overview and integration. *Educational Psychology*, 11(3-4). 193- 215.

Riding, R.J., Glass, A. and Douglas, G. (1993). Individual differences in thinking: Cognitive and neuro-physiological perspectives. Special issues: Thinking. *Educational Psychology*, 13 (3&4), 267-279.

Robertson, I.T. (1985). Human information-processing strategies and style. *Behaviour and Information Technology*, 4(1), 19-29.

Sadler- Smith, E. (1997). "Learning style": Frameworks and instruments. *Educational Psychology*, 17 (1-2),51-63.

Schmeck, R.R. (1983). Learning styles of college students. In R.F. Dillon and R.R. Schmeck (Ed). *Individual differences in cognition* (pp.233-280). New York: Academic Press.

Schmeck, R.R. (1988). Learning strategies and learning styles. New York: Plenum Press.

Smith, R.M. (1984). *Learning how to learn*. Milton Keynes: Open University.

Sonnier, I.L. (1991). Hemisphericity: A key to understanding individual differences Among teachers and learners. *Journal of instructional Psychology*,18(1),17-22.

Squires, G. (1981). *Cognitive styles and adult learning*. Nottingham: University of Nottingham.

Tanaka, J.S., Panter, A.T. and Winborne, W.C. (1986-87). Associations between Daydreaming style and information processing predispositions. *Imagination, Cognitive, and Personality*. 6(2), 159-166.

Tennant, M. (1988). Psychology and adult learning. London: Routledge.

Torrance, E.P. and Rockenstein, Z.L. (1988). Styles of thinking and creativity. In R.R.Schmeck (Ed), *Learning strategies and learning styles* (pp275-290). New York: Plenum Press.

Wilson, J.D. (1981).Student learning in higher education. London: Croom Helm.

Winn, W.D.(1982). The role of diagrammatic representation in learning sequence, Identification and classification as a function of verbal and spatial ability. *Journal of Research in Science Teaching*, 19(1), 79-89.

Witkin, H.A. (1962). Psychological differentiation: Studies of Development. New York: Wiley.

Witkin, H.A. (1979). Socialization, culture and ecology in the development of group and Sex differences in cognitive styles. *Human Development*. 22(5), 358- 372.

Witkin, H.A., Moore, C.A., Goodenough, D.R. and Cox, P.W. (1977).Field dependent and Field independent cognitive styles and their educational implications. *Review of Educational Research*, 47, 1-64.

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