PSYCHOLOGICAL PRINCIPLES FOR E-LEARNING

Dr.Sajna Jaleel
Lecturer
School of Pedagogical Sciences
Mahatma Gandhi University
Kottayam, Kerala, India
Mobile Number: +91-9846467080
e-mail:sajnajaleel@yahoo.co.in

Accepted paper for **3rd Annual Forum on e-Learning Excellence in the Middle East 2010 - Bringing Global Quality to a Local Context**

PSYCHOLOGICAL PRINCIPLES FOR E-LEARNING

Sajna Jaleel
Lecturer
School of Pedagogical Sciences
Mahatma Gandhi University
Kottayam, Kerala, India

Abstract

The fast budding influence of Information and Communication Technology (ICT) and e-learning in content development and content delivery can be seen in every sector of education. Learning and teaching whether it is through actual classroom settings or through technological applications utilizes many psychological principles knowingly or unknowingly. The most commonly used or heard Schools of Psychology are Behaviourism, Cognitivism and Constructivism. All these schools of psychology are developed based on theories formulated by many psychologists and are being effectively applied in actual classroom situations. However, the application of these psychological principles in e-Learning is not much thought of. e-Learning could be more efficient and effective by the contextual use of different psychological principles. This paper tries to analyze the theories and principles of different psychologists in the context of e-learning.

Key words: psychological principles, e-learning, self learning, student teachers.

Introduction

The introduction of computers is considered by many to be the third revolution in education; the first was the printing of books, the second the introduction of libraries. The computers developed in the 1950's were awesome creations. The possibility of educational applications was mainly conjectural at that time, although important instructional experiments were conducted through out the 1950's and 1960's. These experiments were spurred by the development of FORTRAN, a more easily learned computer language, and B. F. Skinner's research in programmed instruction. It was seen that the step by step format of linear programmed instruction lent itself well to the logical "mentality" of the computer. The factor of cost, hardware reliability, and the availability of adequate materials remained major barriers to the widespread adoption of

computers for instruction. (Heinich, R., Molenda, M. and Russell, J. D. (1990)). However, today their use has become diverse. For many of these years, they had been primarily used for information processing. It is well known that year by year, computers are becoming more and more powerful both in terms of their computational speeds and also their capacities for storing data. What has made the big difference in recent years is not the fact that individual computers have dramatically improved in their capabilities, but that all those information islands are being connected by digital highways made possible through the use of the telecommunication infrastructure by the computers, which largely explains why the internet and the www have begun to play such a significant role in our use of computers. It has brought unprecedented changes in many walks of life and education is no exception.

An innovative application of computer in the pedagogy and learning process is e-learning. E- Learning may be network based, intranet based or internet based, which includes text, video, audio, animation and virtual environments. The facility of Internet and Intranet enables e-learning that allows learning anytime and anywhere. E-Learning provides faster learning at reduced costs, increased access to learning and clear accountability for all participants in the learning process. The fast budding influence of Information and Communication Technology (ICT) and e-learning in content development and content delivery can be seen in every sector of education. The American Society for Training

and Development (ASTD) defines e-learning as a broad set of applications and processes which include web-based learning, computer-based learning, virtual classrooms, and digital. The definition of e-learning varies depending on the organization and how it is used; but basically it involves electronic means of communication, education, and training.

Learning and teaching whether it is through actual classroom settings or through technological applications utilizes many psychological principles knowingly or unknowingly. Some of the predictions about the future of education tend to focus not so much on the technology, but on the intersection between pedagogy and technology, and its effect on psychology, epistemology and teaching praxis. The most commonly used or heard Schools of Psychology are Behaviourism, Cognitivism and Constructivism. The early use of technology in educational settings reflected a behaviourist view of teaching and learning. Behaviourism discusses behaviours that can be observed and does not fully consider the thought processes that go on in the learner's mind. Cognitivism differ from behaviourism in that it deals with the internal mental processes of the mind and how these processes could be used to endorse effective learning. Developments in technology , particularly those evident in multimedia, and increased understandings regarding the complexities involved in learning has led to the application of constructivist principles of learning to electronic environments.(Hannafin &Land,1997). Constructivism founded on the premise

that, by learners reflecting on their experiences, and thereafter constructing their own understanding of their world. All these schools of psychology are developed based on theories formulated by many psychologists and are being effectively applied in actual classroom situations. This paper tries to analyze the theories and principles of different psychologists in the context of e-learning.

Objectives of the Study

1. To identify Psychological principles of different Psychologists for the study
2. To analyse the application of select Psycholological principles in e-learning
3. To identify and arrange the Psychological principles for e-learning on the basis of its application

Methodology

For collecting the required information the researcher prepared a Rating Scale consisting of 50 Psychological principles and the cues as ‘always’, ‘frequently’, ‘occasionally’, ‘rarely’ and ‘never’. In addition, psychological principles were collected from different Psychology books, journals and e-sources.

The data collected were coded, classified and tabulated appropriately. For the present study simple statistical technique namely percentage was used for the study. The study was carried out on a sample of 32 post graduate student

teachers having computer knowledge and teaching experience at Mahatma Gandhi University, Kottayam, Kerala, India.

Analysis and Discussion

Jacob (2006) listed 125 Psychological principles of 14 Educational Psychologists in their study on 'Awareness and use of psychological principles by student teachers in teaching Biology'. Educational psychologists selected for the above mentioned study were Thorndike, Skinner, Pavlov, Hull, Guthrie, Tolman, Gestalt, Lewin, Bruner, Vygotsky, Ausubel, Gagne, Watson and Piaget. For the present study, after a preliminary analysis by the investigator, from among the 125 principles 50 are selected. They are listed in Table-1.

Table-1: List of Psychological Principles

Sl. No.	Psychological Principle	Sl. No.	Psychological Principle	Sl. No.	Psychological Principle
1	Self learning	2	Motivation	3	Rule learning
4	Problem solving	5	Change	6	Verbal association
7	Known to unknown	8	Cognitive constructivism	9	Accommodation
10	Chaining	11	Drill and practice	12	Principle of subsumption
13	Simple to complex	14	Response stimulus learning	15	Reflective thinking
16	Work and rest	17	Inductive thinking	18	Trial and error learning
19	Zone of actual development	20	Multiple response	21	Law of effect
22	Learn how to learn	23	Signal learning	24	Meaningful verbal learning
25	Concept learning	26	Learning by experience	27	Symbolic thinking
28	Discovery learning	29	Concept of assimilation	30	Collaborative learning
31	Child centerdness	32	Multiple descrimination	33	Concept of equilibration
34	Generelisation	35	Logical thinking	36	Social constructivism
37	Insight learning	38	Reception learning	39	Classical conditioning

40	Reinforcement	41	Zone of potential development	42	Intuitive thinking
43	Learning by doing	44	Objective observation	45	Simultaneous conditioning
46	Zone of proximal development	47	SR learning	48	Reward expectancy
49	Naturalistic observation	50	Backward conditioning		

These 50 psychological principles were administered to 32 student teachers at the post graduate level and they were asked to rate the application of the psychological principles in e-learning. After collecting the data, total score for each principle is calculated and the principles are arranged based on their scores. Only those principles with total score above 80 were selected for detailed analysis in this paper.

Application of Psychological Principle (with Score greater than 100) in Learning

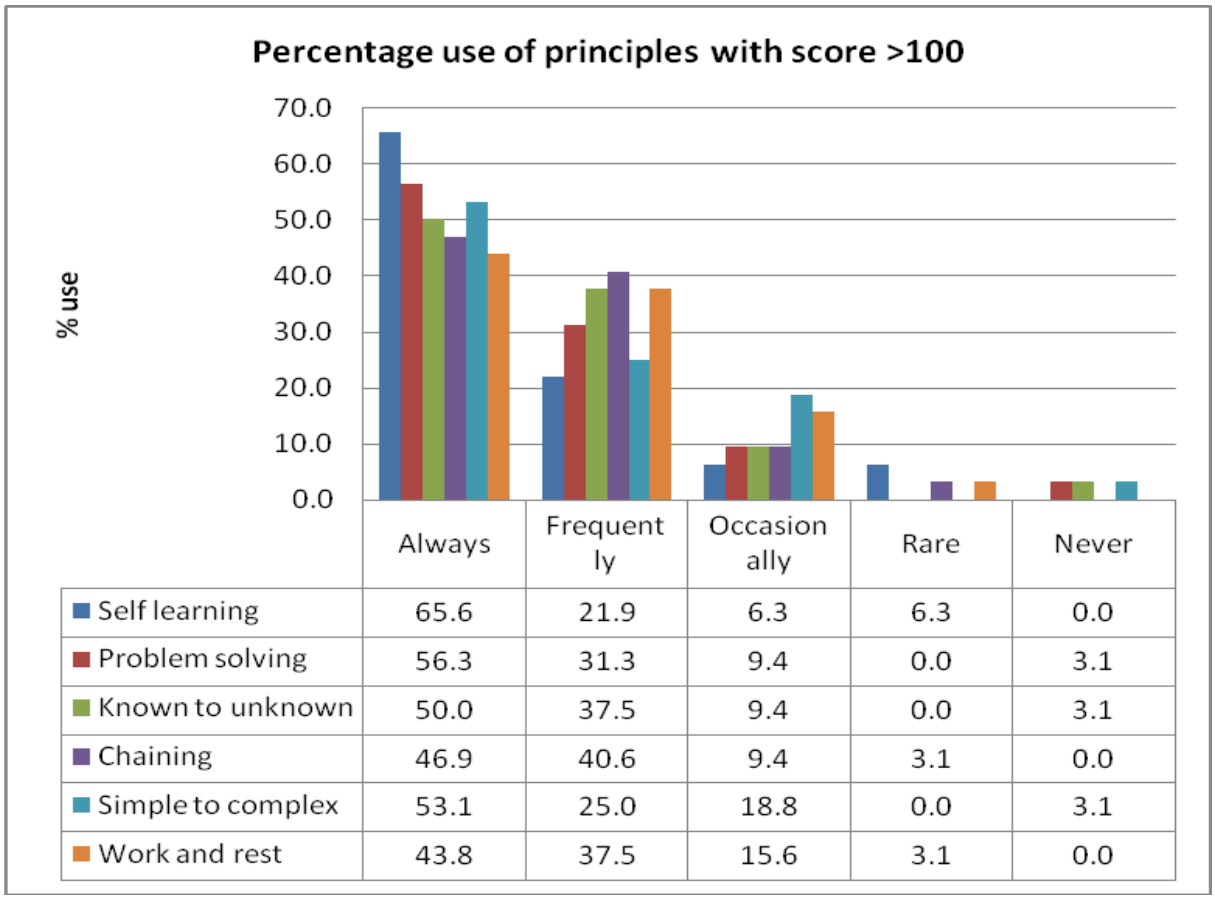
Table- 2 represents the Psychological principles that are used utmost as compared to other principles in e- learning. In self learning, the individual takes the initiative and the responsibility for what occurs. Individuals select, manage, and assess their own learning activities, which can be pursued at any time, in any place, through any means, at any age. Figure shows that 65.6 percentage of student teachers addressed the principle self learning in the application of e-learning as ‘always’.

Table-2: Psychological Principle with Score Greater Than 100

Psychological Principle	Score
Self learning	111
Problem solving	108
Known to unknown	106
Chaining	106
Simple to complex	104
Work and rest	103

The problems that human beings need to solve may differ widely in their context, content and scope. Information processing theorists have identified at least four cognitive factors that affect a person's success in solving a problem: i) working memory capacity ii) encoding the problem iii) depth and integration of one's knowledge relevant to the problem and iv) retrieval of relevant information from long-term memory. Above table shows that the principle of problem solving have at all times application in e-learning and around 56.3 percent of student teachers rate its application as 'always'.

Figure-1: Percentage Use of Principles with Score > 100



	Always	Frequently	Occasionally	Rare	Never
Self learning	65.6	21.9	6.3	6.3	0.0
Problem solving	56.3	31.3	9.4	0.0	3.1
Known to unknown	50.0	37.5	9.4	0.0	3.1
Chaining	46.9	40.6	9.4	3.1	0.0
Simple to complex	53.1	25.0	18.8	0.0	3.1
Work and rest	43.8	37.5	15.6	3.1	0.0

According to Thorndike (1932), what is being taught or learnt at any one time should be linked with the past experience.50 percent of the student teachers pointed out that the principle ‘known to unknown’ should applied ‘always’ in e-learning. 46.6 percentage of Student teachers suggested that principle of chaining should be used always and 40.6 percentage favoured its frequent application. The principle of chaining is that each segment in the chain must be linked with the succeeding segment. Cues produced by one response must be linked with the next response (Hulse, Egeth and Deese, 1981). The principle of moving from simple to complex concepts is favoured by 53.1percentage of student teachers as ‘always’. Hull (1951) emphasized the need for proper rest

and other measures to reduce the ill- effects of fatigue in any act of learning. The principle of work and rest has evolved as a result of the experimental findings in his theory. Here, 43.8 per cent of student teachers pointed out that the principle should be used always where as 37.5 percentage for frequent application.

Application of Psychological Principle (with Score between 90 and 100) in Learning

What a child can do alone and unassisted is a task that lies in what Vygotsky calls Zone of Actual Development ZAD (Muth and Alvermann (1992). The application of this principle in e-learning as suggested by student teachers is in this way, 40.6percentage for always, 34.4 percentage for frequently and 18.8 percentage for occasionally. The principle of learn how to learn is addressed by 43.8percentage of student teachers as ‘always’ and 34.4 percentage for frequent use in e-learning. Bruner recommends discovery learning, where teacher plays a role of a facilitator of learning. In discovery learning the teacher organizes the class so that the students learn through their own active involvement. Students are presented with interesting problem questions or situations. Instead of explaining how to solve the problems, the teacher provides appropriate materials and encourages students to make observations and solve problems. Here, 34.4, 37.5, 21.9 percentages of student teachers respectively for ‘always’, ‘frequently’, ‘occasionally’ for the application of the discovery learning in e-learning.

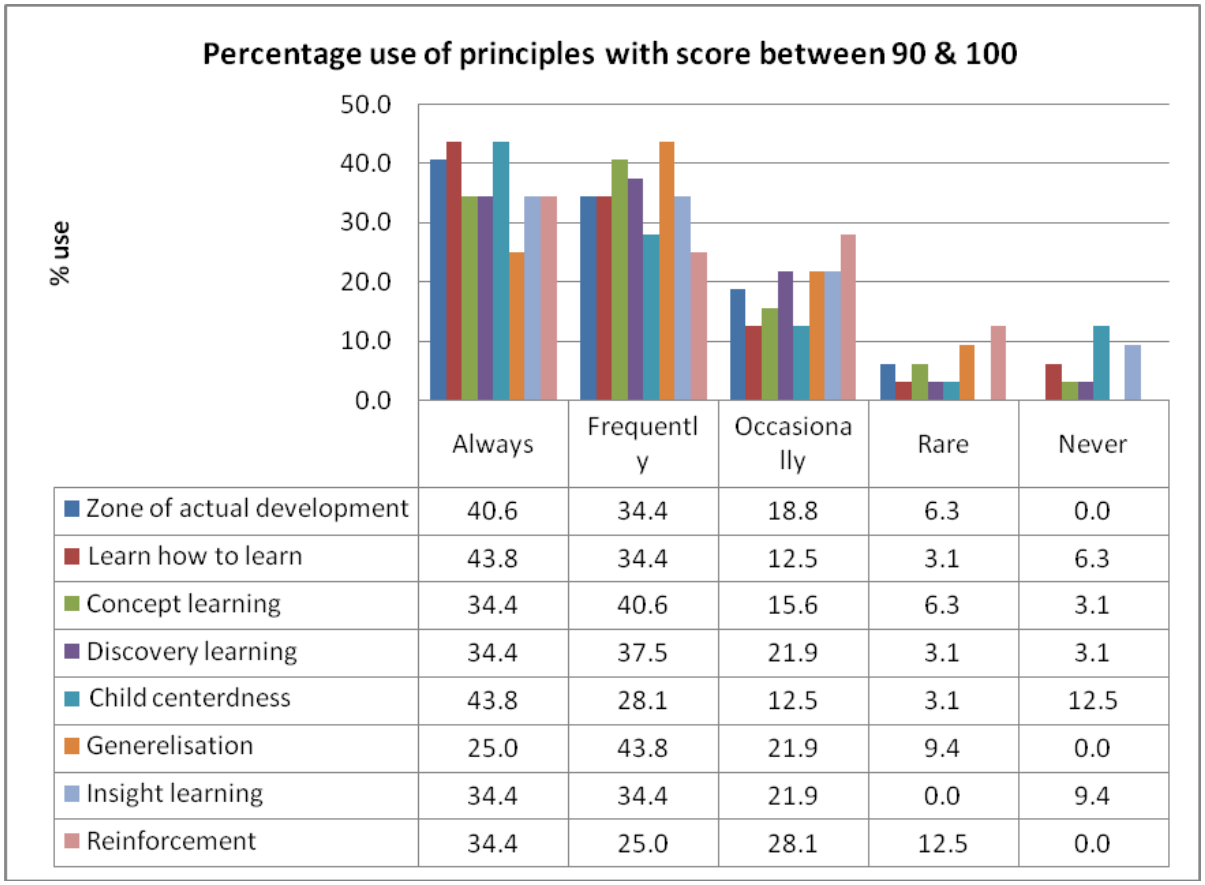
Table- 3: Psychological principle with Score between 90 and 100

Psychological Principle	Score
Zone of actual development	99
Learn how to learn	98
Concept learning	95
Discovery learning	95
Child centerdness	92
Generelisation	91
Insight learning	91
Reinforcement	90

According to Gagne (1974), Concept learning means when the person acquires a capacity to identify and make a common response to a class of events or objects that serve as stimuli. The application of this principle in e- learning is rated by 34.4 per cent of student teachers as always and 40.6 per cent as frequently. In a "Child-Centred" education, it is important to consider the learning style and particular interests of the child. Here in this study, 43.8 percentage of student teachers addressed to the principle as ‘always’ in e-learning. Insight learning is the sudden coherent pattern of solution appears at once. The individual does not perform random activities, but he perceives the situation as a whole and intentionally reaches the goal through awakened insight. We learn not by associating bits of experience but by forming new Gestalts by seeking new patterns and by organising them into a meaningful whole in the total situation. When we struggle with a problem, the solution may come to us all on a sudden. This quick change in our perception is insight

(Munn and Fernald, 1967). Each of the 34.4,34.4 and 21.9 percentages favoured respectively ‘always’, ‘frequently’ and ‘occasionally’ for the application of the principle insight learning in e- learning. According to Ormrod (1998), in generalisation, an individual learns a response to one stimulus and then responds in the same way to a similar stimulus. The major difference is one of control. Generalization involves an automatic, involuntary response in classical conditioning, but a voluntary response in operant conditioning. The application of this principle in e- learning is rated by 25 percentage of student teachers as always, 43.8 as frequently and 21.9 percentage as occasionally.

Figure-2: Percentage of Psychological Principles with Score between 90 and 100



	Always	Frequently	Occasionally	Rare	Never
Zone of actual development	40.6	34.4	18.8	6.3	0.0
Learn how to learn	43.8	34.4	12.5	3.1	6.3
Concept learning	34.4	40.6	15.6	6.3	3.1
Discovery learning	34.4	37.5	21.9	3.1	3.1
Child centerdness	43.8	28.1	12.5	3.1	12.5
Generelisation	25.0	43.8	21.9	9.4	0.0
Insight learning	34.4	34.4	21.9	0.0	9.4
Reinforcement	34.4	25.0	28.1	12.5	0.0

Thorndike, skinner, Hull and Watson, favour the principle of Reinforcement, the principle that behaviours will increase when followed by certain consequences. Here, 34.4, 25, 28.1 percentages of student teachers respectively favoured as ‘always’, ‘frequently’, ‘occasionally’ for the application of reinforcement in e- learning.

Application of Psychological Principle (with Score between 80 and 90) in Learning

Table-4 represents the Psychological principles having total scores between 80 and 90. A major theme in the theoretical framework of Bruner is that learning is an active process in which learners construct new ideas or concepts based upon their current or past knowledge. 40.6 percentage of student teachers addressed the principle learning by doing as ‘always’ applicable for e-learning. Wertsch (1985), Wertsch & Rogoff (1984) defined Zone of Proximal Development as the middle point, the area where the child cannot solve a problem alone but can be successful under adult guidance or in collaboration with a more advanced peer. This is the area where instruction and acceleration can occur because this is the area where real learning is possible. The frequent application of this principle in e- learning is addressed by 50 per cent of student teachers. According to Woolfolk (1990) motivation is the general process by which behaviour is initiated and directed towards a goal. 40.6 percentage of student teachers favoured the use of motivation in e–learning as ‘always’. Where as 34.4 percentage addressed frequent use and 28.1 as ‘always’ for the principle of

Change. According to Hull (1951), principle of change and variety in terms of subjects, teachers and classrooms may be introduced for bringing down the ill effects of boredom and fatigue in children.

Table-4: Psychological Principle with Score between 80 and 90

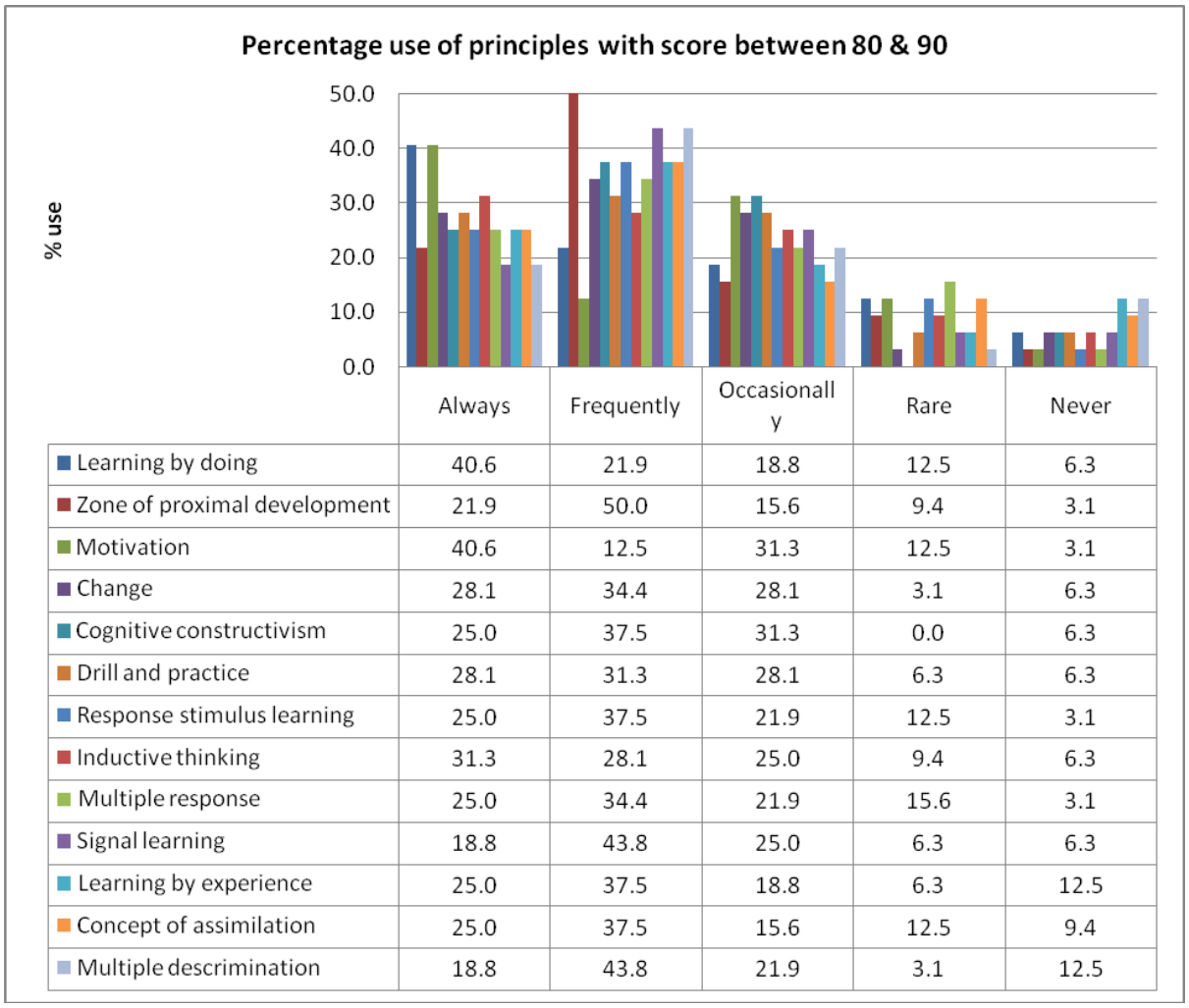
Psychological Principle	Score
Learning by doing	89
Zone of proximal development	89
Motivation	88
Change	88
Cognitive constructivism	88
Drill and practice	86
Response stimulus learning	86
Inductive thinking	86
Multiple response	84
Signal learning	84
Learning by experience	82
Concept of assimilation	82
Multiple discrimination	81

Piaget's belief is that children actively create knowledge rather than passively receive it from the environment. Each new construction makes the cognitive system a bit more powerful and adaptive. In addition to these small scale changes, however, Piaget maintained that at some points during development major, far reaching modifications are required. At these points, the cognitive system, because of both biological maturation and past experiences, has completely mastered one level of functioning and is ready for new, qualitatively different challenges that go beyond what the current set of schemes can handle

(Vasta, Haith and Miller, 1992). 37.5 percentages of student teachers addressed to the above principle as applicable frequently in e-learning.

All learning according to Thorndike (1932) is the formation of bonds or connections between stimulus and response. Drill and practice strengthens the bondage between Stimulus and response. Hull's theory emphasized that a teacher has to be very careful in the proper distribution of drill and practice work so as to avoid unnecessary fatigue and resulting inhibition. 28.1and 31.3 percentages of students respectively suggested the application of drill and practice as 'always' and 'frequently' for e-learning. According to Skinner (1962), his theory 'Operant conditioning' refers to a kind of learning process where by a response is made more frequent by reinforcement. Student teachers addressed this principle as always is 25 per cent and frequently as 37.5 per cent. Regarding Inductive thinking, 31.3 per cent addressed to always and 28.1 per cent for frequent use. Inductive thinking is the ability to generate hypothesis and to think logically about abstractions, symbols, and proposition as well as about available information.

Figure-3: Percentage Use of Principles with Score between 80 and 90



	Always	Frequently	Occasionally	Rare	Never
Learning by doing	40.6	21.9	18.8	12.5	6.3
Zone of proximal development	21.9	50.0	15.6	9.4	3.1
Motivation	40.6	12.5	31.3	12.5	3.1
Change	28.1	34.4	28.1	3.1	6.3
Cognitive constructivism	25.0	37.5	31.3	0.0	6.3
Drill and practice	28.1	31.3	28.1	6.3	6.3
Response stimulus learning	25.0	37.5	21.9	12.5	3.1
Inductive thinking	31.3	28.1	25.0	9.4	6.3
Multiple response	25.0	34.4	21.9	15.6	3.1
Signal learning	18.8	43.8	25.0	6.3	6.3
Learning by experience	25.0	37.5	18.8	6.3	12.5
Concept of assimilation	25.0	37.5	15.6	12.5	9.4
Multiple descrimination	18.8	43.8	21.9	3.1	12.5

Principle of multiple response implies that when an individual is confronted with a new situation he responds in a variety of ways trying first one response and then another before arriving at the correct one (Morgan, 1988). 25 and 34.4 percentage of students addressed respectively as ‘always and ‘frequently’ for the application of principle of multiple response in e-learning. According to Gagne (1970) in Signal learning, the individual learns to make a general diffuse response to a signal. This is learning that is truly involuntary in character and applies to responses that are not typically under voluntary control. Student teachers addressed the application of this principle as frequently are 43.8 per

cent. Where as for principle of learning by experience are 37.5 per cent. Piaget's theory helps in providing a suitable framework of the learning experiences in view of the cognitive development of children and needs of the society. Piaget believes that every child has to initiate his own learning experiences spontaneously and not be a force to advance.

Schemes are the basic building blocks of thinking. They are organized systems of actions or thoughts that allow us to represent mentally or 'think about' the objects or events in our world. Assimilation takes place when people use their existing schemes to make sense of events in their world. Assimilation involves trying to understand something new by fitting it into what we already know. At times we may have to distort the new information to make it fit. This principle is addressed by 25 percentage and 37.5 percentage respectively by student teachers as 'always' and 'frequently'. Regarding the principle, multiple discrimination, 43.8 per cent of student teachers favoured for its frequent use in e-learning. The principle of multiple discrimination is defined as the individual learns to make different identifying responses to as many different stimuli, which may resemble each other in physical appearance to a greater or lesser degree. The learner must be able to tell the different objects varying in qualities.

The study revealed that all the psychological principles have application in e-learning as in the same way as in the normal classroom. This throws light on the use of these principles in curriculum development, syllabus construction,

software development, teacher preparation, in-service training and the selection of learning environment for students in e-learning. Following table is a ready reckoner in the order of preference of Psychological principles for e-learning.

Table-5: Ready Reckoner of Psychological Principles

Order of preference	Psychological principle
1	Self learning
2	Problem solving
3	Known to unknown
4	Chaining
5	Simple to complex
6	Work and rest
7	Zone of actual development
8	Learn how to learn
9	Concept learning
10	Discovery learning
11	Child centeredness
12	Generelisation
13	Insight learning
14	Reinforcement
15	Learning by doing
16	Zone of proximal development
17	Motivation
18	Change
19	Cognitive constructivism
20	Drill and practice
21	Response stimulus learning
22	Inductive thinking
23	Multiple response
24	Signal learning
25	Learning by experience
26	Concept of assimilation
27	Multiple discrimination

Conclusion

Through e-learning, learners are able to access high-quality teaching and learning at any time and place. Interactions with teachers can be structured and managed through online communication to provide greater access and flexibility for both students and teachers. Again, application of the psychological principles in e-learning will definitely enhance its quality.

References

1] Woolfolk, A. E. (1990). *Educational Psychology* (4th ed.). Boston: Allyn and Bacon.

2] Rogoff, B. & Wertsch, J. V. (eds.) (1984). *Children's Learning in the "Zone of Proximal Development"*. San Fransisco: Jossey-Bass.

3] Vasta, R., Haith, M. M. & Miller, S.A. (1992). *Child Psychology. The Modern Science*. New York: John Willey & Sons Inc.

4] Ormrod, J. E. (1998). *Educational Psychology. Developing Learners* (2nd ed.). Columbus: Merril.

5] Dowling, C. & Lai, K. (eds.) (2003). *Information and Communication Technology and Teacher of the Future*. Boston: Kluwer Academic Publishers.

6] Jacob, L. (2006). *Awareness and Use of Psychological Principles by Student Teachers in Teaching Biology*. Unpublished M.Ed. Dissertation. University of Kerala, India.

7] Clarke, A. (2004). *e-Learning Skills*. New York: Palgrave Macmillan.

8] Thorndike, E. L. (1932). *The Fundamentals of Learning*. New York: Teacher's College, Columbia University

9] Morgan, C. T. (1988). *A Brief Introduction to Psychology* (2nd ed.). New Delhi: Tata Mc GrawHill Publishing Co. Ltd.

10] Skinner, C. E. (1962). *Essentials of Educational Psychology*. Calcutta: Asia Publishing Home.

11] Hulse, S. H., Egeth, H & Deese, J. (1981). *The Psychology of Learning* (5th ed.). Johannesburg: Mc GrawHill International Book Company.

12] Hull, C. L. (1951). *Essential of Behaviour*. London: Institute of Human Relation.

13] Munn, N. L., Fernald, D. L. & Fernald, P. S. (1967). *Introduction to Psychology*. Bombay: Oxford & IBH Publishing Co. Pvt. Ltd.

14] Muth, D. K. & Alvermann, D. E. (1992). *Teaching Learning in the Middle Grades*. London: Allyn and Bacon

15] Gagne, R. M. (1970). The Conditions of Learning. New York: Holt, Rinehart & Winston, Inc.

16] Gagne, R. M & Briggs, L. J. (1974). Principles of Instructional Design. New York: Holt, Rinehart & Winston Inc.