LEARNING STYLES CLASSIFICATION: LEARNER CONTROL IMPLICATIONS IN INSTRUCTION AND EDUCATION

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Abstract:
The world of information is becoming increasingly complicated and it gains more dynamic face these days. In this study, not only learning styles in web-based instruction are taken into account, but also the studies that give information about the effects of learner control are investigated. The styles are Kolb, Cognitive, McCarthy learning styles and etc according to a set of criteria of work relevancy their internal architecture techniques are discussed. Our work addresses the issue of software engineering usage through these methods using in e-learning efficient systems. A classification considering the main goal of the methods has been made. For each category, a discussion of the suitability of learning techniques is proposed in cognition of requirements in inception phase of software engineering. The results of researches conducted indicate that in most cases, these methods very efficacious in web-based instruction and education.

Keywords: Learning Styles; E-Learning Systems; Instruction and Education.

1. Introduction

Nowadays learning has very important role in our life. Since people have different learning methods and also various information processing ways, their learning styles vary from person to person. The best learning method of every person is his/her learning style. Cognitive, affective, and physiological structures that affect individual’s perception, relationship with others, and behavior in learning environment, determine his/her learning style. Reflection of technological developments in the field of education requires rearrangements in this field. Individuality in the education comes into prominence with these rearrangements. Educational settings that give value to learner’s learning styles are part of individualized instruction. One of these educational settings is web-based instruction [Roh and So (2005)].

Although people have many similar characteristics, there are some personal differences that make them special in some aspects. Everyone can learn, but he/she cannot learn in the same way as the other people. Learning style is one of the important factors that determine how an individual psychologically perceives his/her learning environment and how he/she responds to and interacts with it [Dunn (1995)].

There is not one learning style to fit all people. Every individual is unique. He/she should find the best way of learning for himself/herself and make progress by using it. Cognitive, affective, and physiological features
that affect individual’s perception, his/her relationship with others, and behavior in learning environment, determine his/her learning style. These differences are fundamental dynamics of social life. Dynamism of the society is because of its individuals’ different thinking ways, initiatives, and their dependence to a specific civilization. Individuals’ behavior shows their style. Every individual owns wearing style as well as thinking, perceiving, and learning style [Gregorc and Butler (1984)].

In the past decades, much attention has been drawn to using of learning styles in implementing software systems is operational ideas in software engineering phases. In software production processes, there are four phases which consist of inception, elaboration, implementation and transition. In first level, called inception is investigated all of requirements for automation system. Inception phases in software production processes are very serious, e.g. in educational environments that technology is used, studies about making the web-based educational environment specific for individuals, learning styles have the most important role and are mostly taken into account and are classified as educational methods [Gregorc and Butler (1984)].

In designing level of e-learning systems, if the inception phases designed to be adopted learner’s requirements lead to creation of high performance systems in e-learning majors for computer based systems. They also utilize as efficiency of them when using at any time and place. So, it has been necessary seems study on learning methods in the context of community and then adopting to applying them in e-learning system. Software engineering needs to recognition these requirements.

The paper deal with learning styles in instruction and education which may be applied in real environments. The paper is organized as follows. The next section is a review of previous works is performed in this domain. In the section 3, we are described learner controller and learning styles considering the principles of learner methods and effective features in instruction and education. The subsections of this category consist of Kolb, Grasha-Riechmann, Cognitive, Dunn and Dunn, McCarthy and Experiential learning styles. In section 4, we are discussed in operational and essential application fields of learning styles and learner controller in web-based educational systems and in electronically instruction software focuses on e-learning techniques. Finally, we highlighted the results of this study are presented in section 5.

2. Literature Review

In literary studies, first personal differences of individuals and then the effects of applying these differences in the environment are investigated. One of these personal differences is the individual’s learning style. When individuals learn through the same method of learning in the same learning environment and also the same evaluation tools are used to assess their learning, it should not be expected that all of them gain the same amount of success, because individuals have different learning styles.

Nowadays, web-based educational systems or computer based educational systems attract vary attentions for visual learners contain ensuring who students can interact with system concurrently. Dunn et al. (1989) offer a research on learning styles in instructional environments and those who suggest that children should learn adopt to their teacher’ styles disregard the biological nature of style. Cooze (2007) presented research upon the vast body of literature for the post secondary online learner and argues the case for additional study in K-12 education [Cooze (2007)]. Since, e-learning is applied by public K-12 schools in the United States. So, online learning become more prevalent and accepted as a means of learning at the K-12 level. The results of this study indicate that instructional designers and e-teachers must account for the fact which learning styles of K-12 learners will need various ways to the delivery of online instruction [Cooze (2007)].

One of the systems which it has much application in instruction and education, is intelligent tutoring systems (ITSs) by composed of using artificial intelligent (AI) and educational learning styles based on cognitive learning theory. In this regard, Gharehchopogh and Khalifelu (2011b) reviewed the ITSs educational application and proposed used modules in. As a result, these omit the incompetence with vast rate and countenance students and teachers to learning in a better manner ITSs [Gharehchopogh and Khalifelu (2011a)].

In order to achieving this aim is possible by identifying learning styles and learner control to adopted in visual implemented systems under the internet technology. Lu et al (2007) concentrated on the relationship between Kolb learning styles and the enduring time of online learning behaviors. They suggested two models of linear regression among of learning results and the enduring time of different online learning behaviors. Both of them were important at the 0.001 level, and they accounted for 54.9% and 60.8% of the variance of the dependent respectively. Their findings were instrumental to instructors and moderators of online teaching. Also,
they conclude instructors by means of online courses should seriously consider the diversity of learning styles when designing and implementing online learning modules for different students and providing a great number of electronic documents for learner and give suitable time to let them absorb knowledge by online reading [Lu et al. (2007)].

In other words, learning style affects an individual’s physical and emotional needs and forms his/her environmental and perceptual preferences. Just as individuals’ personal characteristics, preferences, and needs are different and special to every person, learning styles are also specific characteristics of individuals and they are not preferable to each other. There is no good or bad learning style. What is important is to teach each individual in the most appropriate style of learning so that he/she can learn.

However, Felder and Silverman (1988) discussed about learning styles in engineering education and they are provided teaching techniques to accommodate learning styles what are explained in [Felder and Silverman (1988)]. Kolb and Kolb (2005) presented context for enhancement of experiential learning in higher education. They offer that how experiential learning can be used throughout the educational environment by institutional development programs, consist of longitudinal outcome assessment, curriculum development, student development, and faculty development [Kolb and Kolb (2005)]. When technological developments are taken into account, rearrangement in education which is specific to individual emerges as a result.

In educational environments that technology is used, studies about making the web-based educational environment specific for individuals, learning styles have the most important role and are mostly taken into account and are classified as educational methods. In this regard, Canales et al. (2007) presented the contribution for performing adaptive and intelligent Web-based Education Systems which take into account the individual student learning requirements, by usage of a holistic architecture and framework for developing web-based online educational environments [Canales et al (2007)]. Also, other system designed for teaching computer architecture and organization is structured in [Djordjevic, Nikolic and Milenkovic (2005)].

3. Learner Control and Learning Styles

Considering the concept of learner control in a program that contains learner control and gives learning responsibility to the individual, reveals what is controlled by learner control, when and to what extent. The concept of “learning style” is discussed by Dunn for the first time in 1960s in the United States [Dunn (1990)]. The purpose of Dunn was to show that different people learn with different learning styles and also wanted to explain that learning styles are whatever that prepares learners to learn and remember new and difficult information with various and special ways specific to themselves. According to a study in [Dunn (1990)], she revealed that when learners are taught by learning styles which are almost similar to their own learning styles and methods of learning, they can learn every subject. But when these learners are taught by learning styles which are not similar to their learning styles, they fail to learn. Gregorec (1979) explained this concept differently as a concept that derived from individuals’ distinctive behavior which show how an individual learns and how he/she collates it with the environment. According to [Keefe (1979)], learning styles are cognitive, emotional, and psychological characteristics of learners that determine how an individual perceives, how he/she is influenced and interacts with the learning environment. Learning styles are individuals’ instinctive characteristics [Dunn et al. (1995)]. They affect every moment of life. To help individuals in recognizing and understanding their learning styles means that they can learn more effectively what they want to learn by means of their learning styles. Different researchers at the end of their studies about learning styles face with different learning styles. Some of these studies are classified to be explained here.

3.1. Kolb Learning Style

Kolb learning style refers to the key action in the learning process of individuals during the life, because individuals learn from their experiences in their life. Therefore, experiential learning [Kolb and Kolb (2005)] and also experienced-based education has gained more importance. Kolb examined the ways that individuals approach events, facts and ideas as well as the ways of solving their daily life problems and developed learning styles’ inventory.

In literature, when studies using Kolb learning style are investigated, it can be understood that there are a large number of experimental and relational activities. More experimental studies on this subject dealt with teaching situations that arranged for dominant learning styles and also these studies examined whether they had
any effect on academic success. In relational studies, the relationships between various learning styles and different variables were investigated. In Kolb learning styles which are frequently encountered in studies, four different learning methods; “Converter, Assimilator, Divider, Accommodator” are discussed about developing learning methods and acquisition of new knowledge and skills.

Individuals who have converter learning styles review specific situations from different views and organize the relationships in a meaningful way [Kolb and Kolb (2005)]. They are patient, objective and careful in learning process but they refrain from acting. When alternative ideas like brainstorming come to the existence, they show better performance. Feeling concrete experience and following reflective observation, present a learning style which changes its component. Having this type of learning style, individuals are more successful in viewing specific situations differently. These individuals are able to focus on ideas like brainstorming ideas and associate them to each other. Individuals with converter learning style have intense cultural interest. They consider their own feelings and ideas when formalizing thoughts. The decisive question of learners who prefer to work individually on learning activities is “why?”. These kinds of learners describe their course materials by relating them to their experiences, interests, and future occupations. Teachers should help these learners to be motivated.

The most important characteristic of individuals who have assimilator learning style is their ability in creating conceptual models. They rarely focus on social issues and are more interested in abstract concepts and thoughts. But ideas and thoughts are less evaluated by the individual’s practical values. They are able to understand information and organize them logically and in a systematic form. Abstract conceptualization and reflective observation present assimilator learning style. These individuals have the ability of thinking and also the ability of recognizing values and meanings. When they learn something, they focus on abstract concepts and ideas. Their determining question is “what?” and also they prefer systematic information. The information presented to these individuals should be sequential, logical, and detailed. They also prefer visual presentation and course descriptions. Teacher of these individuals who have this type of learning style must be skillful and have expertise in teaching.

Divider learning style includes abstract conceptualization and active life learning styles. Its main features are problem solving, decision making, logically analyzing ideas, and systematic planning. It is successful in solving social and interpersonal problems as well as technical issues. Problem solving, decision making, logical and systematic planning of ideas are the main characteristics of individuals with this type of learning style. These individuals prefer to deal with technical problems rather than social and personal activities. They pay attention to details, try to understand whole part of the materials, and follow every steps of learning activities. Their determining question is “how?”. The teacher should work like a coach in order to be effective.

Accommodator learning style contains concrete experience and active life learning style. Its main characteristics are planning, making executive decisions, and taking part in new experiences. Exploring the opportunity, taking risks, and doing actions are emphasized. Individuals who have this kind of learning style are open-minded persons in learning process and also they easily adapt themselves with changes. They learn by doing and feeling. Planning, making executive decisions, and experiencing new things are specific characteristics of individuals who use accommodator learning style. They enjoy learning by exploring and discovering. In other words, they prefer to learn practically. Their determining question is “if...what will happen?”. Their tutor should provide opportunities for learners to explore and discover things by themselves in order to learn effectively. In the past thirty years, many researches were done about personality types, gaining early specialization in education, professional life, demanding role, and the effects of applicability of abilities in learning styles. These five properties are important in determining individuals’ learning styles.

3.2. Grasha-Riechmann Learning Style

Grasha-Riechmann learning style [Baykul et al. 2010]) is based on the social interaction model. In this learning style, there are three dimensions related to the social interaction in the classroom: learners’ attitudes and decisions about learning, learners’ opinions about their teachers, and learners’ reactions about the methods used in the classroom [Baykul et al. (2010)]. This model differs from the other models of learning style, because it mostly relies on learners’ responses to classroom activates rather than their personal and cognitive characteristics [Kumar, Kumar and Smart (2004)]. In order to determine learners’ learning styles, learning styles’ scales are frequently used in literature. Diaz and Cartnal (1999) argued that in determining the learning preferences of learners in higher educational level, Grasha-Reichmann learning styles were the most appropriate
tools and they also related this situation to various reasons. First, Grasha-Reichmann learning style is one of the few tools that were developed to determine learning styles of learners in higher educational level. Second, Grasha-Reichmann learning styles focus on learner-teacher, learner-learner, and learner-content interactions. Also Grasha-Reichmann learning styles pay attention to needs of learners, assist instructional designs and curriculum development activities, and help the creation of optimal learning-teaching environments. According to the results of researches on the scope of Grasha-Reichmann learning styles, it is revealed that learners own five learning styles from six available learning styles. These are independent, passive, cooperative, interdependent and competitive learning styles.

3.3. **Cognitive Learning Style**

In this learning style, learners are classified into two groups: field dependent and field independent. Structured considered as a whole, is described as a dependent learners that are learning style. They learn better from structured and detailed learning materials. Questions should be in detailed form and instruction should be done explicitly for them. Teachers rely on sequential presentation of materials. The second groups of learners who are called field independent want to discover and learn by themselves. They rarely affected by criticism and they are able to solve problems without any guidance.

According to the cognitive approach, learning style explains individual’s preferences in acquiring knowledge and also cognitive functions, that is, it explains both perceptual and intellectual functioning. Learning style also includes the individual’s preferences related to environmental factors in learning process [Rule and Grippin (1988)]. For these reasons, cognitive learning style is not considered to be adequate for expressing individual’s learning style. In this approach, learning style is closely related to individual’s personality, nature, and motivation [Loo (2002)]. Kolb experiential learning model is an example for cognitive learning style model. According to the Kolb learning model, learning is a ring formed from four learning ways [Kumar, Kumar and Smart (2004)].

Concrete experience is the first phase of this ring. Concrete experience phase finds basis for observation and reflection. Observations are changed into concepts and generalizations. These concepts and generalizations lead new experiences and interactions during life. After concrete experience phase, learner reflects this experience in various ways. In reflective observation phase, learner observes his/her ways of life. At the end of experiences various results come to the existence. Here a cognitive process that is called abstract conceptualization is used. In abstract conceptualization phase, learners logically form concepts and place their observations into sound form of rules. In the last phase that is active life; learners use their created concepts in problem solving and decision making phases. Social interaction approach is based on the idea that is a consequence of student’s learning and the interaction of students with their teachers and their same age.

3.4. **McCarthy Learning Style**

McCarthy (1987) defined learning style as the individual’s ability in perceiving and processing the knowledge. The base of McCarthy learning style was Kolb learning style model. Kolb (1984) identified four learning ability for determining learning styles.

2.4.1. **The first type of learners**

As a teacher these individuals deal with “being beneficial in personal developments” subject. They encourage their students to be sincere. They help people to gain more awareness. They love discussions related to feelings, group working, and getting real feedback. They also like to help their students to work in groups. They are aware of social powers that affect developments of people. They have the ability to focus on meaningful goals. They are sometimes afraid of being spineless [McCarthy (1987)].

2.4.2. **The second type of learners**

These individuals as a teacher are interested in disseminating the information. They try to be as accurate and knowledgeable as possible. They help learners to understand. They encourage learners very well. They serve information as a basis for success. They direct learners in the situations like note taking in lectures and reading activities. They use experts’ opinions in their lessons. They enjoy facts, details, and regular and systematic thinking. Teachers who placed in this group vaccinate learners with the love of learning knowledge. They
believe that competence should be used logically. Because teacher is the ruler in the classroom, this may sometimes annoy learners’ creativity [McCarthy (1987)].

2.4.3. Third type of learners
These individuals as a teacher deal with improving learners’ efficiency and adequacy. They try to help learners gain efficient skills in order to be economically independent throughout their lives. They believe that the curriculum has to realize such that goals. They consider information as a power that shows different ways to the learners to find out their abilities. They encourage learners to work practically. They also direct learners in problem solving activities, doing experiments, technical works, and practical activities. They believe that learners should approach problems scientifically. Teachers of this group are rigorous and try to improve quality and productivity. They believe that the best method is pragmatic one and also given awards to the learners are useful and appropriate. Knowledgeable teachers are stable, self-sufficient, and technically good but they are incapable in teamwork [McCarthy (1987)].

2.4.4. Fourth type of learners
As a teacher, these individuals try to help learners to discover by themselves. They give importance to learners’ effort in finding different ways in order to solve problems. They also help learners to move with their own visions. They believe that curriculum can motivate learners’ interests. They consider information as a tool in improving and developing larger society. Encourage learners to experiential learning. They enjoy differences in teaching methods. They are hardworking and exciting teachers in giving energy to the learners. To offer new and interesting life to the learners, they never begrudge their knowledge and expertise. These teachers can do everything they want and also they are hasty [McCarthy (1987)].

Although it is understood that each hemisphere of the brain processes information differently, Kolb began to develop ideas on the model of four-quarter split brain. The upper left part is logical, factual, critical, technical, and quantitative; the bottom left part is structural, sequential, planned, organized, and dividing; the bottom right part is relational, emotional, spiritual, and sensitive to touching; the upper right part is visual, intuitive, innovative, imaginative, conceptual, and traditional. In fact the whole part of the brain is used but some parts are more powerful. In other words, individuals whose left semi-sphere is powerful are analyst, reasonable, and learn step by step. But those whose right semi-sphere is developed, are general, deductive, and get meaning from the concept. Sequential processor (left brain) with sequential format prefers to learn step by step.

Initiating to learn a special skill, at first he/she learns details of the issue and then creates a method about the issue. He/she is analyst and reviews cause and effect relationships. By separating related materials, he/she categorizes them. He/she uses language and symbols, produces theory and creates model for understanding. Simultaneous processor (right brain) after getting the general method learns details of the issue. Knows more than that expresses. He/she prefers to learn by restructuring forms and mental relationships. It seeks and uses patterns and relationships. It uses distance, location, and pattern by comparing them with each other.

3.5. Experiential Learning Style
One of the referenced models in teaching environments is Kolb’s experiential learning style. According to this model, learning new knowledge, skill, or attitudes is carried out by four phases of experiential learning. These are, respectively, Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation.

2.5.1. Concrete Experience
In this phase, learners without any prejudice should keep themselves open to new experiences. They learn by feelings. They want to feel and experience new things before understanding them. They give importance to be in real world situations. They enjoy specific examples, role playing situations, and viewing the subject from different dimensions.
2.5.2. Reflective Observation

Learners in this phase can observe their lives from different situations and reflect them. They prefer to learn by observing. They focus on the ability of understanding the meanings of ideas and thoughts. They want to know about the elements which create information and concepts. Instead of working on one situation, they prefer to observe, reflect, and think deeply.

2.5.3. Abstract Conceptualization

In this phase, learners should form concepts in order to place their observations into sound theories. They involve themselves in tasks that investigate concepts and ideas. They prefer cognitive skill operations. They give importance to careful analysis of ideas and well-defined conceptual systems. They want to associate new information and concepts to the old ones.

2.5.4. Active Experimentation

Learners are able to use concepts created in problem solving and decision making phases. On the other words, Learners has a need for immediate feedback and learns best by asking questions. May jump ahead of the instructor and interrupt with questions. Is often an academic rebel, i.e. likes to "buck the system" or look for exceptions to the rules. Works well with group tutorials and group study. So they want to adopt theoretical concepts to personal situations. They also prefer to adopt new information and concepts to different situations.

Learner’s learning style is formed of the composition of four different learning abilities that were described above. By evaluating four learning styles according to Kolb’s learning style inventory, learning style is determined. Based on the experiential learning models in the instructional design, there is an example related to the subject in the concrete experience phase. In reflective observation phase, all aspects of the subject is handled and monitored. In abstract conceptualization, the subject is assimilated with all its aspects. In active experimentation phase, various solutions are adopted with presented problems.

3.6. Dunn and Dunn Learning Style

Kenneth Dunn and Rita define Learning Styles as, “The way in which each learner begins to concentrate process and retain new and difficult information. That interaction occurs differently for everyone.” When a student’s natural tendency and style is triggered, his/her ability to concentrate and make associations improves his chances of transferring information to long-term memory. The Dunn and Dunn Model is a comprehensive model that identifies each individual’s strengths and preferences across the full spectrum of five categories. These five categories have been identified in determining how we learn:

2.6.1. Environmental Factors

Environmental elements such as sound, light, temperature and the design of the room affect learners while learning. For example, some people prefer quiet environment for learning and some others prefer to learn in an environment that there is a sound source like radio or television. In addition, light level of working environment (dark, soft, shiny, light), its temperature level (warm, cool), and objects locations and being placed regular or irregular in the room is important for learners.

2.6.2. Physiological Factors

Physiological elements of learning style are in the form of: perceptual elements (visual, auditory, touching), eating-drinking elements (working with or without food and drinking), elements of time (working whether in the morning, before noon, at noon, or at the evening), and elements of movement (sitting, wandering).

2.6.3. Sociological Factors

The sociological elements of learning style determine how learners react to learning in different situations for example when they work alone, with an authority, with a friend, in a small group, or in a large group.
2.6.4. Emotional Factors

Motivation, perseverance, and responsibility are emotional elements of learning style. So these are in the form of learners’ internal-external motivation, continuity-discontinuity in their working, responsibility-irresponsibility, and structured-not structured planning [Thomson and Mascaine (1997)].

2.6.5. Psychological Factors

The psychological elements of learning style are: holistic (global)-analytic (learn the subject as a whole, learn the subject piece by piece in a specific order), the brain hemispheres (left or right brain dominance), and the way of thinking (when getting the results, while making decisions with or without thinking). In short, this style is based on responses given by learners to different stimuli. Rita and Kenneth Dunn’s learning style is effective because it shows the practical ways of learning at schools. Here it is possible to arrange learner, teacher, teaching materials, and objects of the classroom. Each individual has unique biological and developmental characteristics. This affects the ways that individuals learn knowledge and skills. Unlike learners learn differently but all educators should accept their learning. If learning environment is arranged according to the specific characteristics of the learners, learning quality and quantity can increase. Dunn’s learning style is built on two bases: cognitive styles and brain-splitting. In cognitive styles, individual’s thinking style and his/her being field-dependent are considered while making concepts. Field-dependent and field-independent deal with global and analytical ways of thinking. They form two opposite poles. At one end there are individuals who think as a whole and look at the relationships between parts (holistic) and at the other end, are concurrent (simultaneous) thinkers. They think analytically, learn in the order, and piece by piece.

4. Discussion

Some of the current studies about learning styles and learner control are presented above. Taking into account different learning styles in these studies, different learner controls in educational environments are also investigated from various dimensions. When the results of the studies are analyzed and learning styles are taken into consideration, it is revealed that there are many studies which show the impact of structured learner control on learner achievement in web-based educational environments. Also there are studies that indicate learner control has no effect on learner achievement in web-based educational environment. Although there are many studies about learning styles, there are not sufficient studies on web-based educational environments and learning styles. Investigated studies present different results.

This situation may be caused by some reasons; while learning style models and teaching environment applied in the studies are the same, learner controls are different. Using some learning style models never reveal different studies. So, various studies should be done on this subject. Also it is understood from the different results of the studies that there is a need to work and study extensively on the subjects of learning style and learner control. It is thought that the results of the new studies remove the uncertainty about these subjects. In the new studies, learner control which is not used in previous studies and learning style models can be taken into account in web-based educational environments.

On the other hands, these styles perform a major pattern in the generation of efficient systems in the e-learning fields. E-learning applications and processes consist of web-based learning, computer-based learning, virtual classrooms and digital collaboration [Gregorc (1984)]. In e-learning systems, ITSs are educational systems which aim at high qualified and operational education and try to provide an individual atmosphere for a learner that he/she is in one to one interaction within a professional educator, present necessary resources in time [Cooley and Lohnes (1976)] by applying AI techniques in computer based educational systems to facilitate in instruction and education applications. Learners have more control in ITS [Gharehchopogh and Khalifelu (2011b)]. Therefore, it can serve as foundation for ITSs and e-learning educational systems.

In the inception phases of generation software systems, systems requirements for recognition and elaboration based on real environment’s requirements will be duplicated in iterations. Most people prefer a noticeable style of interacting with, taking in, and processing stimuli or information. Understanding students’ learning styles has been recognized as a significant element for e-learning development, delivery and instruction, which can lead to improved student performance [Shih and Gamon (2002)]. For example, study on
learning styles has consistently indicated that considering personality attribute in preparing and delivering instruction can importantly improve the learning process [Dwyer (1998)].

5. Conclusion

In this study, it has been proposed new classification for learning styles and learner controller what is significant in designing technical high performance software applications. In educational environments that technology is used, studies about making the web-based instructional systems specific for individuals, learning styles have the most important actions and are mostly taken into account and are classified as educational methods. The learner control has no effect on learner achievement in web-based educational environment. Recognition of these styles is essential for software engineers in inception phases of analysis and evaluation of real systems and lead to generation visual environments for them. As a result, learning styles could be effective methods to improve the quality of online educational and instructional systems and e-learning processes. In the future more researches in this area are valuable and effective based on implementing electronically learning styles and learner control.

References


