

Learning styles in an asynchronous e-learning environment

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ABSTRACT

Asynchronous e-learning is one of the modes of learning environment that is including some characteristics of regular learning environment. The main purpose of the current research is to ascertain learning styles of students and their differences based on Academic Performance and Age Groups. Synchronous or asynchronous learner test and the Kolb's Learning Styles Inventory (KLSI 3.1) were used to identify differences among the learning styles of 343 asynchronous students from virtual universities in Tehran that categorized in three different age groups and academic performance. The sample selected by multi-stage random sampling. Researchers conducted Kruskal-Wallis test for differences in students learning styles based on age groups, have revealed significant statistical difference (Chi-square (χ^2) = 11.849, $df=2$, $p=.003 < .05 = \alpha$) between learning styles and age groups of students. Researchers also used Mann-Whitney U as Post Hoc which should be conducted between each two groups. The Kruskal Wallis Test and Mann-Whitney U used as the statistical method. The results of conducted Kruskal-Wallis test indicated (Chi-square (χ^2) = 5.246 while $df = 2$, $p=.073 > 0.05 = \alpha$) revealed no significant statistical difference between learning styles and academic performance of students.

Keywords : Asynchronous, e-learning, learning styles, academic performance and age groups.

1 INTRODUCTION

The history and philosophy of education mentioned that difference in learning styles of people is not new idea as it reported from ancient Greeks [21]. Educators agree that understanding the differences in students' learning styles is an important aspect of effective learning and teaching [22]. In spite of popularity of this phenomenon among humans educational behavior but there is no agreement on definition of learning styles. Keefe (1991) defined learning styles as 'characteristic cognitive, affective and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact and respond to the learning environment. There is popularity among educators that learning environment is one effective factor on shape and kind of learning styles of students. E-learning is one of facilities that created an innovative development in many educational institutions. Due to some of the characteristics and flexibilities of e-learning facilities, higher education institutions, in particular, are interested in adapting this innovation to break both the limitations of time and the place of classroom sessions [1],[10]. Only past couple of years many educators have through need to develop virtual higher education as an alternative to the applicants. As reported by Smart and Cappel, 2006; Song, 2010 higher education institutions throughout the United States are increasingly offering online courses to meet the growing student demand for distance education [16]. Ramage (2002) defined online education as the method of instruction in which the students and faculty are physically separated but connected through an Internet link. The online learning environment allows students the flexibility to enroll in courses without being physically present on the college campus. On the basis of reports, approximately one in three college students enroll in at least one online class [6]. There are fundamentally two types of online learning which included Synchronous & Asynchronous e-learning [6],[11],[12].

Asynchronous e-learning is "refers to instruction that is not constrained by geography or time [11], [12]. Asynchronous learning among Iranian virtual students is current through utilizing and interact students with on-line self-paced learning content (Web pages), e-mail, discussion forums, Web/Computer-Based instruction, e-books, articles, CD-ROM, audio (disc/tape), video (disc/tape), discussion groups, embedded learning and some provided facilities in Learning Management System (LMS) web site of universities that has supported students.

Identifying learning styles of students correspondingly is important that study the needs and preference of students in order to supply them based on learner-oriented process. As asynchronous e-learning environment has become a contemplation alternative for traditional distance learning environment so reexamine and identifying difference learning styles of students due to effects of new environments and its necessity is natural. Although results of some researches such as Kolb and Kolb (2005) mentioned that learning styles are a key factor for the effectiveness of learning in a hypermedia environment [13]. Several researchers reported that learning style of students is determiner factor in success of web-based learning environment [20]. In spite of studies which have focused on examine learning styles of students in different environment, the lack of researches and finding related to effective variables such as gender, academic level or academic streams is perceptible. Kolb (1976) concluded learning style is one of the important factors that affect personal academic competence [19]. As reported by Shukr, Zainab and Rana (2013) in their research revealed that there is significant difference between learning styles of postgraduate and undergraduate students while other researchers such as Farooq and Regnier (2011) reported no significance different which cannot examine or expand the asynchronous learning environment while same report is there for the same results as differences in learning styles among students in

different academic streams [4],[8],[14],[15]. The same problem is exist for other variables such as academic stream. Thus considering this review, researchers focused on these variables in asynchronous learning environment.

1.1. Kolb's learning style theory

Several learning style theory have presented by educators and psychologists and choosing an extensive and accepted by researchers is difficult while this problem is common among humanities science. Researchers selected Kolb's learning style theory due to popularity of this theory among researchers and their references. This theory is base of several theories that presented by other theorists while this theory is used by other researchers that their research was related to virtual and e-learning environment. This theory, "...looks at how learners perceive and process information"[13].

Kolb's theory of learning style mentioned that a learner relies on four different learning modes: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE) [2],[13]some of the characteristics of the learners' base on Kolb's theory are as follows:

- Concrete Experience (CE): being involved in a new experience
- Reflective Observation (RO): watching others or developing observations about their experience
- Abstract Conceptualization (AC): creating theories to explain observations
- Active Experimentation (AE): using theories to solve problems make decisions in addition, four-type definitions of learning styles.

Kolb's mentioned that some combination of these learning modes is incorporated within one of four learning styles that are as follows:

Diverging style: An individual with diverging style has CE and RO as dominant learning abilities.

Assimilating style: An individual with an assimilating style has AC and RO as dominant learning abilities.

Converging style: An individual with a converging style has AC and AE as dominant learning abilities.

Accommodating style: An individual with an accommodating style has CE and AE as dominant learning abilities.

1.2. Objectives of the study

The purpose of this study was to study the learning styles of students in an online learning environment in some universities of Tehran as measured by learning style inventory-Diverging (CE/RO), Assimilating (AC/RO), Converging (AC/AE), Accommodating (CE/AE). The objectives of this research are:

- To ascertain learning styles based on age groups of students in asynchronous learning environments in Universities of Tehran.
- To find out learning styles based on academic performance of students in asynchronous learning environments in Universities of Tehran.
- To find out learning styles of students based on gender, academic level, and majors in asynchronous learning environments in Universities of Tehran.

Researcher defined four research questions on the basis of research objectives as follow:

- Is there any significant difference between learning styles of students and their age groups in asynchronous learning environment in Universities of Tehran?
- What are different learning styles of students based on their age groups in asynchronous learning environment in Universities of Tehran?
- Is there any significant difference between learning styles of students and their academic performance in asynchronous learning environment in Universities of Tehran?
- What are learning styles of students based on their academic performance in asynchronous learning environment in Universities of Tehran?

2. Methodology of the research

2.1. Research design

Causal-comparative design used in order to investigate the objectives. It scrutinizes the relationship among variables in the studies in which the independent variable exists, hence making the study descriptive rather than experimental in nature.

2.2. Sampling and sample

The researcher used probability sample types. Probability sampling types are including many designs and researcher regarding to title, scope and objectives of the study used multistage random sampling as follows:

- Selecting six universities from provided list of Tehran universities that have e-learning centres and virtual universities
- Selecting all virtual students in spring semester of 2012
- Distribution of e-questionnaire with the help of universities through e-mail that were including 16400 students
- Selecting 343 asynchronous students via *Cochran* formula as sample of the study with the help of SPSS for determine best sample randomly among those students that filled up the questionnaire.

2.3. Data collection tools

The data collection tools of the study are as follows:

1. Synchronous or Asynchronous e-learner test: a questionnaire for e-classes

Distinguish between students who are using synchronous tools from those who are using asynchronous tools is essential and compulsory. This questionnaire was developed by the researcher and was including 22 questions and examined some qualities which determined asynchronous e-learners from synchronous e-learner students.

2. Kolb's Learning styles Inventory (KLSI V.3.1)

Researchers used Kolb's Learning styles Inventory (KLSI V.3.1) as a main instrument of the study. Researchers developed an electronic format of Kolb's Learning Styles Inventory (KLSI V.3.1) and sent it to students through email with the help of sample Universities.

2.4. Reliability of the tools

The fundamental purpose of standardization is to establish "reliability" and "validity" of the test. Reliability refers to the ability to yield consistent results from one set of measures to another [3]; Pilot study was conducted among 37 virtual students and

Cronbach's alpha through test-retest design during three weeks found 0.752.

Table no.1 reliability of the instrument (KLSI V.3.1)

Reliability Statistics	
Cronbach's Alpha	N of Items
.752	48

The Cronbach's alpha for a pilot study that was conducted in order to determine reliability of Synchronous or Asynchronous determiner test (a questionnaire for e-classroom). This pilot study was among 37 virtual students. It was through test-retest during three weeks and found 0.815.

2.5. Statistical tools

Researchers used descriptive statistics including frequency and percentage in order to analysis of data related to variables and students demographic characters. Inferential statistics tools including the Mann-Whitney U test as post hoc and Kruskal-Wallis test due to ordinal scale of data as none parametric tools used. All statistical analysis was performed using the SPSS version 18.0 statistical software program.

3. RESULTS OF THE STUDY

1. Is there any significant difference between learning styles of students and their age groups in asynchronous learning environment in Universities of Tehran?

A Kruskal-Wallis test (table no.3) is conducted to assess the differences among learning styles of students in different age groups (First age group, $N = 110$, Engineering, $N = 174$, Medicals Science, $N = 59$). The results show whether Chi square (χ^2) = 11.849 while $df = 2$ and $N = 343$ and $Sig(p) = .003 < .05 = \alpha$. First age group (18 to 25) recorded a higher median (table No.2) score ($Md = 190.73$) than the other two categories of academic majors, while second age group (26 to 30) students recorded (table no.2) second median ($Md = 171.75$) and third age group recorded (table No.2) last median ($Md = 137.82$). The results, demonstrate to Chi-square value (χ^2) = 11.849 and $df(2)$ and $Sig. (p) = .003$ at the $\alpha = 0.05$ while $p = .003 < 0.05 = \alpha$ thus there is enough evidence to reveal an overall significant statistical difference among learning styles of students in different age groups of students.

Table no. 2 mean ranks of students age groups based on learning styles

Ranks		
Age	N	Mean Rank
Style 18-25	110	190.73
26-30	174	171.75
31-45	59	137.82
Total	343	

Table no. 3 kruskal-Wallis test for learning styles and students age

Test Statistics ^{a,b}	
	Style
Chi-square	11.849
df	2
Asymp. Sig.	.003

a. Kruskal Wallis Test

Mann-Whitney U test is Post Hoc test when the results of the analysis of Kruskal-Wallis test are significant. Researchers con-

ducted Mann-Whitney U test as Post Hoc test in order to determine the most effective factor in the differences between three age groups of students in asynchronous learning environment to each other. The results of Post Hoc between learning styles of students and their age groups reveal significant statistical difference between learning styles of first age group and second age group. Thus, the reason of significance difference between learning styles and age group of students was related to differences between learning styles of students in first and second age groups.

2. What are different learning styles of students based on their age groups in asynchronous learning environment in Universities of Tehran?

Table no.4 learning styles distribution among students in first age group (18 to 25 years)

Style ^a				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Diverging	13	11.8	11.8	11.8
Assimilating	37	33.6	33.6	45.5
Converging	37	33.6	33.6	79.1
Accommodating	23	20.9	20.9	100.0
Total	110	100.0	100.0	

a. Mode = Asynchronous, Age = 18-25

Table no.5 learning styles distribution among students in second age group (26 to 30 years)

Style ^a				
	Frequency	Percent	Valid Percent	Cumulative Percent
Diverging	40	23.0	23.0	23.0
Assimilating	36	20.7	20.7	43.7
Valid Converging	74	42.5	42.5	86.2
Accommodating	24	13.8	13.8	100.0
Total	174	100.0	100.0	

a. Mode = Asynchronous, Age = 26-30

Table no.6 learning styles distribution among students in third age group (31 to 45 years)

Style ^a				
	Frequency	Percent	Valid Percent	Cumulative Percent
Diverging	25	42.4	42.4	42.4
Assimilating	16	27.1	27.1	69.5
Valid Converging	16	27.1	27.1	96.6
Accommodating	2	3.4	3.4	100.0
Total	59	100.0	100.0	

a. Mode = Asynchronous, Age = 31-45

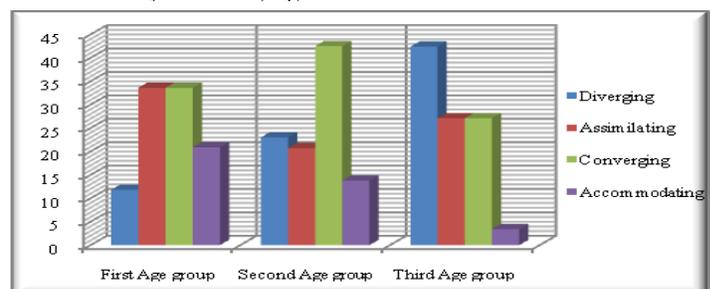


Figure no.1. learning styles distribution among students based on age groups

Related tables (4, 5&6) and figure (1) show in mode of asynchro- IJOART

nous e-learning environment based on first age group (18 to 25 years) Assimilating and Converging learning styles preferred by most of students whereas while Converging style was most preferred learning style between second age group (26 to 30 years). In third age groups (31 to 45 years) Diverging learning style was preferred comparing other learning styles.

3. Is there any significant difference between learning styles of students and their academic performance in asynchronous learning environment in Universities of Tehran?

Table no.7 mean ranks of student's academic performance based on learning styles

Ranks		
	AP	Mean Rank
Style	10-13	152.69
	14-17	180.66
	18-20	171.88
Total	343	

Table no.8 Kruskal-Wallis test for learning styles and academic performance of students

Test Statistics ^{a,b}	
	Style
Chi-square	5.246
df	2
Asymp. Sig.	.073

a. Kruskal Wallis Test
b. Grouping Variable: AP

A Kruskal-Wallis test is conducted (table no.8) to assess the differences among learning styles of students in different academic performance groups (First academic performance group, $N = 88$, second, $N = 197$ and third $N = 58$). The results show whether Chi square ($\chi^2 = 5.246$ while $df = 2$ and $N = 343$ and $Sig(p) = .073 < .05 = \alpha$. Second academic performance group (14 to 17) recorded (table VII) a higher median score ($Md = 180.66$) while third academic performance group (18 to 20) (table no.7) recorded ($Md = 171.88$) and first academic performance group (10-13) (table VII) recorded ($Md = 152.69$). The results, demonstrate to Chi-square value ($\chi^2 = 5.246$, $df(2)$ and $Sig. (.073)$ at the $\alpha = 0.05$, so $p = .073 < 0.05 = \alpha$ thus there is no enough evidence to reveal an significant statistical difference among learning styles of students in different academic performance groups of students.

4. What are learning styles of students based on their academic performance in asynchronous learning environment in Universities of Tehran?

Table no.9 learning styles distribution among students in low academic performance group

Style ^a				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Diverging	16	18.2	18.2	18.2
Assimilating	40	45.5	45.5	63.6
Converging	25	28.4	28.4	92.0
Accommodating	7	8.0	8.0	100.0
Total	88	100.0	100.0	

a. Mode = Asynchronous, AP = 10-13

Table no.10 learning styles distribution among students in medium academic performance group

Style ^a				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Diverging	52	26.4	26.4	26.4
Assimilating	30	15.2	15.2	41.6
Converging	85	43.1	43.1	84.8
Accommodating	30	15.2	15.2	100.0
Total	197	100.0	100.0	

a. Mode = Asynchronous, AP = 14-17

Table no.11 learning styles distribution among students in high academic performance group

Style ^a				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Diverging	10	17.2	17.2	17.2
Assimilating	19	32.8	32.8	50.0
Converging	17	29.3	29.3	79.3
Accommodating	12	20.7	20.7	100.0
Total	58	100.0	100.0	

a. Mode = Asynchronous, AP = 18-20

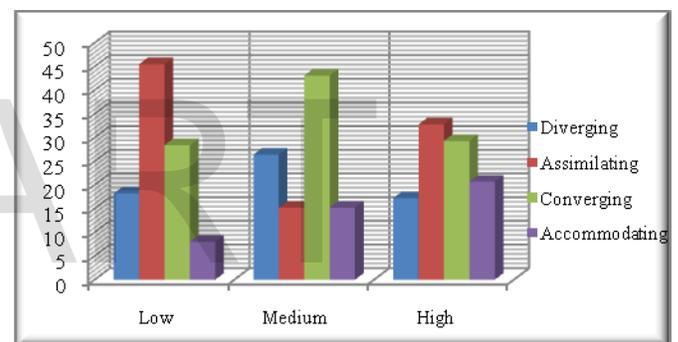


Figure no.2 learning styles distribution among students based on academic performance group

Tables (9, 10&11) and figure (2) show in mode of asynchronous e-learning environment based on academic performance groups, most of students in low academic performance groups preferred Assimilating style while students in medium academic performance group preferred Converging style. Whereas high academic performance group preferred Assimilating style and other learning style preferred subsequently.

4. DISCUSSION AND CONCLUSION

The results show that students in first (18 to 25 years) and second (26 to 30 years) age groups preferred Converging and Assimilating learning style hence third age group (31 to 45 years) preferred Diverging style. Regarding inferential and descriptive analysis, researchers found that there is significance difference between learning styles of students based on age group. Students with Assimilating learning style prefer organizing information into logical and concise form, reading, lectures and analytical models, time to process information Prefer individual work. Use of textbooks, outlines and class notes, Power Point presentations of concepts, study on the basis of theories and analytical models, individualized learning projects, use of email for one on one work and Asynchronous chat forum are some suggested methods that are adjustment to the Assimilating learning

- style.
- The results are relevant to the findings of Dunn & Griggs (1995), smith (2008) found that learning styles change as individuals grow older [7],[17],[18]. Whereas this finding is irrelevant to results of other researches such as Yenic (2012), Duncon (2012), Prasanthi Pallapu (2008) in their thesis found that there is no significant difference between learning styles and age group of students.
- The results indicated that there is no significant difference in learning styles within the academic performance groups of students out of 20 marks. According to the results, students with different performance did not have any different on their learning preference. Students with low (10-13) academic performance preferred assimilating while medium (14-17) and high (18-20) academic performance students selected converging style. Kolb believes people with converging learning style would like technical tasks to social and interpersonal. They also prefer experimenting new ideas. These students prefer simulations, labs and practical application and individual work. Students with Converging style prefer to learn through technical tasks to social and interpersonal and experimenting new ideas, simulations, labs and practical application and individual work. Individualized learning projects that allow for practical applications, Laboratories- either virtual or allow for outside lab work, Online field work to research, Use of email for one on one work, provide information in various formats: text, video, graphic and sound and Asynchronous discussion boards are some suitable methods to their learning style. Moreover the results reveal lack of significance was relevant to results of Gappi (2013), Muhammad Shahid Farooq and Jean-Claude Regnier [8], [9]. This finding is not relevant to the findings of, Shukr, et al. (2013) that reveal there is significantly different in learning styles within academic performance groups of students [15].
- ## REFERENCES
- [1] Al-Fadhli, & Khalfan. (2009). Developing critical thinking in e-learning environment: Kuwait University as a case study. *International Journal of Assesment & Evaluation in Higher Education*, 34(5), 529-536.
- [2] Ally, M., & Fahy, A. (2004). Foundations of educational Theory for online learning. In T. Anderson & F. Elloumi (Eds.), *Theory and Practice of Online Learning* (pp. 3-31). Athabasca, Canada: Athabasca University.
- [3] Best, J. W., & Kahn, J. V. (2008). *Research in Education* (10 th ed ed.). new Delhi: prentice hall of india.
- [4] Buckley, J. (2007). *Learning Styles: Are There Differences Between Academic Majors?* California Mission Achievement Grant.
- [5] Clark. (2012). Student Growth in Asynchronous Online Environments: Larning Styles and Cognitive Development. *Journal of the Indiana University Student Personnel Association* (1), 37-46.
- [6] Clark, Dublin, L., Gottfredson, C., Horton, B., Mosher, B., Parks, E., et al. (2007). *The eLearning Guild's Handbook on Synchronous e-Learning*. Santa Rosa: David Holcombe, eLearning Guild.
- [7] Dunn, R. (2000). Learning styles: Theory, research, and practice. *National Forum of Applied Educational Research Journal*, 13(1), 3-22.
- [8] Farooq, M. S., & Regnier, J.-C. (2011). Role of Learning Styles in the Quality of Learning at Different Levels. *Informatica Economică*, 15(3), 18.
- [9] Gappi, L. L. (2013). Relationships between Learning Style Preferences and Academic Performance of Students. *International Journal of Educational Research and Technology (IJERT)*, 4(2), 7.
- [10] Guri-Rosenblit, S. (2009). Distance Education in the Digital Age: Common Misconceptions and Challenging Tasks. *International Journal of Distance Education*, 23(2), 105-122.
- [11] Khan, B. H. (2005). *Managing e-learning: Design, delivery, implementation, and evaluation*: Hershey, PA17033: Information Science Publishing.
- [12] Khan, B. H. (2006). *Flexible Learning in an Information Society*: Hershey PA17033:Information Science Publishing (August 7, 2006), USA.
- [13] Kolb, D., & Kolb, A. Y. (2005). *The Kolb Learning Style Inventory—Version 3.1, 2005 Technical Specifications*. Boston: MA:Hay Resources Direct.
- [14] Nasser, R., & Carifio, J. (2006). Learning styles and the selection of Majors among Lebanese youth. *Mediterranean Journal of Educational Studies*, 11 (2), 53-70.
- [15] Shukr, I., Zainab, R., & Rana, H. M. (2013). Learning Styles of Postgraduate and Undergraduate Medical Students. *Journal of the College of Physicians and Surgeons Pakistan* 23 (1), 25-30.
- [16] Smart, K. L., & Cappel, J. J. (2006). Students' perceptions of online learning: A comparative study. *Journal of Information Technology Education*, 5, 202-219.
- [17] Smith, D. R. (2008). *Learning Style Preference, Sense of Classroom Community, Gender, Age, and Previous Experience within Computer-Mediated Instruction (CMI)*. North Carolina, Greensboro.
- [18] Tatarintseva, A. (2002). The Influence of the Gender Factor to the Learning Styles of Secondary Students in the Process of Language Learning. *Studies about languages*, 2, 63-68.
- [19] Topçu, A. (2008). Intentional repetition' and learning style: Increasing efficient and cohesive interaction in asynchronous online discussions. *British Journal of Educational Technology*, 39(5), 901-919.
- [20] Wang, Q., & Huay, L. W. (2007). Comparing asynchronous online discussions and face-to-face discussions in a classroom setting. *British Educational Communications and Technology Agency*, 38(2), 272-286.
- [21] Wratcher, M. A., Morrison, E. E., Riley, V. L., & Scheirton, L. S. (1997). *Curriculum and program planning: A study guide for the core seminar*. Nova: Fort Lauderdale Fla.: Nova Southeastern University.
- [22] Zacharis, N. Z. (2011). The effect of learning style on preference for web-based courses and learning outcomes. *British Journal of Educational Technology*, 42 (5), 790-800.