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Designing a Higher Education Curriculum Framework Based on Connectivism Approach

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Abstract: The purpose of this study was to design a higher education curriculum framework based on Connectivism approach. This is a qualitative research in terms of design, and a descriptive-analytical one in terms of methodology. The statistical population consisted of all digital documents, articles, and books related to Connectivism Theory from 2005 to 2017, out of which 120 valid sources were identified and ranked based on the degree of relevance to the research topic. Code extraction began from the most relevant sources and continued until the theoretical data saturation which was obtained after reviewing 30 articles. To validate the proposed curriculum framework, the viewpoints of 5 experts who were selected through Purposeful Sampling were sued in classic Delphi method. To this end, the experts reviewed and modified the proposed framework and eliminated its flaws and ambiguities in three phases and finally, the desired framework was developed. After reviewing the documents related to the Connectivism approach through a descriptive-analytical method, the curriculum was discovered based on this approach and then it was developed within the Nine Elements of Klein`s Curriculum (1992) including Objectives, Content, Teaching-Learning Strategies, Learning Material & Resources, Learners` Learning Activities, Time, Learning Space, Learners` Grouping, and Evaluation methods.

Keywords: Curriculum, Higher Education, Connectivism Approach.

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Introduction

With advances in technology, especially information and communication technology, universities have become more involved with their environment. Therefore, it is necessary to look at higher education with a challenge-based approach. The ways in which graduates are employed, demographic change trend, government systems and political insights, the brain drain phenomenon, and so on are some of the challenges that the contemporary higher education system has to struggle with. Development has been defined as "a process that results from the interaction of new thoughts, new ideas, and new ideals with old structures and institutions, leading to the modernization of structures and institutions". According to this definition, the driving force behind the development of new knowledge is new ideas thoughts. Therefore, universities play an important role in developing societies. On the other hand, human beings are both the target and the agent of development, meaning that development must lead to the improvement of the quality of human life. But what can enhance human ability to achieve development? It is nothing but education, especially higher education, as it leads to the training of specialized human resources needed to manage the society institutions as well as to achieve development (Shahamat, 2015).

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Given the problems and challenges faced by higher education, educators and researchers have continued their intellectual efforts to create multiple theories and models in response to new circumstances. One of these efforts has led to the introduction of a new learning theory called Connectivism by Siemens (2005) that can be useful in aligning higher education curriculum with new developments in the digital world and alleviating the existing problems.

Connectivism Theory claims that unlike the dominant learning theories, it can provide appropriate answers to the above questions by considering new communication technologies and facilities and respond to the challenges and demands faced by educational systems. Fenoglio (2006) for example, believes that understanding of Connectivism Theory as a contemporary dynamic learning theory shows that it has the potential to increase students' involvement in learning experiences. One of the advantages of Connectivism is the consideration of the evaluation of information or knowledge before receiving or learning it. The need to evaluate learning a problem is a meta-skill that is used before the learning itself begins. When knowledge is abundant and rapidly growing, rapid evaluation of knowledge is of particular importance. So the driving force behind Connectivism is the realization of the fact that decisions in the new world are based on rapidly changing foundations (Siemens, 2006). From the Connectivism point of view, learning is the process of creating new nodes and communications. In other words, learning is the process of forming and shaping the networks (Siemens, 2005). Connectivism is a perspective that sees knowledge and cognition as being distributed at the level of networks of individuals and technology and considers learning as the process of communication, growth and routing of those networks (Siemens, 2009). In simpler terms, creating nodes and connecting them together and thus forming a network of these nodes and communications result in learning. In Connectivism, a node may include the smallest information unit in the brain, a concept, a human, and a computer. Since there are different nodes, there will be different networks, too; for example, a network of neural nodes in the brain, a network of people, and a network of interconnected computers. Each of these networks can be nodes within a larger network.

To make it short, some of the unique ideas of Connectivism are as follows:

1. Connectivism applies the principles of network both to define knowledge and to describe the learning process. Knowledge is defined as a specific pattern of relationships, and learning is defined as the creation of new links and patterns as well as the ability to maneuver around the existing patterns and networks

2. Connectivism addresses the principles of learning at different biological / neurological, conceptual, and social / external levels. According to this theory, the same learning structure that creates neural connections can also be pursued in the outside world.

3. Connectivism emphasizes the inclusion of technology as part of the distribution of knowledge. Knowledge is resides in the links we form- the links we establish with other people and information resources such as databases.

4. Context: while other theories have paid limited attention to context, Connectivism identifies the fluid nature of knowledge and links based on context.

5. Perception, consistency, Sense Making, and Meaning: these elements also exist in constructivism and partly in cognitivism. But, considering the speed of knowledge growth, these elements have become crucial in Connectivism (Siemens, 2008). The present study seeks to design a framework for implementing Connectivism ideas in the higher education curriculum. Thus, the theoretical framework of Connectivism-based curricula,

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as discussed above, indicates the specific and unique identity of such curricula. What is most important is the need to pay attention to the features mentioned about Connectivism-based curricula. However, the factors affecting the curriculum are not specifically mentioned in Connectivism Theory. The reason for this can be attributed to the fact that Connectivism Theory is a general learning theory and is not specific to the curriculum, so it is necessary to extract these factors in Connectivism Theory. Accordingly, one of the most important priorities of any researcher in the course of conducting the research will be careful examination of all documents, texts, articles, books, etc. related to Connectivism Theory in order to identify and extract the effective factors on the curriculum according to this Theory. In this Theory, the interaction between the learner and the environment is also emphasized as one of the effective factors in learning. Therefore, based on Connectivism Theory, during an initial review we can name communication, networking, interactions between the learner and the environment, ICT capabilities, learner-centered learning, interaction, temporal and spatial flexibility, etc. as factors affecting in the curriculum.

Given the studies conducted on Connectivism and its association with curriculum in educational centers, especially in higher education, it can be explicitly acknowledged that all these studies have focused on the evaluation of learning in Connectivism Theory, and so far no research with a qualitative and heuristic approach has developed a higher education curriculum framework based on Connectivism approach. Therefore, the present study sought to identify the factors affecting higher education curriculum and the characteristics of its various elements by studying the documents and sources related to Connectivism Theory.

After the final identification of the factors affecting higher education curriculum according to Connectivism Theory, these factors were included into the Klein`s curriculum model (1992) which includes the following nine elements: Objectives, Content, Teaching-Learning Strategies, Learning Material & Resources, Learners` Learning Activities, Time, Learning Space, Learners` Grouping, and Evaluation methods (Fathi Vajargah, 2009).

Research Question: What is the framework for developing a higher education curriculum based on Connectivism approach?

Material and Method

This is a qualitative research in terms of design, and a descriptive-analytical one in terms of methodology. The analytical approach in developing a higher education curriculum framework based on Connectivism approach is according to Morse's context-based approach. In this approach, the researcher puts new knowledge into the framework that others have constructed. After reviewing the documents related to the Connectivism approach through a descriptive-analytical method, the curriculum was discovered based on this approach and then it was developed within the Nine Elements of Klein`s Curriculum (1992) including Objectives, Content, Teaching-Learning Strategies, Learning Material & Resources, Learners` Learning Activities, Time, Learning Space, Learners` Grouping, and Evaluation methods. The statistical population of this study consisted of all digital documents, articles, and books related to Connectivism Theory from 2005 to 2017, of which 120 valid sources were identified. The identified sources were then ranked based on their relevance to the research topic. After ranking, code extraction began from the most relevant sources and continued until the theoretical data saturation. One criterion for detecting saturation is the iteration of the previous data, so that the researcher is constantly faced with data that are iterated. For example, when they hear the same code

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repeatedly, they can guess that they have achieved data saturation. In the present study, after reviewing 30 articles, the theoretical saturation of the data was obtained, such that in the rest of the analysis, the extracted codes from other articles were replicated and no new ones were found. To determine the validity of the discovered themes, the theoretical foundations and previous scientific studies were matched with the extracted themes. Then, given the research method which was qualitative, the experts` opinions were used in Delphi method in order to validate the proposed curriculum framework. For this purpose, 5 experts in the area of curriculum development were selected through purposeful sampling approach. Using classic Delphi method, the experts reviewed and modified the proposed framework and eliminated its flaws and ambiguities. In this method, the researchers analyze the results of each phase of gathering information that may be through interview or questionnaire and then in the next phase, they provide the results to the experts so that they could modify their first estimation according to the experts` views. In the present study, a relative agreement was reached among the experts within three phases and finally, a higher education curriculum framework was developed based on Connectivism approach.

Results

Research Question: What is the framework for developing a higher education curriculum based on Connectivism approach?

After reviewing digital documents, articles, and books related to Connectivism Theory, a total of 455 initial codes were extracted, which were then categorized and merged based on similarity and proportionality after being reviewed and summarized several times. They were then classified into 109 basic themes in Table 1.

Table 1. Basic themes extracted from digital documents, articles, and books related to Connectivism Theory

Row	Extracted Theme	Row	Extracted Theme
1	need-based objectives	56	virtual groups
2	acquisition of problem solving skills	57	websites of scientific & executive organizations
3	production and information management	58	Iran`s centers for statistics & scientific information
4	critical thinking	59	international scientific institutes
5	self-directed learning	60	dissertations and studies
6	management and decision making in complex situations	61	permanent access (24 hours)
7	negotiating and establishing social relationships	62	synchronous presentation
8	flexibility of objectives	63	asynchronous presentation
9	innovativeness of objectives	64	teaching time management
10	applicability of objectives	65	learning time scope
11	motivational objectives	66	learning time proportionality
12	proportionality of objectives	67	learning time flexibility
13	need-based content	68	learner-based learning time
14	content attractiveness	69	access from anywhere
15	expanding the impact of objectives	70	Learning space attractiveness
16	content flexibility	71	Learning space proportionality
17	spiral content	72	activity-based learning space

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18	content attention to the development of capabilities	73	learner-based learning space
19	inclusion of research activity in content	74	innovativeness of learning space
20	deep content	75	development of skills through learning space
21	representing the specialized domain knowledge in content	76	learning space-induced interaction
22	content comprehensiveness	77	deepening the learning by learning space
23	association of content with students' interests, cognitive level and previous experiences	78	to put individuals in groups
24	content proportionality with moods, interests, and level of instructor`s understanding	79	determining how they relate to each other
25	content novelty	80	simultaneous presence
26	enhancing interesting information for learners through network	81	Small groups or couples
27	Large groups	82	defining appropriate information for the learner`s experience
28	tips and suggestions on important communications	83	development of collective wisdom in the group
29	collecting the learner`s information, and supervision	84	exchange of thoughts in the group
30	filtering and removing irrelevant sources	85	deepening the learning by the group
31	modeling and showing the right way to study	86	development of capabilities by the group
32	creating a space to feel the instructor's presence	87	heterogeneity of the group
33	considering learning styles and individual differences of learners	88	proportionality of grouping
34	providing opportunities to interact with different people and resources	89	group-induced interaction
35	emphasis on problem-based learning and learning ways	90	activity-based group
36	choosing ways to enhance cognitive flexibility	91	ethical group
37	discovery learning	92	evaluation as a factor for consolidating what is learned
38	having an instructor with technological literacy	93	evaluation as a factor for the improvement of learning
39	having a strategy with immediate feedback	94	evaluation as a means for determining what is learned
40	case study	95	proportionality of evaluation tools and assignments with learning objectives
41	practicing questioning techniques	96	considering evaluation strategies as part of the learning experience
42	simulation	97	applying different strategies and tools for evaluation
43	blogging	98	using evaluation to provide feedback
44	Web Quest	99	applying holistic assignments
45	editing Wikipedia	100	proportionality of evaluation strategies with the governing theory
46	project	101	preventing learners from plagiarism
47	online discussion	102	using evaluation to improve the learning process
48	efficiency of the learner`s activity	103	the use of assignments proportional to real life
49	learner-based activity	104	evaluation necessity
50	educational media attractiveness	105	proportionality of evaluation
51	multimedia learning materials	106	evaluation comprehensiveness
52	proportionality of resources with objective and content	107	combined evaluation
53	creative resources	108	making changes with evaluation
54	digital libraries	109	self-assessment with evaluation
55	database		

In the next phase, according to the context-based analysis, the extracted themes were included into the framework of Nine Elements of Klein`s Curriculum as the organizer pattern. These elements include Objectives,

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Content, Teaching-Learning Strategies, Learning Material & Resources, Learners` Learning Activities, Time, Learning Space, Learners` Grouping, and Evaluation methods.

1. Objectives: Many of the themes extracted from the resources in the Connectivism-based curriculum have repeatedly pointed out that the objectives are need-centered. In the present day, access to information as one of the most important objectives of the academic curriculum has replaced by higher level objectives such as: problem solving skills, information production and management, critical thinking and self-directed learning. These objectives were previously considered as curriculum objectives in the earlier theories; however, with the development of communication tools and the emergence of Connectivism approach, the nourishment of higher-level objectives has been emphasized more than ever.

Although the resources for determining the objectives of the curriculum at the conventional university and the curriculum based on Connectivism approach are not significantly different, the introduction of ICT technologies into the societies has changed the nature and characteristics of these resources. For example, considering the functions of higher education in the direction of national growth as one of the resources of curriculum objectives, one can say that in the information age, institutions, organizations as well as the labor market need employees who have the skills to manage information, make decisions, plan, negotiate, and so forth.

2. Content: A set of organized knowledge, facts, concepts, principles, practices, generalizations, and attitudes related to a learning material or subject is called "content". (Seraji et al., 2014). In a curriculum based on Connectivism approach, elements of the content are selected according to such criteria as depth, presentation of the specialized domain knowledge, development of problem solving skills, critical thinking, creativity and student interests. Then, the selected content should be presented to students according to such principles as multimedia principle, spatial proximity principle, quality of presentation principle, redundancy principle, personalization principle, hyperlink avoidance principle and attention to learners' cognitive and meta-cognitive features.

In Connectivism-based curriculum, content must be deep, specialized, and comprehensive, and it must be proportional to the learner's moods, interests, and level of understanding.

3. Teaching-Learning Strategies: Teaching is the interaction between the instructor and the learner, which is performed based on an orderly and purposeful plan with the intention of creating learning in learners. In some teaching situations, the process is controlled by the learner and in others, the learner controls the process. Siemens (2010) has mentioned 7 roles for the instructor in network learning environment, which include: (1) Enhancing interesting information for learners through the network (2) Defining the information that is suitable for the learner`s experience (3) Tips and suggestions on important communications (4) Collecting the learner`s information, and supervision (5) Filtering and removing irrelevant sources (6) Modeling and showing the right way to study (6) Creating a space in which the learners feel the instructor's presence from different communication channels (Abedi, 2013).

Therefore, in a curriculum based on Connectivism approach, the role of the instructor is mostly to facilitate discussion, guidance, evaluation and counseling. Accordingly, teaching-learning strategies in Connectivism-based environment should be based on the following principles: (1) Choosing ways that enhance cognitive flexibility in learners (2) Emphasis on problem-based method and learning the ways of learning (3) Providing different opportunities to interact with different people and resources (4) Considering the students' learning styles and individual differences.

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4. Learning Materials & Resources: Learning Materials & Resources are reliable information sources that a student refers to when learning, thinking, doing learning activities or designing new ideas as needed. There are a variety of materials and resources available in a Connectivism-based learning environment, among which the needed materials should be selected on the basis of principles such as the association of resources with the subject of learning, overlap of resources with learning content, proportionality of resources with learners' needs and cultures, being up-to-date, encouraging learners to engage in continuous activity, providing evaluation opportunities, and proportionality of materials with the overall objectives of the curriculum. Digital libraries, databases, virtual groups, websites of scientific and executive organizations, statistical and information centers of the Country, international scientific institutes, dissertations, and studies are examples of learning resources of a Connectivism-based curriculum.

The group for designing a curriculum based on Connectivism approach should select and provide credible learning materials and resources from a wide range of sources according to the degree of relevance of resources to the subject and purpose of learning, the extent of learning content coverage, the proportionality of resources with individual characteristics, the level of knowledge and needs of learners, resource updating, and the association of resources with real life and academic credibility (Attaran et al., 2006).

5. Learners` Learning Activities: Learning activities are a set of opportunities provided in the curriculum to strengthen and deepen what has learned by the learner. In a learning environment based on Connectivism approach, the student must try to work in an individual or group setting, since in this environment, inactivity means absence. This is unlike classroom learning environments where a student may be present in the classroom but do not engage in any learning activities (Attaran et al., 2006).

The capabilities and facilities of a learning environment based on Connectivism approach allow the curriculum designer group to provide students with real life activities and encourage them to engage in collective learning and diverse activities by considering the principles such as developing high-level cognitive skills, developing self-examination and reflection capacities, enhancing motivation, fostering curiosity, and tailoring activities to different learning styles.

6. Time: The student can access the curriculum elements at any time and study the content, perform the activities, search for learning materials and resources, discuss with classmates, and interact with the instructor. These capabilities allow the student to reflect on the content studied, make learning activities more carefully, think about the questions and answers posed in the discussions, and review their answers. The curriculum design group must decide on what elements of the curriculum are to be presented in a synchronous manner and what elements are to be presented in an asynchronous manner. The curriculum design group must consider factors such as available technologies, curriculum objectives, learning topics, academic level, or students' cognitive level when deciding on time. For example, topics such as "psycho-motor objectives" and "teaching to implement some skills" should be presented to the learner through synchronous practices. In contrast, high-level cognitive objectives, controversial activities, and deep and exploratory questions are more properly taught through asynchronous practices (Zainuddini et al., 2010)

7. Learning Space: Spatial flexibility of the curriculum based on Connectivism approach means that the student can interact with the elements of the curriculum from any location and complete their higher education without necessarily observing the actual campus, classmates or instructor. This feature of a curriculum based on Connectivism approach enables working students, housewives, and ethnic and religious minorities to con-

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tinue their university education more easily than ever before. Therefore, the element of space in a curriculum based on Connectivism approach is considered differently from a face-to-face learning environment.

8. Learners` Grouping: The process of putting people in groups and determining how they communicate with each other is called "grouping". Earlier generations of computer-based training programs were essentially designed for individual learning. However, with the development of web-based communication facilities, a new generation of computer-based learning has emerged whose basis is the involvement and formation of learning groups (Mohammadi et al., 2016). In order to form groups in a virtual university curriculum, one has to consider the principles such as co-presence, learning objectives, access to technologies and so on.

Co-Presence: indicates the number of students attending the same curriculum at a similar time.

Learning Objectives: some curriculum objectives are achieved individually, some are achieved in small groups or in couples, and others are achieved in large groups.

Access to Technologies: Communicating with group members requires a variety of broadband communication tools and advanced technologies.

9. Evaluation Methods: Evaluation is the systematic process of collecting, analyzing and interpreting information in order to determine the extent to which the objectives are achieved. Evaluating what is learned is on the one hand a consolidation of what the learner has learned as well as a tool for improving learning, and on the other hand it is a means of quantifying what he or she has learned. Therefore, there are two types of evaluation in a curriculum based on Connectivism approach: (1) Formative evaluation which is performed during the learning process (2) Summative evaluation which is carried out both before and after using the model.

In a curriculum based on Connectivism approach, evaluation methods are selected on the basis of principles such as proportionality of evaluation tools and assignments with learning objectives, viewing evaluation strategies as part of the learning experience, applying different strategies and tools for evaluation, using evaluation to provide feedback and improve the learning process, using holistic assignments in proportion to the real life, proportionality of evaluation strategies with the Connectivism-based curriculum design, and preventing students from plagiarism.

The overall framework of the curriculum based on Connectivism approach in higher education is shown in table 2. It has been attempted to implement the principles and basics of the Connectivism approach within this framework, while adhering to the elements of Klein's curriculum. Therefore, this framework is based on the most up-to-date learning approach and is in line with the current age and the existing facilities and technology.

Table 2. Framework of a curriculum based on Connectivism approach

The Curriculum based on Connectivism Approach in Higher Education								
Objective	**Content**	**Strategies**	**Materials & Resources**	**Learner`s Activity**	**Time**	**Space**	**Grouping**	**Evaluation**
consistency of objectives	being specialized	modeling	multimedia	technological activity	permanent access	access from any place	exchange of thoughts	learning process improvement
need-based	research-based	providing learning opportunity	development of abilities	case study	proportionality	technological space	inducing interaction	consolidation of what is learned
innovativeness	flexibility	discovery learning	deepening the learning	learner-based		being interactive	strengthening social relationships	Determining what is learned
proportionality of objectives	deepness	independent learning		efficiency			co-presence	self-assessment
practical	up-to-date						collective wisdom development	

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Discussion

Considering the research findings and the integration and summarization of 109 themes extracted from Connectivism and based on context analysis, the extracted themes were included within the framework of Nine Elements of Klein's Curriculum as organizing themes. These elements include Objectives, Content, Teaching-Learning Strategies, Learning Material & Resources, Learners` Learning Activities, Time, Learning Space, Learners` Grouping, and Evaluation methods.

Based on the documents and resources of the Connectivism approach as well as the viewpoints of the research experts, in order to achieve a curriculum based on the Connectivism approach in higher education, essential points for curriculum objectives should be considered, including consistency of objectives; because consistency of objectives guarantees a proper and forward movement of the curriculum. Curriculum goals should also be need-based. This means that in the curriculum of higher education centers, objectives should be developed and presented with respect to the needs of the society and the needs of students. Objectives that can meet the present and future needs of students and the society are other themes of the formation of the objectives of a proportional curriculum. That is, the objectives developed should be proportional to the characteristics of students, such as their interests, talents, and so on. These findings are consistent with Eghbal (2014). Objectives must be up-to-date, innovative and practical. This is because information and knowledge become obsolete very quickly and learners have to go beyond mere knowledge and acquire the skills necessary for real life.

The results showed that a flexible content should be provided in developing a curriculum based on the Connectivism approach for higher education. In other words, the content that has uniform pre-defined template and framework and is based on a linear and mechanical model certainly does not foster creativity and critical thinking. This result is consistent with Pourshafei (2010). Content should be specialized and motivational. That is, content should be formulated in such a way to motivate the student and encourage them to become more active and learn more. Deep and research-based content helps nurture students who are self-generators of knowledge and are constantly striving to add some knowledge to the body of knowledge.

Modeling is one of the most important themes to consider when developing learning strategies. In the curriculum based on Connectivism approach in higher education, the instructor as a coordinator in the learning environment provides key elements of a subject in a disciplined and interconnected way as a learning model to the learners (Draxler, 2010). Another important teaching-learning strategy is to provide learners with different learning opportunities. The networked instructor provides learners with a variety of opportunities beyond traditional methods in new and technological ways to further enrich their learning process. That is, the use all teaching methods by the instructor, not just one specific method. These findings are consistent with Mohammadi Mehr et al., (2011) and Maleki et al., (2012). Independent learning is one of the areas that teaching-learning strategies focus on. The teaching method should make students capable of independently reviewing, studying and learning. The focus on teaching should be on students' discovery learning. They must discover on their own and create new and practical knowledge from their own study and research.

In developing a curriculum based on Connectivism approach in higher education, learning materials and resources should have multimedia feature. You can't just use a teaching tool or a teaching aid, rather it is better to use a combination of tools. Virtual space should be positively used in teaching. The use of teaching aids and media is essential because teaching and learning will not take place without them. In fact, much of the learning relies on tools and resources. The findings are in line with Haghighat (2012). The focus of learning materials

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and resources should be on deep and lifelong learning. Teaching tools and aids should enhance and expand the capabilities and abilities of students and even instructors. This requires updating the instructors' knowledge in this field. They must upgrade their knowledge of using software and teaching aids. In the framework of the curriculum provided, the structure of the learning activity must be technological and learner-centered. Only a student with technological and scientific literacy can have extensive and all-round activity. In fact, the learning activity depends largely on the proper use of information technology, media, the Internet, and knowledge of the language of science, i.e. English. Accordingly, in a curriculum based on Connectivism theory, the learner should be placed at the center and necessary arrangements should be provided in this regard. Students need to understand the future application of what they are learning now. If they feel that the discipline they are studying will not be practical in the future, their activity will be decreased (Penati & Sigogenini, 2010). When developing the curriculum framework, the element of time must have two essential features. Permanent access is the most important feature. There is no specific time for teaching in this curriculum. In other words, teaching and learning can happen at any time. So it's always time for teaching. The second feature is the proportionality of time with the desired activity. The learner should have enough time for each activity. On the contrary, too much time will waste student time and resources. According to the findings, what can be important in shaping the spatial structure of learning is to consider the following themes:

Access at any place: the findings show that every space should be used to improve the quality of teaching.

Technological space: providing the learning space with special equipment and facilities of technology such as the Internet, computers, video projectors, and so on will double the activity in learners.

Being interactive: in Connectivism approach, learning space must be capable of inducing interaction among the learners themselves and between the learners and the instructor at all times.

Grouping is the next component of the curriculum based on Connectivism approach, which has the following themes:

Exchange of thoughts: the group should facilitate the exchange of thoughts among the members. Grouping induces learning from each other and sharing knowledge and information.

Induction of interaction: grouping must focus on interaction and collaboration, reinforcing communication and interaction, and providing the sense of belonging to the group in each member.

Enhancing social relationships: working in a group helps learners to communicate closely with each other and, in addition to fulfilling other learning objectives, improves their social relationships.

Co-presence: grouping allows for simultaneous activity and learning among members.

Collective wisdom development: it means to promote the spirit of collectivism and abandon selfishness and egoism.

The last component of the curriculum based on Connectivism approach is evaluation which has the following themes:

Learning process improvement: Evaluation should be consistent with teaching-learning strategies, designed objectives and developed content. Evaluation should place learning at the center of attention.

Consolidation of what is learned: proportionality in applying and implementing evaluation can itself be a major part of teaching and learning. So, learning should not be viewed as just getting scores and passing from one level to another or one grade to another. Sometimes students learn something through evaluation and exams.

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Determination of what is learned: the essence of evaluation goes back to determining the extent to which the objectives are achieved. Therefore, evaluation should determine how much learning has occurred in learners.
Self-assessment: evaluation must take place from within the student. Evaluation must have an inner intuitive state and the student must reach that level of excellence to make a self-assessment.
Research Limitations: the infancy of Connectivism approach and disagreement of experts about the principles of this approach made it difficult and sometimes confusing for the researcher to work.

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