

THE ESSENCE OF COGNITION IN QUANTUM WORLDVIEW

THE NECESSITY OF TEACHING IN UNIVERSITY WITH A TRANS-DISCIPLINARY PERSPECTIVE

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THE purpose of present study is to investigate the necessity and manner of university teaching with a trans-disciplinary perspective based on the illuminations of quantum worldview. The methodological approach in this study is deconstruction. According to quantum worldview, in the micro-dimension electrons are defined in a network of multiple, interwoven, and inseparable bonds, and based on this view in the macro-dimension, human being is confronting a complex, impermanent, and indefinite world which is possible to understand by a holistic and dynamic view rather than a reductionist view. Nowadays the university teachers do the research and teaching in such specialized disciplines that each has its own special structure, concepts, thinking and activity approach. While, according to the quantum worldview and to face the real issues of complex, impermanent, and indefinite life, especially in the present era, one should be aware of the dependence and even the interlacing and being no clear borders between the traditions of the disciplines and to take a trans-disciplinary view. Therefore, it is necessary to discuss about the special traditions of their own discipline and other disciplines as well. In the end, the applications of the research findings are also addressed.

Key Words: *Teaching, Trans-Disciplinary View, Higher Education, Quantum Worldview, Cognition.*

Introduction

Today, the educational process in higher education in the specialized disciplines is defined and implemented independently. It seems History of independent disciplines dates back to ancient Greece. For instance, in his plan for public education, Plato (Bloom, 1991) suggested some disciplines such as arithmetic, geometry, astrology, and philosophy (or dialectic). He also considered essential differences between philosophy and science, as two different human fields of knowledge. However, he suggested teaching talented twenty-year-old youth to understand the integrity and closeness of the disciplines as well as their relation with the universe as a whole.

In the modern era, with the expansion of knowledge boundaries and the necessity of training specialists in any field, the boundaries of knowledge strengthened and were more rigidly defined. In criticism of categorization of different fields of knowledge, Foucault regards this categorization as a result of western rationalism. According to Foucault, the philosophers of the modernism era, using Descartes' reductionism view to understand the social phenomena which were and are a unique whole, divided them into simple components of human sciences, which were then termed psychiatry, statistics, law, pedagogy, etc. (Gutting, 2005).

In the present study the distinction of scientific domains and disciplines and the lack of any link between them in relation to the goals of higher education especially for the graduates is questioned and criticized. It seems that one of the main goals of higher education, especially at graduation, is to

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prepare the students as a beneficial society member in a way that they can be useful in their professional, social, and personal life. Based on such a background the question emerges that what is the role of university education in its common form, which is through separate and independent disciplines, in the achievement of the mentioned goal? In line with this question it can also be asked what are the view points of university teachers that are educating students in the specialized and independent disciplines, who are supposed to be a beneficial society member in the future, regarding the cognition and knowledge? And by holding such a view what is their role in the achievement of students to mentioned goal? Some points should be presented about the questions before answering them. First, every view point toward cognition and knowledge can be shaped in relation to the definition and the essence of nature (Scott and Usher, 2001). In other words, in answer to this question of what is knowledge and how cognition occurs, first it can be asked in this way that “what is existence and how is its essence?” Answering the ontological questions can be illuminative for the questions regarding the nature of cognition and knowledge or epistemological questions. The second point is about the role that the teaching of university teachers of specialized disciplines plays in the preparation of students as beneficial members of the society. In order to analyze such a role, it is necessary to consider what is happening in the present circumstances. Lyotard (2004), one of the postmodern thinkers, offers one such analysis. He believes that in the Information Technology era any information that is available to anyone, investigating the possible relations between different university disciplines can open new horizons for thinking about the knowledge. Based on this ground, he holds that the transfer of knowledge should not be limited to mere transfer of information, but it should include all the processes and events that help students to understand the relations between domains and disciplines that are seemingly distinct. Some of the other thinkers, in line with Lyotard and with regard to the essence of knowledge and the natural conditions of the phenomena in the universe, do not accept the bordering between different university disciplines and ask for the revision and elimination of these borderlines (Zarghamihamrah, 2010). Rutherford (2004), with regard to such thoughts and with the belief that by bordering between the disciplines the natural order of the phenomena are ignored, suggests to the researchers and professionals of the higher education curriculum to destroy the common bordering between the disciplines.

In the present study, the process of university teachers’ teaching is emphasized as one of the components of the university curriculum. The goal is the investigation of the role and necessity of the view beyond the disciplines’ traditions in the teaching process for the preparation of students as a useful society member, so that they can confront the complexities and uncertainties of the future professional, social, and personal life and manage it. With an observation of what is happening it is revealed that the higher education in different countries are facing difficulties in preparing the students as beneficial society members (Yorke, 2009) and these difficulties are increasing day by day.

The basis for the investigation of mentioned necessity in this study is the quantum worldview that has led to the formation of a view toward existence and following that, conclusions about ontology and epistemology. Therefore, in the present study first the essence of cognition and knowledge in the quantum worldview is analyzed and investigated and then, based on that the necessity of trans-disciplinary view point of the university teachers and the awareness about traditions of other disciplines and applying them in their teaching are investigated.

Methodology

In the present study, the essence of cognition in the quantum worldview is analyzed and then, based on that the necessity of teaching in university with a trans-disciplinary view is investigated. For the purpose of present study the research method of deconstruction is applied which is considered as qualitative research method (Given, 2008). Deconstruction is one of the specific concepts of the Derrida’s philosophy who is one of the main postmodern philosophers. Derrida (Lucy, 2004), by calling the definition of deconstruction as difficult and inadequate, believes that deconstruction is not reducible to an essential feature, task or style. In the other words, in Derrida’s opinion, providing a unique definition for deconstruction is invalid, since the concept does not always have constant and univocal meaning. Nevertheless, he believes that absence of univocal meaning will not lead to ambiguity and can be

considered in alignment with enlightenment. So he (1995) writes deconstruction consist of "deconstructing, dislocating, displacing, disarticulating, disjoining, putting "out of joint" the authority of the "is" ' (P 25). So as Lucy (2004) mentions, Deconstruction begins, from a refusal of the authority or determining power of every 'is', or simply from a refusal of authority in general.

Therefore, Derrida uses "deconstruction" for reading and review of any text and assigns to it a new meaning. He (Garrison, 2003) believes that all western ideas are constructed on the foundation of centers such as logos (wisdom), ousia (subject), arche (the primary principle), or telos (the final truth), whose roots are in Plato's ideas. As these ideas emerge and play central roles, other relevant ideas are ignored, suppressed, or marginalized. This is the very process of the dominance of centers and consequently the expansion of injustice. Derrida (1981) maintained that in deconstruction it is necessary to leave any foundations such as logos, ousia, or arche. He regarded deconstruction as a solution for decentralization of outstanding elements and emphasis on suppressed and marginalized elements, and thus achieving justice.

By taking advantage of Saussure's linguistic studies, Derrida deconstructed the knowledge nature of philosophy and decentralized some concepts such as the "truth" of philosophical and scientific discourse, "speech", "metaphysics of presence", and "self". In contrast, he emphasized "metaphor", "writing", "metaphysics of absence", and "otherness" (Graic, 2000).

Based on such a background, deconstruction is a kind of analytical revision of any text with the aim of decentralization and finding new aspects of the subject that are disregarded in the history. On this basis, in the present study, with regard to the Derrida's view about deconstruction it is attempted to deconstruct the disciplinary view in the teaching of the university teachers, so that the necessity of the trans-disciplinary view of the university teachers and the awareness about the traditions of the other disciplines and applying them in the teaching are investigated and revealed, through the analysis of the essence of cognition in the quantum worldview.

The Essence of Cognition in the Quantum Worldview

The philosophical explanation of quantum physics has led to the formation of a view about the existence, or in more precise words, some views about the existence to what is known as "quantum worldview" or "quantum worldviews", and has deduced ontological and epistemological conclusions from that (or those). For more clarification of this point, it should be added that what is called "quantum worldview" is actually a paraphrase of the quantum theory about the physical reality. The important point here is that, from the formation of the quantum physics, different descriptions are offered by prominent physicians like Bohr, Newman, Bohm, and Fraassen, one of which is known as holistic worldview (Graic, 1998) and this worldview is considered as the basis for the present study.

Quantum physics is a branch of physics that studies the physical behaviors of small particles such as electrons and protons, because the electrons and protons are inside atom and this domain is called subatomic. This domain of physics emerged at the beginning of the twenty century.

Some physicists in the 20th century showed that electrons sometimes behave as particle and sometimes behave as wave (Polkinghorne, 2002): George Thomson in England, was able to demonstrate the existence of interference patterns when a beam of electron interacted with a crystal lattice, thereby confirming that electrons did indeed manifest wavelike behavior. He was the son of J.J. Thomson who won his Nobel Prize for showing that the electron is a particle. After that, in the double slits experiment, Feynman showed that electrons can simultaneously show the particlelike and wavelike behaviors. The phenomenon is a neat example of electron wave/particle duality. Electrons arriving one by one, is particlelike behavior; the resulting collective interference pattern is wavelike behavior.

Polkinghorne by asking the question, when an indivisible single electron is traversing the apparatus,

through which slit does it pass in order to get to the detector screen? And trying to answer the question on the basis of the experiment and its modification has illuminated some results:

1. In terms of quantum theory's superposition principle, the indivisible electron can go through both slits. The superposition principle implies two very general features of quantum theory. One is that it is no longer possible to form a clear picture of what is happening in the course of physical process. Living as we do in the (classical) everyday world, it is impossible for us to visualize an indivisible particle going through both slits. The other consequence is that it is no longer possible to predict exactly what will happen when we make an observation.
2. Sometimes the electron would be detected near slit A and sometimes it would be detected near slit B. It would be impossible to predict where it would be found on any particular occasion but, over a long series of trials, the relative probabilities associated with the two slits would be 50-50. This illustrates the general feature that in quantum theory predictions of the results of measurement are statistical in character and not deterministic. Quantum theory deals in probabilities rather than certainties.
3. The other consequence of the modified experiment would be the destruction of the interference pattern on the final screen. No longer would electrons tend to the middle point of the detector screen but they would split evenly between those arriving opposite A and those arriving opposite B. In other words, the behavior one finds depends upon what one chooses to look for. Asking a particlelike question (which slit?) gives a particlelike answer; asking a wavelike question (only about the final accumulated pattern on the detector screen) gives a wavelike answer.

Heisenberg, the well known physician of the twenty century has proposed "uncertainty principle" by investigating the domain of subatomic and with regard to some of the empirical evidence such as the double slits experiment. According to this principle: "it is not possible simultaneously to have perfect knowledge of both position and momentum" (ibid, p.33).

In other words, even if the momentum of electron is measured precisely, its location and situation is not measurable precisely and by exactly measuring the location and situation, the momentum would not be measurable" (Zohar, 1990). The momentum is a physical quantity which is related to the time; therefore, based on the uncertainty principle, identifying the location and situation of an electron is not possible in a specific time. It can be concluded that we are unable to fully understand the electrons in timescale.

As Polkinghorne (2002) mentions: "at the time, In addition to this role as father-figure, Bohr did offer an insightful gloss on the new quantum theory. This took the form of his notion of complementarity. Quantum theory offered a number of alternative modes of thought. There were the alternative representations of process that could be based on measuring either all positions or all momenta; the duality between thinking of entities in terms of waves or in terms of particles. Bohr emphasized that both members of these pairs of alternatives were to be taken equally seriously, and could be so treated without contradiction because each complemented rather than conflicted with the other".

To put it differently, Consistent with the fact that the full description of each electron is its particlelike and wavelike description in relation to the others and as complementary to the others, in the world of subatomic no electron can be completely defined and understood separately and in specific time and location. It can be interpreted in this way that electrons are complementarily bond to each other and they only can be defined in a network of inseparable relations.

Pertaining to that, Selby (1999) believes that the insights from the subatomic world would affect, change, and even transform the manner of human thinking about existence and community. He stated: "such an effect is possible in two forms of metaphorical and actual" (p. 128). As he believes considering the insights resulted from the subatomic world, metaphorically, would offer hypothetical but convincing designs and models for the fact in the macro-dimension. And also in the reality, there are direct relation

and conformity between the subatomic processes and the real situation in the macro-dimension. To be precise, the same situation and relations between the particles dominate the whole human being existence and specifically the social relations, structures, and the communication manners of human being with other people. Based on this, he describes the ontological and epistemological insights of investigation in the subatomic world.

As Selby (1993) believes, the quantum worldview would reject a mechanical and reductionist view toward the universe which believes in dividing phenomenon to its components and identifying these components for understanding it. The mechanical and reductionist view was suggested by philosophers and scientists in the 17 and 18 centuries. This worldview is based on such grounds as separation and domination. Kant (1998), with aspiration from Newton physics, believes that the physical theories and also mathematics theorem are synthetic and apriori or free from experiment. This view toward the scientific knowledge reaches the climax by the positivism philosophy in the 20 century. By depending on and emphasizing the science and the scientific achievements and dividing the synthetic theories to meaningful and meaningless theories and by using the empirical measurement for the meaningful (or scientific) theories, positivists underlie characteristics like objectivity, stability, and certainty. They judge any sentence or predicate that lack the characteristics like certainty as meaningless and by doing this in their action "...most of the philosophical, metaphysical, religious, moral, literary were categorized as meaningless" (Kin Caid, 1996). Consequently, certainty changed to one of the main characteristics of modern era. Because of this Brass (2000) calls the dominant culture of modern period as "certainty culture".

On the other hand, the second rule of Descartes for studying the self and universe states: to investigate any phenomenon, we should divide it into its simple components and start our investigation by understanding the simplest components (Voss, 1993). Based on this, simplifying the phenomena for systematic and precise understanding is a principle in the modern period, therefore, Voithofer (2002) believes that for the supporters of modernism who emphasize the characteristics of simplicity and precision and making the phenomena quantitative and scientific, simplifying the phenomena for systematic and exact understanding is essential.

Instead, the quantum worldview proposes the holistic view. By the worldview we are confronting a universe that in order to understand its components we should look at the whole with a dynamic view; it was stated earlier that the quantum components such as electrons are merely definable in a network of inseparable relationships and they cannot be defined distinctly. Selby (1999) thinks that this basic interdependence in the quantum world offers significant outcomes for human life in the observable sizes (p.129): first, 'self' is dominated by a bigger reality and is only meaningful through dynamic relationship with the whole. Second, whatever happens locally is a universal phenomenon as well, since like a part of whole it affects the whole; and the universal events are local, since the whole would affect the components and third, the past, present, and future are complementary and interwoven elements.

Selby (2001) in a symbolic depiction compares the mechanical and reductionist worldview to a "billiard ball" (Figure 1). This model that is a collection of arranged balls on the billiard table is chosen for "showing the separateness and the external relationships between subjects that would not affect their internal structures and dynamics" (p.7).

He also compares that holistic worldview to the web model (Figure 2). This model explains the interconnected and dynamic nature of the universe that we live in and shows the internal relationships between the subjects as well.

It seems that while in the mechanical and reductionist worldview the human understanding of subjects is supposed to be certain and stable, in the holistic worldview the uncertainty and instability are accepted instead. With this view toward the universe, anything is related to other things, or in deeper sense anything is rooted in other things, and the universe actually is flow of energy and anything and

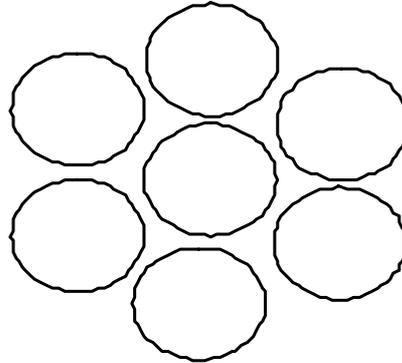


Figure 1: The Billiard Ball Model.

Source: Adapted from Selby (2001), p.7.

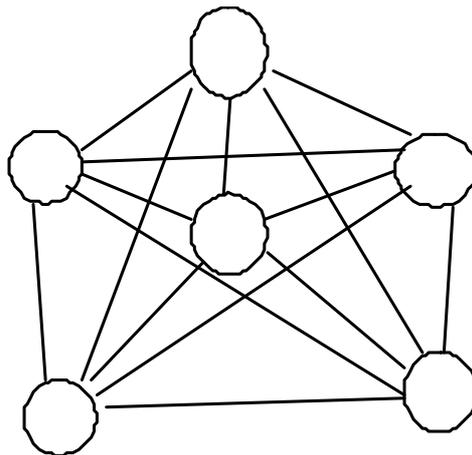


Figure 2: The Web Model

Source: Adapted from Selby (2001), p.8.

any phenomenon are a temporary arrangement on the way of this flow. Therefore, the phenomena are not definite and separate meaningful subjects, but are like instable and variant natures. In this way, the universe has a relational and uncertain nature and the events are connected to each other. So, the human being faces a complex, instable, and uncertain universe that can be understood by a holistic and dynamic view other than a reductionist one.

The Philosophy and Traditions of University Disciplines

As it was mentioned in the previous sections, the educational process in the universities, especially from the modern era up to the present, are followed in the form of university disciplines so that nowadays the universities cannot be imagined without disciplines, departments, and faculties. Stated differently, today the disciplines are scientific territories that cognition, in its common definition, is possible in this territory and by accepting its approaches and traditions. As Matthew and Prichard (2009) believe the approaches and traditions of each discipline which he calls the culture of that discipline, are hard and inflexible, so that thinking in any discipline is only possible through acceptance of the culture of that specific discipline. Regarding the same point, Hirst (1974) has talked about logical order of different forms of knowledge and claims that the logical order of any form of knowledge determines how the concepts relate to each other and how they are organized, and since the manner of relationship and the

organization of the concepts have been different, different types of knowledge have emerged that are basically differ due to the structural difference.

For more clarification, he points to the characteristics that are unique for each form of knowledge. For example, each form of knowledge has unique concepts or schemata. God, sin, and Judgment Day are the concepts of religion and gravity, velocity, and the span of movement are physics' concepts. The other characteristic is the logical structure of different forms of knowledge. The concepts in each form of knowledge have specific terms and structures that are considered and examined and finally, different forms of knowledge, has methodological differences.

Based on the stated characteristics, Hirst calls mathematics, physical sciences, humanities, religion, philosophy, morality, history, literature, and fine art as various forms of knowledge and for more illustration he distinguishes between forms of knowledge and fields of knowledge. As he believes, geography and social sciences which are examples of fields of knowledge and are considered as disciplines in the university have combinational structure and traces of different forms of knowledge can be seen in them. As Hirst believes and since forms of knowledge constitute many of the present university disciplines, teaching in each of these university disciplines is like a process of transferring disciplines traditions such as their epistemological and methodological structure and following that encouraging the students to investigate and analyze the logical and essential characteristics of each form of knowledge.

According to these points, it seems that teaching in diverse disciplines is different from each other. Donald (2002) believes that the problem solving approaches and methods are different in various disciplines, so the experts of each discipline also transfer their own specific methods of thinking and functioning and due to this the strong and may be implicit structures of each discipline would be more resistant and even stronger. The point that is highlighted by Pace (2009) is that it is possible for the thinking and function methods and their difference with the other disciplines may not be explicit to the experts and students of specific disciplines, but it may be implicit to them. For further clarification of the specific and unique characteristics of each discipline and their roles in educational processes in the university, Kreber (2009) considers the disciplines as frameworks for searching and understanding the universe and believes that disciplines have their own specific methods and approaches for thinking that are determined by the expert community of that discipline. Therefore, how the problem is stated, the research process for answering the questions and presenting research achievements are different in various disciplines, and such differences have resulted from different hypotheses and ideologies regarding the cognition and knowledge and the ways to attain them.

In elaborating on the approaches of disciplines for confronting the universe and its phenomena, Kerber indicates to the concepts of "reduction of uncertainty" and "increase of homogeneity". As he believes, each discipline in confronting a specific phenomenon or subject takes a particular approach and following that it develops familiar and appropriate discussions in that discipline. Therefore, on the one hand, the disciplines are looking for the reduction or explanation of complexities of universe and, on the other hand, are aiming at developing the specific and appropriate discussions that leads to the development of homogeneous discussions.

It seems that comparing how various disciplines such as physics, biology, art, and religion would regard a subject like a rose can show the process of the reduction of complexity and increase of homogeneity. In facing a rose, what is of most significance to a physicist is investigating the flower from a view point of the physical processes that occur in it. So, he tries to explain the wave length spread from the flower relative to the color that is seen in it. Biology is looking for explaining and understanding biological processes that led to the life of the flower. An artist seeks to understand and explain the aesthetic features of different parts of the flower and their coordination and the expert that thinks about the religion and the role and place of creator in relation to the beings, sees and describes the flower as one of the creatures of the creator as well. It is clear that the methods applied by each of these investigators for the flower are different from each other.

After having dealt with the specific and different structure of each form of knowledge and many university disciplines, which is revealed through their manner of facing the phenomena and the proposed methods for answering the questions, we can ask these questions. What is the goal behind educating students in different university disciplines and whether various disciplines, despite their differences, follow common goals in educating the students?

By the same token, if the future life of students is divided into three part of professional, social, and personal, the important question is that how and to what extent the disciplines prepare students for facing the complexities and uncertainties of each of these parts? As was mentioned Complexity and uncertainty are concepts that are specially used by quantum worldview and in criticizing the modern views like believing in certainty and reducing complexity. This confrontation is the same as confrontation of holistic worldview and the reductionist worldview.

Barnet (2007), in line with these ideas, considers complexity and uncertainty as the life characteristics and specifically the present life of human being and complains about the shortcomings of university in preparing the student to face the present life.

Kerber (2009) by mentioning the goals such as the citizenship responsibility, lifelong learning and occupational capabilities for the higher education, doubts that disciplinary teaching and research could attain those goals and help students in achieving them. Matthew and Pritchard (2009) also question the role and responsibility of higher education in relation to the society, and think that university is responsible for the development of culture that prepares students for life beyond their disciplines. By indicating to the goals like training responsible citizens, they believe university's responsibility to be much more broader than this and these goals are common between all disciplines. Another point that Tinto (1997, quoted by Kerber, 2009) emphasizes, regarding the goals of higher education, is the connection and dependence between the university researches and social activities. He believes that what is done in the university should be related to the student's life in a society that he lives in. Barnet (2004) by highlighting the goals like critical thinking and moral awareness as the common goals of university educations also holds that after graduation each student should be able to face the complex world in an active, creative, and committable manner. By the complex world he means the situations in which each behavior has numerous effects and there are different answers to each question based on moral views and various and incomparable ideologies. Finally, Baxer-Magola and King (2004, quoted by Kerber, 2009), by proposing new patterns, also call higher education as a meaningful process and believe that during their study the students should constantly think about how the new knowledge developed and construct their own view and learn from others as well.

The Quantum Worldview and the Necessity of Teaching with a Transdisciplinary Perspective: Deconstruction of the Higher Education Role

It was discussed that in quantum worldview, reality has a relational and uncertain nature and the events are connected to and dependent on one another. Selby (1999) defines this connection in three levels of "natural and ecologic systems, personal systems, and social systems" (p.130). He believes if an event or issue occurs in one of the mentioned levels, it would affect other levels as well.

The consequences of this connection and dependence are complexity and uncertainty and because of this the quantum worldview is looking for the confrontation of modern views that have been searching for reduction of complexity and achieving certainty.

The epistemological result of this ontological view is that understanding and identifying the universe with a holistic and dynamic view and comprehending the connections between the various subjects and events is possible. Such a view about the how of cognition, necessitates deconstruction of the role of higher education in educating students for facing the universe and understanding the phenomena. Pike (1990) accepts that how the students deal with society, and natural systems needs a revision in a way that they understand the connections and dependence of each of the three mentioned levels in addition to the relationship of one level to the other. For example, Selby (1999) states, students should

find out about both the mutual connections of mental, sentimental, and physical aspects of each human being and the dynamic and permanent connections between the regional and universal subjects. They should also understand the relationship between personal well being with economical and political decisions of government and rulers, and perceive the role of personal behaviors in the emergence of social aspects or regional and ecological changes too.

Now, the question is how can such students be trained and educated in the higher education?

Nowadays, as was mentioned, the education process is mostly defined and implemented in specialized disciplines that each of them has its own unique and specific concepts, methods, and research activities. While the issues and questions of universe are emerging as altering, complex, and uncertain, not like separate subjects but beyond specialized knowledge and skills in particular disciplines. As a result, Kerber (2009) concludes the education which is limited to specific specialized disciplines cannot warm up students for the complexities and uncertainties of personal, professional, and social life. Barnet (2007), by pointing to the fact that each discipline provides a specific and different framework for understanding and functioning in the universe, also considers the necessity of effective coping with complex and uncertain universe to be further than the framework provided by disciplines for thinking and functioning in the universe.

It seems for going beyond the discipline framework, first the elements comprising this framework should be explored. Among these elements which can be called discipline traditions, are hypotheses about reality and cognition and the methods applied for research in that particular discipline. The next step is identifying and exploring traditions of other frameworks, or in other words disciplines. Since, various disciplines apply different approaches for issues and subjects, awareness about these approaches, opens a wider horizon in front of the students which is vital for meeting the real world. Given that what happens in reality has many various dimensions and only parts of them are dealt with in each knowledge territory, it is worth mentioning that a more complete facing with the happened reality is possible when we meet the subject or issue from different aspects. Pike and Selby (1999) for example indicate to issues like destruction of jungles or water pollution that can be considered from different aspects of development, health, justice, war, and human rights. In this way, seeing a real subject from the window of a discipline or a specific domain of knowledge is overlooking many of aspects which comprise an event in relation to each other. Pike and Selby (1999), by mentioning that students should get familiar with a variety of perspectives regarding each issue, argue observing from various perspectives helps the students to judge fairly by wider and deeper revising of their views; this revision is necessary for the changing universe (p.12).

So when we talk about considerate and responsible citizens, we mean the citizens that meet events in complex and uncertain universe, and have necessary abilities for exploring its different aspects. Pascarella and Terenzini (2005) talk about the “holistic nature of learning” and calls for revision and reorganization of curriculums based on that. Barnet (2004) thinks that in such a leaning which is followed by critical thinking and moral awareness, students find out there are alternative answers to each question in reality which result from incomparable moral and ideological circumstances.

What has been discussed reveals the necessity of trans-disciplinary perspective of students and one of the main steps in this regard is university teachers’ teaching with a trans-disciplinary perspective. This kind of education helps the students to meet the issues and events of the universe beyond the borderlines of their own disciplines.

Conclusion and Suggestions

Based on the holistically quantum worldview which is philosophical explanation of quantum physics about universe and cognition, in the present study it is tried to investigate the necessity of trans-disciplinary perspective, specifically in the teaching of university teachers, and on this basis to deconstruct the role and responsibility of higher education. The question revealing the necessity of this revision is “how the students can be educated as beneficial members of society and how much the disciplines

prepare the students for the complexities and uncertainties of future personal, professional, and social life?”

Now, some of the research findings are pointed out: first, in the quantum worldview and, therefore, in micro-dimension, the behavior of electrons are measurable in a network of multi-connections, interwoven, and inseparable, it is concluded that in macro-dimension, human being is meeting a complex, uncertain, and instable situations which is possible to understand by a holistic and dynamic view rather than a reductionist one. Second, nowadays the university teachers teach and do research in specialized disciplines that each one has its own unique logic structure, concepts, approaches, and methods for thinking and functioning. While, according to the quantum worldview and for facing the real issues of life in complex, uncertain, and instable, especially in the present time, the disciplines and their traditions should be viewed as dependent on each other and to perceive their connections.

Feyerabend with a, to somehow, similar ground discusses the interweaving of the traditions of disciplines and the fact that there is no clear border between them. Affected by the thoughts of Wittgenstein, he (1993) calls the different cultural achievements of human being as “[different] forms of life” and believes that there is no general and universal method or scale for comparing different forms, and due to this using the methods or scale of one form of life for the judgment about other form is illegitimate. He also puts the Western rationalism in this category and concludes that rationalism is not universal and unique in its cognition theory and method of attaining knowledge, nor it can judge other theories and methods of epistemology. That is to say rationalism is one of the many forms of life and is beside them rather than beyond, superior, or inclusive of them.

From this idea that the advancement of science does not follow any specific or unique principle or epistemology, therefore, works of different scientists of various domains of knowledge cannot be judged definitely, Feyerabend concludes that the variety of methods and theories in different domains of knowledge is essential for further criticism, challenge, and exchange of views. According to this point, he calls any specific methodology as limited in his book “Against Method” and by stating that for the advancement of knowledge “anything goes” (ibid. p.5), calls his own theory “an anarchistic theory of knowledge”. For further clarification he writes: It is an ever increased ocean of mutually incompatible alternatives. Each single theory, each fairy-tale, each myth is part of the collection forcing others into greater articulation and all of them contributing, via this process of competition, to the development of our consciousness (Feyerabend, 1993).

Such a view destroys the hierarchical structure of knowledge domains based on which some of the domains are located in the peak due to their higher importance and others are in the bottom of the hierarchy. Thus, the possibility and necessity of discussion between the disciplines and their traditions are revealed more and more. Among other things, the trans-disciplinary perspective of the university teachers in the education process is much more imperative. Finally, according to the findings of the present study, some suggestions are offered to the university teachers:

- 1. Awareness and informing about the epistemology and methodological theories of the discipline:** The first practical step for adopting a trans-disciplinary view and coming out of the restricted borders of discipline is awareness about the theories of the discipline about cognition and also how to reach it. University teachers should ask themselves what is the thinking and functioning methods in their specialized discipline and these methods result from what hypotheses regarding the concepts like reality, cognition, and the way to reach cognition. After searching about these issues they should encounter the students with such questions too. Investigating the questions in the classroom, would lead to illumination of the horizon and framework from which the discipline sees the universe and evaluates it. It is worth mentioning that research about this issue would include expansion, change, and even disciplines’ traditions and structures throughout the history.

In such a research process, the student finds out that his discipline has its own specific theories, ideologies, thinking, and functioning method or structure that is revealed through the manner of

asking questions, doing research and reporting the achievements. He would perceive that the discipline's achievements are based on its language and rules, therefore, it is limited to them or, in other words, it is limited to its structure and framework. Such insight would help the students to understand the fact that his knowledge is not a strict reality, but it is an achievement according to the view and tradition which are followed in that discipline.

- 2. Familiarity with the research traditions of the other forms of knowledge:** After research and teaching about discipline structure, the second step for attaining a trans-disciplinary view is familiarity with the research traditions of the other forms of knowledge. In this step different theories and ideologies, and following that various ways of thinking and functioning are explored in different forms of knowledge. By taking this step in their research and teaching, university teachers would expand the view of students and would familiarize them with other views. These views may be different, incompatible and incomparable with their own view in their discipline and they could also be related to and dependent on their own view. All these views together make the active and effective confrontation of student with the complex and uncertain universe possible much more than before.

The traditions relating to the different forms of knowledge are divisions which shape a more complete reality by being connected to and dependent on each other knowledge. Kerber (2009), by adopting such a view and by indicating to the present issues of human being, such as preserving the earth health or the tribal and regional conflicts, believes that such problems are not solved by reinforcing a specific belief in the students. But it is crucial that different views be presented to them in order to coach their choosing capacity among various and even incomparable alternatives in such a way that after reaching a specific conclusion, they would be prepared to revise them in the lights of other and different views. Teaching in this way, would make teacher and student aware, and despite the uncertainty being unreachable, by doing this an endless path calls them to search; a path that begins with wonder rather than any specific way of thinking, and in this path the student cooperates with the teacher in the process of meaning making.

When these subjects are pivotal and due to the relative familiarity of teachers and students with the research traditions of other forms of knowledge, some opportunities are provided in the classrooms so that teachers and students, while facing the issues and subjects in the real life, benefit from different epistemological and methodological approaches and traditions.

In the end, it should be said that following such suggestions needs training teachers that do not limit themselves only to the practical aspects. A teacher that only concerns about educational content of his curriculum in the sessions of the semester cannot take the mentioned steps in his teaching and so it seems providing the trans-disciplinary view in teaching needs training of teachers for meeting that goal. The awareness of teachers regarding the goals of higher education should be beyond the goals of any special lesson or discipline and the interaction and dissuasion between teachers from various educational disciplines and traditions could be helpful. At this point, attention and respect to difference is very essential.

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