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21.YÜZYIL YÜKSEKÖĞRETİM SINIFLARINDA ÖĞRENEN MERKEZLİ ÖĞRENME ORTAMLARIN OLUŞTURULMASI

CREATING LEARNER-CENTERED LEARNING ENVIRONMENTS IN 21ST CENTURY HIGHER EDUCATION CLASSROOMS

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Özet

Toplumların iş gücünden beklediği yetkinlikler gün geçtikçe karmaşıklaşmakta ve eğitim kurumları bu değişime paralel olarak öğrencilerin hem içerik bilgisine hâkimiyetini hem de problem çözme becerilerini gerektiren çalışma ortamlarında başarılı olmalarını sağlayacak yeni stratejiler geliştirmek zorunda kalmaktadır. Geleneksel yükseköğretim modelimiz 21.yüzyılın getirmiş olduğu zorlukları karşılayamamaktadır. Yeni yüzyılın yükseköğretim kurumlarından beklentileri karşılamak için bu kurumlar programlarını ve pedagojilerini gözden geçirmek durumundadır. Bu çalışmada, yazar yeni ve karmaşık problemleri çözmeleri beklenen 21.yüzyıl öğrenenlerinin ihtiyaçlarına cevap verecek öğretim ortamlarını değerlendirmektedir. Bu bağlamda, teknoloji, mezunlarımıza 21.yüzyılın gerektirdiği temel yetkinlikleri kazandırmaya yönelik değerli bir araçtır. Yükseköğretim kurumlarının asıl hedefi öğrencileri aktif bir şekilde öğrenme sürecine dâhil eden ve onları aktif takım üyeleri yapan öğrenme ortamları oluşturmak olmalıdır. Teknoloji destekli öğrenme ortamları ile gerçekleştirilecek olan anlamlı öğrenme, öğrenenlerin değişen koşullara uyum becerilerini geliştirmelerine ve gerçek hayatta başarılı olmalarına yardımcı olabilir. Yapılandırmacı öğrenme platformlarının önemini vurgulayan bu çalışmada, yükseköğretimde Teknoloji Destekli Aktif Öğrenme sınıflarının örnek uygulamaları irdelenecektir. Ayrıca, öğrenen merkezli öğrenme ortamları oluşturma hususunda öğretmenlerin, eğitim tasarımcılarının ve eğitim yöneticilerinin karşılaşacakları zorluklar ele alınacak ve bu kapsamda eğitimcilerin üstlenecekleri yeni rolleri değerlendirilecektir.

Anahtar Kelimeler: Yükseköğretim, Teknoloji Destekli Aktif Öğrenme, 21.yy Zorlukları.

Abstract

Workforce capabilities are evolving into complexity and educational institutions are to adopt new strategies complied with this change in order to help the students to survive in sophisticated work environments requiring not only mastery of the content knowledge but also problem solving skills. Our traditional model of higher education is not meeting the 21st century challenges. In order to respond the demands of the new era higher education institutions must revise their programs and pedagogies. In this article, the author discusses the ways of fulfilling the needs of twenty-first-century learners who are expected to solve novel and complex problems. In this respect technology is a valuable tool for making our graduates acquire the core 21st century capabilities. Creating learning environments enabling the students actively engaged in the learning process and making them active team members should be the utmost goal of higher education classrooms. Meaningful learning through technology enhanced learning environments can aid the learners to improve their adaptability skills and succeed in real life situations. This paper emphasizing the importance of constructivist learning platforms will focus on good practices of Technology Enhanced Active Learning (TEAL) classrooms in higher education. Furthermore on the way of creating learner-centered learning environments, the challenges that will be faced by teachers, instructional designers, and educational administrators will be discussed and the new roles of the instructors will be elaborated.

Keywords: Higher Education, Technology Enhanced Active Learning (TEAL), 21st Century Challenges.

Introduction

Throughout the centuries human beings have been introduced more and more complicated problems by the oncoming ages and solving the novel problems has been an essential skill determining the success of the human race. As the industrial revolution introduced improved standards of living, beginning from the second half of the 20th century, global citizens of the new age are required to have new capabilities for success in life. The skills that people will need in the 21st century are listed by Tony Wagner (2008) as Critical thinking and problem solving, Collaboration and leadership, Agility and adaptability, Initiative and entrepreneurialism, Effective oral and written communication, Accessing and analyzing information, and Curiosity and imagination.

The paradigm shift in the needs of the new era's citizens automatically has led to the changes in the needs of the 21st century learners and parallel to those changes the educational institutions are assumed the responsibility of fulfilling the expectations of those learners. Thus the current educational models faced the challenge of adapting their curricula, teaching methods and evaluation tools in order to make their students attain the goals set in accordance with the new era's demands. Since the graduates of the 21st century are supposed to work in multinational, complex work environments and solve novel problems, the current teacher centered pedagogies need to be revised. In this respect, the higher

education curricula must go beyond aiming at transferring knowledge from the teacher to the student and in order to address the challenges the curriculum must engage students in the construction of knowledge (Clayton et.al, 2005). Achieving these ends, during the recent decades constructivist approach to teaching and learning has been widely utilized by educators to create student-centered learning environments (Howard et.al., 2000). This new perspective to teaching will be the focal point of this paper and for the sake of setting a clear picture of constructivist learning environments, it would be wise to discuss the differences between the teacher centered and learner centered learner centered environments.

Aim of the Study

Sfard (1998) states that participation in classroom activities facilitates student learning and students learn through interaction with material and people. Beginning with the second half of the 20th century, technological progress has been a driving force to reshape the nature of interaction in 21st century classrooms. Thus the didactive teaching methods in higher education classrooms have started to vanish by the advent of educational technology in educational settings. The aim of this study is to elaborate on the differences between traditional teacher-centered models and constructivist student-centered learning environments. In this respect, Technology Enhanced Active Learning (TEAL) project launched at the Massachusetts Institute of Technology (MIT) and TEAL classrooms of University of Minnesota will be presented as good examples of student-centered learning environments. In this study the challenges that will be faced by teachers, instructional designers, and educational administrators in creating those technology-rich innovative learning environments and the new roles of the instructors will also be discussed. In line with the aim of the study, the following research questions were posited.

1. What are the differences between *Teacher-Centered* and *Student-Centered* Learning Environments?
2. How did the developments in educational technology affect the higher education classrooms?
3. What are the challenges faced by 21st century educators?

Teacher Centered vs. Student Centered Learning Environments

Traditional teacher centered pedagogies are actually a reflection of behaviorist approach to learning. Behaviorists regarded the learners as tabula rasa i.e. a blank slate and ignored them as active participants of the learning process. Though the students are naturally quite comfortable with being such a passive actor of the traditional learning environment, presenting information does not necessarily lead to learning. Assuming the information transfer from teachers to students is successful, the retention of the knowledge gained by rote learning is also another issue to consider for educators. The effectiveness of traditional and interactive learning environments is shown in Figure 1. As the Learning Pyramid illustrates the retention rates of traditional learning environments are quite lower than the constructivist learning environments in which students are active participants in a learning process by seeking to find meaning in their experiences.

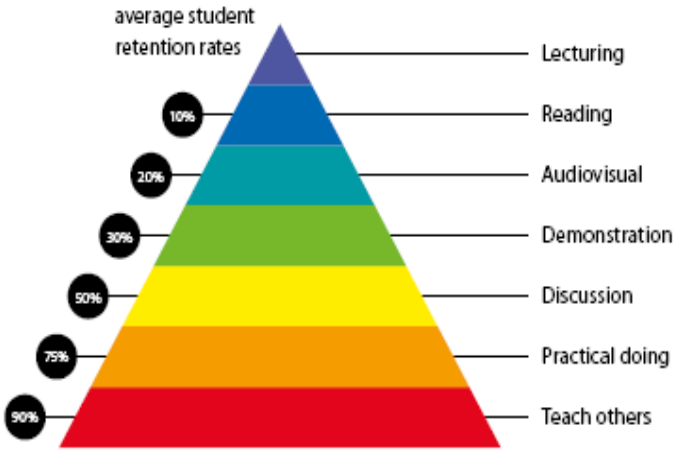

Figure 1. The Learning Pyramid
(Source: National Training Laboratories, Bethel, ME (1960, cited in Palloff&Pratt, 2009, p. 19)

Behaviorists focused on the teacher and the process of teaching. The teacher is the possessor of the knowledge and his/her ultimate responsibility is to transfer the factual information to the learners. The cognitive capacities of the learners are underestimated and they are supposed to be passive recipients of knowledge and obedient observes of the teaching process which is carefully pre-planned in detail by the omnipotent instructor. On the other hand, learner-centered instructional designs regard the learner as an essential element of the classroom. The differences between the teacher and learner centered designs are as follows;

Table 1. Teacher-centered and Learner-centered Paradigms (Huba, M.E. & Freed, J.E., 2000)

Teacher-Centered Paradigm	Learner-Centered Paradigm
Knowledge is transmitted from professor to students.	Students construct knowledge through gathering and synthesizing information and integrating it with the general skills of inquiry, communication, critical thinking and problem solving.
Students passively receive information.	Students are actively involved.
Emphasis is on acquisition outside the context in which it will be used.	Emphasis is on using and communicating knowledge effectively to address enduring and emerging issues and problems in real-life contexts.
Professor's role is to be primary information giver and primary evaluator.	Professor's role is to coach and facilitate. Professor and students evaluate learning together.
Teaching and assessing are separate.	Teaching and assessing are intertwined.
Assessment is used to monitor learning.	Assessment is used to promote and diagnose learning.
Emphasis is on right answers.	Emphasis is on generating better questions and learning from errors.
Desired learning is assessed indirectly through the use of objectively scored tests.	Desired learning is assessed directly through papers, projects, performances, portfolios, and the like.
Focus is on a single discipline.	Approach is compatible with interdisciplinary investigation.
Culture is competitive and individualistic.	Culture is cooperative, collaborative and supportive.
Only students are viewed as learners.	Professor and students learn together.

Educators advocating learner centered designs seek ways to provide the learners with interaction rich learning environments through which students are engaged in challenging academic tasks. Such designs are especially a must for higher education which is supposed to involve and engage students in learning to apply theoretical knowledge to practical situations (Astin, 1996). Global competition among higher education institutions created a need for change in the teacher centered practices and forced them to set educational goals requiring new approaches to curriculum, instruction, and learning (Kehm and Stansaker, 2009). So, this led to a shift from "teacher centered" to "student centered" practices in higher education and this paradigm shift in return led to change in teacher and student roles. Thus

the teachers became facilitators in the learning process rather than providers of knowledge and students assumed the role of knowledge constructors and active team members solving the problems presented by the teachers. Collins and O'Brien (2003) define student-centered instruction as;

> *"Student-centered instruction [SCI] is an instructional approach in which students influence the content, activities, materials, and pace of learning. This learning model places the student (learner) in the center of the learning process. The instructor provides students with opportunities to learn independently and from one another and coaches them in the skills they need to do so effectively. The SCI approach includes such techniques as substituting active learning experiences for lectures, assigning open-ended problems and problems requiring critical or creative thinking that cannot be solved by following text examples, involving students in simulations and role plays, and using self-paced and/or cooperative (team-based) learning. Properly implemented SCI can lead to increased motivation to learn, greater retention of knowledge, deeper understanding, and more positive attitudes towards the subject being taught"*

Students' active participation in the learning process is especially important for the mastery of critical thinking and problem-solving skills, and for increasing the likelihood of students' program completion (Braxton et.al, 2008; Prince, 2004). Student centered learning is actually constructivist perspective of learning which advocates meaningful learning and rejects rote learning. Piaget, the founding father of cognitive constructivism, states his theory of learning as;

> *"Individuals' cognitive schemes allow them to establish an orderliness and predictability in their experiential worlds. When experience does not fit with the individual's schemes, a cognitive disequilibrium results, which triggers the learning process. This disequilibrium leads to adaptation. Reflection on successful adoptive operations leads to new or modified concepts, contributing to re-equilibrium. Thus from a constructivist perspective, knowledge is not passively received from the world, from others, or from authoritative sources. Rather, all knowledge is created as individuals (and groups) adapt to and make sense of their experiential worlds (MacLellan &Soden, 2004, p. 254)."*

Constructivism as a theory of knowledge is "the philosophy, or belief, that learners create their own knowledge based on interactions with their environment including their interactions with other people" (Draper, 2002, p.522). Constructivism has two basic principles. The first principle states that knowledge is not passively received but actively built up by the cognizing subject and the second principle claims the function of cognition is adaptive and serves the organization of the experiential world, not the discovery of ontological reality (Husen&Postlethwaite, 1989).

By the time learners becomes tertiary level students, they have already fossilized old habits inhibiting them functioning without control and their basic concern is to get a pass grade.

Teachers as facilitators use a number of techniques to motivate those students in learning environments and making them acquire the core 21st century capabilities. In this respect technology-enhanced constructivist learning platforms seem to be very valuable tools to involve students in the learning process. Though the aim of constructivist designs is quite clear, the question "How to achieve this end?"is difficult to answer. The model of active learning is the answer of this question.

Active Learning and Educational Technology

Active learning refers to the learning process incorporating the learners' mental and psychological involvement in order to capture ideas and construct meaning by interacting with peers to tackle the challenging academic tasks presented by the instructor. Learner-content and learner-learner interaction are the key elements of active learning. Active learning, enabling the learners to solve problems, form and answer questions, act in groups to discuss the given cases and share experiences, increases the quality of student learning. Since the learners are forced to create meaning rather than memorizing information transmitted by the teacher, active learning is regarded as a means to achieve ''deep' learning" which is the learning and teaching form needed in higher education (Haack, 2008). Engaging the learners in interactive learning settings require clearly defined instructional strategies. Cooperative learning techniques provide the instructors with various ways that can be used to facilitate active learning in classrooms. Cooperative learning is a form of active learning and the general title for a set of classroom teaching activities where students work in small groups to help one another studying an academic subject matter (Tan, Sharan & Lee, 2006, p. 4). Johnson et.al. (1994) define cooperative learning as "instructional use of small groups so that students work together to maximize their own and each other's learning." Both definitions put emphasis on group work and students' interaction. Though group work is essential element of cooperative learning, not all group work activities are labeled as cooperative learning activity in classrooms. According to the Johnsons' model cooperative student groups working as teams in order to achieve a common goal should fulfill the following conditions (Johnson et.al.,1998).

Positive interdependence. Team members are required to depend on each other to attain the group goal. If any member of the group fails to fulfill his/her responsibility, the group work and other members suffer.

Individual accountability. All group members are evaluated on the basis of their contribution to the group work and their mastery of the content to be covered.

Face-to-face promotive interaction. Group work is an interactive process and completion of group tasks depends on group members' exchange of ideas, feedback and teaching one another.

Appropriate use of collaborative skills. In order to attain group goals via cooperative efforts group members are required to have collaborative skills i.e. leadership, communication, decision making, and conflict management skills.

Group processing. On the way to reach the desired goals, group members are supposed to define the goals, consistently evaluate the group performance, and tailor the procedures in order to make group efforts more and more effective.

Our educational institutions currently host 21st century learners who were born late 1990s and after 2000. Those learners are called as millennials and they are confident, team oriented, civic minded and multi-tasking (Howe, N. and Strauss, W., 2003). Those learners are social and practiced users of digital technology. So, applying cooperative learning techniques in digital learners' classrooms entail the use of technology in instructional designs. Use of educational technology in learning environments not only supports meaningful and deep learning but also helps the students to visualize the complex concepts via dynamic images in technology rich environments. At this point the question is how should the educators design instruction for the millennium's leaders, workers, and citizens. The answer of this question lies in the term; The Technology-Enabled Active Learning (TEAL).

The Technology-Enabled Active Learning (TEAL) project launched at the Massachusetts Institute of Technology (MIT) involves media-rich software for simulation and visualization in science and technology courses sets a model for higher education. In the late 1990s, MIT as a higher education institution sought ways to increase student engagement and increase learning gains in courses already given in lecture format. Those attempts turned into an educational innovation and MIT Professor John Belcher, teacher of first-year physics, and his two colleagues Peter Dourmashkin and David Lister started the Technology Enabled Active Learning (TEAL) project. Mixing the pedagogy, educational technology and classroom design with a new approach, those professors reformatted the teaching of freshman physics at MIT. In fall 2000, the TEAL project was launched with two renovated classrooms each cost $1.5M. The two TEAL classrooms contained an instructor's workstation in the center of the room and this workstation was surrounded by 13 round tables, each seating nine students

(Figure 2). Those classrooms also equipped with thirteen whiteboards and eight video projectors with screens dot the room's periphery.

Figure 2. MIT TEAL Classrooms Layout (Source: http://web.mit.edu/edtech/casestudies/ teal.html)

Students formed groups of three and three groups sit at each table. Based on active learning major principle of favoring cooperation rather than competition, groups are formed of students with mixing ability i.e. varying levels of knowledge. Each group was provided with a computer to view lecture slides and collect data from experiments. In these TEAL classrooms students are aided by animated simulations to visualize concepts and they carry out experiments in groups during class. For each question presented by instructor groups are supposed to discuss and negotiate answers with group members. Instructors' questions in TEAL classrooms are answered by an electronic polling system with handheld voting keypads. TEAL instructors do not lecture whole class; instead they walk around the tables and comment on the group works, facilitate group interaction and assess students' understanding. The educational innovation and the new pedagogy used in the TEAL classrooms produced about twice the average normalized learning gains for low-, intermediate-, and high-scoring students when compared to traditional instruction (http://web.mit.edu/edtech/casestudies/ teal.html). MIT freely shares materials developed for teaching in this format through the MIT iCampus outreach and the OpenCourseWare website and it is expected that other higher education institutions will be inspired by the TEAL project and similar courses will be delivered in this format.

University of Minnesota is one of the American universities inspired by MIT's Technology Enabled Active Learning (TEAL) classrooms on student learning. They started with remodeling MIT's TEAL classrooms and in 2007 they established two Active Learning

Classrooms (ALC) with the capacities of 45-person and 117-person ALC (Figure3). Then the capacity of University of Minnesota Active Learning Classrooms (ALCs) reached 1179 students taking a wide range of courses from biology to chemistry, and from environmental sciences to calculus. Active Learning Classrooms are student-centered and technology-enriched learning environments enabling the instructors and students to employ effective teaching and learning strategies like problem-solving, case based scenarios, computer simulations, group discussions and peer evaluation. Like MIT TEAL classrooms, University of Minnesota ALCs have large, round tables that seat nine students each in teams of three. The student laptops are connected to 50-inch wall-mounted LCD and the instructor has the control of any table display for projection on the room's large dual display screens. Instructors can also choose a specific display on the large projection and student screens from an instructor station.

Figure 3. TEAL Classroom, University of Minnesota

Active Learning Classrooms are not welcomed by all instructors who were favoring the lecture-style teaching in large lecture halls. So, a research with two groups of students was conducted in order to find out the effects of the active learning pedagogy on students' academic engagement and learning outcomes. In this research, instructors taught two sections of the same class and one section was selected as experiment and the other section was selected as control group. For both groups the same syllabus, materials, instructional methods, and assessment tools are used. Findings of this, research presented in Figure 4, showed that active learning group students are engaged in the learning process more than the control group and controlling for numerous demographic variables, students in the active learning classes were found to have outperformed those in the control group (http://www.pkallsc.org/assets/files/UniversityofMinnesota-ActiveLearningClassrooms. pdf)

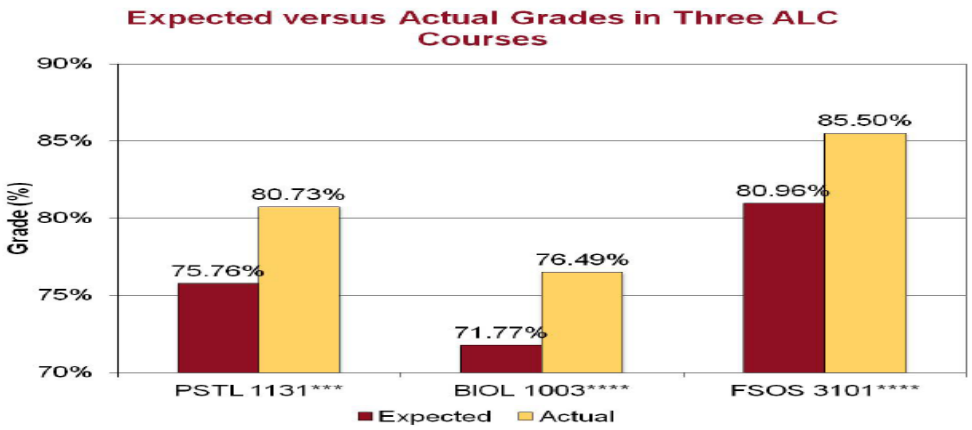

Figure 4. Active Learning Classes' Expected versus Actual Grades

Though such good practices are promising increase in learning outcomes, innovative educators are expected to welcome some challenges. The instructors of such active learning classrooms may face some challenges because of the new design of the classroom which has no more focal point and enriched by technology. Switching from traditional modes to creative instructional strategies makes the conventional instructors experience difficulties. TEAL classrooms are quite noisy and destructive for instructors who have taught classes lecturing for years. TEAL instructors are also supposed to do some work before and after classes to plan classroom activities maximizing student learning. Shifting the personal digital identity that individuals create to an academic digital identity and engaging students in their learning journey through technology is also a challenge for instructors teaching in technology enhanced learning environments (Hiradhar & Gray, 2008). Another challenge for adopting technology enhanced active learning practices is limited funds for educational innovations. So, innovative instructors are also expected to raise funds for their creative teaching practices.

Even if those barriers are successfully overcome, in order to successfully put active learning in practice the instructors and the learners should assume their new roles. The all-knowing teachers who were the dispenser of information and manager of a learning process turn into learning coaches and facilitators. On the other hand, traditional students who were supposed to attend lecture halls and spend some time as passive listeners are obliged to be creative problem solvers, effective team members and sophisticated users of technology.

Conclusion

Technology as a valuable tool can significantly help the educators to help the students meet the individual and societal needs of the 21st century. The goal of employing technology in education is to create learning environments facilitating student involvement in the learning process. Through using technology in classrooms, instructors can enhance teaching and learning activities and establish constructivist learning platforms to make the learners construct their own knowledge. Sharing good practices in the higher education community can help instructional designers to develop effective strategies to use educational technology in their own settings. The two TEAL cases presented in this paper are promising enough to encourage the educators to establish their own TEAL approach in their institutions to make teaching and learning practices more effective. 19th century traditional model of lecturing university students in large lecture halls proved to be ineffective and the research data showed that engaging students in group activities increase learning outcomes, energize traditional classrooms and motivate students to school work. As the technology enhanced active learning practices become more and more widespread, educational administrators should seek new ways of funding this new pedagogy and train the instructors to adapt the changes and face the challenges of the new era.

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