Social Media in Higher Education:

Teaching in Web 2.0

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Chapter 6

Personalization of Learning Environments in a Post–Industrial Class

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ABSTRACT

The chapter deals with trends of educational processes and learning environments in post-industrial society. A historicist approach is used for this purpose. This approach is based on two theoretical recourses: analysis of historical forms of acquiring knowledge and analysis of historical forms of educational processes. The authors show that the contemporary educational process is greatly affected by two innovative phenomena: social media and personal identity online (PIO). They consider socialization and personalization as two unique entities having opposite characteristics of the post-industrial educational process. Based on such a dialectic approach to the educational process, they define the concept "Personal Ubiquitous Educational Environment". The authors report the preliminary results of research on a teachers' training course conducted on the basis of such an environment. The research focuses on clarifying both innovative components of contemporary educational processes: social media and PIO.

1. INTRODUCTION

One of the main goals of any society is to provide an educational system that includes a set of tools that can be utilized to ameliorate problems encountered in the social and economic world. The corresponding educational process and curriculum usually aim at targeting the knowledge and skills needed for dealing with problems throughout the world.

The transition of our society to the post-industrial epoch (Masuda, 1981; Huber, 1984) serves as a background and an initial point of our study. Post-industrial society has become

more a society of services rather than a society of production. It creates new ways of human interaction with society, where artificial interfaces separate individuals from the real world social environment. One of the trends of the previous industrial society, namely, the globalization and formalization of social institutions, and as a consequence, the decreasing role of the individual, has recently been replaced by personalization, placing the individual at the center of the world (Every, Garcia & Young, 2010).

Accordingly, recently the main objectives of education have changed to reflect these tendencies. The newly conceived educational process requires changing the role of the teacher to the learner (Carolyn & Foster, 2010; Fazal, DeSimone, & Lieman, 2010). Thus, the teacher is not a single content provider any more. The learner becomes increasingly freer to collect knowledge as needed and has the power to decide. Owing to the latest achievements in information and communication technology, e.g., wireless broadband, IP, and cloud computing, the learning has become increasingly more ubiquitous, meaning that the world is adapting to the learner's mobility with no formal class distinction (Dede, 2011).

Obviously, it is senseless for the educational system to compete with the Internet and other innovative sources of educational content. On the contrary, it is much more promising to utilize this means for enhancing students' personal skills and abilities to improve the effectiveness of leaning.

Western society, in general, and education, in particular, is evolving toward personalization. This personalization is strongly connected with the new phenomenon of Personal Identity Online (PIO) that has been intensively studied in recent years (Bowman, 2009; Rodogno, 2011). The concept of PIO personifies a specific characteristic of an individual's behavior in a network environment, which manifests itself in a unique opportunity to form the individual's identity differently from that in reality. The world network opens up new opportunities for self-expression and for forming

identity. The PIO is the form of personalization that typifies post-industrial learning environments (Floridi, 2011).

Another remarkable factor characterizing the coming epoch is the phenomenon of social media. Social media are traditionally defined as the use of Web applications supporting the creation and exchange of user-generated content. Here, we give to the concept of social media a more general and culturological interpretation, rather than the technological one. We consider the social media as a cultural phenomenon, substantially intensifying and enhancing interpersonal communication and significantly altering the nature of the relationship between an individual and a society "personality-society". Note that the relationships "personality-personality" and "personality-society" are immediately perceived as simple and are unprecedentedly multifaceted. The simplicity of relationships/mutual connections is clearly seen in the availability of new communication tools (from mobile devices to social networking sites) for any level of the society, regardless of education, age, and economic status. Diversity of communication connections is a new phenomenon related, for example, to the above-mentioned phenomenon of PIO, and to the fact that an identity (a personality) in cyberspace can be perceived not only as a real person, but also as an "infosphere" directly associated with the person (Floridi, 2011). The infosphere of an individual consists of the memory of the discussed personality/individual, the memory about the personality and multiple media documents related to the personality, lifestyle, etc. Infosphere of an individual somehow exists and functions in the cyberspace, independently of the corresponding personality. It is clear that this has created a new media reality that, in our opinion, is the most important tool for understanding the phenomenon of social media. In the era of social media, social consciousness is formed in accordance with new, previously unknown principles, thus establishing new goals in all public institutions. It is obvious

that education is not an exception. In Web 2.0, the possible forms of network activity of modern students are extremely diverse. These forms include blogs and forums, social networks, wikis, etc.

Thus, the above two phenomena: the social media and the personal identity online determine new forms of an educational process and new learning environments.

In this way, the increased personalization is strongly connected with the increased importance of "soft" skills, such as creativity, motivation, meta-cognition, etc. (Cohen, 2009; Shute et al., 2009). In order to achieve soft skills, the development of learning environments of the new type must become a reality. The study of such learning environments, called Personalized Ubiquitous Educational (PUE) environments, is the subject of this chapter. One of the best examples of the PUE is a cloud educational environment (Sultan, 2010; Geth, 2010).

An important point in our study is in understanding that the concept of personalization in recent educational situations greatly differs from the conventional concept. This new understanding is based on considering the PUE as a social environment and not just a technological one.

We hypothesize that the socially oriented PUE environment will provide teachers with the means to prepare a student for "multi-dimensional abilities required from them in the 21st century" (Kojukhov & Levin, 2010; Johnson, 2010), which refers to such soft skills as creativity, motivation, meta-cognition (Cohen, 2009; Shute et al., 2009). We study teachers' training programs oriented toward the extensive use of the personalized ubiquitous educational environment tools as a key for success. We hypothesized that integrating such tools enhances the students' acquisition of soft skills. The results of our study indicated that the main principles of the Personalized Ubiquitous Educational Environment are indeed justified.

Our chapter is organized as follows. Section 2 discusses the theoretical sources of the study. The two main sources are considered: section 2.1 - historical forms of acquiring knowledge, and section 2.2 - historical forms of educational processes. Section 3 presents the concepts of personal identity online (PIO) and social media in an educational context. The study of the teachers' training, based on the Personalized Ubiquitous Educational Environment, is presented in section 4. Conclusions are given in section 5.

2. SOURCES OF STUDY

2.1. Historical Forms of Acquiring Knowledge

Historically, a number of forms of acquiring knowledge were developed. These forms correspond to different types of observations of the surrounding world.

Chronologically, the first form of acquiring knowledge was the period of direct observation. At this stage of human development, a person observed the surrounding world, analyzed it, and tried to draw conclusions. An observation is based on the direct impact of the object on the senses of the observer. Obviously, direct observation is determined by the observer's five senses, which, in turn, are biologically limited.

The above limitation of human senses was overcome by applying instruments, thus forming the next form of acquiring knowledge, namely, indirect observation, which, in turn, includes two forms. If a device placed between an object and the sensory organs of the subject amplifies the quantitative impact of the object on the subject, then this kind of observation is called an indirect observation of the first type. Devices of this type are mechanical or optical devices that enhance or improve human perception of reality (examples: a magnifier, an optical telescope, a microscope, etc.). Such devices of the first type appeared earlier than tools of the second type. The tools of the second type are tools used for indirect observation, which ensure that observation takes place. Such a tool,

when placed between an object and the sensory organs of the subject, changes qualitatively the effect of the object such that it becomes observable. Instruments of the second type include devices that ensure human observation of such physical phenomena and processes, which are not observable with the available human senses. Examples of such devices are a compass, a Geiger counter, and a manometer.

Note that both of these types of observations are based on converting energy from one form to another.

Until quite recently, the above-mentioned types of observation were considered the only possible ways of learning about the world. However, the advent and wide dissemination of computer tools and devices whose operation is based not on energy conversion, but on transforming information, has suggested a fundamentally new way of observing reality.

At the beginning, the information technology was not perceived as a new form of acquiring knowledge. This is due to a number of reasons. We will mention two of the most important reasons.

The first reason is that historically, computers were seen as a technological tool designed to compete with the human brain. The obvious future of the computer was considered to be the creation of artificial intelligence. Moreover, it was thought that artificial intelligence (AI) would replace the currently used instruments to better understand reality, but that AI would not replace learning tools. The second reason is that since computer environments, by definition, were understood to replace reality to some extent and therefore, they could not be considered to be tools for studying reality.

That is why today, when proclaiming that information technology is a cognitive paradigm, we interpret the place of computers in society in a new way – as a mediator between humans and the social reality. As a result, our society has become virtualized (Ivanov, 2006). The new virtualized society corresponds to a new acquiring knowledge form in which reality is mediated by devices whose operation is based not on energy transformation, but on transformation of information. The virtualization process is obviously related to the intensive introduction/embedding of various computer tools (from microchips up to complex computer networks) for use in various household appliances. However, virtualization takes place only if these tools create artificial micro-worlds where human beings may exist and where their personality is formed/affected. Virtual perception and the corresponding acquiring knowledge are based on the construction of such artificial micro-worlds. In fact, people study reality by observing its simulation. Belief in the epistemological omnipotence of virtual environments characterized the period when personal computers appeared and the contemporary feeling of progress into an information society.

A modern person, when studying the world and its culture, enjoys all of the above acquiring knowledge forms - direct, indirect, and virtual. Such acquiring knowledge can be defined as an integral, scientific cognitive process, in which physical reality is complemented by technological means of learning. Note that combining the real world and artificial micro-worlds was accepted as a reasonable compromise, as a balanced habitat. Such a combined environment, as well as the acquiring knowledge based on this type of environment, will be termed the physical-technological environment and the physical-technological acquiring knowledge, correspondingly.

All of the above forms of acquiring knowledge could be classified as science-technological. Such an acquiring knowledge was formed during the industrial era, and dominated then. In our new, post-industrial society, a new acquiring knowledge was formed, which can be characterized as a socio-technological. The virtual cognitive process, based on constructing computer micro-worlds, gives way to such cognitive processes in which the social component complements the physical component, and sometimes even dominates it.

According to constructionist epistemology, artificial micro-worlds in cognitive processes are strongly linked to the era of computer simulations. It even created the impression that the world, where technology dominates, becomes synthetic and virtual, and formed the belief in the all-conquering power of technology in any society.

In our post-industrial society, the social component plays the dominant role in acquiring knowledge – and this is due to several reasons:

1. A society of services is socially oriented. (Industrial society was oriented toward science and technology. Recall that medieval society was religiously, spiritually oriented).
2. The success of communication technologies. Certain devaluations of the value of knowledge favor the media. For the first time in the history of modern civilization, people may intelligently communicate, regardless of the distance and, in some sense, even regardless of time.
3. Forms of social consciousness change, as well as the ways of forming them. Modern means of communication raise the social component of reality to an unprecedented height.
4. Personality and identity is being formed in a new way. Personality increasingly expresses itself in virtual space, which is a new international social reality.

Thus, nowadays, it is appropriate to speak about a new, socio-technological acquiring knowledge. This new type of cognitive study underlies educational processes and learning environments of post-industrial society, which is the focus of this chapter.

2.2. Historical Forms of an Educational Process

In this section, we consider and analyze the evolution of an educational process during and related to various historical epochs. Three epochs are considered: pre-industrial, industrial, and post-industrial. We discuss both a representative educational process and a learning environment for each of the epochs.

In pre-industrial society, the dominance of individual education was quite suitable for the structure of medieval social production. There are two types of the pre-industrial education: (1) skills-oriented practical education, meaning education of the type "do-as-I do"; (2) advanced theoretical education comprising a number of subjects, where the teacher was a highly qualified expert who taught the subject according to his/her individual plans. Consequently, education in pre-industrial society as well as the corresponding educational environment can be characterized as personal, with direct teacher-student contact.

The bright ideas brought forth by John Amos Comenius served as the basis for education in industrial society. A class-oriented educational system was created that perfectly matched that of society, with its orientation toward the production of goods and industrial progress. One of the main peculiarities characterizing industrial society education is its social orientation toward formalization/standardization. The meanings and terms of a formal curriculum, a formal class, and a formal lesson were established in the Age of Enlightenment. The classroom-lesson environment unifies and standardizes relations between teachers and students, thus, defining the social role of the teacher in society. In contrast to pre-industrial society education, which is personalized education, industrial society can be characterized as having socialized education.

In contrast, post-industrial society is considered as a society of services rather than a society of production. In our opinion, post-industrial education has undergone a new process of fulfilling the role of a teacher (the teacher's authority). This is manifested by the self-educational activity of today's students having ubiquitous access to information, in which the teacher is no longer the unique content provider. In the post-industrial school, the classic classroom-lesson system loses

its usual significance. The ubiquitous manner of acquiring knowledge changes the conventional meaning and the essence of the traditional classroom. We refer to this new type of classroom as a ubiquitous classroom.

The idea of personalizing the educational process was first proposed by Seymour Papert (Papert, 1980). It is clear that the idea of personalization conflicts with the conventional classroom-based educational process. Papert and his followers perceived the classroom-based system as an obstacle to social progress and as contradicting the fundamental principles of cognition (Papert, 1991). Naturally, this brings to mind a dichotomy view in which society is divided into two portions: (1) conservative, based on a classroom-oriented system, the centralized curriculum, the authoritarian teacher, the omnipotence of the Ministry of Education, and (2) progressive, having students at the center and symbolizing the rejection of centralism and based on the principle of individualism.

Papert and his followers consider the new liberal school as based on the principles of constructionism (Harel and Papert, 1991; Cakir, 2008). According to these principles, the student builds his own micro-world, in which he implements his own cognitive abilities. In this way, the idea of decentralization and individualization has merged with the ideas of progress, freedom, and creativity. In contrast, the old, classroom-oriented system was associated with a centralized authoritarian education that does not take into account the individual student. At the same time, the idea of constructionism was fundamentally related to the use of computers in the classroom. The computer has played a revolutionary role in the constructionist approach, radically changing classroom-based education.

As seen from the above, an idea proclaimed 30 years ago returns to the forefront of educational processes and learning environments, and in fact, it serve as their principal component. Obviously, nobody speaks about returning to the Middle Ages, with their "do-as-I do" education. The personal

micro-worlds mentioned in the preceding section are of major importance, since a student studies the surrounding world when operating in his personal micro-world. Nevertheless, one may obviously notice that the growth of the personalization component in the educational process proceeds concomitantly with a significant reduction in the role of the social component of education.

One of the important points of our paper lies in understanding the fact that such a highly individualized educational process does not correspond enough to our increasingly complex urban post-industrial society. Neglecting the social component in favor of personal component, while constituting the core idea, poses a serious problem. Developing a modern society is linked to rapid growth of communications and as a result, with unprecedented socialization of society. Under these circumstances, obviously, private individual micro-worlds that generated such an impressive breakthrough in the 1980s will soon be transformed into so-called social micro-worlds, though the remaining personal component. Such social micro-worlds can now be seen in the form of various social networks, blogs, Web 2.0 means, etc., which has changed the live styles of millions of people and has become increasingly more popular in our daily life. The relationships of our personal and social lives are rapidly changing. This, in turn, has affected education both at the level of the educational process and at the level of learning environments.

It is important to emphasize that both historical forms of acquiring knowledge considered in the previous chapter, and the historical forms of educational processes discussed in the present chapter indicate the great importance and inevitability of the socialization of education and the learning environments. Note that this does not occur by accident: awareness of the fact that the information technology is a social phenomenon and is not a technological phenomenon constitutes one of the most important achievements in the development of our modern society at this stage.

3. PERSONALIZATION OF THE CONTEMPORARY LEARNING ENVIRONMENT

3.1. Personal Identity Online in a Post-Industrial Class Society

Pure virtual micro-worlds, when representing a highly personal learning environment, are often devoid of the most important component of education - the social component. This highly significant component has successfully fulfilled learning environments in the post-industrial era. But does a student's connection to a global network deprive the learning environments from their individual, private components? (The private component has always been an essential component of learning environments). The answer is unequivocally negative. The fact is that "a network-based student" implements a so-called cyberspace Personal Identity Online (PIO) (Floridi, 2011).

The concept of PIO is relatively new. It personifies a specific characteristic of an individual's behavior in a network environment, which manifests itself in the form of a unique opportunity to form and exhibit the individual's identity differently than is done in reality. The world network of unsurpassed access to data opens up new opportunities for self-expression and the formation of identity. We consider the PIO to be a form of personalization that typifies modern learning environments.

3.2. Personal Identity Online as an Extension of Papert's Ideas

The last 30 years ushered in years of intensive computerization of society and of incredible achievements in information technology. Perhaps the idea that micro-worlds will replace classroom-based education was just an illusion. Our goal is to show that this was not the case. Here, we will show that the constructionist approach successfully describes the coming post-industrial educational system, but that it needs some clarifications.

The first clarification concerns individualization of the educational system and its resources. Modern ideas about a new educational system are based mainly on the opposite opinion. Personalization is not considered to be related to individualization of computerized resources. On the contrary, the distribution of our resources turned out to be more intensive and that is why distribution increased personalization. This is especially evident in the phenomenon of "cloud" computing in education (Sultan, 2010; Geth, 2010).

The second clarification concerns the intimacy of the educational process. This position is worthy of our support. Papert noted that 30 years ago and we also see that personalization of the learning process is strongly connected with expressing and forming the learner's personal identity. Moreover, today we extend the concept by introducing Personal Identity Online (PIO) (Floridi, 2011) - an identity that a user establishes in online communications – the concept that constitutes the essence of post-industrial digital life. As is well known, the task of forming a learner's personality is one of the main pedagogical tasks that concern today's educators. In former societies, this task was carried out by the education system in reality. However, personality is something multi-dimensional and goes beyond its "linear" incarnation. The PIO removes personality from its default state, enabling it to appear in a new dimension.

The recent learning environments are not just customized microworlds but instead are individual micro-worlds constructed in virtual space and are interconnected with one another.

On the one hand, Papert's ideas for reforming education, such as a virtualized environment for learning, are, without a doubt, much appreciated in our study. On the other hand, over the past 30 years, many changes have occurred in an ever-developing society that could not be accounted for by Papert. Among them is the rapid development of mobile technologies and ubiquitous communication in the background of a complete virtualization of society. These changes led us to conclude that ubiquitous communication with vir-

tual reality is not just a technology but is also a way of life. Taking into account the examined trends, as well as the fact that educational technology is increasingly becoming a part of our daily lives; it seems reasonable to expand the instrumentalist approach of Papert. To this end, we propose to review and study a virtual learning environment as an alternative system, including the ends and means and human-controlled technology; in other words, implementing a virtual adaptive training system for the virtual community.

All together, with the latest development in broadband wireless communications, a growing number of virtual communities are being created where a user (a student or teacher) actively behaves behind his personal identity in creating the Personal Identity Online (Ke et al., 2011; Rodogno, 2011). Personal Identity Online is a social identity platform that a user establishes in online communities and websites. Although some people prefer to use their real names online, some internet users prefer to be anonymous, identifying themselves by means of pseudonyms that reveal varying degrees of personally identifiable information (Bowman, 2011; Rodogno, 2011).

In a modern world, in which the division between online and offline is being erased (Floridi, 2011), and where the online world does not respect geographical boundaries, "the self uses the digital imaginary concerning itself to construct a virtual identity through which it seeks to grasp its own personal identity (the question ''who am I for you?'' becomes ''who am I online?''), in a potentially feedback loop of adjustments and modifications leading to an equilibrium between the off-line and the online selves" (Floridi, 2011).

We propose developing Seymour Paper's Personalization and Virtualization approach, which one may call a Personal Identity Off-line by adding a Ubiquitous trend to the new Personal Identity Online that we study in the context of the Personalized Ubiquitous Educational Environment. Specifically, we study (1) the role of the Personal Identity Online in creating the soft skills

used by the students and (2) how the teachers may help students to apply these skills (Cohen, 2009; Shute, 2009).

In this context we study both the identity a user constructs by him and the identity the user constructs through others (Amelung, 2007). In the Personalized Ubiquitous Educational Environment, the identity that a user constructs through another person comes from the information that is currently available. The forms of information, including online availability, quality of work contributed, and replies in discussion forums, significantly contribute to shaping and transforming his identity.

Another important point related to identity is that the online identity is always present and accessible to others (Amelung, 2007). For any objects uploaded to the environment, or, for example, communications in collaborative tools, the information remains readily available and continues to influence the actions of others, even if the user is not currently on-line in the system. Users construct identities of others by knowing about and interacting with the continuously changing information provided through ongoing learning activities. Therefore, a user constructs his identity by first knowing what information he has contributed to the social context and more importantly, by knowing how others act on that information. This activity has an impact on the shared social context of a learning social community because the artifacts that personalize each user are always available and accessible (e.g. ubiquitous).

3.3. Personal Identity in On-Line Discussion Forums

The increased personalization in education is also realized by the increased importance of soft skills, such as discussion ability and meta-cognition (Cohen, 2009; Shute et al, 2009), compared with professional skills. We also believe that in order for students to master soft skills, modern teachers should apply these skills on a regular basis.

Teachers' meta-cognition is one of the most important personal variables that affect their engagement in modern educational environments, which include the information-seeking behaviors, the processing of information gathered in online environments, discussion forums, etc. Activities such as planning how to approach a given task, monitoring comprehension, evaluating progress toward the completion of a task, and knowledge of these activities are meta-cognitive in nature, so an important step in enhancing the education environment outcomes is to obtain clarity with regard to the influence of meta-cognition on how and how often teachers and learners bring themselves into the learning process in online forum discussions.

As part of our main hypothesis described in the Introduction we propose investigating the relationship between different components of the Personalized Ubiquitous Educational environment and participation in online discussions as well as analyzing strategy variables or factors that can influence cognition and knowledge building. One such component is Personal Identity Online, which as discussed in (Ke et al., 2011). This is correlated with the content of students and teachers' participation in online discussion and hence, facilitates building collective knowledge. It is critical to design online interaction contexts to support identity presence in a manner that promotes students' meta-cognition and development of soft-skills for constructing a community collective knowledge rather than simply sharing experiences and individual insights.

Teachers' meta-cognition affects their effective participation in online discussions and in comprehending the main ideas in online discussions, in constructing links between previous and new knowledge in multiple message sequences, and in evaluating the available resources. Teachers who effectively use meta-cognitive knowledge are largely strategically inclined and may utilize a cognitive platform to identify relevant content and applicable services in the right place and at the right time, depending on their context. Mutual

message exchange between participants can take place at any time. Participants must read the messages and ask questions, make comments; provide answers, and other useful feedback.

In the developed Personalized Ubiquitous Educational environment, each teacher is obligated to participate at least twice a week in the educational discussion forum, thus increasing the interactivity. Each teacher's message in the forum discussions is assessed in terms of the interaction types of the coding technique developed by McKinnon (2000). A grading rubric developed by Topku&Ubiz (2008) is used to score the teachers' messages, thereby determining the quality of their participation in covering all the components of meta-cognition: meta-cognitive knowledge, meta-cognitive judgments and monitoring, and self-regulation and control of cognition.

In order to investigate how discussion forums influence students' soft skills, teachers should encourage students to participate in discussion forums as well. Teachers help their students to use search tools such as Google, Yahoo, and other education cloud searching tools and to follow useful links in an educational Web site such as Moodle. They should even provide some keywords, depending on the context and new information or experiences, and set up checkpoints for knowledge of self as well as deepen the discussions.

The online discussions in general also serve to provide teachers with a tool to support their students with one of the most important soft skills, namely, the ability to effectively communicate. The results will help teachers adjust the topics of the online discussion forums.

Personal Identity On-line, as part of the social presence of the participants, directly affects variance in the quality of the participation, which refers to the degree of engagement in meaningful discussions and collective knowledge building (Ke et al, 2011). PIO promotes the creation of new features in a system of education that would induce scaffolding of students' thinking, which consequently can increase students' "knowledge

of self", stimulate interactive, rich messages, and stimulate effective use of the educational cloud computing tools. Instructing and guiding tools may force students to assess their learning needs, and enhance the use of meta-cognition strategies.

3.4. Personal Identity On-Line in Digital Curation

Digital curation (Higgins, 2011) is one of the most innovative and widespread kinds of network behavior. Curation a special form of blogging, in which students receive an input stream of data generated in accordance with a predefined set of keywords (tags), and then carry out their own filtering (with supervision) by selecting the messages (data), which in the student's opinion, are of interest and are "worthy" of being included in their personal "curation blog".

The result of "individual curation" is a comprehensive curation stream. This stream, in turn, has quite a personal character, because an element of the infosphere has been introduced. The curation corresponds perfectly to the present stage of social media. The streams, whose authors are both students and teachers, may freely interact, thus forming meaningful networks. The role of these networks and their dynamics in education is great. The curated streams are able to interact with each other. Meta-curation should be understood as management of the curated streams. In post-industrial classes, meta-curation may become one of the main activities used by the teacher. Hence, the new conditions greatly change the previous role of the teacher. The Meta-curator (teacher) directs the streams in a productive direction, in accordance with the curriculum. Actually, in a classroom, the teacher can be considered as the curator, who is the first among equals.

One can imagine a variety of learning activities associated with the curated content.

In the above context, one should note that the learning activities have evolved in the classroom as follows.

- In a traditional classroom, the process goes from observation - to forming the content, then to an oral and written statement of the content. Alternatively, the process may start by remembering something, or from reading some content, and it may be followed by remembering the content and introducing it as a restatement; this process may consist of a presentation or a composition.
- In the post-industrial class, the process may be much shorter: from learning the material, web surfing, and searching, the process may comprise analysis and preservation of the content and, ultimately will lead to the curation.

It is important to emphasize that the apparent superficiality of the modern educational process, in comparison with the traditional process, may be just an illusion. Perhaps we are simply not accustomed to the new reality of information that, in turn (and of course), needs to be investigated.

3.5. The Concept of Personalized Ubiquitous Educational Environment

We consider a post-industrial society as virtualized (Ivanov, 2006), where man-machine interfaces increasingly alienate an individual from social reality. The epistemological basis of our study lies in using the constructionist approach, which claims that human learning is achieved within socialized personal micro-worlds created by humans (Papert, 1980). Virtual society is a complex global micro-world created by individuals from their micro-worlds, which replaces the social reality of the industrial society.

We define the following three principles, which are applicable for education:

- Virtualization of reality involves transforming reality into a new context - a form of simulated reality, a new form of mani-

festing universal human activity by creating new knowledge, thus expanding the boundaries of objective reality. One of the major new examples of virtualized reality is that of the cloud (Satyanarayanan et al., 2009), where the educational content forms a new educational cloud paradigm (Sultan, 2010; Geth, 2010).

- Ubiquitous reality is a virtual reality (including educational content), with which the student and teachers maintains permanent communication in time and space. This permanent communication with the educational content by also adding learners' location and social context is called Ubiquitous Learning (Dede, 2011; Graf & Kinshuk, 2008).
- Personalization is concerned with forming a personalized learning environment. This process is based on adapting to the learner's profile by using various technologies for investigating the specific learning history of past training activities, i.e. personal identity by using educational data mining.
- The above three phenomena are graphically presented in Figure 1.

Ubiquitous reality, as shown in Figure 1, is a personalized projection of virtual reality, available for the student with the help of a mobile terminal (laptop, cell phone, iPhone, iPad, etc.).

In a Post-Industrial society, in which the division between online and offline is being erased, "the self uses the digital imaginary concerning itself to construct a virtual identity through which it seeks to grasp its own personal identity in a potentially feedback loop of adjustments and modifications leading to an equilibrium between the off-line and the online selves" (Floridi, 2011). From the other hand, Seymour Papert's Personalization and Virtualization approach, which one may call a personal identity off-line by adding a Ubiquitous trend transforms to the new Personal

Figure 1. Scheme of a personal ubiquitous educational environment based on three principles: Virtualization, ubiquitous reality, and personalization
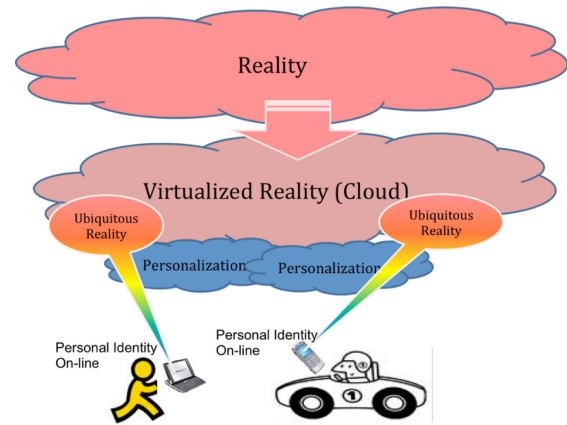
Identity On-line (PIO) that we study in the context of the Personalized Ubiquitous Educational (PUE) environment.

Activities such as planning how to approach a given task, monitoring comprehension, evaluating progress toward the completion of a task, and knowledge of these activities are meta-cognitive in nature, so an important step in enhancing the education environment outcomes is to obtain clarity with regard to the influence of meta-cognition on how and how often teachers and learners bring themselves into the learning process in online forum discussions. PIO is correlated with the content of students and teachers' participation in online discussion. It is critical to design online interaction contexts to support PIO presence in a manner that promotes students' meta-cognition and development of soft-skills for constructing a community collective knowledge rather than simply sharing experiences and individual insights.

Teachers' meta-cognition affects their effective participation in online discussions and in comprehending the main ideas in online discussions, in constructing links between previous and new knowledge, and in evaluating the available resources and exploring those tools that will be used in communicating with the teachers' com-

munity as well as for creating and customizing their Personalized Learning Networks (PLNs) (Curos, 2010) that include social communities, forums and digital curation networks (Higgins, 2011).

3.6. Personalized Ubiquitous Educational Environments for Teachers' Training

We hypothesized that the most suitable learning environment for postindustrial education is the personalized ubiquitous educational environment. Indeed, the PUE environment is perfectly supported by recent advances in mobile technologies, including the extensive development of multiple social networks, allowing students to be constantly linked to the material being studied, as part of various educational forums (Cohen, 2010, Johnson, 2010, Yang, 2006).
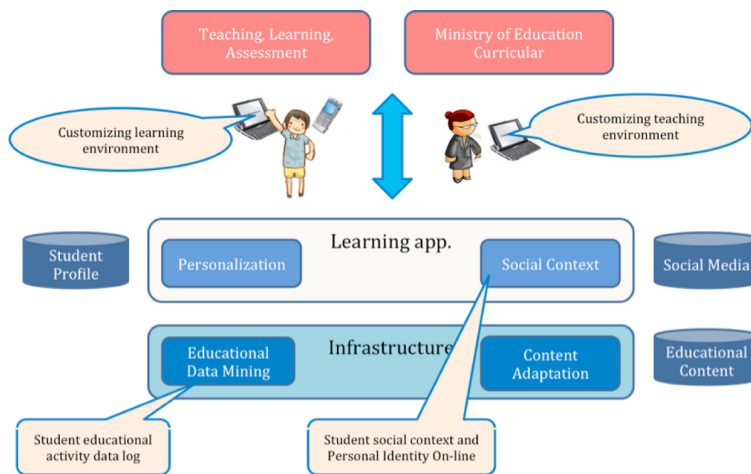
The personalized ubiquitous educational environment can be characterized by the following (See Figure 2):

- It comprises all the necessary components that can be formalized/computerized.
- The environment may take the form of a dialog system adaptable to specific stu-

dents' needs, and it is based on information about the student (educational data mining), which is strictly private and stored in his profile.

- The teacher's position in the environment is radically changed in comparison with the traditional class. The teacher (the mentor) now becomes a counselor and coordinator. The teacher is also one of the developers and users of the environment, including curriculum products and tools used to evaluate the progress (rather than knowledge) of the learner.
- Any educational content can be automatically synthesized and transformed to any form that is most applicable for the student, with extensive use of multimedia.
- An important component of the learning environment is a user's Social Presence status and his location, which can be used to adapt learning materials according to a specific geographical location and a situation within a learning environment. The Social Presence status includes the Personal Identity On-line (Rodogno, 2011; Amelung, 2007), which will constitute one of the main parts of our study.

Figure 2. Personalized ubiquitous educational environment for teachers' training

The study of the proposed Personalized Ubiquitous Educational (PUE) environment is done in the context of teachers' communication with the environment, its use in the class and even active participation in its customization. The study includes the development of a curriculum for teachers training in the PUE environment. During the training interviews with the teachers are held with the purpose of understanding how teachers use technology in their classrooms (practices), as well as why they decide to use technology in those ways (values, beliefs, targeting specific needs), as proposed by Lopez & Willis (2004). The results of these interviews are studied in conjunction with the epistemology tests that teachers undergo before, during and after the training – specifically using the environment by teachers in the class (Russel M et al., 2007). The collected data includes evaluations on teachers' traffic pattern during their use of the environment. These evaluations pass meta-cognition analysis in order to assess the level of meta-cognition of their interaction with the environment as proposed in Topku & Ubiz (2008). The correlations among the various aspects of teachers' beliefs and their participation in online discussions in the forums using their Personal Identity On-line are studied by using the methods described by Wang & Chai (2010) and Song & McNary (2011).

4. STUDY OF TEACHERS' TRAINING BASED ON A PERSONALIZED UBIQUITOUS EDUCATIONAL ENVIRONMENT

In this section, we provide a description and some preliminary results of our research, the aim of which is to check the main idea presented in the previous sections. We investigate what occurs in a contemporary teachers' training class with intensive use of the Personal Ubiquitous Educational (PUE) Environment. Specifically, we study two main fundamental phenomena: personalization and socialization.

4.1. Research Methodology

The research includes developing a curriculum for teachers' training in the Personalized Ubiquitous Educational Environment. During the training, we study meta-cognitive aspects of teachers and students' interaction with the environment and the inter-connection between meta-cognitive and epistemological aspects of this interaction.

Population Studied

A group of 10 teachers took part of the course and participated in the study. The course lasted half a year (1 semester). Teachers were required to have only a basic understanding of using technology in their classes, such as the ability to use Power Point software for preparing teaching material and having only basic Internet skills. There were no limitations regarding the professional background of the participants. The participating teachers were requested to adopt a Personalized Ubiquitous Educational environment in their classes.

Research Tools

Interviews

The research included personal interviews with the participants before the intervention and afterwards. The interviews were based on (Lopez & Willis, 2004) and (Russell M et al., 2007). During the interviews, the teachers were asked about their epistemic beliefs regarding using educational technology in their classes. The study uses the life experiences of the teachers in order to better understand how teachers use technology in their classes, as well as why they decide to use technology in specific ways (values, beliefs, targeting specific needs). During and after the course, additional interviews with the teachers were conducted. The interviews were semi-structured and based on correlations among the various aspects of teachers' beliefs and their online interactions in building knowledge using the methods described in (Wang & Chai, 2010).

Personalized Ubiquitous Educational Environment

The Moodle-based environment is used as a tool for collecting the data and as a data-mining tool. This tool collects data about teachers' online interaction with the content as well as during their online discussions in forums. In this context, we studied both parts of the teacher's Personal Identity Online: the identity that a teacher constructs by himself and the identity that the teacher constructs from others (Amelung, 2007). In the Personalized Ubiquitous Educational Environment the identity that a teacher constructs from others comes from the available information. The forms of information, including on-line availability, the quality of the work contributed, and replies in discussion forums, significantly contribute to shaping the identity. The collected data are analyzed in conjunction with the data collected from the interviews.

4.2. Course of Study

The study includes both qualitative and quantitative research and is divided into three parts answering the three research questions as part of main research hypothesis described in the Introduction.

The First Part of Study: Preliminary Interviews

The first part of the study includes interviews with the participating teachers, which focus on their epistemic beliefs about using educational technology in their classes. The study uses the life experiences of the teachers in order to better understand how teachers use educational technology in their classrooms (in practice), as well as why they decide to use this technology in specific ways (values, beliefs, targeting specific needs, etc.), as proposed in (Lopez&Willis, 2004). The collected data include (Russell M et al., 2007) the following factors (or categories) for using teacher technology:

1. Teacher's use of technology for preparation.
2. Teacher's use of technology for delivery.
3. Teacher-directed student's use of technology.
4. Teacher's use of personalized learning networks (social communities, discussion forums, etc.).

The main purpose of the first part of the study is answering the first research question: how teachers' beliefs may potentially affect their success in deploying a new environment and in developing their Personal Identity On-line.

The Second Part of Study: Intervention

A new course for teaching in a Personalized Ubiquitous Educational Environment is being developed in the School of Education at Tel-Aviv University. This course includes a number of essential theoretical topics that allow teachers to better understand the new sociological and technological trends influencing education, as described in the previous chapters. There are a number of practical exercises within the agenda of the course, allowing teachers to explore those tools that will be used in communicating with the teachers' community as well as for creating and customizing their Personalized Learning Networks (PLNs) (Curos, 2010). For instance, the teachers' PLN includes social communities, forums and digital curation networks.

The second part includes evaluations of teachers' traffic patterns during their use of Moodle. These evaluations encompass meta-cognition analysis in order to assess the level of meta-cognition of their interaction with the environment, as proposed in (Topku&Ubiz, 2008).

The discussion forum is an example of a tool used for constructing and managing knowledge collaboratively by posing certain types of engaging activities, such as facilitative/guiding questions and examples of real cases (e.g., videos and episode dialogues). Teachers' meta-cognition is one of the most important personal variables that affect

students' engagement in the environment task as well as their creative ability to solve problems. This includes a deeper level of understanding, the development of higher-order thinking, increased information-seeking behaviors, the processing of information gathered in online environments, etc. Activities such as planning how to approach a given task, monitoring comprehension, evaluating progress toward completing a task, and knowledge of these activities are meta-cognitive in nature, so an important step in enhancing education environment outcomes is to obtain improved clarity with regard to the influence of meta-cognition on students' learning and to assess how often teachers and students are engaged in the learning process through online forum discussions.

Therefore, the main purpose of the second stage is answering the second research question: what is the relationship between different components of the environment and teachers' participation in online discussions as well as what are the strategy variables or factors that can substantially influence cognition and knowledge building. One such component is the Personal Identity Online, through which students and teachers participate in online discussions and correlate content, and hence, engage in collective knowledge building. It is critical to design online interaction contexts to support identity presence in a manner that promotes students' meta-cognition and development of soft-skills for constructing community-based collective knowledge rather than simply sharing experiences and individual insights. Teachers' meta-cognition affects their effective participation in online discussions, comprehending the main ideas in online discussions, constructing links between previous and new knowledge in message sequences, and in evaluating the available resources. Teachers who effectively use meta-cognitive knowledge are largely and strategically inclined and might have a cognitive platform to effectively identify the relevant content and applicable services in the right place and at the right time, depending on their context. Mutual

exchange of messages between participants can take place at any time. Participants must read the messages and ask questions, make comments, and provide answers.

Each teacher must participate in the discussions at least twice a week. The discussion forums are based on the learning environment, causing increased interactivity. Each message from teachers in the forum discussions is assessed regarding the interaction types of coding technique developed by McKinnon (2000). A grading rubric developed by Topku&Ubiz (2008) is used to score the teachers' messages, thereby determining the quality of their participation; it covers all components of meta-cognition: meta-cognitive knowledge, meta-cognitive judgments and monitoring, as well as self-regulation and control of cognition.

In order to study how discussion forums affect teachers' soft skills, teachers are encouraged to participate in the discussion forums. It is suggested that they use search tools such as Google, Yahoo, and other education cloud searching tools and that they follow useful links at the Moodle site. The teachers are even provided with some keywords, depending on the context and new information or experiences, to set up checkpoints for knowledge of self and to deepen the discussions.

The correlations between the various aspects of teachers' beliefs and their online interactions are studied by using the method described in (Wang & Chai, 2010).

The Third Part of Study: Interviews after the Intervention

The third part includes interviews with teachers centered on their practical experience in using the Personalized Ubiquitous Educational Environment. The purpose of this part is answering the third research question: how teachers expect to use the new environment in their classes as well as what features they believe are more successful and what factors should be considered for further development. The results may promote the creation

of new features that would help the scaffolding of students' thinking and stimulate interactive and rich messages and effective use of education tools. New instructive and guiding tools may force students to assess their learning needs, and enhance the use of meta-cognition strategies.

4.3. Preliminary Results of Study

The results of the teachers' participation in the discussions are scored in terms of meta-cognition (Topku&Ubiz, 2008). The following interaction types are taken into account:

- Acknowledgement
- Questions
- Comparison
- Contrast
- Evaluation
- Idea for an Example
- Clarification/Elaboration
- Cause and Effect

The distribution of the teachers' messages according to interaction type and their meta-cognition level, as well as the number of interactions (initial post, response to the initial post, response to other responses, etc.) is coded accordingly (Topku&Ubiz, 2008).

The preliminary results imply that instructors should encourage teachers to promote their Personal Identity On-line by sending messages explaining or clarifying concepts using examples from their education practices. Using keywords or tags as described above in the context of digital curation is highly appropriate for this purpose. These messages usually contained high levels of interactions, motivating teachers to control and check in their minds their knowledge structure as related to concepts under discussion. This fosters high-level meta-cognition and stimulates students' awareness of knowledge of the task and self. It also relates the course content to prior knowledge and experience, as well as makes inferences.

In measuring the correlation between the presence of Personal Identity On-line in the discussions and the high level of meta-cognition, the following findings were reported:

Online posts and replies in discussion forums with high-quality work and out-of-box thinking significantly contribute to shaping the Personal Identity, gain followers, and promote multiple citations.

On-line discussions with participants who's Personal Identity relies on trustful personal experience, based on educational practice, are usually associated with more follow-up participation in discussions, implying a higher rate of meta-cognition in the overall discussion.

One of the most significant findings of our analysis is that online forum designers should explicitly encourage Personal Identity Online expression within online interactions. This may be achieved by developing the tools and means needed to promote discussions that are both creative and present identity. For instance, educational instructors can reward highly meta-cognitive online discussions that present identity.

Another finding, also suggested in (Ke et al, 2011), is that in order to promote meaningful on-line discussions, it is critical to promote the creation of social community-based identity. This idea links identity presence with collaborative knowledge, where online students not only express their personal identities but also construct a joint social identity in order to achieve collaborative knowledge building.

5. CONCLUSION

Recently society has been undergoing a period of significant changes in all aspects of life. The educational system, as one of the fundamental institutions of modern society, consequently is strongly affected by these changes. The new educational processes that have appeared in our post-industrial society, as well as the correspond-

ing innovative learning environments, were the focus of our paper.

We considered the new education system in a historical perspective by analyzing the evolutions of (1) forms of acquiring knowledge and (2) forms of educational processes.

In analyzing both of the above evolutions, we claim that recently education has evolved under the strong influence of two contradictory tendencies: personalization and socialization. Personalization is manifested as a new phenomenon "Personal Identity On-line", characterizing the recent most popular activity of humans – their life in cyber-space. Socialization is manifested in the form of the phenomenon of Social Media, characterized by new forms of social relations and public awareness of a virtualized post-industrial society.

In view of such a dialectic point of view regarding the personalization and socialization phenomena, we formulated requirements for the educational environment of a new type – the Personalized Ubiquitous Educational (PUE) Environment. We conducted our research on the basis of the PUE.

Our study, conducted in a teachers' training course, and which was based on the extensive use of the PUE, was aimed at addressing a number of questions in order to verify our hypothesis about personalization and socialization.

In particular, we studied the phenomena of the Personal Identity On-line and Social Media by analyzing the behavior of teachers participating in the teachers' training course in our "post-industrial class". As was reported in the paper, the preliminary results of our study strongly support our initial beliefs.

The main result of our paper is justification of our working hypothesis that a) personalization, which is manifested as a new form of Personal Identity Online and b) socialization, which is manifested as various forms of social media, are correct and useful concepts for studying and better understanding the educational environments of our post-industrial society.

We believe that the presented approach opens up the way for future studies concerning various issues involving our post-industrial educational systems.

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KEY TERMS AND DEFINITIONS

Personal Identity Online (PIO): Identity that a user establishes in online activities and experienced in a variety of ways depending on what activity is undertaken: e-mail exchange, participating in web forums, exploring virtual worlds, or simply surfing around the Internet. One's online activities through one's PIO can affect, expand and alter the way in which one view him-self.

Personalization: A process concerned with forming a personalized learning environment. This process is based on adapting to the learner's profile by using various technologies for investigating the specific learning history of past training activities, i.e. personal identity by using educational data mining.

Personalized Ubiquitous Educational (PUE) Environment: An educational environment leveraging virtualization of social reality, personalization processes in education and ubiquitous access to the learned content. PUE comprises all the necessary components that can be computerized and be adaptable to specific users' needs where students and teachers are both the developers and the users of the environment. An important component of the environment is users' personal identity online that can be used to adapt learning materials.

Social Media: A cultural phenomenon, substantially intensifying and enhancing interpersonal communication and significantly altering the nature of the relationship between an individual and a society.

Ubiquitous Reality: Virtual reality (including educational content), with which the student and teachers maintains permanent communication in time and space.

Virtualization of Reality: A process that involves transforming reality into a new context - a form of simulated reality, a new form of manifesting universal human activity by creating new knowledge, thus expanding the boundaries of objective reality.