

# PEDAGOGY 2.0 IN PRE-SERVICE TEACHER EDUCATION

By

**TAMI SEIFERT**

*Senior Lecturer, Kibbutzim College of Education, Tel-Aviv.*

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## **ABSTRACT**

*The article reviews the use of Web 2.0 environment in teacher education, emphasizing the constructivist social pedagogy approach. Pedagogical abilities of Web 2.0 tools are discussed, demonstrating their applications in teaching various subjects, especially to assist collaborative and creative learner-oriented teaching. Contributions of these tools to teaching-learning are described in three collaborative environments-based courses. The tools included: forums, collaborative synchronous lectures, Wiki environment, a closed Facebook group, blog writing, collaborative documents writing, using smartphones in lessons and location-based activities, class YouTube channel for student-teachers' clips and debates, structuring collaborative knowledge and online anonymous peer assessment regarding discussion on digital citizenship, group data collection through surveys etc. Intertwining various environments to assist course teaching increased student-teachers' awareness of effective exploitation of these environments for teaching objectives. Pedagogical considerations for choice of tools, environments, and applications are discussed. Conclusions relate to the contributions of ICT, contents, and pedagogy integration to teacher education.*

*Keywords: Web 2.0, Web 2.0 Tools, Pedagogy 2.0, Collaborative Tools, 21<sup>st</sup> Century Skills, Pre-service Teacher Education, Learning Design, Constructivist Pedagogy.*

## **INTRODUCTION**

Changes occurring in the technological field in the current era present many challenges to the teaching role and many teacher-educators feel that they lack the abilities to appropriately train a new generation of teachers. Today's teachers have an important role to play in providing appropriate tools to their pupils so that, they can realize their cognitive and technological abilities. To adapt to the demands of the modern era, Daggett (2005) suggests altering the focus of teaching from a teacher-oriented focus to a student-oriented focus so that, the teacher guides, directs, and supports the student's learning process. He believes that this is the only way in which the learners can develop leadership skills, team work, and the essential skills that they need to cope with challenging issues in modern daily life.

An important part of present-day teacher training now involves the development of teaching skills for computerized environments, improving mastery of digital tools and development of the ability to harness these tools,

for innovative, relevant, and challenging teaching. Computerized environments offer improved possibilities for active constructivist student-focused learning (Kear, 2011), stimulating motivation and critical thinking. The use of the new technology creates opportunities to expand teaching-learning methods and the manner of their implementation and sets challenges to educators regarding the way in which to shape their teaching. Teachers are expected to acquire knowledge that will allow them to make the appropriate choices and use technology intelligently to blend different learning contents with the different available technological means and pedagogic considerations (Technological Pedagogical and Content Knowledge, T-PACK) (Koehler and Mishra, 2005). Educators are required to think about the adaptation of teaching methods to a constantly changing world, in which digital activities are integrated regularly in teaching.

With the introduction of computerized activities in teaching, learning is created through the learners'

interaction with materials displayed on the web. This is in line with the Connectivist Approach, since this activity allows participation in creative processes, the processing of information and learning, and produces mutual relations between participants in the formation of common knowledge (Siemens, 2006). This approach alters the way in which people learn and opens up alternative ways to learn and teach. Connectivism represents a transition from teacher-focused teaching to an approach that emphasizes creation of contents and is led by the learner. This type of learning experience is challenging and rewarding since, it expands teaching beyond the classroom boundaries. In activity of this sort the learner's needs, preferences, skills, and fields of interest are all taken into account (Conole et al., 2007; Gibson, 1977). Tim Berners-Lee (2000) the founder of Internet envisaged that the Internet would become a space where everyone had immediate access to the net, not only in order to surf, but also to create contents. And indeed, Web 2.0 technology facilitates the construction of a teaching model characterized by collaboration, an interactive net where independent learners can participate and cooperate through a variety of means of communication (Rogers et al., 2007; Sheely, 2006).

We have all witnessed the Web 1.0 age, where anyone could consume information but, only a very few persons were in charge of posting the contents. During this period, there was a clear division between those who produced the information, distributed it, or consumed it. McLuhan and Barrington (1972) argued that the electronic technology facilitated integration of the information producers with its consumers. In his book, *The Third Wave*, Toffler (1980) adopted this approach. He predicted that these functions would begin to merge and the boundaries between them would become blurred, he dubbed this the "Prosumer" process, welding together the terms professional/producer/ consumer. Bruns (2008) minted the term Producersage for the Web 2.0 world indicating that in a collaborative community in the digital space, the function of the consumer and end-user have long vanished. In the varied spaces of the net, the consumers have also become the producers although they are often unaware of the implications of their collaborative practice.

The Web 2.0 environment has become increasingly prevalent and it stimulates the creation of collaborative content creation, participation in social networks, sharing, and exchanging information as learners become active participants and teachers guide and support the learning process. The Web 2.0 tools allow educators to shape an updated learning environment while shifting the focus from information-based teaching to learner-oriented teaching (Tammets, Väljataga, and Pata, 2008).

To change the teaching paradigm, it is necessary to appropriately exploit applications offered by technology and examine the different ways in which they can be implemented. Technological developments offer an opportunity for re-defining the functions of the learner, teacher, and information, the teacher-learner-information interaction and the meaning of the teaching environment, and to define needs for social and cognitive support in these environments (Odom, 2010). Pedagogical uses of the different Web 2.0 environments constituted key components in the contents of the three courses studied in this research, aiming to prepare students for an informed implementation of Information and Communication Technology (ICT) in their teaching and learning process. These courses, which took place in a teacher education college are described in more detail below.

## 1. Background

### *1.1 21<sup>st</sup> Century Skills and Student-teachers' Training*

A study conducted in the USA by CDW-G (2011) with approximately one thousand high school pupils, teachers, and technological experts found that 84% of the students believed that technological means were important for their training, but these means were not exploited for their benefit by their teachers. According to the students, while 60% of the teachers use technology in their teaching, only 26% of the students noted that they were encouraged to use technology. 47% of the teachers noted that they did not form their lessons in such a way that students could use technology during the lessons. The review showed that, few teachers consider the need for 21<sup>st</sup> century skills in their classes although they conduct lessons in classrooms that have technological equipment, something that gives the students a sense of unpreparedness for their further studies

in higher education institutions, and a lack of preparation for future professions and the labor market that awaits them.

In their book "Born digital", Palfrey and Gasser (2008) estimate that approximately one billion young people have been born into the digital knowledge environments so that the use of these environments is natural for them, while the learning environments and teaching methods in schools have barely altered. Thus, there is a growing gap between the reality in school and the reality in which children live outside school. Today's school pupils employ alternative infrastructures, that threaten traditional face-to-face teaching. Access to information and knowledge, from any location and at any time, sets significant challenges to educators. The teacher is no longer the sole source of knowledge since the students are exposed to the widest possible variety of accessible media providing them with information, including mobile media. On the other hand, exposure to this reality creates opportunities for educators to examine their teaching methods, to bring themselves up-to-date and to lead an appropriate pedagogy. Thus too, an opportunity arises to reexamine the structure of the school, the classroom, and its components, school time management, the learning space, character of learning, learning programs and teaching-learning strategies and assessment. There is no other alternative other than to create an innovative education system, that trains its learners for the information-rich society in which they live, while harnessing the added value of technological means as pedagogic aids and as levers for learning.

### **1.2 Web 2.0 Environment in Teaching-Learning Processes**

A comprehensive report about the effects of the Web 2.0 tools on teaching and learning indicates that this environment offers new inquiry methods, creates varied opportunities for collaborative learning and expose learners to updated literacy (Crook, Fisher, Graber, Harrison, and Levine, 2008). Moreover, as part of the collaborative creation process, learners can express themselves through numerous means, improve their ways of expression and develop a sense of ownership of and responsibility for their works. They can also enhance the options of collaboration

through peer assessment.

This potential for constant creation and connectivity between the users constitutes a considerable challenge for those who wish to benefit from these tools in teaching-learning processes to implement social-constructivist pedagogy (McLoughlin and Lee, 2008). McLoughlin and Lee offer a definition of what they name Pedagogy 2.0, an environment which characterizes learners as content producers and encompasses: varied opinions, dynamic teaching, open, dynamic and reflective communication, accessibility to numerous formal and informal sources, and the ability to get support from a network of peers, teachers, experts, and communities.

The effectiveness of learner-oriented contents stems from the processes by which they are created, knowledge structuring, and collaboration as opposed to focusing only on the final product (Boettcher, 2006). In this Web 2.0 tools context, constructivism is an appropriate learning model, since these tools facilitate connection between people and ideas while encouraging personalization, collaboration and creativity leading to knowledge construction.

### **1.3 Innovative Pedagogy**

According to Salomon (2009), the introduction of technology was not accompanied by a change in the school culture, definition of teachers' role, and work methods. Consequently, there was no meaningful pedagogical change which justified the intensive work and massive investment in the equipment. Conole and Culver (2010) maintain that this stems from the fact that teachers are unaware of the potential embodied in the new technologies and lack competences to design learning activities which effectively make use of the technology.

Educators need to think about adapting teaching methods to the changing world, whereby IT activities are currently integrated into teaching. Puentedura (2011) suggests a SAMR framework for characterizing the level of technology-integrated teaching. This model consists of four levels: (1) Substitution – at this level technology is used for replacing older tools; (2) Augmentation – this level is close to the first level of use with additional functions; (3) Modification – at this level technology is used more effectively. Parts of the task are re-designed, thus modifying

the learning method; (4) Redefinition – this level is parallel to the high levels of thinking – synthesis and assessment – leading to teaching and learning models which are different from those not using technology.

Pupils today operate infrastructures of alternative learning which threatens the face-to-face traditional teaching. Indeed, we are required to reflect about mediating between the knowledge level of pupils whom Prensky (2009) calls 'natives' and the teachers whom he calls 'immigrants'. The more so teacher-educators who experience the accelerated changes, though some of them find it difficult to overcome the technological gaps (Seifert, 2015). Figure 1 illustrates the power relations between the three generations.

Figure 1, based on the model of Prensky (2009) and on the TPACK model of Koehler and Mishra (2005) presents the relations between the three generations: pupils, students, and lecturers. By virtue of their role, the lecturers are entrusted with the knowledge and pedagogy of future teachers' education. However, their technological literacy is mostly limited. Conversely, the students are reasonably versed in technological competences and are capable of coping with the technological needs at a realistic degree. Throughout their studies at teacher education institutions they are exposed to the teaching of traditional contents and pedagogy which lack the pedagogical models adapted to the spirit of the 21<sup>st</sup> century. When they come to

school, they are drawn into the traditional models which they have experienced still in their practicum period. In spite of the high exposure to technological means, the pupils on their part do not expect updated pedagogy and accept the teaching at school as is. They experience the gap between the varied uses they implement with the technological means and the way of teaching. The pupils consider the technological gap between the reality in and out of the class as self-understood. Accessibility to information and knowledge at any place and any time sets considerable educational challenges. Teachers are no longer the source of knowledge since the pupils are exposed to an extremely wide variety of interactive media which facilitate access to knowledge. This leaves no choice but, to establish an innovative education system which prepares its learners towards the society of knowledge in which we are living.

#### 1.4 ICT-Pedagogy Integrating in Teacher Training

Within the broader area of ICT, there is a widespread recognition of the need for ongoing professional development and support to integrate technologies effectively (Pelgrum, 2001; Van Melle et al., 2003). ICT offers various possibilities to education, but its implementation is challenging and many teachers still struggle to integrate technology in their teaching practice (Goktas et al., 2013). It is obvious that unless teachers perceive as valuable the new technologies, they will be unwilling or unable to use them meaningfully and therefore in-service teacher training programs should be carefully designed to provide teachers with skills to evaluate and integrate the appropriate educational software. (Nikolopoulou and Gialamas, 2016). According to Nikolopoulou and Gialamas, teachers' confidence with technology can be increased via attending appropriate in-service teacher training. In-service teacher training programs should be carefully designed as these are expected to provide teachers with skills to evaluate and integrate the appropriate educational software. Within the broader area of ICT, there is a widespread recognition of the need for ongoing professional development and support to integrate technologies effectively as well as technical, financial, and administrative support (Pelgrum 2001; Van

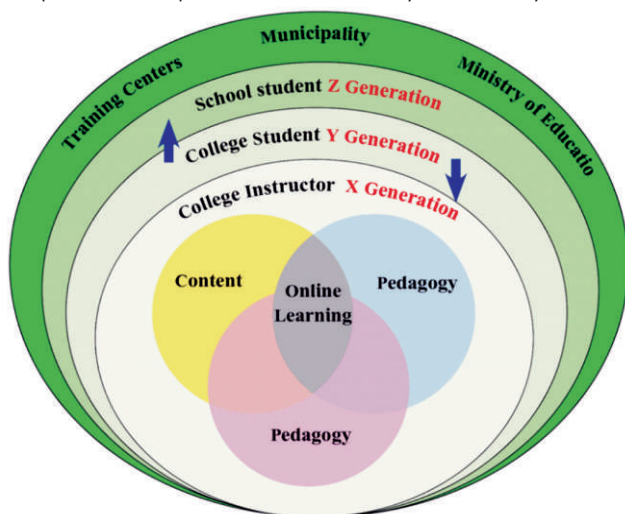


Figure 1. The 3-Generation Teaching Model and the Attitude of each Generation towards the Contents, Technology and Pedagogy [Adapted from Prensky (2009) and Koehler and Mishra (2005)]

Melle et al., 2003).

## **1.5 Description of the Learning Environment and the Course Structure**

The pre-service teachers [hereafter – “Student-teachers”] attended one of two compulsory courses entitled ‘Teaching and learning in ICT environments’ and ‘Teaching and learning in innovative environments’ conducted over an academic semester. The courses were taught using the learning management system Moodle. The environment was designed for information presentation and for communication. The information environment comprised the following elements: course contents, current messages, course activities, course tasks, blogs, an online activity diary, a timetable, and task assessment. The course communication activities in the Moodle included: message posting, forums, collaborative writing, self and peer online assessment, surveys, debate groups, blog writing, synchronous communication through a chat, task assessment, and personal report writing. The synchronous events were transmitted in a live Elluminate environment.

The course engaged in the following topics: search processes and information literacy, acquaintance with inquiry models including Webquests, blogs, and forums, collaborative learning – wiki, Google Drive tools, YouTube, interactive games, using technology to enhance escape room experience, experience of location-based learning through mobile technologies, training for online teaching, planning an ICT-oriented teaching unit, using Face book in teaching, pedagogical approaches in a technology-rich environment and education for digital citizenship. In each of the courses, the environments and contents were adapted to the students’ area of specialization.

This chapter presents, examples of activities performed throughout the course as well as an effective model for building online lessons. The courses were prepared and taught with due consideration of design and planning, and adjustment to the students’ needs.

## **2. Activities Performed Throughout the Course**

### **2.1 Social Networks and their Use in Teaching**

During the course, the lecturers and students managed a closed Facebook group. The group was intended to

discuss privacy issues on the net, to share applications, articles in the field of social networks and events and to familiarize the student-teachers with the potential of this environment and its limitations for teaching needs. Different student-teacher groups used the closed group in different ways. Some of the learning groups enlisted the Facebook environment for their needs, turning it into a platform for regular communication between the participants. Although the experience during the course was in the Facebook environment that was familiar for most of the students, various other social networks were presented that could be implemented and which provided responses to specific needs. This experience allowed the student-teachers who had previously chosen not to belong to one of the social networks, to get to know the environment and its different aspects and the issues that should be considered in its regard.

### **2.2 Use of Google Drive Tools such as Documents and Questionnaires and Surveys to Construct Knowledge and for Management**

During the course, questionnaires and survey were used both for the pedagogical aspect of teaching and the organizational management aspect. The student-teachers used the surveys to discover differences in their technological usage habits in comparison to those of their pupils or youth and to investigate the status of computerization in the schools. These surveys were administered over the last six years and allowed the student-teachers to identify trends concerning the level of computerization in different schools all over Israel over a period of years and differences in technological usage habits of adults in comparison to young people. Additionally, they administered questionnaires and surveys to obtain information concerning their preferred activities, days recommended for synchronized lectures, preferred transportation to trips (either independently or in organized transport), attitudes towards synchronized lectures in which they had participated and concerning which they could be immediately up-dated. During the course, the student-teachers employed these environments for personal uses both as student-teachers and in their practicum experience in the schools.

### ***2.3 Discussion of the Internet as the instigator of an educational-cultural revolution***

One of the course lessons involved reading information relating to the field of instructional technology and different viewpoints on its integration in teaching. In this lesson, the student-teachers used the "jigsaw" method. In the lesson, several excerpts from articles were divided into five areas. Questions were administered regarding each area, referring the student-teachers to reading. Learning took place through four main stages: At the first stage the class was divided into "mother groups" of five learners each (according to the number of areas). Each learner was given a different area to study. At the second stage, the "expert groups" stage, the learners regrouped into new groups according to the articles they had received to read in the area, they learned the subject and prepared a presentation that summarized the main points. At the third stage, the learners returned to the mother groups. Each learner in the group taught the other members of the group about the area in which they had become "experts" and together they learnt about all the areas. At the fourth stage, that deviated from the regular "jigsaw" structure, the student-teachers were asked to present their personal attitudes, approaches, and beliefs regarding the integration of technology in teaching and learning. At the end of the experiment, the student-teachers wrote up their personal reflections on the process. The jigsaw method, applied in the above-described activity, permitted the student-teachers to get to know the issues associated with the implementation of instructional technology in teaching over the years and to consolidate a pedagogical-educational self for the assimilation of technology in teaching in an intelligent manner. The "jigsaw" method was used in class with one of the groups to discuss TED talks on educational technology, using the "flipped classroom" strategy, having the students watch the TED talks at home and using class time to expand upon the content through collaborative learning.

### ***2.4 The use of a personal lecturer-student blog and a participatory blog***

The student-teachers were exposed during the course to different types of blogs and the possible ways in which they

could be used. On a personal blog, they wrote up their reflections concerning teaching contents and the teaching methods used over the course. Additionally, they managed regular communication between the lecturer and student-teacher on a shared blog and contributed their consideration on a collaborative blog on the course contents from their personal viewpoint. These environments helped both the lecturers and the student-teachers to think about learning and teaching processes and to share their learning experiences with the lecturer and other student-teachers.

### ***2.5 Lecture on Web 2.0 in a Synchronic Environment***

Over the course the student-teachers were invited to several synchronic events in an Elluminate environment, in which they could conduct regular communication in real time. One of the lectures was devoted to Web 2.0 environments. This lecture applied collaborative principles throughout the lecture and so this experience served as modeling to transmit the issue of interaction and collaboration. The synchronic lesson process included the participants' construction of knowledge, participation in surveys, in a chat and in discussions, involvement and a sense of creativity and responsibility. The students classified Web 1.0 tools and Web 2.0 tools, sharing a wide variety of collaborative environments; they worked together to define terminology and created a distinction between blog environments, the forum and Wiki according to various parameters that they determined. The students testified that beyond their acquisition of knowledge from the synchronic experience, they learned various ways to deliver a synchronic lecture, while creating interaction and collaboration between the participants throughout the lecture. Following the lecture, the student-teachers were able to learn more about the learning environment and to deliver a short lecture in this environment to their peers. Throughout the course there was a continuous event that allowed the student-teachers to manage a conversation in real time at any given moment.

### ***2.6 The Teachers' Role in Education for Digital Citizenship***

During the academic year 2012, the college began to operate a program for digital citizenship in cooperation with and with the support of the Israeli Internet Association.

The purpose of this program was to increase awareness of digital citizenship among the student-teachers and lecturers, with an aspiration that the student-teachers would assimilate this awareness in their practicum experience, and later also as teachers in schools. As a preliminary activity for the development of the program, the student-teachers were asked to discuss nine aspects of digital citizenship (Ribble, 2012), including: digital ethics, digital literacy, digital rights and responsibility, digital communications, digital security, digital access, digital law, digital consumerism, and digital health. Following discussion of the different aspects on a forum, the student-teachers wrote a collective document about the role of the teacher in education for digital citizenship. This activity contributed to the student-teachers understanding and taught them that the college lecturers' perceptions of them as the student-teachers and their own perceptions of school pupils lacked knowledge and sensitivity to ethical issues involved in different aspects of education for digital citizenship. The activity reinforced their desire to include the subject in the school's agenda. As part of the pedagogical training, students could implement an activity adjusted to the level of their students in one of the nine aspects discussed in class.

## ***2.7 Using Collaborative Teaching Tools for Different Disciplines***

The students learned to use various collaborative tools. They contributed items to Wikipedia, acted in a collaborative YouTube channel, managed brainstorming through a map of terms and also experienced the implementation of a conceptual map for a chosen discipline. The students worked on a Webquest in groups (creating a collaborative presentation), and they worked on collaborative documents on the subject of the future school and 21<sup>st</sup> century skills in real time and in a-synchronic communications. Some of them even collaborated on mobile tools during the course, performing collaborative tasks on the college campus. They initiated activity that permitted sharing of data, information, files, and notifications. This activity reinforced the fact that it is possible to exploit an available environment for pupils in their daily life while reinforcing interpersonal

communication skills with which they are familiar. The student-teachers created collective feedback for the course, cooperated in writing lesson plans, and shared reflective writing following the implementation of a lesson that they had planned in class.

## ***2.8 Online Self-Assessment and Peer-Assessment***

The students performed self-assessment and anonymous peer assessment. The student-teachers invested serious efforts in preparing their assignments, and earnestly evaluated their peers' work. They noted that they had learned various methods of performing the assignment, and that this had helped them to position themselves in relation to others and they had learned how to overcome blocks in evaluating colleagues, and improved their evaluation abilities. One student explained: "The stage of self-evaluation was not simple, because its never easy to assess yourself. Nevertheless, I was able to see things from another viewpoint in which I really examined my ability to do something better and whether I had done things correctly. It sharpened my understanding of how to integrate evaluation methods in my future work ...also when I was at the stage of evaluating my colleagues I needed to put myself in the teacher's shoes and suddenly various collaborative activities that I had not previously seen were opened up for me. It was fun to see and measure the nature and quality of the activity according to the criteria on the gauge and I was able to notice the significant learning that we gained from that process" And another student added: "the stage of self-evaluation allowed me to make an objective observation of the task that I had performed. In this method of evaluation, I saw things that I had not noticed before, which are important to consider in any questionnaire/ document. Peer evaluation clarified for me what it is appropriate to include and how it is appropriate to create a collaborative document. Also, it gave me special and varied ideas concerning different forms and uses for a collaborative document that I had not thought about previously." One student added: "Exposure to the different ways of learning that I observed during the course and also to the course's evaluation method improved my awareness of my stagnated cognitive fixation regarding the subject of school teaching and

opened my mind so that I thought about examining alternative teaching methods relating to the issues of pupils' motivation and diversity. I can now envisage myself working with pupils on particular subjects according to the 'flipped' classroom and using interactive and collaborative tools."

## 2.9 Mobile Technology

In the course, the student-teachers experienced a lesson delivered through smart phones and tablet computers operated by two student-teachers. The activity included nine different stations in the college campus. The student-teachers worked in groups and at each station they performed a different task. The stations included the production of a short video, performing a needs survey in the cafeteria and collecting these needs in a collective document, creative paper work and recording it, "selfie" photographs through various social networks, "speak to me with flowers" – an activity to identify and define plants all over the campus, movement experience and a feast in line with the contents of books that they encountered in library activities. The student-teachers uploaded the materials on a special Facebook site in real time and at the end of the activity; the student-teachers who created and performed collected all the information that had accumulated as a result of the experiences at the different stations on a special site that they created. The activity demanded the student-teachers' follow-up in the preparatory stages necessitating both their mastery of the different environments and also their emotional support. This activity showed the student-teachers that the instructor needs to support and guide the learning.

Planning learning experiences using ICT – Towards the end of the course, the students were required to plan a learning experience incorporating the use of digital tools and resources that in maximally effective ways cultivate specific competences i.e. certain types of Technological Pedagogical Content Knowledge. Some of the students were able to apply the lessons they designed as part of their pedagogic training. Students reported that their teaching skills were increased-not only for using ICT in researching teaching materials and preparing for instruction, but also in class instruction.

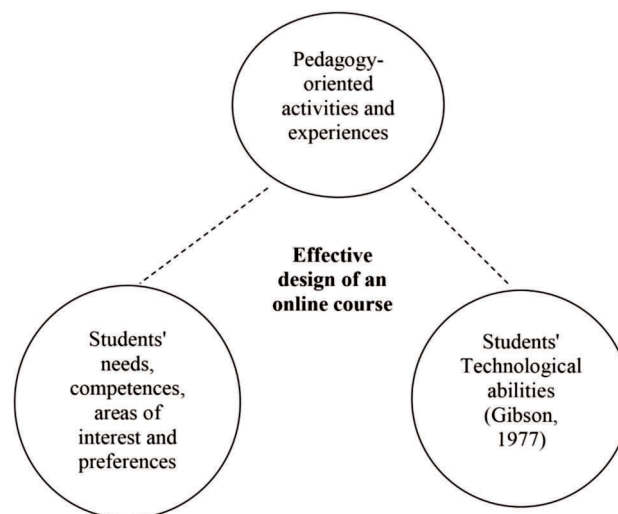


Figure 2. Model for Effective Design of an Online Lesson

## 3. Design, Planning, and Implementation of Learning Content

The preparation and teaching of the courses involved design, planning, and adaptation of the contents to the students' needs. Figure 2 presents the model for the planning of the course.

The model presented in Figure 2 presents the characteristics and considerations taken into account in planning and designing the course. Firstly, the course contents were mapped, and activities were developed, emphasizing the ICT environment's contribution to the activity goals. The pedagogical approach manifested by the activity was linked to appropriate tools and environments chosen for the purpose of the activities. In addition to the thinking invested in finding the added value of technology in each activity, sometimes the technological affordances of the different tools guided the choice of activities (Gibson, 1977) and harnessing the tools and the ICT environment to the planning of the lesson. This part of the preparation was planned as appropriate for the students' level of computer literacy, needs, areas of interest, and preferences. Moreover, the course was conducted in a flexible learning space, which included four immobile projectors, one mobile projector, mobile desks with connections to electrical sources and an interactive board. Due to the fact that the course took place in a flexible space, the students were able to practice different optional ways of implementing the



relevant pedagogy in practice in class. This model can serve as modelling for the student-teachers and show them how it is possible to expand ways of organizing and implementing lessons with various teaching methods at school.

The design of the course took various activities and experiences over the learning period into account, and was adapted to the students' disciplines and specializations. The courses for B.Ed. students were different from the courses for students in the academic training stream of M.Ed. studies. Some of the student-teachers consulted the pedagogic instructors over the course with regard to the contents of the activity. The student-teachers experienced choosing the best possible technological means to serve the goals of the activity. Often, the choice stemmed from the needs of the activity and in other cases the technological affordances led the students to choose a particular tool/environment. The different choices were adapted for the students' needs, skills, fields of interest, and preferences. Another consideration that guided the planning of the course was the level of interactivity between the lecturer and the student-teachers. Frequent use of Web 2.0 allowed the course to be very interactive.

Interactivity was introduced to the student-teachers gradually and in several stages over the course. At the initial stage of the course, the students were required to perform personal assignments in order to get to know the Moodle environment in which the course was delivered. At the second stage, they had to perform assignments in couples, necessitating joint work on the assignment. At the next stage the student-teachers were required to perform collaborative work in groups using their discretion with regard to the work and the ways of cooperating. Towards the last stage of the course, which was mainly performed by the M.Ed. students in the academic training stream, the student-teachers were asked to construct a teaching unit in their discipline, while taking into consideration all the pedagogical-technological-contents-design considerations. This stage was entirely performed in the Moodle environment, in the same course, in order to allow the student-teachers to follow the work process of their peers and the different examples of teaching that they designed.

For the future units to be applicable for teaching, open and available learning environments such as Roojoom, Google Sites, were presented to the students. In order to increase the applicability of the learning units, those units were aimed to be implemented with pupils during a week of concentrated practical work in school. The evaluation of the pedagogical-technological unit was guided and assessed by both the pedagogical trainer and by the ICT lecturer.

During the course, the student-teachers underwent the experience from two viewpoints – the view point of the learner and the teacher's viewpoint, both through their work on the assignments that they received and also through their planning of assignments for their pupils. They noted the teaching goals, level of interactivity, role of the teacher and methods of assessment. The students also experienced the different environments from the viewpoint of the way in which they were implemented in the school in which they worked. Some of the student-teachers learned with the help of the environments in practice during the lessons they delivered in the schools, while others harnessed the environments to teaching beyond the boundaries of their lessons and the classroom.

In every course, there were four-five online sessions, one synchronized lecture and eight-nine face-to-face sessions. Throughout the course the student-teachers communicated with their peers and with the lecturer as part of their personal course planning and the collective learning. During the course, the student-teachers practiced various pedagogical uses with the assistance of and implementation of the collaborative environments mentioned above, while examining the contribution of the different activities to learning: forums, synchronic participatory lecture, Wiki environment, writing in a blog, writing documents in a collaborative manner and group collection of information with the help of a participatory survey.

In addition, as part of one of the assignments, the student-teachers were required to present their application of a tool or environment in their teaching. Among the tools and environments that they chose were: Google Earth application in teaching of environmental sciences,

application of a social network in mathematics and algebra lessons for junior high school pupils, while recording the debate regarding thinking and discussion concerning the role of a social network in teaching-learning processes from the aspect of definition of a closed learning group, definition of the members of the network and anonymity of the participants, YouTube as a class channel to perform initiatives and collect films, Dropbox for collaborative work, OneNote as a digital notebook in which the students composed collaborative contents and in parallel discussed the implications of the use of a digital notebook in class etc. The student-teachers shared pedagogic and practical aspects of their trials with the chosen tools and discussed them.

Assessment was given in the course for the performance of the different assignments and included the lecturer's assessment, self-assessment and online peer assessment. The methods of assessment used in the course were alternative assessment methods and emphasized the learner's responsibility for the learning process. The unique nature of the activities allowed the students to use various technological tools to create contents and share their learning with their peers. They were thus able to discover the potential of these tools beyond the context of what they learned in class.

The lecturer's role involved regular interaction with the learners. The integration of the different environments and ways of assessments part of the teaching strategies in the course constituted models for the student-teachers and helped them to develop awareness of possible effective use and implementation of the different environments according to the teaching goals. Assessment of the collaborative work was performed through remarks on Wiki pages/Google Docs or as part of the students' writing on Wiki pages/Google Docs. Peer assessment required clear presentation of the criteria for assessment and the pedagogic considerations for choice of tools. The different environments and applications were presented and discussed following the different assignments, under the assumption that the pedagogical considerations would not be obvious to the student-teachers just because they had practiced different activities, and their reflection was

an essential element in their training process for teaching. The student-teachers were asked to give their opinions regarding the choice of applications for which Web 2.0 provides a clear advantage and they were asked to determine the level of the teacher's involvement in the assessment process. An important aspect that arose during the collaborative content design work in the Web 2.0 environment and in general was the issue of ethics, maintaining copyright and taking care to correctly ascribe citations and recognize these issues in discussion concerning academic work rules – in contrast to the ease of cutting and pasting.

#### 4. Methodology

The research population consisted of 28 regular B.Ed. students, 104 M.Ed. students and 20 students in the retraining stream (n=152). The B.Ed. students studied in a 4-year stream and most of them attended the studied course in their first year of studies. The M.Ed. students studied in a 2-year stream and attended the course in their first year of studies. The students in the retraining stream studied specially tailored individual programs over two years. They attended the ICT course as part of their studies of teaching methods and practicum. Ninety-two percent of the sample were female and the average age was 27 years. The B.Ed. female and male students were younger (M=23) than the M.Ed. and retraining stream female and male students.

In order to examine Student-teachers' attitudes toward the integration of technology in teaching, this study employed a mixed method approach which combines quantitative and qualitative research methods (Johnson and Onwuegbuzie, 2004; Keeves, 1998). Data about the manner chosen by the students to connect theory to the planning of contents from a pedagogical perspective, their teaching experiences and the ways in which they implemented what they had learned in practice were gathered before, during, and at the end of the course by means of surveys, lecturer-student correspondence, reflection about the tasks, personal blogs accompanying the course, collaborative forums, and several personal interviews. Student-teachers were asked to give their opinions on the integration of technology in teaching. In

the pre-test the general mean is given for three groups. The post-test provided the general mean for the groups at the end of the course. Student-teachers' attitudes were graded on a scale of 1 (not at all) to 5 (to a very large extent) and they were tested before the course (preliminary test) and at its end (concluding test).

## 5. Integration of Web 2.0 Tools from the Student-teachers' Perspective

The attitudes towards ICT-integrated teaching embraced by the B.Ed. students, M.Ed. students and retraining students were investigated before and after the course. Thus too the research investigated their perceptions regarding the potential of implementing the acquired environments and tools in their teaching and the extent to which they intended to implement ICT-oriented teaching in their practice as teachers. The student-teachers felt that this was a friendly course, where it was comfortable to understand things but that it required much investment. The differences between the attitudes of students studying in the three academic streams were small.

Table 1 shows the opinions of all the student-teachers (B.Ed., academic retraining degree (retraining) and M.Ed. studies) regarding the integration of technology in

Students' Attitudes Concerning Integration of Instructional Technology	Pre-test Students' General Mean (SD)	Post-test Students' General Mean (SD)	t-tests	df
Integration of instructional technology permits a variety of teaching methods	3.9 (0.90)	4.3 (0.77)	3.74*	293
Integration of instructional technology enables creative preplanning of lessons	3.3 (1.2)	3.4 (1.1)	0.74	293
Integration of instructional technology promotes collaborative learning	3.02 (0.9)	3.51 (0.8)	5.05*	293
Integration of instructional technology permits planning of interactive lesson in which learners take an active part	3.76 (1.02)	4.21 (0.9)	4.16*	293

**Table 1. Attitudes of all Student-teachers Regarding the Integration of Technology in Teaching before and after the Course (2n=15)**

teaching.

The data in Table 1 indicates that for all the questionnaire items (apart from the second: integration of teaching permits creative preplanning of lessons) there was a significant improvement in student-teachers' attitudes from the beginning of the course until its end. Table 2 shows the comparison between the attitudes of B.Ed. students with attitudes of students in the retraining stream and students studying for an M.Ed. with regard to the integration of instructional technology, for each of the studied

Group	Items	Pre-test (SD)	Post-test (SD)	t	df
Bachelor' degree	N	28	28		
	Varying teaching methods	4.32 (0.91)	4.61 (0.74)	1.25	54
	Creative preplanning of lessons	3.89 (0.16)	4.04 (0.79)	0.66	54
	Collaborative learning	3.07 (0.61)	3.18 (0.72)	0.60	54
	Planning interactive lessons	4.39 (1.03)	4.46 (1.07)	0.25	54
Retraining stream	N	20	20		
	Varying teaching methods	4.15 (0.75)	4.65 (0.49)	2.51***	
	Creative preplanning of lessons	3.70 (0.92)	4.00 (0.73)	1.14	
	Collaborative learning	3.45 (0.69)	3.95 (0.79)	2.19**	
	Planning interactive lessons	3.90 (0.79)	4.35 (0.59)	2.05**	
M.Ed.	N	95	104		
	Varying teaching methods	3.79 (0.90)	4.16 (0.79)	3.13**	197
	Creative preplanning of lessons	3.06 (1.26)	3.13 (1.17)	0.42	197
	Collaborative learning	2.92 (0.95)	3.52 (0.79)	4.88*	197
	Planning interactive lessons	3.55 (0.99)	4.13 (0.82)	4.50*	197

**Table 2. Attitudes of Students in the Different Academic Streams Concerning the Integration of Instructional Technology before and after the Course**

parameters (variation of teaching methods, creative preplanning of lessons, collaborative learning and planning interactive lessons) at the beginning of the course and at its end.

The data shown in Table 2 indicates that with regard to all the questionnaire items (apart from the second – integration permits creative pre-planning of lessons) there was an improvement in the student-teachers' attitudes from the beginning of the course and until its end. There was no change in the attitudes of B.Ed. students in any of the parameters. Among the M.Ed. students, there was a higher level of significance of the improvement than among the retraining students. The source of the differences between B.Ed. students and students studying for a M.Ed. or in the retraining stream can be found in the fact that B.Ed. students learn the course "teaching and learning in computerized environments" in Year 1 while students studying for an M.Ed. or in the retraining stream undergo coordinated training and this course is taught in line with their practical work in schools. M.Ed. and retraining students noted that the integration of instructional technology permits them to use a variety of teaching methods, irrespective of the discipline that they will teach in the future. The student-teachers found that they could be helped by various computerized environments and tools to develop varied lessons that were more interactive and employed collaborative work. For example, one of the M.Ed. students noted: "It transpires that it is also possible to do things in a different way, in an interactive, collaborative and experiential way. This sentence summarizes what I have learned in the course. No more frontal, old-fashioned and boring teaching in the classroom. So, I have tried to develop an intelligent, experiential plan that would involve adventure with focused content learning, and the mastering of contents with a voyage to the unknown with regard to possible products, and especially allowing expression of different intelligences in the group". Another female student added: "the combination of learning materials that we prepare (to supplement what is learned), establishing a questions group on Face book, assistance and follow-up of the pupils' learning and examining it, allows us to go deeper into the learning and even to demand that the pupils will integrate the computer tools as

part of the learning environment that they have to cope with. Undoubtedly, innovative approaches need support by the school under the understanding that this is the way to cope with the many advantages that the computer and various digital tools offer. In the end the new tools improve the pupil's abilities and make it easier for the pupils, teacher and the class!"

With regard to the question asking to what extent the students intended to integrate instructional technology in their teaching in school, no significant differences were found between the responses to the pre-test and the responses to the post-test. The B.Ed. students did not alter their attitudes at the end of the course in comparison to the beginning of the course ( $M=3.2$ ). Thus, too the students in the retraining stream did not alter their attitudes at the end of the course ( $M=3.5$ ). The M.Ed. students expressed their desire to integrate instructional technology in the schools already at the beginning of the course as did the retraining stream students ( $M=3.5$ ). At the end of the course their attitudes were slightly lower ( $M=3.2$ ), but not significantly so.

Analysis of the student-teachers' answers to the open questions and analysis of their personal blogs revealed that participation in the course helped them to develop activities that required high level thinking from their pupils, to be able to provide a response to learners with different learning styles, different needs and different preferences and to adapt themselves to up-to-date teaching in the spirit of the modern era. A female student studying for a B.Ed. noted: "the course in general and the final project in particular taught me that it is possible to seriously improve teaching in class with the help of computer technology to the right extent and balance. Although this requires preparation, I understand (and I don't yet have experience) that this pays for itself." Another female student added that she understood that the integration of instructional technology necessitates a change in attitudes for some teachers: "It was fascinating to see how a simple learning program from a book could take on a more sophisticated form and packaging, that was interesting and activating. It is especially important to exploit it in the learning environment of the school and to introduce it as part of the class learning program. Perhaps there are teachers who

fear that the computer will steal their "show" but this course reinforced my feeling that the computer should be integrated in addition to and not instead of something else."

It is not sufficient to learn about the tools and environments. The student-teachers noted that it was important to learn how to exploit the value added that technology is able to offer. A female student noted: "the work empowered and trained me for my computerized work ... it seems that the computerized systems will contribute much for me in the future and will expand my horizons. It will help me prepare a more goal-focused high quality lesson in a more professional and effective way, putting the emphasis on maximum exploitation of time planning, and on the organization and design of the lesson in an appropriate and professional manner." From the students' reports it is also clear that there should be a stronger connection between the course on computerized teaching and pedagogical guidance and practice in schools. Moreover, the students felt that it was very important to expose them to the computerized contents in the course from the viewpoint of the learner and also from the viewpoint of the teacher and to create a broad range of models for computer-assisted teaching. A male M.Ed. student related to the influence of the teaching environment on the teaching method, noting: "As the course advanced and I learnt more and more about the inherent advantages in the use of "innovative" online means and as I was able to observe high school pupils in the school where I am training as part of the practical workshop, I understood that this is not something superfluous rather these are essential tools that should be integrated in the learning system as early as possible. These are tools of a "new kind" that assist the learning process, in which the teacher is the guide and directs and the learner is a responsible learner who develops independent learning and critical thinking skills".

Another male student related to instructional technology as a lever to change perceptions of teaching: "it is difficult to change habits and bring others to adopt innovative work practices ... there is no room for cynicism, and the field of instructional technology is essential and extremely important for the education of the future generation. Its true

that the tools that were presented over the semester seemed rather ideal in consideration of the state of the education system today, but they allowed us to observe the entire education system in a critical way. But alongside the criticism, there is a wealth of practical tools that can create change. Even if not an immediate practical change, rather a change in awareness and perceptions relating to education for the 21<sup>st</sup> century." The students did indeed perceive the integration of instructional technology as part of a new pedagogy.

Differences were found between B.Ed. students who were in their first year of studies and students studying for a M.Ed. or in the accelerated retraining stream. While the M.Ed. students and those studying in the retraining stream found that what they learned contributed and was immediately applicable to their practical experience, the B.Ed. students who participated in the course in their first year of studies, did not necessarily see the pedagogical value of what they learned and in addition to the acquisition of tools for teaching in the future, their expectations also related to the acquisition of tools to enrich their technical abilities to serve them throughout their studies.

Through their different experiences over the course, the students acquired skills that would allow them to choose work environments in accord with their teaching goals. Additionally, the students learned to recognize the pedagogical approaches suitable for the different teaching methods in the digital environment and acquired tools to apply them in an intelligent way in the planning of their lessons.

The course was perceived by the student-teachers as an effective and useful part of their training for computer-assisted teaching. Moreover, as a result of their exposure to various state-of-the-art tools and environments and to a range of computerized teaching models, the course was seen as helping the student-teachers to become up-to-date teachers. This was expressed in the implementation of interactive teaching in which it was possible to activate the pupils through different models of investigative learning both in and outside the schools. The strength of this learning is that it provides a response to diverse learners and assists coping with technical difficulties using video and audio

tools, the recording of teaching units and preparation of visual guides. The student-teachers expressed their willingness and readiness to assimilate the different environments in their teaching. As one of the male students noted: "We live in a digital era, using digital language, a language that the youth use more fluently than us and so preparing computerized learning units for them can be profitable for both sides ... nevertheless I understood that in order to "speak" this language we have to learn it thoroughly and to understand it more." The student-teachers' words reinforce the need for suitable training and development of their ability to teach with the assistance of instructional technology as part of the teacher training process, but it is also obvious that the support of the school is needed.

Some of the student-teachers produced computerized lessons in the field of their specializations as part of their practicum experience in schools and shared their experiences, deliberations and insights with the class. During the first stages of the course several student-teachers said they found it difficult to follow what was required from them in the course's different teaching units. As one female student put it: "Its funny to look back on all my reactions, especially my hysterical reactions at the beginning of the semester, in which I wrote that it was difficult for me to find my way in the course and to understand what was required of me! I'm sure that this is not the first time that you have encountered a student who was exposed to computerized teaching for the first time". Another female student wrote: " I still feel that I lack knowledge in this world and I feel that it is slightly distant from me, but I definitely go out onto the path "equipped" by the course and with openness and stronger curiosity to learn more about this subject". This finding points up the need for clear structuring of the course while presenting the course requirements, expectations, goals, the work environment, technical and pedagogical support, ways of presentation of assignments and assessment methods.

### 6. Solutions and Recommendations

At the beginning of the course, most of the student-teachers have been hardly acquainted with any pedagogical applications of the various ICT tools in

teaching. Some of them had no attitudes towards the integration of ICT in teaching while the majority failed to see the potential embodied in the applications of the various tools for personal use and teaching. Analysis of the activities illustrates that the course lecturer adapted the kind of tool to the activities implemented. This enabled diversification of the teaching method so that it included: individual work activities, collaborative activities, peer teaching, place-oriented activity, and presentation of issues for discussion.

The research findings indicate that such a course dealing with the use of various ICT tools and various methods of learning, facilitated learning opportunities which greatly contributed to the learning process. The various topics presented in the course provided a teaching model characterized by independent learners, by interaction and varied communication and collaboration options (Rogers et al., 2007; Sheely, 2006) and generated teachers' creativity, whereby the students were engaged in knowledge construction in a way which was meaningful for them. Moreover, the students have learnt that in the various activities they design, it is important to choose the suitable educational tool. Modeling best practices enhanced teachers' positive attitude and confidence regarding its implementation.

Both the collaborative work and the independent work experienced by the students enabled each participant to learn from the varied references, get ideas, contribute from their experience and their knowledge and comprehend the perspective of the lecturer and the learners. Since the gaining the both perspectives is not taken for granted, it is essential to reflect both perspectives along the course. The information was not submitted for perusal only to the lecturer but was presented to everyone. This enhanced the learners' responsibility for the outputs they submitted as well as for choosing the activities through which they activated their pupils.

The working process throughout the course and the students' feedbacks upon completion of the course attested to a change in the teacher-students' teaching paradigm (McLoughlin and Lee, 2008) and higher levels of engagement and in generating content. From this point of

view the students-teachers need to be exposed to constructivist learning approaches which profess collective wisdom and to a connectivistic learning approach (Siemens, 2006). They acquired competences essential for integrating social processes in teaching in accordance with their pupils' language and thinking. Thus, they could engage in a lifelong learning which will be more relevant to their pupils' needs in the changing reality (Prensky, 2009). Additionally the research findings show that the learning method in the course and the student-teachers' active involvement during the course enhanced their sense of control and ownership of the discourse and the information, their engagement and sophisticated and creative utilization of the technological environment. The course design enabled the implementation of theory and practice together. The TPACK model and the SAMR model served as a compass to the activities' design and to the refinements of its implementation. This study illustrates that, teachers who during their education experience optimal applications and develop from theory to practice self-guided activities, might also lead an innovative pedagogy and re-shape the learning transpiring in spaces known to them and to their pupils and facilitate leading a dynamic, relevant, and experiential teaching.

This study has several limitations. The research should be expanded to include a larger number of student-teachers and to expand the number of interviews to a wider population. Moreover, it is recommended reflecting to the student-teachers the structure of the activities, asking them to characterize, and analyze the activities they develop according to the pedagogical models they encountered in the course and perhaps even expand the use of models they adopted in the course.

Integrating the technology in an informed pedagogical way in teaching and learning is a professional challenge for the student-teachers. They need to apply a thorough, flexible and creative thinking as well as a suitable training in order to accomplish the learning-educational goals. Teachers should be made aware of the potential encompassed in the new technologies and get help in developing competences necessary for shaping learning activities which effectively use the technology. In this

context the activities can be mapped by the model of Puentedura (2011) which comprises several levels of IT integration. The activities should not be based only on a level of replacing older tools but should aspire to re-define the learning process and learning method.

It is important to be aware of the differences between the three generations (pupils, students and lecturers) and of the fact that each generation should be attentive to its needs, capabilities and the requirements of the generation it educates and in the transition period it is beneficial to act side by side. Teacher education programs must tackle the difficulties and the generation gap and train students and college lecturers accordingly.

### Conclusions

To sum up, the paper describes an online teaching environment, that constitutes a teaching method which promotes interaction and collaborative work, integrates teacher assessment, self-assessment, and peer assessment. The findings show that, the student-teachers who have learned in this learning environment perceive the integration of ICT as enhancing their interaction and collaboration, helping them to diversify their teaching methods, even beyond the class boundaries and stimulating them as learners to assume responsibility for the learning process. The sample of B.Ed. students and the retraining students should be enlarged in future studies. In order to improve the B.Ed. students' attitudes towards teaching and learning in ICT environments, it is recommended that they should be supported with mentoring throughout all their years of teaching education and practicum, tutoring them to adopt varied ways of ICT-integrated teaching. Using the Web 2.0 environment stimulates the students' sense of ownership of the material they have written, offers self-expression in a variety of media types and narrows the gap between in-school experience and outside-school experience. It responds to learners with different preferences and helps teachers to implement a proactive and constructivist approach in education. The teaching method needs to be altered. Using varied Web 2.0 tools combined with pedagogy leverages flexibility and the creative options offered by Web 2.0 can make the learning process more dynamic, creative, and productive.

Students should be able to implement a variety of teaching methods in the education system. Moreover, it is recommended reflecting to the students the structure of the activities, asking them to characterize and analyze the activities they develop according to the pedagogical models they encountered in the course and perhaps even expand the use of models they adopted in the course. Furthermore, in their capacity as teachers, they should consider themselves responsible for leading a pedagogical change in the teaching method.

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## ABOUT THE AUTHOR

Tami Seifert is currently a Senior Lecturer at Kibbutzim College of Education, Tel-Aviv. She has a PhD in Urban Studies and Instructional Design and Technology from Old Dominion University (Virginia, USA) in 2001. She earned both her B.Sc and M.Sc from Tel-Aviv University. Between 2003 and 2005 she completed a post-doctorate from Tel-Aviv University on implementation of handheld computers in education. She served as head of the Department of Educational Computing, the head of Academic ICT and vice-director of the Teacher Training for Graduates Program at Kibbutzim College of Education (2007-2014). Courses Tami has taught in the past five years include: *Innovative Technologies in Education*, *Online Education*, *The Design of Online Instruction: From Planning to Assessment*, *Social Networking in Educational Contexts*, *Application of Video in Teaching*. She promotes and advises digital literacy among faculty so that they can serve as role-models for their own students, helping to bridge the technological gap between generations.

