Teachers in a changing world: attitudes toward organizational change

Orit Avidov-Ungar · Noga Magen-Nagar

Abstract The objective of this study was to explore how teachers' professional attributes affect their attitudes towards assimilating a computerized system for managing learning and teaching in school. Sixty teachers from an experimental high school assimilating computerized system for managing learning and teaching were sampled and participated in this study. The research tools included in-depth interviews with a sample of 10 teachers and a questionnaire on attitudes towards change. The interviews indicate a hierarchy in the behavioral attributes towards change, from resistance associated with knowledge and skills towards resistance based on professional aspects and professional values and identity. An AMOS analysis finds that a high level of computer literacy predicts low resistance to change, while considerable seniority and a key position in school predict a high level of resistance to change. The study hones our understanding of the unique impact of the teacher's readiness to assimilate changes in school.

Keywords Attributes of resistance to change · Professional attributes · Assimilating technology in school · Educational reform

Introduction

The introduction of innovative technology in school is a complex and challenging process that offers schools in general (Resnik 2007), and teachers in particular an abundance of new challenges (Northcote and Lim 2009). This study seeks to explore

O. Avidov-Ungar (✉)
Achva Academic College, The Open University, Moving Post Shykmim, 79800 Arugot, Israel
e-mail: oritav65@gmail.com

N. Magen-Nagar
Ministry of Education, Gordon College, Haifa, Israel
e-mail: nogamagen@gmail.com

the assimilation of a computerized learning management system (LMS) from the professional perspective of the teacher in school.

In the last decade, there has been massive penetration of technological LMS in schools (Koberg et al. 2003). In view of the research findings reporting disappointment with the results of assimilating these technologies (McDermott and O'Connor 2002; White 2007; de Smet et al. 2012), advanced studies are being conducted in an attempt to examine which factors influence the assessment of computerized LMS, and the transition of educational organizations to this innovative pedagogic paradigm (Venezky and Davis 2002; Becker 2001; Wallace 2004; Halverson and Smith 2010).

The transition to the innovative pedagogic paradigm is a change in which the organizational system adopts new patterns that differ from those existing previously (Bakker and Schaufeli 2008; Chong 2008). The studies indicate that assimilating processes of change in teaching methods and their application in school entail considerable difficulty, and the teachers' abilities and skills as a professional-pedagogic factor in the process of change are the prime factor for the occurrence of radical change in the innovative pedagogic perception within the education system (Fullan and Smith 1999; de Freitas and Oliver 2005; Cunningham 2009; Halverson and Smith 2010; Selwyn 2010). According to Rogers model "Diffusion of Innovations" (Rogers 2003), assimilation takes place in several distinct stages. At first, the "Knowledge" phase, the staff is exposed to the innovational concept and developing awareness to its necessity. As a result, motivation to experiment with the innovative tool increases. This allows the move toward the second phase in which a positive attitude toward the innovative tool is developing (the "Persuasion" phase). The positive attitude leads to a phase in which one decides to adopt the innovative tool (the "Decision" phase) and work toward implementing it in the organization (the "Implementation" phase). The last phase is the "Confirmation" in which using the innovative tool is sustained for a long period of time while acknowledging it advantages and efficacy.

The computerized system examined in this study was developed in Israel and is used in schools worldwide (Macfadyen and Dawson 2010). It is based on the approach that all teachers are managers in their domain, and therefore need organized information that will help them to promote the school targets from the administrative and pedagogic perspectives. The computerized system is termed in Hebrew "Mashov," an acronym for the Hebrew words expressing the three principles embodied in the system: 1. Immediacy—feeding all events during the lessons into the software in real time; 2. Transparency— of the data for all the role holders through using the software; 3. Monitoring—the learning processes, the discipline, and the teacher's work daily. In Israel, this system operates in some 500 public schools (Blau and Hameiri 2012).

From an understanding of the centrality of the teacher in the process of assimilating educational technologies (Hattie 2009), a significant portion of studies focus on the attempt to examine reliable attributes and their impact on the teachers' resistance to the process of change, and on their ability to effectively assimilate innovative educational technologies in their work in school (see, for example, Bogler and Somech 2004; Coffman 2009; Halverson and Smith 2010; Avidov-

Ungar and Friedman 2011). Diverse studies on assimilating innovative technologies in education systems report that the main factors for failure or success are linked mainly to the teachers' attributes and their attitudes toward the change (Hattie 2009; Fullan and Smith 1999). Some researchers (Allport 1935; Katz and Stotland 1959; Rajecki 1982) note three components to this: cognitive, emotional, and behavioral. On the basis of this division, other researchers identified components of the resistance to change: 1. Cognitive resistance, manifested in locating, analyzing and presenting the weaknesses and faults entailed in the change, raising claims and arguments supporting maintaining the existing situation and presenting its advantages, while denying or ignoring data or information that indicate the crucial need for change; 2. Emotional resistance, which includes negative emotions such as contempt, anger, hatred, hostility or sadness. The hostility and the anger are directed toward the attributes or the agents of the change, nostalgia for the current situation, and a sense of connection and high commitment to it; 3. Behavioral resistance, which includes taking actions intended to sabotage the plan for change or its initiators, and is manifested in protest, demonstration, and even includes recruiting people for common support of the struggle against the change (Fox and Amichai-Hamburger 2003; Oreg 2003). Zimbardo (1992) opines that it is possible to amend attitudes by altering each of the components of the position (cognitive, emotional, behavioral), where change in one component is likely to generate change in the general position.

Kent and McNergney (1999) maintain that the objection of teachers to change in the technological context stems from diverse factors, that can be classified as follows: (1) Place-dependent factors— factors connected to infrastructures associated with assimilation, such as a lack of compliance of the classroom with the innovative operation of the technologies, difficulty in providing each classroom with an Internet connection, and the unsuitability of the technology to the learning content; (2). Teacher-dependent factors—factors that relate to the low degree of interest or lack of awareness of teachers of the need for change, as well as their fear of change in their status and the loss of control of the class. Thus, without the teachers' cooperation, without examining their knowledge, and without taking into consideration the norms and inherent resistance to change in the organizational culture, leading significant change in assimilating innovative technologies in school will not be possible (Ogobonna and Harris 2003; Vaillant 2005; Zimmerman 2006; Levin and Fullan 2008). The teachers' professional ability (Borko 2004) and the conditions and organizational culture of the school as a learning organization (Coppieters 2005) influence the teachers' attitude toward change and, accordingly, the effectiveness of assimilating innovative technologies (Sarason 1995).

This study starts from the assumption that the teachers are an important and key element in school, and therefore their professional attributes are a significant factor in the processes of school change (Collinson et al. 2009). The teachers' professionalism in assimilating innovative technologies is described in this study from several professional aspects, such as mastering computer literacy (CL) (Woodrow 1992; Virkus 2003; Koschmann 2005), teaching experience, school experience, and school position. The professional literature notes that the resistance hardest to handle stems from the belief that the change affects the participants strength and status (Buchanan and Boddy 1992). In other words, the greater the teachers' teaching seniority and

seniority in school, the stronger will be the resistance to change. In contrast, a teacher who takes upon himself a dominant role in school is more committed and involved, and thus will contribute to the change that the school adopts (Baskin 2001).

This study focuses on a high school in Israel, one of the pioneering schools that lead change in assimilating a computerized LMS as part of a national reform for adapting schools to the skills of the twenty-first century. The readiness for change among the teachers and their motivation is not fixed; they change and develop according to the stage in their careers, and according to the changing reality (Cheng 2009; Sergiovanni 2001). The studies show that teaching seniority, school seniority and position in school (Baskin 2001) afford motivating conditions that lead to creating a bond and connection between the teachers' inner motives (such as self-esteem, empowerment and a sense of capability) and the adaptation to changes (Maskit 2011; Avidov-Ungar and Friedman 2011). Hence, the current study explores these attributes together with their connection to resistance to change. The additional variable "mastery of CL" is included in the research, as it is important and influential in assimilating the technological LMS (Valsamidis et al. 2012). As far as we know, no integrated research has been conducted that explores the results of resistance to change, together with understanding the process, under the impact of the professional attributes of resistance to change when assimilating the technological LMS in school, which is the goal of this study.

The research objective and research questions

This study aims to examine how teachers' professional attributes affect their positions regarding assimilating a computerized LMS in school.

The research questions are

1. How do the teachers perceive the computerized LMS as part of the organizational culture? What are the advantages and opportunities offered by the use of the computerized system? What are the disadvantages and difficulties in the use of the computerized system? How does the teacher's professional role inhibit or encourage the use of the computerized system? How does the computerized system integrate with or contradict the teachers' professional values?
2. Do the teachers' professional attributes (CL, school role, teaching seniority, and school seniority) predict the resistance of teachers to change relative to assimilating the computerized LMS from the cognitive, behavioral, and emotional perspectives?

The quantitative research hypotheses

1. Differences will be found in resistance to change according to the level of CL; those with a low level of CL will resist change to a greater degree than those with moderate and high levels of literacy.
2. Professional attributes contribute to explaining the variance in the level of resistance to change relative to assimilating the computerized LMS, from the cognitive, emotional, and behavioral aspects, as follows:

   a.   The greater the teaching and school seniority, the greater will be the resistance to change regarding assimilating the computerized system

   b.   The more central the role in school, the less will be the resistance to change in assimilating the computerized system.

   c.   The greater the teachers' level of CL the less will be the resistance to change regarding assimilating the computerized system.

The research participants

Sixty teachers (62.5 %) out of 96 teachers from an experimental high school were sampled at random and participated in the study. Semi-structured, in-depth interviews were conducted with ten of them.

The sample included 40 women (66.7 %) and 20 men (33.3 %), ranging from 23 to 65 years of age. The average age (M) was 41.51 and the standard deviation (SD) was 9.48. Most of the teachers in the sample have considerable teaching seniority. More than half have been teaching for more than 10 years and 25 % of them for between 6 and 10 years. Also, more than 40 % of the teachers have been working for between 1 and 5 years in school and another 35 % for more than 5 years. The percentage of teachers who have worked in school for less than 1 year and of teachers who have worked in the school since its founding is relatively low (about 12 %).

The quantitative research variables

Dependent variable

The teachers' resistance to the use of a computerized LMS in teaching and learning was examined generally and according to three components: the cognitive, the emotional, and the behavioral aspects.

Independent variables

a.   Teaching seniority—the participants' teaching seniority was coded according to the number of years: 1 = first year; 2 = 2–5 years; 3 = 6–10 years; 4 = since its founding (12 years previously).

b.   School seniority—the teachers' seniority in the current school is coded according to the number of years: 1 = less than 1 year; 2 = 1–5 years; 3 = more than 5 years; 4 = since its establishment (12 years previously)

c.   Role filled in school—the teachers' role in school is coded as follows: 1 = grade coordinator/subject coordinator; 2 = member of the school administrative staff; 3 = homeroom teacher/subject teacher.

d.   Mastery of CL—the level of mastery of CL was measured by ranking the answer to the question, "To what extent do you define yourself as having skills/being computer literate?" Those who were ranked 1 or 2, accounting for 20 % of the sample, were defined as having low CL; those who were ranked 3, 35 %

of the sample, were defined as having moderate CL, and those who scored 4 or 5, 45 % of the sample, were considered to have high CL.

The research method

The study was conducted using a combination of two research methods: quantitative and qualitative (Connelly and Clandinin 1999). The advantage of the combined research method lies in the fact that while the quantitative method examines the results of the process, the qualitative method examines the process as it occurs. Qualitative research reveals those internal factors that are usually concealed during quantitative research (Frank 1998). The combination of the two methods will contribute to a deeper and more significant understanding of the teachers' resistance and their attitudes regarding assimilating a computerized LMS in school (Clandinin and Rosiek 2007).

The research tools

Semi-structured in-depth interviews

An in-depth interview is a qualitative methodological tool that combines flexibility and openness on the basis of structured questions (Kouritzin et al. 2009). Sample questions from the interview include: How does the use of a computerized system inhibit or encourage the teachers' work? How does the computerized system influence your work? How does the computerized system affect your relationships with colleagues and with your superiors?

Data analysis was based on the analytical approach of field anchored theory (Strauss and Corbin 1990). The findings were analyzed while coding the teachers' interviews. The process of developing the categories and their formulation included three main stages: (1) Open coding—topics that repeated themselves and can be characterized; (2) Axial coding—renewed mapping of the findings along the axis of each category according to those criteria; (3) Selective coding—thickening the categories and finding additional anchors for their existence. The purpose was to reach the "core categories" and thereby to explain the teachers' attitudes regarding the computerized system.

Questionnaire on attitudes toward change

The degree of resistance to assimilating the computerized system was measured using a questionnaire that was developed by Goldrat (2001) for teachers in schools in Israel, adapted to the technological changes examined in the current study—assimilating the computerized LMS. The questionnaire included 16 statements relating to three components of resistance to change—the cognitive, emotional, and behavioral components. The items were measured on a six-rank Lickert scale, wherein each teacher was asked to note the degree of his agreement with each statement ranging from one (do not agree at all) to six (totally agree).

High internal consistency reliability was found among the items on the questionnaire (Cronbach's alpha was 0.92). A summary variable was constructed for general resistance according to the average rankings for the questionnaire items, wherein the highest score for the variable reflects greater resistance to change.

The division according to items and Cronbach's alpha values for all three components of resistance to change are presented in Table 1.

The connections between the various components of resistance and between the components themselves were calculated using Pearson correlations. The correlation matrix is presented in Table 2.

Table 2 indicates that the three components were found to be connected to each other in positive and distinct correlations of moderate to high strength. In other words, the greater the teachers' resistance to change in one of the components, so too the resistance regarding the other two components increased.

Findings

In order to answer the research question regarding the degree of impact of the teachers' professional attributes on their attitudes regarding assimilating the computerized LMS in school, two types of analysis—qualitative and qualitative—were conducted.

Qualitative analysis

The analysis of the interviews with the teachers, pertaining to their attitudes toward assimilating the computerized LMS as part of the organizational culture, will describe the main aspects arising from their comments, as regards: (a) The advantages and opportunities offered by the use of the computerized system; (b) The disadvantages and the difficulties following the use of the computerized system; (c) How the use of the computerized system inhibited or encouraged the teachers' professional functioning; (d) Whether the computerized system and professional values can survive together.

The following describes each of the components described by teachers in relation to assimilate LMS school organizational culture.

The advantages and opportunities offered by the use of the computerized system

The comments of the teachers interviewed indicate that, despite the difficulties in assimilating the computerized system, the organizational culture offers many advantages: order and organization, ongoing updating at the parental and staff levels, tracking the students, transparency and monitoring, and creating a feeling of technological progress. A total of 112 statements relating to the advantages and opportunities offered by the use of a computerized system (28 %) were tallied.

- Order and organization (50 references—41 %): The computerized system created a feeling among the users that there is order in the school, that things are documented and tracked. There is a feeling of consistency that also creates transparency.

Table 1 Division of the items for three components of resistance to change and Cronbach's alpha values

Component	Items	Sample item	Alpha
Cognitive	1, 2, 3, 4, 5, 7	I do not understand why it was necessary to assimilate the computerized system	0.89
Emotional	6, 8, 9, 10, 11	I get annoyed when I think about the computerized system	0.86
Behavioral	12, 13, 14, 15, 16	I try to persuade others to resist the assimilation of the computerized system	0.78

First, it is very important to those who are very organized. It's a great help (.). It's convenient, it orders and organizes (…). Prior to the assimilation of the computerized system our school was a mess; things are more organized and events there are tracked.

- Tracking the students (34 references—27 %): This is an administrative-organizational tool in which information about the students can be conveyed, while enabling control and tracking, making the teaching organized and consistent.

  I can really see the development, what I have accomplished and what I have not accomplished. I can introduce grades, comments, things I really check during the year; there is better control of events, knowing exactly when a student of mine is not functioning or when there is a decline in his scores (…), in his functioning, his attendance, behavior—this is effective for tracking and improves the ability to track.

- Ongoing updating at the parental and staff level (20 references—16 %): The computerized system is a tool that enables an organization to update the parents and the educational staff on important administrative and pedagogic issues. The tool facilitates available communication, immediacy that affords a feeling of proximity between the teacher and the parents on the one hand and the students on the other.

  So first of all, really, updating: Others can participate so that they know what is happening and of course, some sort of parental involvement in learning. This is updating which eventually can help and is very important for school—conveying information quicker; this is a platform for sending things, for integrating information, the flow of data in all directions alleviates staying in the flow of things for me and keeps the others in the picture.

- Transparency and monitoring (10 references—8 %): The tool creates a culture in which almost everything is visible, a sense of "no secrets," and reporting and accountability is obligatory.

  Transparency and mentoring are the advantages. This can also be used for mirroring vis-à-vis the students, with high accessibility: one can

Table 2 The correlations matrix between the three components of resistance to change and themselves

	Cognitive resistance	Emotional resistance
Emotional resistance	0.75**	–
Behavioral resistance	0.50**	0.56**

** $P < 0.01$

    see everything that happens. This also obliges me to behave according to the rules.

- Technological progress (10 references—8 %): The computerized system is a technologically sophisticated system. It preserves information, enables hindsight, foresight; everything is documented. There is a feeling that school is moving toward working at a high level in the technological era, like in hi-tech, as one of the teachers said.

    This entails an element of progress; it is part of the technological progress and we, as teachers, are part of it. It is always good to be part of progress—this tool brings the gospel of innovation. It improved the previous situation, great transparency for all, this is progress, a quantum leap.

The disadvantages and the difficulties following the use of the computerized system

Together with the advantages and the opportunities, the interviewees reported only partial use of the computerized system. The teachers report impatience with feeding data into the system, their lack of participation in applying the change in school, and the concern of undermining interpersonal systems following the assimilation of the computerized system in school. A total of 148 references (34 %) were counted in the interviews, relating to the disadvantages and difficulties in the use of the computerized system.

- Impatience with feeding the system (70 references—47 %): The use of the computerized system demands considerable time and effort by the teacher. The main aspect of the work is administrative-organizational work, which, at least at this initial stage of the assimilation, the teachers do not see as added value but as an addition to their regular work.

    Every lesson—I want to start the lesson and am pressured regarding some material, so I drop everything and start to enter data to the system. Forget checking names and feeding in what the homework was; let's get on, that's what I feel.

- Lack of teacher involvement in assimilating the change (44 references—30 %): The interviewees were asked whether they feel partners in the process of assimilating and using the computerized system. The teachers, almost without exception, reported a lack of involvement in the assimilation process.

I do not feel a partner to the assimilation. Really not. I did not feel involved at any stage. Nothing. No one asked us. We were told that we had to do it. The system is sterile—it is a tremendous disadvantage that some of us are neutralized and there is no real involvement.

- The fear of undermining interpersonal systems following the assimilation of the system in school (34 references—23 %): The interviewees were asked to cite the disadvantages stemming, in their opinion, from the use of the system. This question arose as most interviewees had some experience with the undermining of their relationships vis-à-vis the staff, following the assimilation of the computerized system. The teachers report poor communications and being hurt by their colleagues. Similarly, most of them see the tool as having potential for assimilating superficial organizational communications, lacking the complexity and depth necessary, in their opinion, in relationships between those involved in education.

  Yes, yes. I had a case this year where I turned to a new teacher in whose field I needed her help, and she used the system to react very strongly and unpleasantly. I don't know whether she would have reacted like this face to face; there is no real dialogue.

How did the use of the computerized system inhibit or encourage the teachers' professional functioning?

A total of 88 references (20 %) to the computerized system and to the teacher's professional functioning were counted. Many of the teachers report that the computerized system is an organizational-administrative tool and not a pedagogic tool (40 references—45 %). They talk about the professional facet of their functioning and note that the system diminishes their value. The teachers claim that they become "clerks," the servants of the administration system. The pedagogic value of the computerized system has yet to be internalized.

The interviewees were asked questions, on this topic, regarding their superiors' evaluation of them and the level of their hurt from the partial implementation of the change. Most of the interviewees replied that they felt the computerized system to be an administrative tool that was assimilated by the principals to supervise and monitor the teachers (24 references—32 %). Many of the interviewees claimed that review using this tool does not necessarily reflect their professionalism and work in the field.

On the other hand, some of the teachers noted that the computerized system positively affects the connection between the teachers in school (20 interviewees—23 %).

  In order to meet that which is demanded of us by the system, we need to talk with each other, the teachers need to be coordinated, and otherwise things written by one teacher contradict those written by another.

Can the computerized system and professional values survive together?

Seventy-eight references (18 %) to professional values and those of the computerized system were counted. During the interviews, difficulty was noted regarding assimilating parts of the computerized system in view of the harm to their beliefs, opinions, and their educational credo. Below are the main issues reported by most of the interviewees:

- Negating freedom of action and personal judgment (30 references-39 %): The teachers felt that the possibility of being flexible in student evaluation was denied them, that their complex view and familiarity with the students was not taken into consideration. In this they became partner to a uni-dimensional evaluation.

  I do not have the ability to 'give' to students who have great difficulty. For example, I have one child who is a 60, 70 but he makes such effort. I would add ten points more to his scores because of the effort he makes. I have autonomy in my classroom, but I don't have the ability today to do this. They also won't allow me to because they so want to be realistic.

- Harm to human dignity: (18 references—23 %): This category embodies a sense that the computerized system facilitates a culture of gossip and penetration of the teachers' and students' privacy. A feeling is created that there is nothing that is personal or covert.

  In the beginning, when I first read announcements, I sometimes felt uncomfortable when someone was affected. I do what is necessary for myself…sometimes there are all sorts of mutual digs, or unintentional hurtful comments. I compartmentalized myself from exchanging information amongst teachers, as there is a tendency to gossip, towards irrelevant things and that kills the purpose. There is tremendous invasion of privacy. I once saw a coordinator noting things for broad dissemination—why is something one way and not another? Are you sure? Is this real? Things I, as a teacher, do not need to know.—I feel uncomfortable that the privacy of others is invaded.

- Communications (18 references – 23 %): On the one hand, the media becomes easy, available, direct, but on the other hand the interviewees testify to the "unbearable ease" of sending information and announcements leading to contempt and sometimes also to a lack of deep thought.

  The superficiality of communications. We become a flat society. We lose a lot from this. The concept says that technology is an alternative for interpersonal contact. And this cannot be. Eventually, teaching is dialogue with people. We constantly talk about a school with dialogue, but there is no real dialogue. If I could, I would remove this tool from school. I would create something quite different as regards communications. Like my colleagues, I seek deep processes and communications, and real dialogue,

and I think that the computerized system does not enable this at the technical level, and mainly not at the content level.

- Damage to the educational work (12 references—15 %): The computerized system, by its very essence of being a technological-administrative-organizational system, emphasizes technical aspects and pays less attention to the value of pedagogic aspects. (Emphasis on the technical, and less on the practical, facet.)

    To care for a person necessitates the human voice and human warmth that a computer cannot convey. If I could I would work totally differently at school; when I think about my work as a homeroom teacher it's not the computerized system and bureaucratic issues but what I give the student. How I relate to the student. How I develop my profession. Interpersonal matters…I think that this is the more important facet in my work; I personally don't like working with insignificant technical matters.

Quantitative analysis

Descriptive statistics for resistance to using the computerized system in school are presented in Table 3.

As can be observed in Table 3, the low average values for each component of resistance testify to the relatively low level of resistance to change in the research sample. Of the three components, the greatest resistance is manifested in the emotional component, while the lowest is manifested in the behavioral component.

A one-way MANOVA analysis was conducted to examine the first research hypothesis, according to which differences would be found in resistance to change according to the level of mastery of CL: those with low literacy resist the use of the computerized system more than those with moderate and high literacy, with the independent variable being the level of CL and the dependent variables the dimensions of resistance—cognitive, emotional, and behavioral—to the use of a computerized system. The analysis finds a difference, tending to distinct, between the levels of CL mastery [$F(6, 110) = 2.07$, $p = 0.062$, $\eta^2 = 0.101$]. Further one-way ANOVA analyses were conducted, to explore the differences for each index of resistance, and in addition, comparative analyses for pairs were conducted according to Scheffe, in order to locate the source of the differences between the groups. The averages and standard deviations of the indices of resistance regarding the use of the computerized system, and the results of the analyses of variance according to the one-directional ANOVA analysis and the results of the Scheffe analysis are presented in Table 4.

Table 4 shows that statistically distinct differences were found between the levels of low and of high mastery relative to cognitive and emotional resistance. Teachers with a low level of CL resist the use of the computerized system in a stronger cognitive manner than teachers with high CL. Similarly, teachers with low CL resist

Table 3 Averages, standard deviation, minimum, and maximum values for resistance to the use of the computerized system

Dimensions	M	SD	Min	Max
General resistance	1.76	0.71	1	3.94
Cognitive resistance	1.86	0.84	1	5
Emotional resistance	2.17	1.04	1	4.8
Behavioral resistance	1.19	0.43	1	3

the use of a computerized system in a more emotional manner than teachers with a high level of CL.

Path analysis was conducted using structural equation modeling with the AMOS 7.0 (Analysis of Moment Structures) program (Arbuckle 2006) in order to examine the impact of the teachers' professional attributes on their attitudes toward assimilating the computerized LMS in school. This program facilitates simultaneous examination of an entire system of variables and the connections between them, and the improvement of the reliability of the examination through reference to the measurement model and the structural model.

The technique of analyzing a causal model is preferable to examining a complex theoretical model, where many variables are presented that affect each other on a certain sequence and can be analyzed simultaneously (Lavee 1988). In this path, analysis-independent variables were defined (exogenous variables) that were the professional attributes, and included the teachers' role in school and their teaching seniority, followed by the mediating variables (the endogenous variables) which were the teacher's seniority in school and the level of CL. The other endogenous variables were three indices of resistance to using the computerized system: cognitive resistance, emotional resistance, and behavioral resistance. The analysis examined the marginal contribution of the exogenic variables and of each of the endogenic variables on predicting the resistance to the use of the computerized system. At the first stage of the analysis, the measurement model used the four indices—χ^2, RMSEA, NFI, and CFI—that are used to examine the model most suitable for the reality (Bentler and Bonett 1980). The lower the value of χ^2 and its lack of distinction, the more the model is compatible with the reality (Kline 2010; Hoyle and Panter 1995). When the RMSEA is 0.05 or less it manifests close compatibility; when the value is 0.08 or greater it manifests a mistake in structure, and when it is greater than 0.1 it necessitates rejecting the model. The closer the NFI and the CFI values are to 1, the greater the degree of compatibility (Byrne 2009; Hoyle and Panter 1995). Table 5 presents the evaluation of the path analysis model using compatibility indices.

The results of the model presented in Table 5 show that the value of χ^2 (df = 2) 0.77 is not statistically distinct ($p = 0.681$). The index RMSEA (0.000) is lower than 0.05. The NFI index (0.992) is very high and is close to one and CFI (1.000). These findings testify to the excellence of the model, and its suitability for the research data.

Table 4 Averages, standard deviation, F values for the indices of resistance to the use of the computerized system, and the results of the Scheffe analyses according to the levels of CL mastery

		Low level of CL mastery (L.CL) (N = 12)	Moderate level of CL mastery (M.CL) (N = 21)	High level of CL mastery (H.CL) (N = 27)	F (2, 57)	η^2	Scheffe
Cognitive resistance	M	2.28	2.06	1.51	5.01**	0.15	H.CL > L.CL
	SD	1.04	0.94	0.46	–	–	
Emotional resistance	M	2.88	2.54	2.18	4.57*	0.14	H.CL > L.CL
	SD	1.00	0.75	0.43	–	–	
Behavioral resistance	M	1.27	1.28	1.08	1.51	0.05	–
	SD	0.48	0.55	0.26	–	–	

* $P < 0.05$, ** $P < 0.01$

Note L.CL Low computer literacy; *M.CL* Moderate computer literacy; *H.CL* High computer literacy

Evaluation of the structural model that classifies the connections and the impacts between the variables was conducted at the second stage. Figure 1 presents the path analysis, the corrected promoting coefficients (β) between the exogenic variables and the endogenic variables, and between the endogenic variables, and the percentages of explained variance (R^2) of the endogenic variables.

Examination of Fig. 1 shows that teaching seniority explains the variation in the teacher's seniority in school (24 %). Teaching seniority, school seniority, and CL together explain the variance of the cognitive resistance and the behavioral resistance toward the use of the computerized system (29 and 20 % respectively). Positioning school and CL together explains the variance in the emotional resistance toward the use of the computerized system (28 %). Hence one may claim that the factors included in the model explain well the teachers' resistance as regards the cognitive, emotional, and the behavioral facets relative to the use of the computerized system.

The path coefficients were examined according to their direct impact and thereafter according to their indirect impact. The figure shows that the "teaching seniority" variable does not affect the variables of "level of CL mastery", "cognitive resistance", "emotional resistance", and "behavioral resistance". The variable "school seniority" has a distinct positive, strong impact on cognitive resistance for use of the computerized system ($\beta = 0.42$***), on behavioral resistance for use of the computerized system ($\beta = 0.37$**), but in a indistinct manner on emotional resistance and on the level of CL mastery. In other words, the more years of teaching seniority, the greater the teachers' cognitive and behavioral resistance to using the computerized system. The "school position" variable has a distinct, negative impact of moderate strength on the emotional resistance to using the computerized system ($\beta = -0.25$*) but not a distinct impact on cognitive behavior, behavioral resistance, and the level of CL mastery. In other words, the more teachers hold key positions in school (grade coordinator or subject coordinator) the greater their emotional resistance to using the computerized system. The CL variable distinctly, negatively, and moderately-strongly affects the

Table 5 The evaluation of the path analysis model using compatibility indices

Index	Index value
χ^2 (df = 2)	0.77
CFI	1.000
NFI	0.992
RMSEA	0.000

cognitive resistance to using the computerized system, the emotional resistance to using the computerized system ($\beta = 0.33**$), affects the emotional resistance to using the LMS ($\beta = -0.39**$), and the behavioral resistance to using the LMS ($\beta = -0.28*$). In other words, the greater the teachers' mastery of CL, the less their cognitive, emotional, and behavioral resistance to using the computerized system.

Examination of the indirect impact finds that "teaching seniority" distinctly, strongly and positively affects cognitive and behavioral resistance ($\beta = 0.42***$ and $\beta = 0.37**$ respectively). At the same time, there is no indirect impact of the "teaching seniority", "school seniority" and "position in school" variables on the three components of resistance, when the mediating variable is the level of CL mastery.

Thus, one may aver that the teacher's seniority indirectly affects the cognitive and behavioral resistance to using the computerized system. Similarly, the teachers' level of CL mastery directly affects all the components of resistance to the use of the computerized system, but is not a mediating factor among the other professional attributes (teaching seniority, school seniority, and position in school) and the resistance to change.

In conclusion, the results demonstrate that even though the teachers agreed to use the computerized system, they sense that the use in this system does not enable them the flexibility required in their profession. The qualitative analysis reveals that "professional values" such as negating their freedom of action and personal judgment motivates the teachers to oppose change.

Conclusions and discussion

The main barrier to integrating innovative technology in the education system is the teachers' attitudes toward the role of computation in teaching and their ability to integrate it successfully as part of their professional role (Cunningham 2009). Accordingly, if the teachers hold positive attitudes to integrating computation and they have the knowledge and skills to apply them in practice, they will integrate computations in their work successfully (Bitner and Bitner 2002; Anderson and Maninger 2007). This study focuses on the implications of the teachers' professional attributes on assimilating a computerized system in their work in school. The findings indicate the significant advantages for its use, such as a solution for order and organization, updating the parents and staff, tracking ability, transparency and progress, as well as indicating many difficulties and disadvantages.

These findings are compatible with the comments by Zander (1970) and Baskin (2001) who note that one of the factors due to which resistance to change is generated is when it arouses inner conflict that is connected to the process of

consolidating the teachers' professional identity as professionals, and when there are both negative, as well as positive, elements and professional dissonance is generated in their attitudes (Beijaard et al. 2004). The study clarifies the fact that all teachers have several facets that motivate them to structure a professional identity (Rodgers and Scott 2009); one, a contextual identity developed in the context of the individual's experiences; the second, an identity developed relative to the social demands of the environment; the third, linked to the dynamism of the individual's development within the organization and its attributes; and the fourth associated with the intra-personal identity between and within the various sub-identities that comprise the individual's professional identity as a teacher (Connelly and Clandinin 1999; Beauchamp and Thomas 2009). One may assume that these processes of constructing an identity, which also embrace the professional conflicts in assimilating a computerized system, affect the teachers' attitudes and the attributes of their resistance to such assimilation.

Another condition that also leads to resistance to change, according to Zander (1970) and Richardson (2001) is when the change is forced and the employees are not included in its application. The teachers reported a lack of involvement by the administration regarding assimilating the change, and also noted the lack of preparation regarding its implementation. Bogler and Nir (2012) study revealed that teachers who perceive the school as a supportive organization, which values their contributions and cares about their well-being, also tend to have higher intrinsic and extrinsic job satisfaction.

Robertson (1992) maintains that when the teachers serve as the origin rather than a pawn, they are less motivated regarding change and their personal responsibility for its successful assimilation decreases.

The change is perceived as criticism of the employees' style of work, or as harming them. When change serves the superiors as a tool to monitor or to evaluate the teacher, the chances that the teachers will resist the change are greater (Fullan and Hargreaves 1996). Many of the teachers noted that the computerized system is a tool that was assimilated in the system by the principals to supervise and monitor the teachers. Similarly, many of the teachers claim that inspection using and through this tool do not necessarily reflect their professionalism and their professional work. The change also arouses concerns about undermining interpersonal relationships at work (Ogobonna and Harris 2003).

This study also shows the attitude of the teachers to this condition. Most of the teachers interviewed have experience of the undermining of staff relationships. The teachers report defective communication, having been hurt by their colleagues, and that the change causes their colleagues to have the courage to say things that are less pleasant through the use of the system, which would have been avoided had these things needed to be said face to face.

The findings help to clarify the fact that resistance to change in assimilating the computerized system is connected to the teachers' professional-personal level (Zimmerman 2006). The professional–personal reasons that are highlighted by this study are lack of knowledge and necessary skills to implement the change, additional work for the teaching role, conflict of values, and personal identity. The interviewees' comments indicate that there is a hierarchy between the attributes of the resistance to change, as described below in Fig. 2.
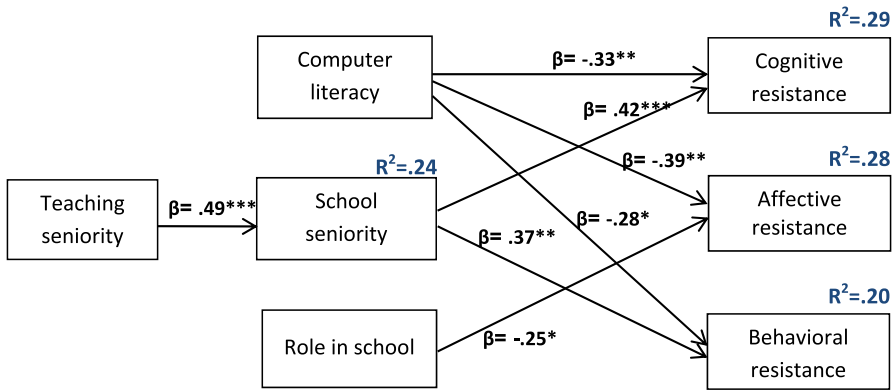
Fig. 1 The results of the path analysis for predicting resistance to use of the computerized system

Reference to each of the attributes is presented here:

- Lack of knowledge and skills needed to apply the change—the difficulties are mostly due to technical barriers, such as lack of technological knowledge in assimilating the computerized system. Thus, as noted in the study, those with low CL expressed greater resistance toward the change from the cognitive and the emotional perspectives.
- More work for the teachers—the use of the computerized system takes time and resources that are not within the framework of the teachers' traditional role. The teachers emphasize the clerical work that is not defined as part of their professional work. In accordance with the position model (Richardson 2001) the individual who is aware of the necessary tasks ex officio is liable to refuse to perform actions that are the result of the change, as they are not included in the domain of his position, and expand the burden they are expected to bear (Karasek 1979).
- Resistance to change that affects the individual's key values or his professional identity—if the planned change is perceived as contradicting the values that guide the teachers and the attributes of their personal identities, they will resist change (Zuckerman 1979; Rodgers and Scott 2009). The study clarifies the fact that teachers have difficulty in applying such parts in the computerized system in view of the harm to their beliefs, opinions, and their educational credo. Thus, for example, the study finds that teachers with a low level of CL resist the use of the computerized system at cognitive and emotional levels more than teachers with high CL. These findings support the claim that in order to reduce the resistance of teachers to change, a process must be created that enables them to handle the change according to the knowledge they have acquired (Fullan and Hargreaves 1996).

To sum up, the qualitative and the quantitative findings are found to be along a sequence that explains the process of gradual and significant change at both the individual–teacher level as professionals and at the organizational-school level, as regards assimilating the LMS in school.
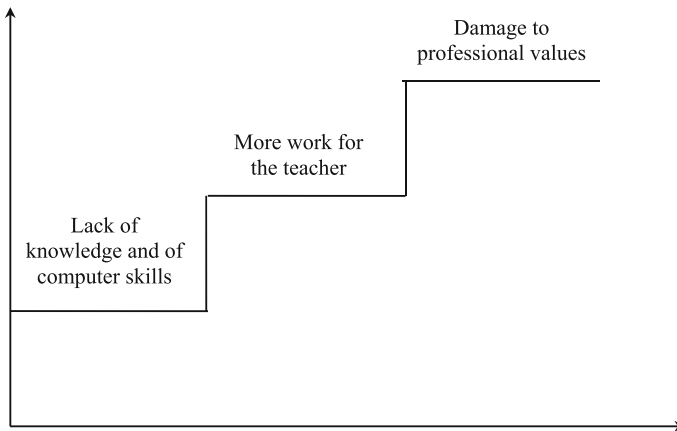
Fig. 2 The hierarchy of attributes of resistance to change among teachers in assimilating the computerized system

Figure 2 below describes the main attributes of the resistance to change among teachers in assimilating the computerized system.

The figure shows a hierarchy in the attributes, starting from the basic level connected to knowledge and skills, above which is the level associated with the professional aspects connected to the teacher's functioning in practice in the classroom, then the highest level, where the resistance is connected to values and professional identity.

In view of these findings, the conclusion arising from the study is that the teachers' resistance to change regarding the assimilation of the LMS manifests the personal-internal processes the individual experiences regarding change, so the teachers who are subjects of change unconsciously use different defenses (cognitive and behavioral) in order to protect themselves from the change or from the feelings that the change arouses in them (Oldham and Kleiner 1990). These unconscious defenses are sometimes liable to prevent them from accepting the change and consolidating a position toward it (Halton 1994). The research findings show that the teachers' positions cannot be ignored, but on the contrary, they should be understood and considered, in order to make the required adjustments at the organization for a more efficient implementation process.

This will allow a more efficient use of the LMS and thus enhance both the teachers and the organization efficacy. In our research, the use of both quantitative and qualitative data can assist the understating of the processes that affect resistance to change and give insight to the teachers' perspective and ideas for change.

The research findings support the hypotheses. The findings of the SEM path analysis are innovative, and even expand the significance of the professional attributes of teaching seniority, school seniority, role in school, and level of CL relative to the assimilation of technological change. Until now, these attributes were considered to be the teachers' background and personal attributes, each with its unique impact on their readiness to accept change in general (Fullan and Smith

1999; de Freitas and Oliver 2005; Cunningham 2009; Halverson and Smith 2010; Selwyn 2010) and technological change in general (de Freitas and Oliver 2005). In the current study, these attributes were analyzed simultaneously along a sequence and found to be influences of varying intensity for predicting resistance to change. A high level of the teacher's CL predicts low resistance to change, particularly in the personal assimilation of LMS in school. This finding complements other studies that find that the teachers' technological knowledge is very important relative to their attitudes toward technological change with LMS in school (Ogobonna and Harris 2003; Carter 2008; Coffman 2009). Similarly, and as in other studies, greater school seniority was found to predict high resistance to change.

The current study finds that a key role in school predicts high resistance, in contrast to the findings of other studies (Baskin 2001). The reasons for this may stem from the perception of the essence of the school role, which does not testify necessarily to involvement and participation in decision-making and processes of change, but to coordinating a subject from the administrative, limited and narrow perspective (Dias and Diniz 2014; Avidov-Ungar 2010).

The research findings further indicate that school seniority, role in school, and CL predict resistance to change directly, in contrast to teaching seniority that indirectly predicts resistance to change. These findings indicate the differences between types of professional attributes among teachers; thus teaching seniority is a demographic–personal attribute, similar to gender and education, while school seniority, role in school and CL are attributes that the teacher "acquires" in school, where he teaches, and they are inherently connected to the organizational culture (Borko 2004). Therefore, attributes of this type may directly affect resistance to processes of change in school, as they may also affect resistance to assimilating a computerized system for teaching and learning. One may therefore also assume that resistance to change will be manifested in all the components of the attitude—cognitive, emotional, and behavioral—and they are likely to contribute to better understanding of the future behavior of the teacher relative to the assimilation of the computerized LMS. Furthermore, the research conclusions testify to the fact that CL, school seniority, and role in school are professional attributes that reflect the organizational culture, and their implications for the level of resistance to change are direct and significant. Accordingly, improvement in school culture, manifested mainly in nurturing the teachers' professional attributes, should be seen as a central element in reducing resistance to change when assimilating the LMS in school. While our study was conducted on an experimental school in which the system was implemented, we do believe our finding could reflect similar processes that take place in schools that undergo assimilation process of innovative technology.

References

Allport, G. W. (1935). Attitudes. In C. Murchison (Ed.), *Handbook of social psychology* (pp. 798–844). Worcester, MA: Clark University Press.

Anderson, S., & Maninger, R. (2007). Pre-service teachers' abilities, beliefs, and intentions regarding technology integration. *Journal of Educational Computing Research, 37*(2), 151–172.

Arbuckle, J. L. (2006). *AMOS 7.0 user's guide*. Chicago: SPSS.

Avidov-Ungar, O. (2010). Islands of innovation or comprehensive innovation. Assimilating educational technology in teaching, learning, and management: A case study of school networks in Israel. *Interdisciplinary Journal of E-Learning and Learning Objects, 6*, 259–280.

Avidov-Ungar, O., & Friedman, Y. (2011). *Empowering teachers—essence and models. Information available to the professional*. Jerusalem: Henrietta Szold Institute (Hebrew).

Bakker, A. B., & Schaufeli, W. B. (2008). Positive organizational behavior: Engaged employees in flourishing organizations. *Journal of Organizational Behavior, 29*(2), 147–154.

Baskin, E. F. (2001). Change management concepts and models: Sponsorship, early adapters and the development of urban teachers. In R. E. Cooter Jr. (Ed.), *Perspectives on rescuing urban literacy education. Spies & saboteuse & saints* (pp. 24–76). New York: Lawrence Erlbaum Associates.

Beauchamp, C., & Thomas, L. (2009). Understanding teacher identity: An overview of issues in the literature and implications for teacher education. *Cambridge Journal of Education, 39*(2), 175–189.

Becker, H. (2001). *How are teachers using computers in instruction*? Paper presented at the 2001 Annual Meeting of the American Educational Research Association, University of California, Seattle.

Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education, 20*(2), 107–128.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88*, 588–606.

Bitner, N., & Bitner, J. (2002). Integrating technology into the classroom: Eight keys to success. *Journal of Technology and Teacher Education, 10*(1), 95–100.

Blau, I., & Hameiri, M. (2012). Teachers–families online interactions and gender differences in parental involvement through school data system: Do mothers want to know more than fathers about their children? *Computers & Education, 59*, 701–709.

Bogler, R., & Nir, A. E. (2012). The importance of teachers' perceived organizational support to job satisfaction: What's empowerment got to do with it? *Journal of Educational Administration, 50*(3), 287–306. doi:10.1108/09578231211223310.

Bogler, R., & Somech, A. (2004). Influence of teacher empowerment on teachers' organizational commitment, professional commitment and organizational citizenship behavior in schools. *Teaching and Teacher Education, 20*, 277–289.

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher Journal, 33*(8), 3–15.

Buchanan, D. A., & Boddy, D. (1992). *The expertise of the change agent*. London: Prentice Hall.

Byrne, B. M. (2009). *Structural equation modeling with AMOS*. Mahwah, NJ: Lawrence Erlbaum Associates.

Carter, E. (2008). Successful change requires more than change management. *The Journal for Quality & Participation, 31*(1), 20–23.

Cheng, Y. C. (2009). Paradigm shift in pre-service teacher education: Implications for innovation and practice. In C. P. Lim, C. Brook & G. Lock (Eds.), Innovative practices in pre-service teacher education: An Asia-Pacific perspective (pp. 3–21). Rotterdam: Sense. Retrieved May 23, 2010, from https://www.sensepublishers.com/files/9789087907532PR.pdf.

Chong, K. H. (2008). Coping with conflict, confronting resistance: Fieldwork emotions and identity management in a South Korean evangelical community. *Qualitative Sociology, 31*(4), 36–390.

Clandinin, D. J., & Rosiek, J. (2007). Mapping a landscape of narrative inquiry: Borderland spaces and tensions. In D. J. Clandinin (Ed.), *Handbook of narrative inquiry: Mapping a methodology* (pp. 35–75). Thousand Oaks, CA: Sage.

Coffman, T. (2009). Getting to the heart of technology integration: Virginia's instructional technology resource teacher program. *Learning and Learning with Technology, 36*(7), 20–23.

Collinson, V., Kozina, E., Lin, Yu-Hao K., Ling, L., Matheson, I., Newcombe, L., et al. (2009). Professional development for teachers: A world of change. *European Journal of Teacher Education, 32*(1), 3–19.

Connelly, F. M., & Clandinin, D. J. (1999). *Shaping a professional identity: Stories of educational practice*. New York: Teachers College Press.

Coppieters, P. (2005). Turning schools into learning organizations. *European Journal of Teacher Education, 28*(2), 129–139.

Cunningham, C. A. (2009). Transforming schooling through technology: Twenty-first-century approaches to participatory learning. *Education and Culture, 25*(2), 46–61.

de Freitas, S., & Oliver, M. (2005). Does e-learning policy drive change in higher education? A case study relating models of organizational change to e-leaning implementation. *Journal of Higher Education Policy and Management, 27*(1), 81–95.

de Smet, C., Bourgonjon, J., de Wever, B., Schellens, T., & Valcke, M. (2012). Researching instructional use and the technology acceptance of learning management systems by secondary school teachers. *Computers & Education, 58*(2), 688–696.

Dias, S. B., & Diniz, J. A. (2014). Towards an enhanced learning management system for blended learning in higher education incorporating distinct learners' profiles. *Educational Technology & Society, 17*(1), 307–319.

Fox, S., & Amichai-Hamburger, Y. (2003). The power of emotional appeals in promoting organizational change programs. *Academy of Management Perspectives, 15*, 84–94.

Frank, K. A. (1998). Quantitative methods for studying social context in multilevels and through interpersonal relations. In P. D. Pearson & A. Iran-Nejad (Eds.), *Review of research in education, 23* (pp 171-216). Washington, DC: American Educational Research Association.

Fullan, M., & Hargreaves, A. (1996). *What's worth fighting for in your school*? New York: Teachers College Press.

Fullan, M., & Smith, G. (1999). Technology and the problem of change. Retrieved from http://www.michaelfullan.ca/Articles_98-99/12_99.pdf.

Goldrat, A. (2001). *The connection between the perception of uncertainty, tolerance for ambiguity and a sense of pressure and the attitude of employees towards organizational change*. Jerusalem: Henrietta Szold Institute.

Halton, W. (1994). Some unconscious aspects of organizational life. In A. Obholzer & V. Z. Roberts (Eds.), *The unconscious at work: Individual and organizational stress in the human services* (pp. 11–18). Routledge: London.

Halverson, R., & Smith, A. (2010). How new technologies have (and have not) changed teaching and learning in schools. *Journal of Computing in Teacher Education, 26*(2), 49–55.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. London: Routledge.

Hoyle, R. H., & Panter, A. T. (1995). Writing about structural equation models. In R. H. Hoyle (Ed.), *Structural equation modeling*: *Concepts*, *issues*, *and applications* (pp. 158–176). Newbury Park, CA: Sage.

Karasek, R. A. (1979). Job demands, job description latitude and mental strain- implications for job redesign. *Administrative Science Quarterly, 24*, 285–309.

Katz, D., & Stotland, E. (1959). A preliminary statement to a theory of attitude structure and change. In S. Koch (Ed.), *Psychology*: *A study of a science* (Vol. 3, pp. 423–475). New York: McGraw-Hill.

Kent, T. W., & McNergney, R. F. (1999). Teaching with technology: Expanding models of instruction. In T. W. Kent, & R. F. McNergney (Eds.), Will technology really change education? From blackboard to Web (pp. 34–48). Thousand Oaks, CA: Corwin.

Kline, R. B. (2010). Principles and practice of structural equation modeling (3rd ed.). New York: The Guilford.

Koberg, C. S., Detienne, D. R., & Heppard, K. A. (2003). An empirical test of environmental, organizational, and process factors affecting incremental and radical innovation. *The Journal of High Technology Management Research, 14*(1), 21–45.

Koschmann, T. (2005). Medical education and computer literacy: learning about, through, and with computers. *Academic Medicine*, *70*, 818–821.

Kouritzin, S. G., Piquemal, N. A. C., & Norman, R. (2009). *Qualitative research: Challenging the orthodoxies in standard academic discourse(s)*. New York: Routledge.

Lavee, Y. (1988). Linear structural relationships (LISREL) in family research. *Journal of Marriage and Family Research, 51*, 937–948.

Levin, B., & Fullan, M. (2008). Learning about system renewal. *Educational Management Administration & Leadership, 36*(2), 289–303.

Macfadyen, L. P., & Dawson, S. (2010). Mining LMS data to develop an "early warning system" for educators: A proof of concept. *Computers & Education, 54*, 588–599.

Maskit, D. (2011). Teachers' attitudes toward pedagogical changes during various stages of professional development. *Teaching and Teacher Education, 27*(5), 851–860. (an international journal of research and studies).

McDermott, C. M., & O'Connor, G. C. (2002). Managing radical innovation: An overview of emergent strategy issues. *Journal of Product Innovation Management, 19*(6), 424–438.

Northcote, M., Lim, C. P. (2009). The state of pre-service teacher education in the Asia Pacific region. In C. P. Lim, C. Brook, & G. Lock (Eds.), *Innovative practices in pre-service teacher education*: *An Asia-Pacific perspective* (pp. 22–38). Rotterdam: Sense. Retrieved May 23, 2010, from https://www.sensepublishers.com/files/9789087907532PR.pdf.

Ogobonna, E., & Harris, L. C. (2003). Innovation organizational structure and performance. *Journal of Organizational Change Management, 16*(5), 512–533.

Oldham, M., & Kleiner, B. H. (1990). Understanding the nature and use of defence mechanisms in organizational life. *Journal of Managerial Psychology, 5*(5), 1–4.

Oreg, S. (2003). Resistance to change: Developing an individual differences measure. *Journal of Applied Psychology, 88*(4), 680–693.

Rajecki, D. W. (1982). *Attitudes: Themes and advances*. Sunderland, MA: Sinaur Associates.

Resnik, J. (2007). Discourse structuration in Israel, democratization of education and the impact of the global network. *Journal of Educational Policy, 22*(2), 147–171.

Richardson, V. (2001). Teacher change. In V. Richardson (Ed.), *Handbook of research on teaching* (pp. 905–950). Washington, DC: AERA.

Robertson, I. T. (1992). *Motivation: Strategies, theory and practice*. London: Institute of Personnel Management.

Rodgers, C. R., & Scott, K. H. (2009). The development of the personal self and professional identity in learning to teach. In M. Cochran-Smith, S. Feiman-Nemser, D. J. McIntyre, & K. E. Demers (Eds.), *Handbook of research on teacher education* (pp. 732–746). New York: Routledge.

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). New York: Free.

Sarason, S. B. (1995). The school culture and the processes of change. In S. B. Sarason (Ed.), *School change*, *the personal development of a point of view* (Chap. 6, pp. 65–84). New York: Teacher College, Columbia University.

Selwyn, N. (2010). Looking beyond learning: Notes towards the critical study of educational technology. *Journal of Computer Assisted learning, 26*(1), 65–73.

Sergiovanni, T. (2001). *Leadership*: *What's in it for schools*? London: Routledge Falmer.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.

Vaillant, D. (2005). Educational reform and the role of teachers. *Prelac Journal, 1*, 38–51.

Valsamidis, S., Kontogiannis, S., Kazanidis, I., Theodosiou, T., & Karakos, A. (2012). A Clustering methodology of web log data for learning management systems. *Educational Technology & Society, 15*(2), 154–167.

Venezky, R. L., Davis, C. (2002). Que Vademus? The transformation of schooling in a networked world. OECD/CERI research report.

Virkus S. (2003). Information literacy in Europe: A literature review. *Information Research, 8*(4), 1–159. Retrieved from http://informationr.net/ir/8-4/paper159.html.

Wallace, R. M. (2004). A framework for understanding teaching with the internet. *American Educational Research Journal, 41*(2), 447–488.

White, S. (2007). Critical success factors for e-learning and institutional change—some organizational perspectives on campus-wide e-leaning. *British Journal of Educational Technology, 38*(5), 840–850.

Woodrow, J. E. J. (1992). The influence of programming training on the computer literacy and attitudes of pre-service teacher. *Journal of Research on Computing in Education, 25*(2), 200–219.

Zander, A. (1970). Resistance to change—its analysis and its prevention. In M. Hartom, M. Weiss, & Y. Reuveni (Eds.), *Dynamics of an organization*. Tel Aviv: Yachdav.

Zimbardo, P. G. (1992). *Psychology and life* (13th ed.). New York: HarperCollins.

Zimmerman, J. (2006). Why some teachers resist change and what principals can do about it. *NASSP Bulletin, 90*(3), 238–249.

Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal*. Hillsdale, NJ: Lawrence Erlbaum.

Orit Avidov-Ungar is the Head of Research Authority and senior lecturer at the School of Education Systems Management at Achva Academic College. She is also a member of the faculty of the Open University of Israel. She heads the team specializing in professional development at the Mofet Institute and is academic advisor to the Ministry of Education in Israel on management of the implementation of innovative technology systems and the professional development of teachers. Her research studies deal

with the implementation of innovative technologies in education systems, the empowerment and professional development of teachers, and leading organizational change in education systems.

Magen-Nagar is a Senior Lecturer and Director of MA Program of Teaching and Learning: Educators' Mentorship Training, Gordon Academic College of Education. She is a researcher and academic consultant in the national ICT program entitled "Adapting the education system to the 21st century", in the Department of Science and Technology, Ministry of Education. She is also a postdoctoral fellow at the Department of Education, Ben- Gurion University. Her areas of research include integrating ICT in education, the quality of teaching, teachers' attributes, and autonomy in education.