

## **The Effect of PICTK and TPACK Knowledge on ICT Instructors' Sense of Empowerment**

**Noga Magen-Nagar**

Ministry of Education, Gordon College of Education  
Israel

**Orit Avidov-Ungar**

The Open University, Achva Academic College  
Israel

**Abstract.** The implementation of technology in the national Information and Communication Technology (ICT) program is supported by instructors who act according to the program's outputs. The current research has two goals: to examine the predictive variables of ICT instructors who instruct at the district level (henceforth: "district ICT instructors") compared to ICT instructors who instruct at both the district and the school levels (henceforth: "district-school ICT instructors") and to examine the effect of Program Information Communication Technology Knowledge (PICTK) and Technology Pedagogy and Content Knowledge (TPACK) on the ICT instructors' sense of empowerment for facilitating the implementation of ICT in schools. One hundred and twenty-one ICT instructors participated in the research: 77 district ICT instructors (64%) and 44 district-school ICT instructors (36%). The research tool consisted of four self-report questionnaires. Path analysis was performed using structural equation analysis. The main results show that PICTK knowledge has a significant positive effect on TPACK knowledge among the district ICT instructors, whereas there was no change among the district-school ICT instructors. The results indicate that PICTK and TPACK knowledge does not necessarily promote the pedagogical-ICT knowledge of the ICT instructor, but is critical for his or her sense of empowerment. It is therefore recommended to continue support for all ICT instructors, and to expand their personal knowledge about the evolving ICT program.

**Keywords:** PICTK knowledge; TPACK knowledge; sense of empowerment; ICT instructors.

### **Introduction**

Empowerment is increasing the ability of the other to act (Conger & Kanungo, 1988; Maeroff, 1988; Muijs & Harris, 2003; Short & Rinehart, 1992). There are

those who claim that empowerment is an ideology and a worldview, that it is a process and not a single event, and a person who lacks empowerment therefore does not actualise his or her professional potential (Sandy, 2010; White, 1992). According to Blasé & Blase (1997), there are no people who absolutely lack empowerment or who have absolute empowerment. Empowerment is defined on a developmental spectrum, on which people can move between greater or lesser empowerment. Thus, empowerment is not an “absolute threshold”, but rather a dimension that changes over time with different intensities at different points of time (Zimmerman, 1990). During the empowerment process the person’s belief in his or her ability to make decisions and solve problems are apparent, and this is therefore a process of personal development (Muijs & Harris, 2003). Empowerment of role holders, such as the Information and Communication Technology (ICT) instructor, is a deliberate process whose goal is to develop and enable members of the organisation to actualise their personal potential and growth, a process that enables actualisation of personal qualities, a sense of belonging and belief in self-efficacy and self-control (Datnow, Hubbard & Mehan, 2002).

### **Empowerment of role holders**

Empowerment in the education system is based on the belief that people have skills and ability, but need experience and opportunities in order to express them (Dembele & Schwille, 2006; Hargreaves, 2005). Role holders in education systems who are empowered, active and confident in their power will also act beyond their fields of responsibility, will initiate, and will contribute to the success of the school and the organisational environment in which they function and/or to their success as professionals (Blasé & Blase (1997; Irwin 1996). Role holders who are empowered have a higher sense of responsibility pertaining to their role and pertaining to the tasks which they must perform and the goals which they should achieve (Avidov-Ungar, Friedman & Olshtain, 2014). They are involved in choosing and developing curricula which best meet the needs of the system (White, 1992) and in their work they also influence students’ achievements (Pollak, 2009; Reeves, 2009).

Short & Rhinhart (1992) list six measures that compose the construct of teachers’ empowerment: decision-making, professional growth, status, self-efficacy, autonomy and impact. Maeroff (1988) claimed that the professional status of teachers and role holders in education systems can be improved by raising their self-image, adding pedagogical and academic knowledge to their existing knowledge and imparting possibilities for work at an equal level with the principal and with other teachers (Cribner, Truell, Hager & Srichai, 2001). Efficacy develops when these role holders acquire self-knowledge and believe that they have the necessary skills for the desired outcomes. Thus, a sense of self-efficacy empowers the role holder in his or her doing and performance (Bandura, 1989). The empowerment process is one of the main factors which generate the process of change in education and enable its progress (Sandy, 2010). Empowerment of role holders, who are the spearhead of the leaders of change, is therefore an important resource which assists the educational

organisation in coping with a changing reality (Avidov-Ungar & Shmir-Inbal, 2013; Kaniuka, 2012).

### **Change in education systems**

Models that describe effective implementation of processes of change indicate that the first critical stage in implementation of the change is the stage in which those involved in the implementation understand the need for this change (Cook, Holley & Andrew, 2007; Shaw, 2005) and a sense of urgency is created among them that the change is essential for improving and advancing the organisational system (Hargreaves & Goodson, 2006). Even after understanding the need for the change, differences may exist between various interested parties: in their perception of the goals of the change, in their personal and organisational interests and in their attitudes towards the desired nature of the change (Fullan, 2006; Fullan, Bertani & Quinn, 2004; Klein & Sorra, 1996). In this context, ICT instructors are a major and critical link for the success of the change. The National ICT Program is intended to create change and to convert the school into a teleprocessing organisation which optimally implements ICT (Ministry of Education, 2013a). The program was constructed based on a comprehensive approach founded on a logical intervention model of inputs, outputs and products, which creates a framework for planning, implementation and evaluation. A close connection between inputs, outputs and products demonstrates the logical basis of the intervention program's rationale (Sundra, Scherer, & Anderson, 2003). Inputs of the ICT program include the resources given to the schools, which are mainly instruction, equipment and routine maintenance. The nature of the instruction and its contents change according to progress in the program (Ministry of Education, 2013a).

The national ICT program in Israel, "adapting the education system in the 21st Century", has been operating since 2010, And comprise hundreds of elementary and secondary schools, representing about 40% of the schools in Israel. The purpose of the program is: implementing innovative pedagogy, while deliver 21st century skills, combined with information and communication technologies. ICT program is holistic, and composed of five activities complement each other:

- a) Adapting curriculum for teaching - learning - assessment in the information era
- b) The development and supply of the teaching - learning - assessment digital available to teachers and learners.
- c) Professional development of teachers.
- d) Establishment of ICT infrastructure and maintenance logistics.
- e) Monitoring and evaluation of the components of the program.

Every school required products directed learning in an online environment, innovative teaching and managing ICT organization.

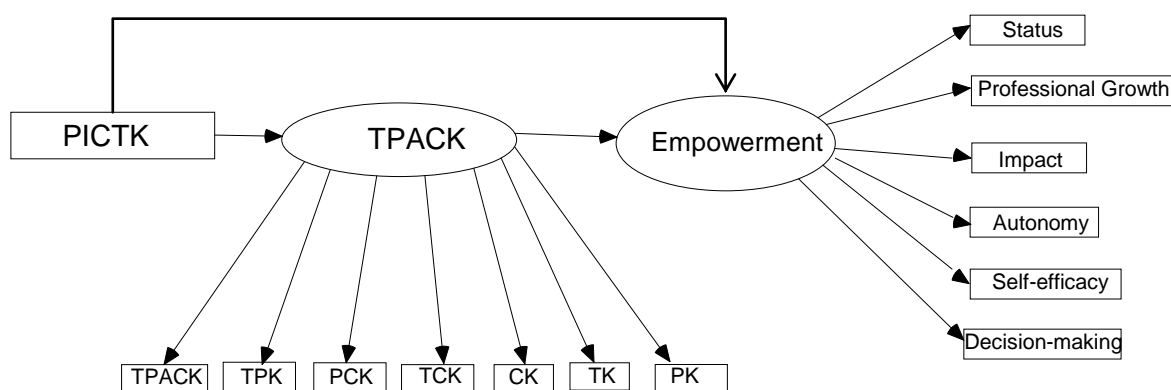
During the preparation stage for implementing the ICT program, designated ICT instructors were chosen, whose role is to lead and assist the schools in the implementation of ICT according to the perception and outputs of the program. The ICT instructors' work is carried out at two levels: (1) At the school level, where the school ICT coordinator also serves as an ICT instructor who assists the

school in introducing the technological change and guides the teachers towards successful implementation of the program's outputs; (2) At the district level, where a district ICT instructor is responsible for approximately five schools. The main role of this instructor is to guide the school principal and school ICT coordinator to realise all the outputs of the National ICT Program (Ministry of Education, 2013b). The instructor's work is perceived as a consistent and continuous intervention process which assists the teacher in his or her professional development, with improvement in the quality of teaching and in the learning achievements (Ministry of Education, 2013c). Choosing the teacher for the instruction role is therefore carried out via the appropriate pedagogical considerations. A teacher who was chosen to instruct teachers in ICT is a teacher with professional-pedagogical authority to instruct. The teacher is chosen due to having extensive and successful experience in the field and having Technology Pedagogy and Content Knowledge (Ministry of Education, 2013b), which is called TPACK, and is knowledge that characterises the teacher's ability to include technology in teaching in an educated manner (Koehler & Mishra, 2008).

The training and professional development of the ICT instructors construct personal knowledge which includes insights from four aspects of the ICT program in Israel: context, inputs, process and products. The knowledge framework is a more advanced logical intervention model, the Context, Input, Process, Product (CIPP) model which refers to the processes of implementation and change undergone by the schools. The instructors learn the ICT program, but more than that, they learn how to evaluate its components with reference to the school for which they are responsible. The context aspect refers to the preliminary planning and definition of the program and its justification. The inputs aspect refers to the structure of the program and to the strategic planning which includes timetables, manpower, resource utilisation, etc. The process aspect refers to implementation of the program and the quality of the process. The products aspect refers to achievements in the context of the goals of the program and the effects of the program, in terms of effectiveness and sustainability (Stufflebeam, 2007). In the present study, this knowledge is called Program Information Communication Technology Knowledge (PICTK).

### **The research goals**

The research has two goals: to examine the predictive variables of ICT instructors who instruct at the district level (henceforth: "district ICT instructors") compared to ICT instructors who instruct at both the district and the school levels (henceforth: "district-school ICT instructors") and to examine the effect of PICTK knowledge and TPACK knowledge on ICT instructors' sense of empowerment for facilitating the implementation of ICT in the schools. Figure 1 presents the research model.



**Figure 1: The proposed research model**

### The research hypotheses

1. District ICT instructors and district-school ICT instructors will perceive PICTK knowledge as influencing their sense of empowerment.
2. District ICT instructors and district-school ICT instructors will perceive PICTK knowledge as influencing their TPACK knowledge during their instruction.
3. District ICT instructors and district-school ICT instructors will perceive their instructive TPACK knowledge as influencing their sense of empowerment.

### Method

#### Participants

The participants included 121 ICT instructors who were appointed in 2012-2013 by the Ministry of Education in order to promote teaching in an ICT environment in schools that participated in the National ICT Program. Of these, 77 (64%) are “district ICT instructors” and 44 (36%) are “district-school ICT instructors”. About half (47.9%) of the instructors have a teaching seniority of 17 or more years and about half (52.1%) have a seniority of 4 to 16 years. The majority (64.5%) have an MA, about a third (28.9%) have a BA and a few (2.5%) have a Ph.D. Table 1 presents the distribution of seniority in instructing of the district ICT instructors and the district-school ICT instructors.

**Table 1: Distribution of the seniority in instructing of district ICT instructors and district-school ICT instructors (%)**

The group	Teaching Seniority			
	1-3 years	4-5 years	6-10 years	11 or more years
District ICT instructors	63.6	10.4	6.5	18.2
District-school ICT instructors	81.8	4.5	2.3	9.1

## The research tool

The research tool is a self-report questionnaire. The research hypotheses were tested using four questionnaires that were administered to the ICT instructors:

1. *Empowerment questionnaire*: The sense of empowerment was measured using a questionnaire developed by Short & Rinehart (1992). The questionnaire tests the perception of the responders regarding the extent of their empowerment on issues related to their work as instructors. The questionnaire contains 29 items that were adapted to the work of the instructors. It is constructed on a 5-level Likert scale. The sense of empowerment was measured according to six measures: 1. Decision-making – the choice of what and how to instruct, the partnership for making decisions on events in the field of instruction; 2. Role status – the sense of esteem and respect and the function in a professional environment; 3. Role autonomy – control over the agenda and the schedule; 4. Sense of self-efficacy – the belief in the self and the feeling that I am leading others to growth, change and empowerment; 5. Professional growth – the knowledge, learning, involvement in the curricula and the partnership in processes of team development; 6. Impact – the opportunity to collaborate in a team, to teach others, to contribute of my knowledge and to influence teachers and principals. A high internal consistency was found for the six sub-scales. Table 2 presents the measures of the questionnaire, the means, standard deviations and reliabilities.

**Table 2: Measures of the empowerment questionnaire – means, standard deviations and reliabilities (N=121)**

Questionnaire measures	No. of items	Example	M	SD	Cronbach's alpha
Decision-making	6	I am involved in decisions that are related to the instruction budget in the district/schools	3.78	.55	.64
Status	6	My colleagues treat me with respect	4.44	.48	.72
Autonomy	3	I am able to plan my own schedule	4.32	.66	.74
Self-efficacy	5	I believe that I am good at what I do	4.59	.45	.75
Professional growth	4	The instruction work gives me an opportunity to continue to study and become more professional	4.24	.75	.77
Impact	5	Colleagues at work end to listen to my advice	4.29	.62	.80
All empowerment questionnaire items	29		4.26	.47	.93

2. *PICTK knowledge (Program Information Communication Technology Knowledge) questionnaire*: This questionnaire was intended to test the knowledge of the ICT instructors on the National ICT Program. The questionnaire was constructed for the present study and included 10 statements on a 5-level Likert scale. The reliability of the questionnaire was  $\alpha=.86$ . An example of an item is: "The ICT program is based on an ICT model of innovative technology".

3. *Instructive TPACK knowledge (Technology Pedagogy and Content Knowledge) questionnaire*: A TPACK questionnaire that was developed by Koehler & Mishra (2008) was adapted to the current study in order to test the instructive TPACK knowledge of the ICT instructors. The questionnaire was adapted to the field of instruction. We asked senior ICT instructors to go over the questionnaire and test the compatibility of the items to the field of instruction. The questionnaire was given to eight judges and their comments were taken into account when constructing the final version of the questionnaire. The questionnaire tests the extent to which technology is used in instruction on a 5-level Likert scale. The questionnaire contains seven measures: pedagogical knowledge, technological knowledge, content knowledge in the field of knowledge, pedagogical content knowledge in the field of knowledge, technological content knowledge in the field of knowledge, technological pedagogical knowledge, technological pedagogical content knowledge. Table 3 presents the measures of the questionnaire and their means, standard deviations and reliabilities.

**Table 3: Measures of the instructive TPACK knowledge - means, standard deviations and reliabilities (N=121)**

Questionnaire measures	No. of items	Example	M	SD	Cronbach's alpha
Pedagogical knowledge (PK)	3	I am able to use a variety of teaching styles when I instruct	4.51	.49	.69
Technological knowledge (TK)	4	I am able to solve technical problems that are related to hardware	3.94	.68	.82
Content knowledge (CK)	3	I can decide for myself on the scope of the learned content in the fields of my instruction	4.34	.52	.65
Pedagogical content knowledge (PCK)	4	I am able to teach the teachers I instruct in an online environment	4.63	.47	.82
Technological content knowledge (TCK)	3	I am able to create an online environment that enables the teachers I instruct to construct new	4.42	.56	.79

Technological pedagogical content knowledge (TPK)	4	knowledge and skills I am able to conduct an online activity among the teachers I instruct	4.36	.41	.91
Technological pedagogical content knowledge (TPACK)	4	I am able to use technology in order to successfully represent content which I instruct	4.18	.61	.74
All instructive TPACK knowledge questionnaire items	25		4.33	.42	.92

4. *Demographic questionnaire*: The instructors answered a questionnaire on demographics, such as gender, age, role in the education system, academic education, seniority in teaching and seniority in instruction.

### The research procedure

At the beginning of the 2013 school year, the ICT instructors were asked to answer an online self-report questionnaire that was intended for the present study. Anonymity and confidentiality were ensured by including no identifying details in the questionnaire.

### Results

Path analysis with structural equation modeling using the AMOS 7.0 (Analysis of Moment Structures) software (Arbuckle, 2006) was performed in order to test the effect of PICTK knowledge on instructive TPACK knowledge and their effect on the sense of empowerment of the instructor. This software enables testing variables and relations between them simultaneously as well as improvement of the test by reference to the measurement model and the structural model. This analysis can therefore confirm or reject the theory on which the research is based.

The first step in structural equation modeling is evaluation of the measurement model, and it is performed by testing measures that indicate its fit to the model. The four measures  $\chi^2$ , RMSEA, NFI and CFI are used to test the model which best fits reality (Bentler & Bonett, 1980; Kline 2005). Table 4 presents the fit measures of the proposed research model.

**Table 4: Fit measures of the proposed research model**

Fit measures	Recommended levels of fit	Value of the measure
$\chi^2$	n.s. at $p < .05$	113.671, $p < .05$
$\chi^2/df$	<5	1.29
CFI	>.90	.97



NFI	>.90	.90
RMSEA	<.08	.05

The results in Table 4 indicate a good fit of the proposed research model to the research data. The corrected loading coefficients ( $\lambda$ ) of the measurement model of the district ICT instructors and of the district-school ICT instructors are presented in Figure 2 and Figure 3.

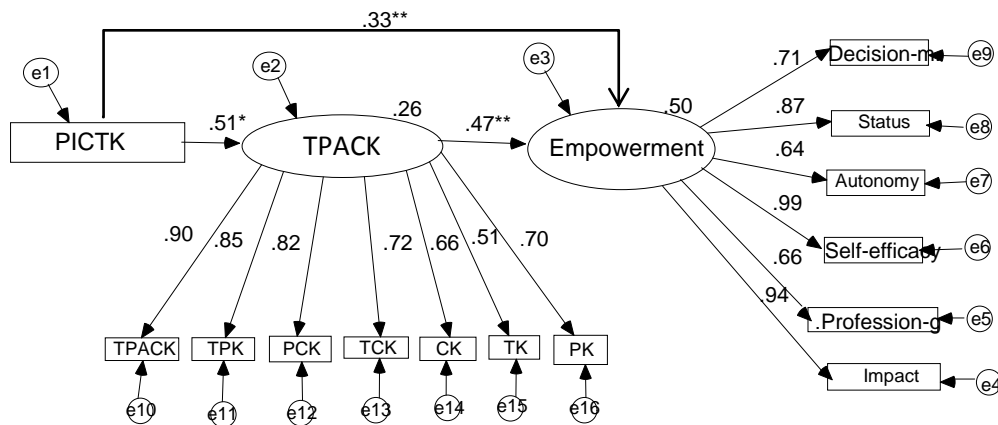


Figure 2: Path analysis for district ICT instructors

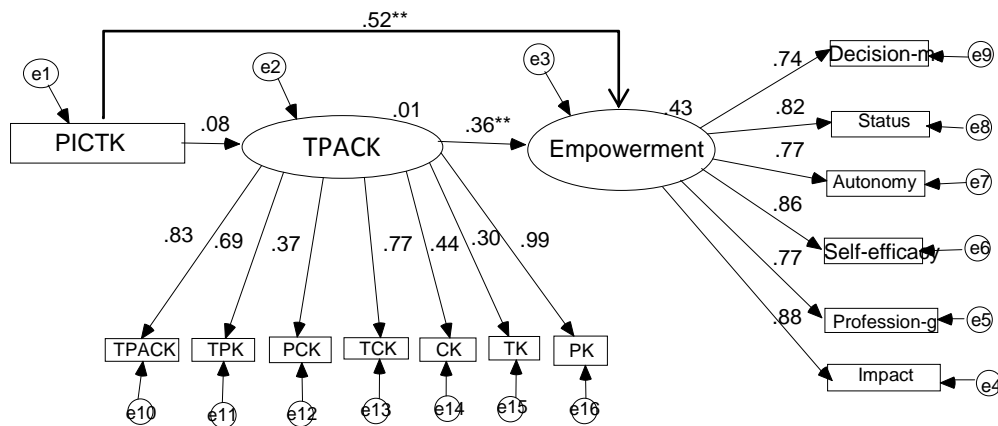


Figure 3: Path analysis for district-school ICT instructors

The second step in structural equation modeling is evaluating the structural model which estimates the causal relations between two types of variables: exogenous variables which are the independent variables and are not affected by other variables in the model, and endogenous variables which are affected by

other variables in the model. The exogenous variable in the present study is the observed variable PICTK. The endogenous variables are instructive TPACK and sense of empowerment. The variable instructive TPACK is a latent mediator variable that was measured by seven observed variables: PK, TK, CK, TCK, PCK, TPK and TPACK. The variable sense of empowerment is a dependent and latent variable that was measured by six observed variables: status, professional growth, impact, autonomy, self-efficacy and decision-making. Figure 2 presents the path analysis of the district ICT instructors and Figure 3 presents the path analysis of the district-school ICT instructors. Each figure presents the standardised effect coefficients ( $\beta$ ), the percent of explained variance ( $R^2$ ) and the standardised loading coefficients ( $\lambda$ ) of the observed variables.

### **Convergent validity – estimation of the loading coefficients of the observed variables**

Figures 2 and 3 indicate that most of the measures of the two latent variables (instructive TPACK knowledge and empowerment) are significant ( $p < .001$ ) and well reflect all the theoretical concepts in the model, except for TK, among district-school ICT instructors. It can be seen that the standardised loading coefficients ( $\lambda$ ) of the instructive TPACK knowledge range between .51 and .90 among district ICT instructors, where the measure of TPACK knowledge was the most valid ( $\lambda = .99$ ). Among the district-school ICT instructors, the standardised loading coefficients ( $\lambda$ ) of the instructive TPACK knowledge range between .30 and .99, where the PK ( $\lambda = .99$ ) was the most valid. The standardised loading coefficients ( $\lambda$ ) of the empowerment measures among the district ICT instructors range between .64 and .99, where self-efficacy ( $\lambda = .99$ ) was obtained as the most valid, but not much more than the measure of impact ( $\lambda = .94$ ). Among the district-school ICT instructors, the standardised loading coefficients ( $\lambda$ ) of the empowerment measures range from .74 to .88, where the measure of impact ( $\lambda = .88$ ) was the most valid.

The results of the goodness of the measurement model and estimation of the loading coefficients of the observed variables indicate that all of the concepts were measured in a valid manner, and therefore strengthen the theoretical basis that guided the choice of the different measures for the two groups.

### **Testing the structural model and confirmation of the research hypotheses**

Figures 2 and 3 demonstrate a similar picture of a high level of explained variance of empowerment among the district ICT instructors and the district-school ICT instructors, which is explained by PICTK knowledge and instructive TPACK knowledge (50% and 43%, respectively). However, the PICTK knowledge explains about one third of the explained variance (26%) of the instructive TPACK knowledge among the district ICT instructors, whereas among the district-school ICT instructors PICTK knowledge does not explain the instructive TPACK knowledge (1%).

When testing the first research hypothesis it can be seen that among the district ICT instructors, PICTK knowledge has a significant moderate positive effect on the empowerment level ( $\beta=.33$ ,  $p<.001$ ) and among the district-school ICT instructors this effect is even stronger ( $\beta=.52$ ,  $p<.001$ ). Thus, the greater the PICTK knowledge of the ICT instructor, the greater is his or her sense of empowerment and the hypothesis was confirmed.

When testing the second research hypothesis it can be seen that among district ICT instructors, PICTK knowledge has a significant positive effect on instructive TPACK knowledge ( $\beta=.51$ ,  $p<.001$ ). Thus, the greater the PICTK knowledge of the district ICT instructor, the greater is his or her TPACK knowledge. However, PICTK knowledge has no effect on the TPACK knowledge among district-school ICT instructors ( $\beta=.08$ ,  $p>.05$ ). Thus, the hypothesis was confirmed only among the district ICT instructors.

When testing the third research hypothesis it can be seen that among the district ICT instructors, instructive TPACK knowledge has a significant strong positive effect on the level of empowerment ( $\beta=.47$ ,  $p<.001$ ). Among the district-school ICT instructors, this effect is moderate ( $\beta=.36$ ,  $p<.001$ ). Thus, the greater the TPACK knowledge of the ICT instructor, the greater is his or her sense of empowerment and the hypothesis was confirmed.

## **Discussion and conclusions**

The concept of empowerment includes a range of meanings that pertain to the cultivation of the individual and strengthening him or her and his or her function in the personal and organisational environment in which he or she operates (Hemric, Eury & Shellman, 2010). Thus, empowerment is a process that can be motivated by the individual, while the organisation can supply the climate, relations, resources and means for achieving better control of the individual over his or her environment (Pollack, 2009; Reeves, 2009). Empowered individuals are individuals with high self-confidence, a high level of awareness of themselves and their environment, and high motivation for action and change. They are "driven" by learning and innovation and are characterised by activity for realising goals which they defined for themselves within the space of their activity in their personal and professional world (Johnson & Short, 1988; Segedin, 2011).

The findings regarding the first research hypothesis indicate that ICT instructors perceive PICTK knowledge as affecting their sense of empowerment. PICTK knowledge has a significant moderate or higher positive effect on the sense of empowerment of both groups of ICT instructors. The individual as an empowered professional is a person who is active within his or her field of expertise, receives and gives expression to expertise even beyond his or her role, is active and contributes to the success of the organisation, is an active participant in decision-making, dares and takes risks and struggles for his or her promotion. It is therefore recommended to continue to cultivate the different ICT instructors and to expand their personal knowledge on the evolving ICT program, with the goal of having the ICT instructor use PICTK knowledge for

understanding the processes of change which are taking place in the school, such that he or she will be able to formulate an instruction plan that will be adapted to the needs and goals of the institution, out of a sense of strong internal empowerment. The products of the empowerment are expressed in raising their status and strengthening the knowledge, abilities and professional skills of the role holders (Avidov-Ungar *et al.*, 2014; Avidov-Ungar & Shmir-Inbal 2013; Lecos *et al.*, 2000). Knowledge on the ICT program thus becomes empowering knowledge for the role holder.

The findings regarding the second research hypothesis indicate that the ICT instructors perceive PICTK knowledge as affecting their TPACK knowledge. PICTK knowledge has a significant positive effect on instructive TPACK knowledge only among district ICT instructors, whereas it has no effect among district-school ICT instructors. The findings indicate that knowledge on the ICT program, i.e. PICTK knowledge, does not necessarily promote the TPACK knowledge of the district-school ICT instructors, but has critical significance for their sense of empowerment. It is possible that these ICT instructors regard their instructive role from a focus of the practice of teaching, and less for promotion of the broad perception of the ICT program in the school context. On the other hand, it can be assumed that the district ICT instructors base their instruction work, which includes TPACK knowledge, on the knowledge they acquired regarding the ICT program, i.e. PICTK knowledge, and are able to connect between the actions of the types of knowledge. This viewpoint may cause a stronger sense of empowerment than among the district-school ICT instructors.

Banathy (1992) claims that a comprehensive viewpoint is constructed based on the integration of concepts which are related, since it is then possible to find interrelations between the concepts and to organise them into a model. Role holders in education systems who are empowered have a higher sense of responsibility pertaining to their role and to the tasks which they must perform and the goals they must achieve. It is reasonable to assume that the district ICT instructors act out of a greater sense of responsibility in a broader field, which enables creating the connections between the information items on the PICTK programs and items of instructive TPACK knowledge and this enhances their sense of empowerment.

The findings regarding the third research hypothesis indicate that the ICT instructors perceive TPACK knowledge as affecting their sense of empowerment. Both groups of ICT instructors are empowered due to their instructive TPACK knowledge. Thus, they can plan the instruction content, teach the teachers teaching strategies in an ICT environment, adapt online teaching methods during instruction, etc. Role holders in education systems who are empowered, including ICT instructors who are active and confident in their power, will also act beyond their fields of responsibility, will initiate and will contribute to the success of the school and the organisational environment in which they operate and to their success as professionals (Irwin, 1996).

It can therefore be assumed that ICT instructors with instructive TPACK knowledge which is adapted to the teachers' and the schools' needs are teachers

with a high level of TPACK knowledge and have a broader viewpoint, which enables them to use this knowledge when instructing teachers. Thus it seems that they are successful in their work on the one hand, and are meaningful to the environment on the other hand. These findings strengthen the claim of Avidov-Ungar et al., (2014) that deep understanding of the demands of the role, accepting a broad role in the early stage of the career, understanding that experience is a significant resource, participating in a growth-promoting learning framework and regarding the school as an organisational-comprehensive framework are factors that promote a higher sense of empowerment among role holders in education systems. The research findings renew the meaning of TPACK knowledge of ICT instructors. It is therefore important to learn the essence of instructive TPACK knowledge in the professional development of ICT instructors, which includes broad aspects composed of pedagogy, content of the different fields of knowledge and technology, such as the efficacy to instruct teachers towards educated use of technological means in different fields of knowledge or efficacy to create an online environment which enables the instructed persons to construct new knowledge and skills. It is possible that this will enable better results in the implementation of the ICT program in the school.

Furthermore, the present study illuminates three roles of the ICT instructor: the instructor as a technology leader, the instructor as a pedagogy leader and the instructor as a leader of change (Comber & Lawson, 1999; Lai & Pratt, 2004). The perception of the role of instructor thus affects his or her understanding of the role, influences his or her preferences, decisions on everyday dilemmas and the manner in which he or she performs the tasks derived from the demands of the role (Markham, 1998; Moursund, 1992). It was further found that when a sense of empowerment is added, which is expressed in a sense of efficacy and in the ability to influence the change in the organisational environment, performance of the role is carried out with maximal efficiency (Dembele & Schwille, 2006).

In future research it is recommended to expand the circle of participants and to test the differences between the groups that were tested in the present study and a group of school ICT instructors. It is further recommended to test additional factors, both personal and professional, that affect instructive TPACK knowledge and the sense of empowerment of ICT instructors among different role holders.

## References

- Arbuckle, J. L. (2006). *AMOS 7.0 user's guide*. Chicago: SPSS.
- Avidov-Ungar, O., & Shmir-Inbal, T. (2013). Empowerment patterns of leaders in ICT and school strengths following the implementation of national ICT reform. *Journal of Information Technology Education: Innovations in Practice*, 12, 141-158.
- Avidov-Ungar, O., Friedman, I., & Olshtain, E. (2014). Empowerment amongst teachers holding leadership positions. *Teachers and Teaching: theory and practice*, 20(3).1-17.
- Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist*, 44, 1175-1184.
- Banathy, B. (1992). *A systems view of education: Concepts and principles for effective action*. Englewood Cliffs, NJ: Education Technology Publications.

- Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88, 588-606.
- Blase J., & Blase J. (1997). The micropolitical orientation of facilitative school principals and its effects on teachers' sense of empowerment. *Journal of Educational Administration*, 35(2), 138-164.
- Comber C. A. & Lawson T. A. (1999). Superhighways technology: Personnel factors leading to successful integration of information and communications technology in schools and colleges. *Technology, Pedagogy and Education*, 8(1), 41-53.
- Conger, J. A., & Kanungo, R. N. (1988). The empowerment process: Integrating theory and practice. *Academy of Management Review*, 31(3), 471-482.
- Cook, J., Holley, D., & Andrew, D. (2007). A stakeholder approach to implementing e-learning in a university. *British Journal of Educational Technology*, 38(5), 784-794.
- Cribner, J. P., Truell, A. D., Hager, D. R., & Srichai, S., (2001). An exploratory study of career and technical education teacher empowerment: Implications for school leaders. *Journal of Career and Technical Education*, 18(1), 46-57.
- Datnow, A., Hubbard, L., & Mehan, H. (2002). *Extending educational reform: From one school to many*. London: Routledge Falmer.
- Dembele, M., & Schwille, J. (2006). Can the global trend toward accountability be reconciled with ideals of teacher empowerment? Theory and practice in Guinea. *International Journal of Educational Research*, 45(4-5), 302-314.
- Fullan, M. (2006). The future of educational change: system thinkers in action. *Journal of Educational Change*, 7 (3), 113-122.
- Fullan, M., Bertani, A., Quinn, J. (2004). New Lessons for Districtwide Reform. *Educational Leadership - Leading in Tough Times*, 61(7), 42-46.
- Hargreaves, A. (2005). Educational change takes ages: Life, career and generational factor in teacher emotional responses to educational change. *Teaching and teacher Education*, 21, 267-983.
- Hargreaves, A., & Goodson, I. (2006). Educational change over time? The sustainability and nonsustainability of three decades of secondary school change and continuity. *Educational Administration Quarterly*, 42(1), 3-41.
- Hemric, M., Eury, A. D., & Shellman, D. (2010). Correlations between perceived teacher empowerment and perceived sense of teacher self-efficacy. *Journal of Scholarship and Practice*, 7(1), 37-50.
- Irwin, J. W. (1996). *Empowering ourselves and transforming schools: Educators making a difference*. Albany, NY: State University of New York Press.
- Klein, K. J., & Sorra, J. S. (1996). The challenge of innovation implementation. *The Academy of Management Review*, 21(4), 1055-1080.
- Johnson, P., & Short, P. (1988). Principal's leader power, teacher empowerment, teacher compliance and conflict. *Educational Management & Administration*, 26(2), 147-159.
- Kaniuka, T. S. (2012). Toward an understanding of how teachers change during school reform: Considerations for educational leadership and school improvement. *Journal of Educational Change*, 13(3), 327-346.
- Kline, R. B. (Ed.) (2005). *Principles and practice of structural equation modeling*. New York: Guilford.
- Koehler, M., & Mishra, P. (2008). Introducing TPACK. In AACTE committee on innovation and technology (Ed.), *Handbook of technological pedagogical content knowledge (TPCK)*. New York: Routledge.
- Lai, K.W., & Pratt, K. (2004). ICT leadership in secondary schools: The role of the computer coordinator. *British Journal of Educational Technology*, 35(4), 461-475.
- Lecos, M. A., Cassella, C., Evans, C., Leahy, C., Liess, E., & Lucas, T., (2000). Empowering Teacher Leadership in Professional Development Schools. *Teaching and Change*, 8 (1), 98-113.

- Maeroff, G. I. (1988). *The empowerment of teachers: Overcoming the crisis of confidence*. New York, NY: Teachers College Press.
- Markham, S. K. (1998). A longitudinal examination of how champions influence others to support their projects. *Journal of Product Innovation Management*, 15, 490-504.
- Ministry of Education (2013a). *Adaptation of the education system to the 21<sup>st</sup> century*. Science and Technology Administration, Ministry of Education. <http://cms.education.gov.il/educationcms/units/madatech/ictineducation>. Accessed 1 September 2013 (Hebrew).
- Ministry of Education (2013b). Circular number 3 for elementary schools in the second and third years, months April-June 2013. *Adaptation of the education system to the 21<sup>st</sup> century*. Science and Technology Administration, Ministry of Education. [http://cms.education.gov.il/EducationCMS/Units/MadaTech/ICTInEducation/MismachimVenehalim/Hozerey\\_Agaf/Hozer\\_Agaf.htm](http://cms.education.gov.il/EducationCMS/Units/MadaTech/ICTInEducation/MismachimVenehalim/Hozerey_Agaf/Hozer_Agaf.htm). Accessed 1 September 2013 (Hebrew).
- Ministry of Education (2013c). Circular of the General Administration 2014/2 (b) 8.3-4. *Education workers in instruction roles*. [http://cms.education.gov.il/EducationCMS/applications/mankal/arc/sd2bk8\\_3\\_4.htm](http://cms.education.gov.il/EducationCMS/applications/mankal/arc/sd2bk8_3_4.htm). Accessed 1 September 2013 (Hebrew)
- Moursund, D. (1992). *The technology coordinator International Society for Technology in Education*. Eugene, Oregon.
- Muijs, D., & Harris, A. (2003). Teacher leadership-improvement through empowerment? An overview of the literature. *Educational Management & Administration*, 31(4), 437-448.
- Pollak, C. J. (2009). *Teacher empowerment and collaboration enhances student engagement*. Master of Science in Education, School of Education, Dominican University of California, San Rafael, CA.
- Reeves, D. B. (2009). Model teachers. *Association for Supervision and Curriculum Development*, 66(5), 85-86.
- Sandy, L. D. (2010). Social capital, empowerment and educational change: A scenario of permeation of one-to-one technology in school. *Journal of Computer Assisted Learning*, 26(4), 284-295.
- Segedin, L. (2011). The role of teacher empowerment and teacher accountability in school-university partnerships and action research. *Brock Education*, 20(2), 43-64.
- Shaw, G. (2005). Collaboration in Aid – ICT In Teacher Education: But What About Sustainability? In: S. Grag et al (Eds.), *Open and Distance Education in Global Environment: Opportunities for collaboration*, New Delhi: Viva Books Inc.
- Short, P. M., & Rinehart, J. S. (1992). School participant empowerment scale: Assessment of the level of participant empowerment in the school. *Educational and Psychological Measurement*, 54(2), 951-960.
- Stufflebeam, D. L. (2007). Cipp evaluation model checklist. [http://www.wmich.edu/evalctr/archive\\_checklists/cippchecklist\\_mar07.pdf](http://www.wmich.edu/evalctr/archive_checklists/cippchecklist_mar07.pdf). Accessed 21 February 2012
- Sundra, D. L., Scherer, J., & Anderson, L. A. (2003). *A guide to logic model development for CDC's prevention research centre*. Atlanta, GA: Prevention Research Centers Program Office, Centers for Disease Control. <http://www.ojp.usdoj.gov/BJA/evaluation/guide/documents/cdc-logic-model-development.pdf>
- White, P. A. (1992). Teacher empowerment under "ideal" school-site autonomy. *Educational Evaluation and Policy Analysis*, 14(1), 69-82.
- Zimmerman, M. A. (1990). Taking aim on empowerment research: On the distinction between individual and psychological conceptions. *American Journal of Community Psychology*, 18, 169 -177.