Revised Selected Papers

Accademia Musicale Studio Musica
Michele Della Ventura, *editor*

2019

# Proceedings of the International Conference on New Music Concepts and Inspired Education

Vol. 6

ACCADEMIA MUSICALE STUDIO MUSICA

**Accademia Musicale Studio Musica**

# International Conference on New Music Concepts and Inspired Education

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# Preface

This volume of proceedings from the conference provides an opportunity for readers to engage with a selection of refereed papers that were presented during the International Conference on New Music Concepts and Inspired Education. The reader will sample here reports of research on topics ranging from mathematical models in music to pattern recognition in music; symbolic music processing; music synthesis and transformation; learning and conceptual change; teaching strategies; e-learning and innovative learning. This book is meant to be a *textbook* that is suitable for courses at the advanced undergraduate and beginning master level. By mixing theory and practice, the book provides both profound technological knowledge as well as a comprehensive treatment of music processing applications.
The goals of the Conference are to foster international research collaborations in the fields of Music Studies and Education as well as to provide a forum to present current research results in the forms of technical sessions, round table discussions during the conference period in a relax and enjoyable atmosphere.
36 papers from 16 countries were received. All the submissions were reviewed on the basis of their significance, novelty, technical quality, and practical impact. After careful reviews by at least three experts in the relevant areas for each paper, 12 papers from 10 countries were accepted for presentation or poster display at the conference.

I want to take this opportunity to thank all participants who have worked hard to make this conference a success. Thanks are also due to the staff of "Studio Musica" for their help with producing the proceedings. I am also grateful to all members of Organizing Committee, Local Arrangement Committee and Program Committee as well as all participants who have worked hard to make this conference a success.
Finally I want to appreciate all authors for their excellent papers to this conference.

April 2019 Michele Della Ventura

# Contents

# Exploring primary education teachers' perceptions of their Technological Pedagogical and Content Knowledge

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**Abstract.** This paper presents an investigation examining teachers' perceptions of their knowledge and skills with regards to the integration of ICT in their instructional practices. By adopting the Technological Pedagogical Content Knowledge (TPACK) model, a new scale was developed and used to explore primary education teachers' technological, pedagogical, and content knowledge. The analysis of the results showed that the participants appear to believe that they have a good level of knowledge with regards to the content and the pedagogy and they are using various ICT tools. However, it seems that they have not integrated the TPACK dimensions of knowledge and skills to that degree that they will be able to design and implement appropriate ICT-based interventions in their classroom practice.

**Keywords.** ICT in education, TPACK, teachers' perceptions, integration skills

## 1 Introduction

Over the past decade the debate about 21st century education is prevalent, among academics, educators and policy makers, and emphasizes on students' development of higher-order learning skills, such as critical thinking, problem solving, creativity, communication and collaboration [3,17,18]. In this perspective, digital technologies, Web tools, electronic platforms, mobile devices etc. are proposed not as a simple medium to support traditional instruction but as the lever for radical changes in pedagogy, learning design and classroom practices, i.e. to create enhanced learning environments that promote students' knowledge construction through authentic, inquiry, and collaborative learning activities.

However, there is a significant gap between the overoptimistic scenarios regarding ICT, within educational policy and pedagogy, and how the teachers actually harness these technologies in educational practice. Existing literature indicates that most teachers have a very good level of knowledge and skills regarding specific ICT tools but they do not make effective use of ICT to improve their instruction and support students' active learning with ICT [16,21]. The majority of primary and secondary teachers appear to use ICT in a peripheral manner in the context of teacher-centred approaches, i.e. as an isolated means for lecturing, transmitting information and drill-and-practice [6,8]. Many researchers agree that the teachers failed to effectively incorporate theoretical and practical aspects of digital technologies into effective pedagogical practices in their classroom

[11,12,14].
In the last decade, the notion of Technological Pedagogical Content Knowledge (TPACK) has been gaining popularity among researchers and educators as a comprehensive framework of the knowledge that supports a) the integration of digital technologies in educational practice [2,21] and b) teacher preparation and professional development programs for ICT integration into educational practice [4,7].
By adopting the TPACK framework, the present article reports upon the design and the implementation of a survey investigating Greek primary teachers' knowledge and skills toward the integration of digital technologies in their classroom practices. A new TPACK scale was created to explore teachers' perceptions of their abilities to design and implement ICT-based interventions in classroom practice. The findings showed that the participants appear to have a good level of knowledge concerning content, pedagogy and ICT tools. However, they did not appear able to integrate their TPACK knowledge and skills in order to effectively design and implement ICT-based interventions in their classroom.

## 2 Theoretical background and literature review

Technological Pedagogical Content Knowledge was proposed as an integrated framework of teacher knowledge that determines effective teaching and enhanced learning with digital technologies [15]. This model goes beyond seeing in isolation the three constitutional elements, i.e., content, pedagogy and technology. The notion of TPACK encompasses an integrative knowledge base of technological knowledge and skills, as well as knowledge of subject matter content, learners' profile, established practices, and the pedagogy necessary for teachers to be competent to teach with ICT in the classroom [10]. Therefore, the knowledge of TPACK consists of seven domains which are formed upon the interrelations among content, pedagogy and technology (Figure 1).
There is extended research evidence that TPACK demonstrated as an effective framework for a) researching teachers' knowledge and skills to integrate ICT in their instruction, b) designing and examining teacher education and professional development programs and c) providing a significant recommendations to the teachers regarding effective design of meaningful and subject-specific practices in their classroom by harnessing the features of the particular ICT used [7,10,20]. The results of previous studies indicated that there is no TPACK scale which is suitable for different educational settings and contexts. Controversial results have also been found in terms of which TPACK components are rated higher by the teachers or how various demographic factors affect teachers' perceptions of TPACK knowledge [4,5,11,13,16].
Therefore, the present study aims to contribute to the literature on how TPACK framework can guide the development of teachers' ICT integration knowledge and skills. Specifically, the aim of the study was: 1) to create a new TPACK scale related to the reality of the Greek primary schools, 2) to examine how TPACK knowledge was reflected on teachers' learning design and implementation abilities with ICT in classroom practice, and 3) to investigate and update existing information about the development of Greek primary teachers in TPACK.

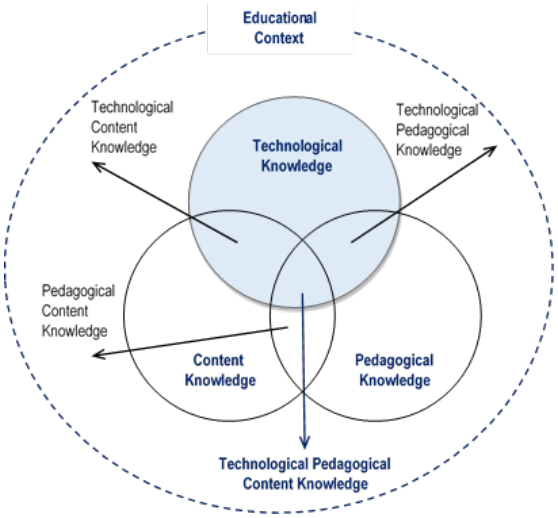


Fig. 1. TPACK dimensions (adaption from Koehler & Mishra (2006)).

## 3 Context of the study

In 2010, the Greek Ministry of Education launched an educational reform for compulsory education, i.e. primary and lower secondary schools, under the title *"New School - 21st Century School"*. This initiative addressed along three main dimensions: a) the development of a *New Curriculum* which emphasises on new pedagogical approaches and the use of digital technologies in the teaching and learning practices; b) the *Digital School* action aiming at the creation of the National Learning Object Repository for primary and secondary education [19]; and c) the *National in-service Teacher Training Program* (NITTP) aiming to enhance their knowledge and skills to effectively use ICT in teaching practice (this is known as the B' level, i.e. a follow-up program of the A' level national teacher training program for acquiring the basic ICT skills).

The NITTP program was offered across the country between 2011 and 2015, and an overall of 27,500 primary and secondary teachers participated in. Teachers' coursework in each program lasted for 96 teaching hours including lectures, workshop and laboratory sessions, teacher support, and classroom implementation activities. We assumed that a new-evolving educational context is currently shaped in the Greek primary schools, which could exert a supportive impact to teachers' willingness and ability to use ICT in their classroom as a tool to enhance students' learning.

## 4 Research method

### Sample and procedure

The participants in this study were 399 in-service primary education teachers coming from five prefectures of the country. They were invited to anonymously respond to the

TPACK survey just after their enrolment in a teacher professional development massive on-line course. Finally, we received and analysed 360 completed questionnaires from 83 male and 277 female teachers. A total of 94 teachers completed the NITTP Program about ICT in educational practice while 275 teachers attended the A' level of the national training program about basic ICT skills. On the other hand, 85 teachers did not receive any training about ICT and ICT in education.

A self-report survey was used with the aim to collect teachers' self-ratings regarding their understanding of digital technologies through the lens of TPACK knowledge. The questionnaire was hosted and provided through a LimeSurvey platform installed and supported by the e-Learning Research Group, Department of Social and Educational Policy, University of Peloponnese. Data were gathered in the platform and then analysed using SPSS ver. 23.0 statistical package.

**The instrument**

The instrument was a five-point Likert-type scale (1=strongly disagree, 5=strongly agree) which included 62 questions representing the various domains (dimensions) of the TPACK model. The questions were presented as phrases that teachers had to answer in relation to their development on TPACK knowledge and skills. The significant difference in this particular TPACK scale, compared to other scales in the literature, is that all subconstructs were described using the same number of questions (7), while the overall TPACK was represented by 8 items.

Previous studies have shown that the role of the educational context and the school culture in Greek schools is very important; many teachers believe that the wider educational context is not friendly or influential to the integration of ICTs in their instruction [1,6,8]. We therefore added a new dimension, the Educational Context (EC), including nine (9) items.

Internal consistency of the TPACK constructs was calculated through Cronbachs' alpha values for each subscale. The values were ranging between 0.89 and 0.95, thus indicating that the internal reliability of the survey items is very good.

## 5 Results

Figure 2 shows the perceived mean values of the eight constructs within the TPACK scale. The majority of the teachers reported high levels of content knowledge (4.19) and pedagogical knowledge (PK=4.20). Next, they rated themselves highest on pedagogical content knowledge (PCK=4.01) followed by the technological knowledge (TK=3.85). The level of teachers' perceived knowledge seems to gradually decline for the combined technological dimensions of the TPACK model (TCK=3.56 and TPK=3.44). The lowest rated dimension was TPACK (M=3.18) which reflects teachers' uncertainty and difficulties in understanding how the constitutional dimensions could be integrated into a comprehensive knowledge of TPACK, thus supporting their efforts to make ICT an essential part of their instruction. In addition, it is clear that the majority of the participants consider that the educational context, as shaped by school-related factors, is supportive and promotes the use of ICT in teaching and learning practices (M=3.52).

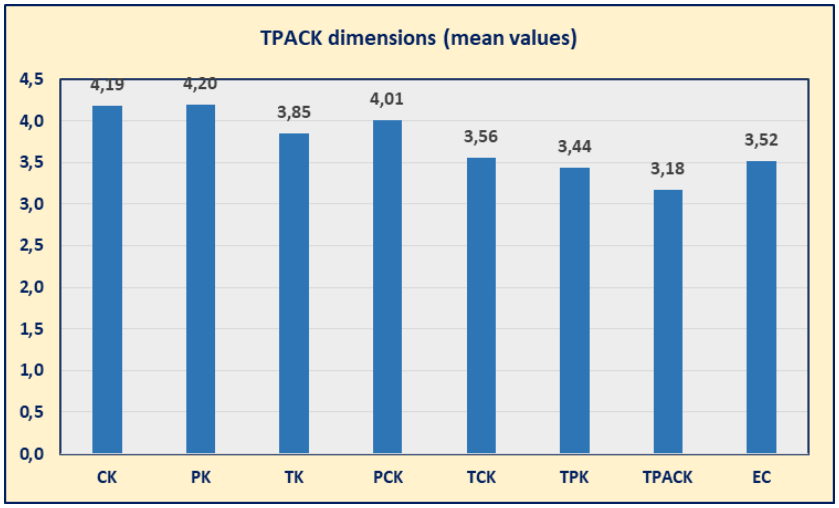


Fig. 2. Mean values of TPACK dimensions.

TABLE I: INDICATIVE QUESTIONS OF TPACK SUBSCALES

| TPACK Domain | Question | Mean | SD |
|---|---|---|---|
| CK | I have sufficient knowledge about my subject matter | 4.31 | 0.574 |
| PK | I know how to organize my instruction and to maintain the pedagogical control of my class | 4.29 | 0.543 |
| TK | I am able to use computers and digital tools | 3.91 | 0.802 |
| PCK | I know effective ways to guide my students' thinking in my subject matter | 4.01 | 0.633 |
| TCK | I know ICT tools that are suitable to present concepts in my subject matter, which are difficult to be presented by other means | 3.50 | 0.923 |
| TPK | I am able to choose appropriate ICT tools, for any unit in my subject matter, that enhance my teaching practices | 3.53 | 0.844 |
| TPACK | I can design and implement inquiry learning activities with ICT tools to help my students' understanding in specific content (e.g. simulations, digital material, Web sources etc.) | 3.29 | 0.944 |
| EC | In my school there is cooperation and support among peers with the aim to harness ICT in our teaching practices | 3.27 | 1.052 |

Table I presents indicative examples of questions in the seven TPACK domains as well as the teachers' responses (mean and standard deviation values).

Table II summarises the results of the descriptive statistics for each dimension in the TPACK scale concerning male and female teachers. Mann-Whitney U test was conducted to evaluate the hypothesis of different perceptions of TPACK dimensions between men and women. The results showed that, on the average, male teachers rated their knowledge significantly higher than did female teachers in relation to the TPACK dimensions of TK ($U$=8376.5, $p < 0.001$), TCK ($U$=9436, $p < 0.001$), TPK ($U$=8676, $p < 0.05$), and the

overall TPACK ($U$=9182.5, $p < 0.005$).

TABLE II: SUMMARY OF DESCRIPTIVE STATISTICS FOR TPACK SUBSCALES

| TPACK Domains | Male (N=83) | | Female (N=277) | |
|---|---|---|---|---|
| | M | SD | M | SD |
| Content Knowledge (CK) | 4.21 | 0.416 | 4.18 | 0.478 |
| Pedagogical Knowledge (PK) | 4.20 | 0.467 | 4.20 | 0.461 |
| Technological Knowledge (TK) *** | 4.10 | 0.640 | 3.78 | 0.703 |
| Pedagogical Content Knowledge (PCK) | 3.98 | 0.510 | 4.02 | 0.492 |
| Technological Content Knowledge (TCK) *** | 3.78 | 0.750 | 3.49 | 0.764 |
| Technological Pedagogical Knowledge (TPK) * | 3.62 | 0.706 | 3.38 | 0.753 |
| Technological Pedagogical and Content Knowledge (TPACK) ** | 3.37 | 0.772 | 3.12 | 0.754 |
| Ability to integrate ICT in classroom practice (IA) | 3.45 | 0.834 | 3.35 | 0.836 |
| Educational Context (EC) | 3.69 | 0.484 | 3.55 | 0.560 |

Note. *p < .05, **p < .005, ***p < .001

Statistically significant differences were also identified between the teachers who attended the B' level of the NITPP program and their peers who did not had this opportunity (they appeared with lower mean scores): TK ($U$=10071.5, $p < 0.005$), TCK ($U$=7715, $p < 0.001$), TPK ($U$=9276.5, $p < 0.001$), and overall TPACK ($U$=8109.5, $p < 0.001$).
Comparing to previous studies in Greece [1, 8], the findings concerning the nine factors of the educational context dimension appear promising towards creating a friendly/positive environment that could influence teachers' decisions and their attempts to use ICT in classroom practice (M=3.52). The results demonstrated that the participants consider as important influential factors towards using ICT in their instruction a) the enhanced *appreciation of their work* by the students and their parents (mean values 4.05 and 3.82) and b) their *professional image to superiors* (M=3.92) and to their peers (M=3.73). In addition, the perception that *current Curriculum promotes the use of ICT* in their teaching was prevalent among the participants (3.52). On the other hand, *ICT infrastructure* (M=3.16) and systematic use of ICT by *other teachers* in their school (M=2.82) received lower scores, thus they appear as not supportive factors towards integrating ICT in classroom practices.

## 6 Conclusions

The results of this study showed that the majority of the teachers in the sample consider that they have a very good knowledge of the main TPACK constructs, i.e. CK, PK and TK. However, most teachers seem to perceive them separately and are not able to develop

their TPACK to a comprehensive level that could help them to integrate ICT tools into real classroom practices related to their subject-matters. In other words, the majority of the teachers face difficulties to effectively integrate these types of knowledge in a meaningful framework in order to design their own ICT-based interventions by considering curriculum requirements, students' learning needs, the affordances of specific digital technologies and both, constraints and realities of school and classroom contexts.

This study agrees with the findings of similar surveys about measuring TPACK knowledge which indicate that teachers' content and pedagogical knowledge outweigh all the other dimensions of TPACK [5,11,12]. Our analysis revealed also statistically significant differences in TPACK between male and female teachers, also reported in precious studies in different countries [4,5,9,14]. In addition, the findings confirm the argumentation that teachers' TK is an important factor that determines their TPACK level as well as their ability to use ICT as learning tools in classroom practice [7,13].

Considering the role of the educational context in Greek primary schools, this study indicated promising changes to a direction that creates a supportive environment for the integration of ICT into educational settings. The lack of technological equipment and the lack of collaboration among teachers in the schools are still existing as negative factors to teachers' decisions about using ICT in their classroom.

The present study indicates that teachers' TK appeared to be an important factor upon which TPACK is built. Further research is necessary to shape the possible trajectories primary teachers use towards developing their TPACK knowledge. Our future research orientations will be directed toward investigating teachers' learning design capacity and pedagogical ability to integrate ICT in both, primary and secondary classroom practices, using quantitative and qualitative data.

## References


[1] K. Atsoglou, & A. Jimoyiannis (2012). Teachers' decisions to use ICT in classroom practice: An investigation based on Decomposed Theory of Planned Behavior. *International Journal of Digital Literacy and Digital Competence*, 3(2), 20-37.

[2] Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2013). A review of technological pedagogical content knowledge. *Education Technology and Society*, 16(2), 31-51.

[3] C. Dede (2011). Reconceptualizing technology integration to meet the challenges of educational transformation. *Journal of Curriculum and Instruction*, 5(1), 4–16.

[4] A. Doering, S. Koseoglu, C. Scharber, J. Henrickson, & D. Lanegran (2014). Technology integration in K-12 geography education using TPACK as a conceptual model. *Journal of Geography*, 113(6), 223-237.

[5] S.J. Jang, & M.F. Tsai (2013). Exploring the TPACK of Taiwanese secondary school science teachers using a new contextualised TPACK model. *Australasian Journal of Educational Technology*, 29(4), 566-580.

[6] A. Jimoyiannis (2008). Factors determining teachers' beliefs and perceptions of ICT in education. In A. Cartelli & M. Palma (eds.), *Encyclopedia of Information Communication Technology* (pp. 321-334). Hershey. PA: IGI Global

[7] A. Jimoyiannis (2010). Designing and implementing an integrated Technological Pedagogical Science Knowledge framework for science teacher's professional development. *Computers & Education*, 55(3), 1259-1269.

[8] A. Jimoyiannis, & V. Komis (2007). Examining teachers' beliefs about ICT in education: implications of a teacher preparation programme. *Teacher Development*, 11(2), 149-173.

[9] Jordan, K. (2013). The influence of gender on beginning teachers' perceptions of their Technological Pedagogical Content Knowledge (TPACK). *Australian Educational Computing*, 28(2), 1-21.

[10] M.J. Koehler, & P. Mishra, (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.

[11] J.H.L. Koh, & C. S. Chai (2014). Teachers' clusters and their perceptions of technological, pedagogical content knowledge (TPACK) development through ICT lesson design. *Computers & Education*, 70, 222-232.

[12] J.H.L. Koh, C.S. Chai, & C.C. Tsai (2013). Examining practicing teachers' perceptions of technological pedagogical content knowledge (TPACK) pathways: a structural equation modeling approach. *Instructional Science*, 41, 793-809.

[13] Liang, J.-C., Chai, C. S., Koh, J. H. L., Yang, C.-J., & Tsai, C.-C. (2013). Surveying in-service preschool teachers' technological pedagogical content knowledge. *Australasian Journal of Educational Technology*, 29(4), 581-594.

[14] T.C. Lin, C.C. Tsai, C.S. Chai, & M.H. Lee (2013). Identifying science teachers' perceptions of Technological Pedagogical and Content Knowledge (TPACK). *Journal of Science Educational Technology*, 22, 325- 336.

[15] P. Mishra, & M. J. Koehler, (2006). Technological Pedagogical Content Knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.

[16] Niess, M., & Gillow-Wiles, H. (2017). Expanding teachers' technological pedagogical reasoning with a systems pedagogical approach. *Australasian Journal of Educational Technology*, 33(3), 77-95.

[17] OECD (2015). Students, computers and learning: Making the connection. Paris: OECD Publishing, https://doi.org/10.1787/9789264239555-en

[18] P21 (2018). *Partnership for 21st Century Learning*. http://www.p21.org

[19] Photodentro (2018). http://photodentro.edu.gr

[20] Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education*, 42(2), 123-149.

[21] J. Voogt, P. Fisser, N. Pareja Roblin, J. Tondeur, & J. van Braak, (2013). Technological pedagogical content knowledge: A review of the literature. *Journal of Computer Assisted Learning*, 29(2), 109-121.

This book presents a collection of selected papers that present the current variety of all aspect of music research, development and education, at a high level. The respective chapters address a diverse range of theoretical, empirical and practical aspects underpinning the music science and teaching and learning, as well as their pedagogical implications. The book meets the growing demand of practitioners, researchers, scientists, educators and students for a comprehensive introduction to key topics in these fields. The volume focuses on easy-to-understand examples and a guide to additional literature.

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