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Geolocalizing with LKT: Digital Teaching Competence and Space Competence with TPACK

Isabel María Gómez-Trigueros
isabel.gomez@ua.es https://orcid.org/0000-0003-4666-5035
Facultad de Educación, Universidad de Alicante. Calle Aeroplano, s/n.
03690 San Vicente del Raspeig, Alicante. España.

KEYWORDS

Geolocation
Digital Teacher Competence
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THEORETICAL FRAMEWORK

The concept of competence included in the OECD's 2003 project called DeSeCo suggests a set of basic capacities, abilities and / or skills, which constitute essential learning for citizens, framed in the Information and Knowledge Society (IKS). Among the key competences is the so-called spatial ability (or Spatial Competition hereinafter SC), which is the set of capabilities related to the positioning, location and understanding of the territory in the area of geography. There is no consensus regarding its definition; the numerous works on the subject coincide in considering it as the ability to represent, generate, remember and transform symbolic non-linguistic information (Vázquez Maris & Noriega Biggio, 2010).

In this research, the spatial competence is recognized as the intellectual capacity involved in solving problems such as the interpretation of maps, among other academic activities and daily life.

In the field of education, the work on SC has focused on the areas of Science, Technology, Engineering and Mathematics (STEM domains) (Wai, Lubinski & Benbow, 2009) and, in an especially in geometry (Schelly, Anzolone , Wijnen & Pearce, 2015) and in engineering (Torner, Alpiste & Brigos, 2014).

The following basic components that configure it are identified: 1) Spatial perception; 2) Spatial visualization; 3) Mental rotations of 2D and 3D figures; 4) Spatial relations and 5) Spatial orientation (Villa Sicilia, 2016). This last component is linked to the geographical discipline in charge of the knowledge of: "the distribution, location and interconnection of the different elements that characterize the geographical places and spaces of different magnitude, of the societies that inhabit it and their cultural diversity, of the use that they make of the resources of the natural environment and the organization of the territory" (Royal Decree 1105/2014, of December 26).

Future teachers, whose task is to train their students in competencies, must have the SC to be transmitters and teachers of such knowledge and must appropriate the didactic potential of Information and Communication Technologies (ICT) for that end. These circumstances have led to the development of a new educational paradigm (Gómez Trigueros, 2015; Ortega Sánchez & Gómez-Trigueros, 2017), which requires

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Correspondencia autores: isabel.gomez@ua.es (Isabel María Gómez-Trigueros).

the inclusion of technologies in educational models and, consequently, the need to develop the competences and skills of teachers for the proper use of these resources, as basic instruments in their training.

The current question is how to implement teaching and learning (T-L) models that allow content, pedagogies and technologies to be brought together in a dynamic and inclusive way. Among the various options, which seek to resolve this complex symbiosis, is the Technological Pedagogical Content Knowledge (TPACK) model (Mishra & Koehler, 2006) that proposes, among other aspects, the conjunction between the so-called Base Knowledge of the Teacher (Shulman, 1987) and the novel ICT resources (Gómez-Trigueros, Ruiz-Bañuls & Ortega-Sánchez, 2019).

OBJECTIVES

In the current context, technological resources can help in the learning and understanding of space in an autonomous way (Fombona Cadavieco & Vázquez-Cano, 2017). The Geographical Information Technologies (GIT), the Learning and Knowledge Technologies (LKT) and their didactic application can develop educational programs that allow an integral formation of the students, bringing the physical environment closer to the student.

This study focuses on: evaluating the level of geospatial competence of teachers in training; to know their perception regarding the use of technologies for teaching; study and assess the importance they attach to manipulative, didactic and pedagogical training of technological resources (ICT and LKT) in their university training and assess progress in geospatial competence at the end of the intervention.

METHODOLOGY

The work has been approached from a descriptive approach, with a mixed methodology.For its development, an exploratory type research design has been used, based on the use of the questionnaire as an information collection instrument (Pardo, Ruiz & San-Martín, 2015; Gómez-Trigueros & Binimelis, 2020). The research has been developed during the academic year 2019-2020, in the context of learning from the Faculty of Education of a Spanish university.

The study has been configured throughout four phases (Gómez Trigueros, 2015): theoretical review on Digital Teaching Competence (DTC), the TPACK model, GIT, LKT and previously developed studies on the concept of spatial-geospatial competence; the design and subsequent validation of the instruments by faculty from other national and international universities; the collection of information through questionnaire 1 and the development of classroom practice and, finally, the distribution of questionnaire 2 and the emptying of information.

We have opted for a methodological design based on survey type studies, and a descriptive and inferential cross-sectional quantitative methodology. Two questionnaires have been applied. The first, from the employee by Schmidt et al. (2009) and Gómez Trigueros (2015), validated by experts. It consists of 15 items measured on a five-point Likert scale (1, Strongly disagree - 5, Strongly agree), and organized into five study dimensions: 1. Sociodemographic characteristics (items 1-3); 2. Knowledge of Content (KC) (items 4-6); 3. Technological Pedagogical Knowledge (TPK) (7-9); 4. Technological Knowledge of Content (TCK) (items 10-12); and 5. Pedagogical and Content Knowledge (PCK) (items 13-15); the questionnaire 2, also validated and structured from the same dimensions, with a different wording so as not to condition the answers nor provide training for the participants (Gargallo-López et al., 2017) and with the intention of achieve a diachronic or longitudinal analysis that involves the study of one or more phenomena over time, as is the case (López-Roldán & Fachelli, 2015).

Cronbach's alpha coefficient has been calculated to verify their reliability with results that confirm the existence of a high and adequate internal consistency of both instruments (questionnaire 1 $\alpha = .903$; questionnaire 2 $\alpha = .958$). Also, the Pearson's Chi-Square index was found with results of p-value <1 = Sig. 0.001 in both instruments, indicative of the high correlation of the questions asked.

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To determine if there are significant differences between the analyzed dimensions and taking into account the differences that have been seen in the descriptive results (M and DT), we have proceeded to compare, using inferential statistics, the scores obtained in the variables of each phase (questionnaire 1 and 2). To do this, we applied the Student's t test for related samples.

RESULTS AND CONCLUSIONS

The results obtained in this research show that the teachers, participants in the study, have a poor geospatial competence (CK dimension) when they begin their preparation as future teachers (2nd year of Bachelor and Master of Teaching).

Similarly, there is detected little training in the sample in methodologies that adequately combine content and technology (PCK dimension). On the contrary, and responding to another of the objectives set out in this work, the values obtained show a positive perception of the students about their professional capacity in digital skills (TPK dimension) and in the use of technologies for teaching geospatial contents. (TCK dimension).

Also, the study highlights a deficient capacity to discern how to properly implement the ICT-LKT and GIT resources, for the transmission of content related to location and orientation (PCK dimension).

All these evidences allow us to conclude that, despite the importance of teaching the spatial capacity to the citizens, the curricula of Master's degrees in Social Sciences: Geography and Master of Teachers, Geography and History specialty, continue without betting on classroom practices that specifically meet such requirements. Likewise, and despite the positive self-efficacy in digital skills of future teachers, the lack of adequacy of the undergraduate and postgraduate curriculum proposals of teachers for the correct implementation of GIT in initial training is verified. It is essential, for educational improvement and understanding of geographic space, to enhance skills related to digital competence such as the recovery, selection, creation or exchange of digital contents and experiences in virtual environments (Gómez-Trigueros, 2019); and with geospatial skills.

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