Ciencia en la frontera: revista de ciencia y tecnología de la UACJ.
Volumen XV, pp. 37-47, 2018 / Impresa en México

ISSN 2007-042X
Derechos reservados © 2016 UACJ

Diseño y validación de un cuestionario para evaluar competencias básicas en TIC para la educación

Arnulfo Ramos-Jiménez,[1]* Rosa P. Hernández-Torres,[2] Miguel Murgía-Romero[3]

Recibido: 7 de diciembre 2018, segunda versión: 19 de febrero 2019, aceptado: 25 de febrero 2019.

RESUMEN
Objetivo: Diseñar y validar un cuestionario para conocer las habilidades básicas en el uso de las TIC en contextos educativos, que pueda ser aplicado a estudiantes y maestros de nivel secundaria y bachillerato. Métodos: Bajo una metodología estructurada y flexible, se formó un grupo focal de siete profesionales en ciencias sociales y educación. El cuestionario diseñado se aplicó a 27 expertos independientes en los ámbitos social y educativo; posteriormente, se aplicó dos veces a una población piloto. Se realizaron análisis descriptivos, factoriales y de consistencia interna. Resultados: El cuestionario incluyó veintitrés preguntas con respuestas de opción múltiple y tres dimensiones: infraestructura, habilidades y actitudes. Estudiantes y profesores mencionan tener el mismo nivel de dominio de las TIC, el 95% de los docentes aprueba su uso en las escuelas. Conclusiones: Proporcionamos un instrumento validado para conocer las habilidades básicas en el uso de las TIC con fines educativos.

Palabras clave: educación media, adolescencia, informática, computadoras, internet.

1 Departamento de Ciencias de la Salud, Instituto de Ciencias Biomédicas, Universidad Autónoma de Ciudad Juárez. aramos@uacj.mx.
2 Facultad de Ciencias de la Cultura Física, Universidad Autónoma de Chihuahua, Chihuahua (México). rphernant@yahoo.com.
3 Unidad de Biomedicina, Facultad de Estudios Superiores Iztacala, Universidad Nacional Autónoma de México. miguelmurguia@gmail.com.

* Corresponding author: Dr. Arnulfo Ramos-Jiménez, Anillo Envolvente del Pronaf y Estocolmo, Ciudad Juárez (32310) Chihuahua, México. Tel. +52 (656) 688-1800. aramos@uacj.mx.

INTRODUCTION

Information and communication technologies (ICT) are here to stay and evolve; ICT are currently necessary for a global, technician and informed 21st. century world. It is not easy to imagine a human being that, living in a digital society, will not use some form of ICT during the day; therefore it is implied that individuals who do not have/use this resource are in a clear economic-educative disadvantage (Tello, 2007). ICT are used at home, work, and school; they are part of people's culture, entertainment, and education. It has been calculated that a teenager spends two or more hours per day using ICT and the Internet, as an average (Carbonell *et al*., 2012; Gobierno de España, 2014), it could be for entertainment or necessity, and in some cases it is an addiction problem (Carbonell *et al*., 2012). The time spent using ICT depends on several economic, educative, socio-cultural, and even political factors (AMITI *et al*., 2006; Gerick *et al.*, 2017); albeit differences among countries are quite notorious (Wastiau *et al.,* 2013). Just to cite an example: in 2004 Mexico reported that 12% of its population had access to the Internet, compared to 65% in the US and 83% in New Zealand (AMITI *et al.,* 2006); in 2014, however, a survey conducted in northern Mexico showed that 98.5% of secondary school students manifested to have 1 or more computers at home, and 95% had access to the Internet, in contrast only 25% mentioned that the Internet was available in their schools (Tarango *et al.,* 2014). Even though the socio-economic conditions in northern Mexico are better than in other regions (Inegi, 2014), and the apparent advance during those eight years to reduce the digital gap is enormous, these positive results could be due to erroneous methods or instruments to measure. Moreover, official data showed that 45% of the homes have computers and 57% of the population use the Internet (Inegi, 2015); in the northern State of Chihuahua 60% of homes have access to the Internet, while the national average is 39% (Inegi, 2015).

As mentioned it seems that ICT have not been incorporated into Mexican schools as fast as required; however, research with validated instruments are needed to corroborate this information. Regarding the instruments, several questionnaires have been applied in Mexico to know the competence, the use, the attitudes and the values of ICT (Muñoz-Repiso & Tejedor, 2012; Usluel *et al.,* 2008), i.e., Noriega *et al.* (2014) used an instrument from Unesco consisting of 64 questions to know the basic competence in the use of ICTs by university teachers of northern Mexico, authors mention that 87% of them use the Internet and e-mail four or more times a week, while 55% use computers for different tasks besides the Internet. They also mentioned that teachers trained in ICT use plan more efficiently their academic activities compared to those having no computer; it was also noted that the older the teacher, the lower the use of ICT. Despite being interesting data, some of these instruments have not been validated or it is not mentioned in the reports; among those instruments are: Noriega *et al.*, (2014), Tarango *et al.*, (2014), and Torres-Gastelú and Kiss (2016), which have been applied in Mexico, the lack of validation reported could lead to biased information. Moreover, there is the need to compare different populations such as that of Torres-Gastelú & Kiss (2016), but difficult to conduct if the instrument is not validated.

On the other hand, to own and use a computer not necessarily imply that users are trained in ICT to obtain useful information so that they are out of the digital gap; furthermore, ICT competence is a set of abilities, knowledge, and attitudes for the correct use of devices, software, applications and digital information with the purpose to learn, to transfer knowledge and to live productively in society. The goals of using ICT in schools are to simplify and facilitate access to information, improve communication, and increase the quality of these tools. The information required to achieve these goals is not easy to reach with non-validated instruments. To the best of our knowledge, in Mexico we have no trustworthy and updated values in the use of ICT, mainly in the school setting; so, it is very important to have a reliable instrument that allows researchers to know the scenario, which prompted us to design and validate a questionnaire to know the basic competences (frequent use, skills, knowledge and attitudes; see questionnaire, supplementary file 1) in the use of ICT in educative settings that could be applied to students and teachers alike in the secondary and high school levels.

METHODOLOGY

2.1Research design

To design and validate the instrument we followed a focal group consensus, after a structured methodology called in French Bricolage, supported by

the Delphi method (Okoli & Pawlowski, 2004). The focal group included six graduate students in social sciences and education, and a researcher in charge. Three hour-long meetings per week were held where tasks were given to develop during the week.

The chronological steps in the method were:

Select the topic and objectives: according to the current knowledge of the topic by the team.
Define the topic.
Ask the question: What do we want to know or to measure?
Assess the problem.
Assess the objectives.
Identify the study population.
Search for information and instruments in literature, experts, specialists, and target population.
Reorder the topic and objectives: according to the new data obtained by the team.
Re-assess the question.
Re-assess the problem.
Re-assess the objectives.
Re-assess the selection of study population.
Construction of the instrument.
Select the instrument.
Assume costs.
Define the construct.
Identify factors or dimensions.
Select the question.
Select the answer.
Write the questions: brainstorm.
Integrate, organize and select the questions.
Elaborate the instructions.
Design the typographic format.
Tests of internal validation.
Validation of content: cabinet tests asking specialists, focal groups, experts, the population.
The 1st design of the instrument.
Application of first pilot test and results analysis.
The 2nd design of the instrument.
The 2nd pilot test.
Factorial analysis and internal consistency tests.

Once the instrument was constructed, according to steps 1-3, it was criticized and commented by specialists, experts and target population (step 4). After collecting criticisms and suggestions, the questionnaire was re-structured (ICT supplementary file 1). For the experts' test (judges, Delphi method) a second questionnaire was selected (ICT supplementary file 2) (Ramos-Jiménez *et al.,* 2013), and both were applied to 27 independent professionals (not related to the study) with different specialties like psychology, engineering, sociology, teaching, accountability and social work. Subsequently, the questionnaire was conducted by double piloting. The 1st piloting was applied to 24 students and 12 teachers of secondary schools which, besides to answering the questionnaire, were asked to criticize and suggest ways to improve it. The 2nd piloting was applied to 331 students (197 from secondary and 134 from high school), and to 139 teachers (74 from secondary and 65 from high school) from public schools located in low-income areas of Ciudad Juárez, Chihuahua (Table 1); those participants only answered the questionnaire. In the 2nd piloting nine public secondary schools and six public high schools, were randomly selected: four students and two teachers of each of the six semesters for every scholar level.

2.2 Ethics and testing

All participants in the tests voluntarily collaborated in the study after the researchers' invitation at the schools; since the study only required to answer a questionnaire, no signed informed consent was needed; however, school authorities, as well as parents and students, accepted to participate. The protocol was reviewed by the Ethics Committee of the Universidad Autónoma de Ciudad Juárez, following the guidelines of the Helsinki's Declaration. The questionnaire was applied by the team previously trained in surveys application, and the questionnaire was personally delivered to each student when in the classroom and during a pause between their academic activities; the teacher was not present during the test, and there was no time limit to fulfill the questionnaire, but it took 10 to 15 min for completion. The questionnaires were collected checking that each one was completely answered.

2.3 Judges' validation of the questionnaire

It is also known as logical validation and indicates the degree of agreement that a group of experts in the topic, in the construction and design of instruments and psychometrics gives to the instrument, its items, and its factors. This second instrument consists of 18 items, 17 with three Likert responses and one open response (ICT supplementary file 2). Score 1 means a deficient meet, score 2 is a medium, and score 3 is a sufficient; the average score was calculated in such a way that values lower than

3 indicate that the instrument has to be re-thought and re-structured. This work shows the obtained results up to the 2nd pilot piloting.

2.4 Statistics

To establish differences between groups, descriptive and comparative statistics (students vs. teachers, secondary vs. high school students), utilizing Chi-square test (χ^2) and Student's t tests for comparisons between sex, were used. Associations and grouping among variables were carried out by exploratory factorial analysis for categorical variables (optimal scaling) as a method of reducing dimensions: Discretization by the grouping method, normalization of dimensions by the variable principal method. The internal consistency for each construct by Cronbach's α, and for these last evaluations only the questions with ordinal answers were included (16 items). Statistics package SPSS ver. 22 was used.

RESULTS

3.1 Designed questionnaire

The chosen instrument was a 30 items questionnaire with a multiple-choice answer and four dimensions (ICT supplementary file 1). As described in Methods, it was re-designed two times: the first one was after judges, specialists and target population scrutiny; while the second one was after application of the first pilot test.

3.2 Internal validation

According to the described internal validation processes, the final questionnaire includes four dimensions or constructs (ICT supplementary file 1): the first deals with technological resources in schools (4 items), the second with teachers' and students' abilities to use ICTs (8 items), the third with teachers' attitudes towards using ICT in the classroom (11 items), and the fourth about the teachers' strategies proficiency to create learning settings in the classroom (7 items). Teachers answered all items of the questionnaire, but students only sections 1 and 2. The items were constructed with several options of a closed answer and seven items were with open answer. In this work, we show only the information regarding sections 1 to 3.

The criticisms on the instrument due to experts and target population that made us to re-design the questionnaire were:

Long questionnaire

Too much information making the instrument heavy to answer

High-level vocabulary

Repeated and disorganized questions

Incomplete or too long constructs

Deficient writing

Misspellings and typos

3.3 Judges' validation

The questionnaire had an acceptance of 86.6% when applied to primary school children older than nine years old; 89.7% when applied to secondary school teenagers; and 91.4% when applied to adults (high school and college students, and teachers). For the above, the questionnaire was well understood by the surveyed individuals since no doubts were recorded when applied, and all the items were answered.

3.4 Descriptive analysis

On the second pilot test, surveyed individuals mentioned that better conditions to use ICT occurred in high school *vs*. secondary school. No differences were observed when compared ICT proficiency and training between both scholar levels (Figure 1).

Both students and teachers perceived the ICT availability at schools similarly, and their proficiency on ICT for academic goals (Figure 2).

Regarding the attitudes towards ICT, high school teachers dedicate more time to use them for academic performance but not for recreational purposes vs. secondary school teachers. In general, < 5% teachers mentioned that ICT are complicated, not necessary and annoying, but high school teachers had a little better willingness towards their usage (Figure 3). Secondary school teachers perceived better that ICT improve the interest to learn at classroom *vs*. high school teachers (Figure 3).

The first age for using computers was one year earlier in secondary vs. high school students (8.6±1.7 vs. 9.5 ± 1.9 years old); while high school teachers started three years earlier than secondary teachers (17.0±7.1 vs. 20.5±7.8 years old) (Table I).

3.5 Factorial analysis and internal consistency

As observed in Table II, the factorial model was adjusted to three dimensions, the main one (second dimension) included teachers' attitudes towards using ICT in classroom (31.3% variance, Cronbach´s α - .84), the second one (first dimension) included items related to teachers' and students' abilities in

using ICT (23.2% variance, Cronbach´s α - .86), and the third one (third dimension) included the technological resources at schools (9% variance, Cronbach´s α - .63).

DISCUSSION

ICT are tools that every person should handle to be updated in the day to day information; they are currently present in all social structures and human settings, but their incorporation is different in each context and country (Gerick *et al*., 2017; Wastiau *et al*., 2013). However, reports indicate that the Internet and smartphones use becoming addictive among youngsters below 18 years of age (Carbonell *et al*., 2012); furthermore, their use has been related to drug abuse and other problems (Frangos *et al*., 2011; Sánchez-Martínez & Otero, 2009). Therefore to know their impact is a critical field of study, even though few validated instruments exist in the educational and academic area (Hsu, 2017; Lau & Yuen, 2014). In the educational area, several questionnaires have been applied with contrasting information outcome; so, this study designed and validated a questionnaire to know the basic skills of both students and teachers to use ICT for an educative purpose. This was done through a rigorous but flexible structured methodology, suggested to construct questionnaires (Bhuasiri *et al*., 2012; Okoli & Pawlowski, 2004; Rattray & Jones, 2007). For its design, the established rules to construct questionnaires were followed, which applied a diverse structured methodology, i.e., focal groups, literature search, creating an a priori factorial structure, experts' and professionals' support, approaching the target population, applying the questionnaire to a pilot population, psychometrics analysis (items analysis, exploratory factorial analysis, etc.), among others (Bhuasiri *et al*., 2012; Okoli & Pawlowski, 2004; Ramos-Jiménez *et al*., 2013; Rattray & Jones, 2007). Those three hypothetical constructs described in Methods were validated, and the internal consistency was adequate; however, convergence analysis compared to other instruments, the confirmatory analysis, the test-re-test, and the external validation with different populations have to be done, as it has been reported (Hsu, 2017; Ramos-Jimenez *et al*., 2018; Ramos-Jiménez *et al*., 2013).

The complete questionnaire was a quali-quantitative one including four dimensions and 30 items of multiple choice, with possible open answers in seven items; dimensions 1 to 3 (23 items) are reported here. The fact that the applied questionnaires were completely answered in less than 15 min shows that the instrument was simple and clear; moreover, the structured method applied confirm the validity of the content and the proper approach of the constructs (Okoli & Pawlowski, 2004; Rattray & Jones, 2007). The importance of the study is that even though there are several validated instruments to know the use, skills and attitudes towards ICT (Gerick *et al.,* 2017; Hsu, 2017; Lau & Yuen, 2014; Lu *et al.*, 2015), just a few are fit for Mexico.

One validation process is to subject the instrument to experts and judges' scrutiny (Rattray & Jones, 2007). This instrument was submitted to a panel of 27 judges, mainly from the social and educational fields, who approved with a high qualification the questionnaire (> 85%), especially if it was applied to adults. Before the application of the instruments to the target population and to confirm the clarity of the items, their application on at least one occasion to a pilot sample is recommended (Rattray & Jones, 2007). In our case, the questionnaire was replicated twice to two samples of students and teachers, from which practical suggestions were collected in the results. Other questionnaires on the same topic have applied validations from two expert rounds (Lu, Tsai & Wu, 2015).

Both, the factorial exploratory and internal consistency analysis proved the existence of the three established constructs. The three-dimensional model explains 63.5% variance with a total Cronbach´s α = .98 for all dimensions, although the consistency value for the third domain of the questionnaire is low (9% of total variance and Cronbach´s α - .63), this is not a weakness though since it was evaluated with only two variables. The low value of Cronbach's alpha is a product of the reduced number of items, however, alpha coefficients of 0.60 can be considered acceptable when the scales are made up of a low number of items (Hair *et al.,* 2006). Similar to our questionnaire, those constructs found for this type of studies are available infrastructure and resources access, skills towards ICT use, and attitudes of individuals (Gerick *et al.,* 2017; Lu *et al.,* 2015; Wastiau *et al.*, 2013). Also, to non-validated questionnaires applied in Mexico, already mentioned in the introduction, the literature shows extensive questionnaires designed for a specific study (Muñoz-Miralles *et al.,* 2014; Wastiau *et al.,* 2013); however, those studies do not mention design and

validation data, which might bias the information reported.

In our study 80% students and teachers, as an average, own computers, and 68% have access to the Internet; while 57% of these devices/services have regular quality, and 22% are high or very high quality. In addition, 10% of teachers stated that they are not proficient enough to use ICT. In contrast, in the European Community during 2012 existed one computer/laptop for 3-7 students at schools (Wastiau *et al.,* 2013), i.e., both teachers and students have access to ICT at school and they have skills for using them; whereas 37% of schools are highly digitalized, 48% moderately digitalized and 15% have computers but no Internet. As observed, in Mexico we have not reached international standards for self-sufficiency in the use of ICT, with about 10% of scholar population being digitally illiterate. The advantage of ICT self-sufficiency in education is that they are intended to make the individual competent in the current digital age, like providing access to information, making students self- sufficient and teachers purposeful for using ICT at classroom as a method to teach; however, technology access is not equal among countries, even in the European Union (Wastiau, *et al.,* 2013).

Regarding the attitudes towards ICT, we found that teachers use them for education rather than for recreation, and less than 5% stated their lack of attitude neither interest in their use. Reports indicate that these problems predict the use and skills of ICT, and these are diverse and different between countries, like the ratio computers/students, hardware quality, technical support for students, educational support, skills for using ICT, courses on ICT for teachers and students, importance of ICT for teaching among school authorities, teachers' attitudes towards ICT, and age of teachers (Gerick *et al.*, 2017).

CONCLUSION

The questionnaire to know basic competence to use ICT for educational purposes is a valid one to be applied to students and teachers of secondary and high-schools. While skills and use of ICT for educational purposes are continually growing, it is clear that Mexican schools are behind in their use.

5.1 Limitations

One weakness of the present work was not including, within the validation process, the last section of the instrument. The reason was that we observed that few schools had technological resources for teachers to design their classes applying the TIC, therefore this section could be biased. This instrument does not evaluate the skills to use software and specific applications for educational purposes, neither the widespread use of social networks for academic goals. In order not extending the document, confirmatory analyzes are not included.

Acknowledgments

We thank the students Lucero, Abril, Zenia, Ilsa, Lluvia and Lupita for the support in the application of the instruments.

REFERENCES

Amiti, Canieti, & FMD. (2006). Visión México 2020: Políticas públicas en materia de tecnologías de información y comunicaciones para impulsar la competitividad de México. México: Instituto Mexicano para la Competitividad. Retrieved from http://imco.org.mx/wp-content/uploads/2006/12/re_agenda_digital_2020_amiti_06.pdf.

Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A. P. (2012). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education*, 58(2), 843-55.

Carbonell, X., Chamarro, A., Griffiths, M., Oberst, U., Cladellas, R., & Talarn, A. (2012). Problematic Internet and cell phone use in Spanish teenagers and young students. *Annals of Psychology*, 28(3), 789-96.

Frangos, C. C., Frangos, C. C., & Sotiropoulos, I. (2011). Problematic internet use among Greek university students: an ordinal logistic regression with risk factors of negative psychological beliefs, pornographic sites, and online games. *Cyberpsychology, Behavior, and Social Networking*, 14(1-2), 51-58.

Gerick, J., Eickelmann, B., & Bos, W. (2017). School-level predictors for the use of ICT in schools and students' CIL in international comparison. *Large-scale Assessments in Education*, 5(1), 5.

Gobierno de España. (2014). Encuesta sobre hábitos de uso y seguridad de internet en menores y jóvenes de España. España: Ministerio del Interior Retrieved from http://www.interior.gob.

es/documents/10180/2563633/Encuesta+sobre+hábitos+de+uso+y+seguridad+de+internet+de+menores+y+jóvenes+en+España/b88a590a-514d-49a2-9162-f58b7e2cb354.

Hair, J., Black, W., Babin, B., Anderson, R. & Tatham, R. (2006). Multivariate Data Analysis. 6th Edition, Pearson Prentice Hall, Upper Saddle River.

Hsu, S. (2017). Developing and validating a scale for measuring changes in teachers' ICT integration proficiency over time. Computers & Education, 111, 18-30.

Inegi. Instituto Nacional de Estadística y Geografía. (2014). Censos Económicos 2014. Resultados definitivos: Remuneraciones. Retrieved from http://www.inegi.org.mx/est/contenidos/proyectos/ce/ce2014/default.aspx

Inegi. Instituto Nacional de Estadística y Geografía. (2015). Encuesta nacional sobre disponibilidad y uso de tecnologías de la información en los hogares. Retrieved from http://www.inegi.org.mx/saladeprensa/boletines/2016/especiales/especiales2016_03_01.pdf

Lau, W. W., and Yuen, A. H. (2014). Developing and validating of a perceived ICT literacy scale for junior secondary school students: Pedagogical and educational contributions. Computers & Education, 78, 1-9.

Lu, C., Tsai, C.-C., & Wu, D. (2015). The Role of ICT Infrastructure in Its Application to Classrooms: A Large Scale Survey for Middle and Primary Schools in China. *Educational Technology & Society*, 18(2), 249-61.

Muñoz-Miralles, R., Ortega-González, R., Batalla-Martínez, C., López-Morón, M. R., Manresa, J. M., & Torán-Monserrat, P. (2014). Acceso y uso de nuevas tecnologías entre los jóvenes de educación secundaria, implicaciones en salud. Estudio JOITIC. *Atención Primaria*, 46(2), 77-88.

Muñoz-Repiso, A. G. V., & Tejedor, F. J. T. (2012). The incorporation of ICT in higher education. The contribution of ROC curves in the graphic visualization of differences in the analysis of the variables. *British Journal of Educational Technology*, 43(6), 901-19.

Noriega, J. A. V., Moran, L. E. T., & García, E. E. M. (2014). Evaluación de competencias básicas en tic en docentes de educación superior en México. Píxel-Bit. *Revista de Medios y Educación*, (44), 143-55.

Okoli, C., & Pawlowski, S. D. (2004). The Delphi method as a research tool: an example, design considerations and applications. *Information & management*, 42(1), 15-29.

Ramos-Jiménez, A., Wall-Medrano, A., Esparza-Del Villar, O., Castro-Valles, A., Hernández-Torres, R. P., Murguía-Romero, M., & Villalobos-Molina, R. (2018). Systematic Validation of a Self-Administered Questionnaire to Assess Bullying: From elementary school to high school and by sex. *Revista Electrónica de Investigación Educativa*, 20(1): 26-37. ISSN: 1607-4041.

Ramos-Jimenez, A., Wall-Medrano, A., Esparza-Del Villar, O., & Hernández-Torres, R. P. (2013). Design and validation of a self-administered test to assess bullying (bull-M) in high school Mexicans: a pilot study. *BMC public health*, 13(1), 334.

Rattray, J., & Jones, M. C. (2007). Essential elements of questionnaire design and development. *Journal of Clinical Nursing,* 16(2), 234-43.

Sánchez-Martínez, M., & Otero, A. 2009. Factors associated with cell phone use in adolescents in the community of Madrid (Spain). *CyberPsychology & Behavior,* 12(2), 131-37.

Tarango, J., Romo-González, J. R., Murguía-Jáquez, L. P., & Ascencio-Baca, G. 2014. Uso y acceso a las TIC en estudiantes de escuelas secundarias públicas en la ciudad de Chihuahua, México: inclusión en la didáctica y en la alfabetización digital/Use and access to ICT in students of public secondary schools in Chihuahua City, Mexico: inclusion in teaching and digital literacy. *Revista Complutense de Educación,* 25(1), 133.

Tello, E. 2007. Las tecnologías de la información y comunicaciones (TIC) y la brecha digital: su impacto en la sociedad de México. RUSC. *Universities and Knowledge Society Journal,* 4(2), 5.

Torres-Gastelú, C. A., & Kiss, G. 2016. Perceptions of Students towards ICT Competencies at the University. *Informatics in Education-An International Journal*, 15(2), 319-38.

Usluel, Y. K., Askar, P., & Bas, T. 2008. A structural equation model for ICT usage in higher education. *Educational Technology & Society,* 11(2), 262-73.

Wastiau, P., Blamire, R., Kearney, C., Quittre, V., Van de Gaer, E., & Monseur, C. 2013. The use of ICT in education: a survey of schools in Europe. *European Journal of Education*, 48(1), 11-27.

Table I. Characteristics of participants.

		Men + Women	Men		Women	
Educational level	Category	Participants	Participants	Age (years, means ± SD)	Participants	Age (years, means ± SD)
Secondary	Students	197	96	13.1 ± 1.1	101	13.2 ± 1.1
	Teachers	74	35	40.5 ± 8.9	39	37.9 ± 7.6
High School	Students	134	55	16.4 ± 1.1	79	16.3 ± .9
	Teachers	65	36	38.2 ± 12.0	29	34.7 ± 6.3
Total		470	222		248	

Student's t tests for the differences between sex.

Table II. Variance explained for each item in the three dimensions of questionnaire.

Items	Variance by dimension 1	2	3	Total
The quality level of technological didactic resources at my school is:	0.657	0.215	0.862	1.734
How are the infrastructure conditions in the computer center at my school?	0.46	0.395	0.893	1.748
How much is your interest in ICT?	1.058	0.169	0.427	1.654
What is your skill level in ICT?	1.123	0.008	0.473	1.604
How well do you think teachers and students handle ICTs at the classroom?	0.709	0.402	0.464	1.575
Evaluate your ICT formation along your education:	0.845	0.325	0.212	1.382
My training in ICT handling at the classroom as a way of learning is:	0.798	0.282	0.356	1.436
How much interest do you have in developing higher skills in using ICT?	0.154	0.679	0.101	0.934
How do you think that using ICTs improved your educational/labor performance?	0.149	0.681	0.102	0.932
How useful do you think are ICTs as tools for teaching-learning?	0.154	0.679	0.102	0.935
Do you think that using ICTs improves interest to learn in the classroom?	0.152	0.68	0.103	0.935
Do you think that using ICTs improves team work in the classroom?	0.153	0.679	0.103	0.935
In what degree do you think that using ICTs makes us dependent?	0.154	0.679	0.101	0.934
Do you consider that using ICTs promotes responsibility, social values and ethical commitment?	0.153	0.679	0.104	0.936
During the last month, as average, how much time did you invest using ICTs for educational/academic purposes per day?	0.153	0.679	0.101	0.933
During the last month, as average, how much time did you invest using ICTs for recreational purposes per day?	0.155	0.679	0.102	0.936
Total active	7.027	7.91	4.606	19.543
Percentage of explained variance for each dimension	0.232	0.313	0.090	0.635
Cronbach's α for each dimension	0.857	0.841	0.627	0.98

Exploratory factorial analysis and internal consistency. Dimensions: 1, Teachers' and students' skills in using ICTs; 2, Attitudes of teachers about using ICTs in the classroom; 3, Technological resources at schools.

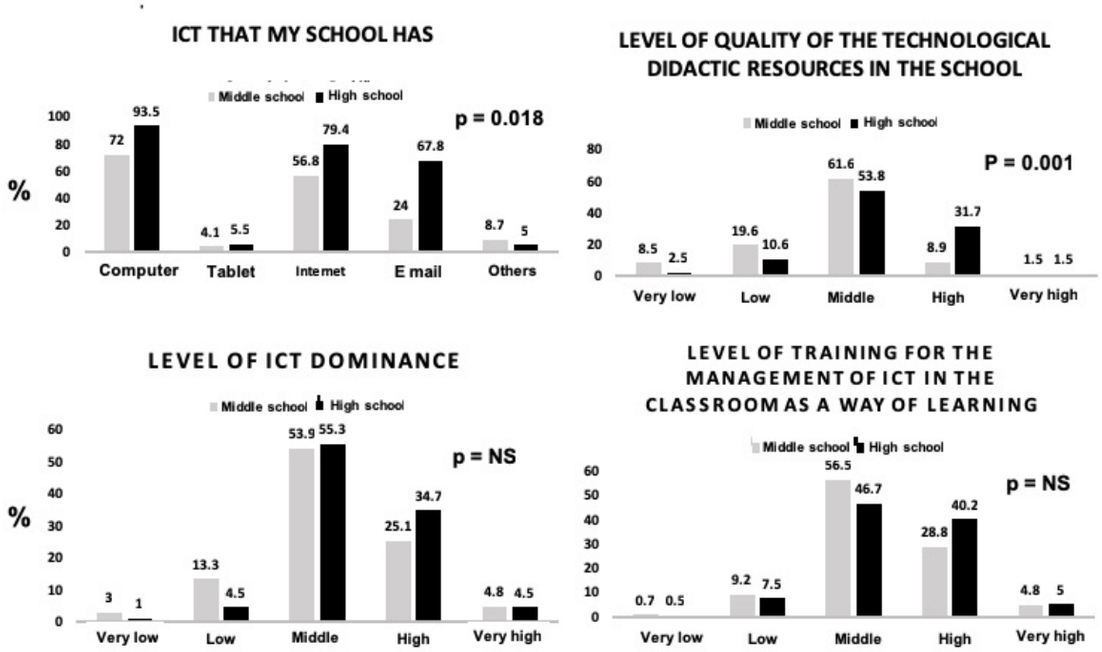

Figure 1. *ICTs at schools and skills using ICTs; difference by educational levels. x^2 = Chi-square test. NS = not significant. Images generated in Excel.*

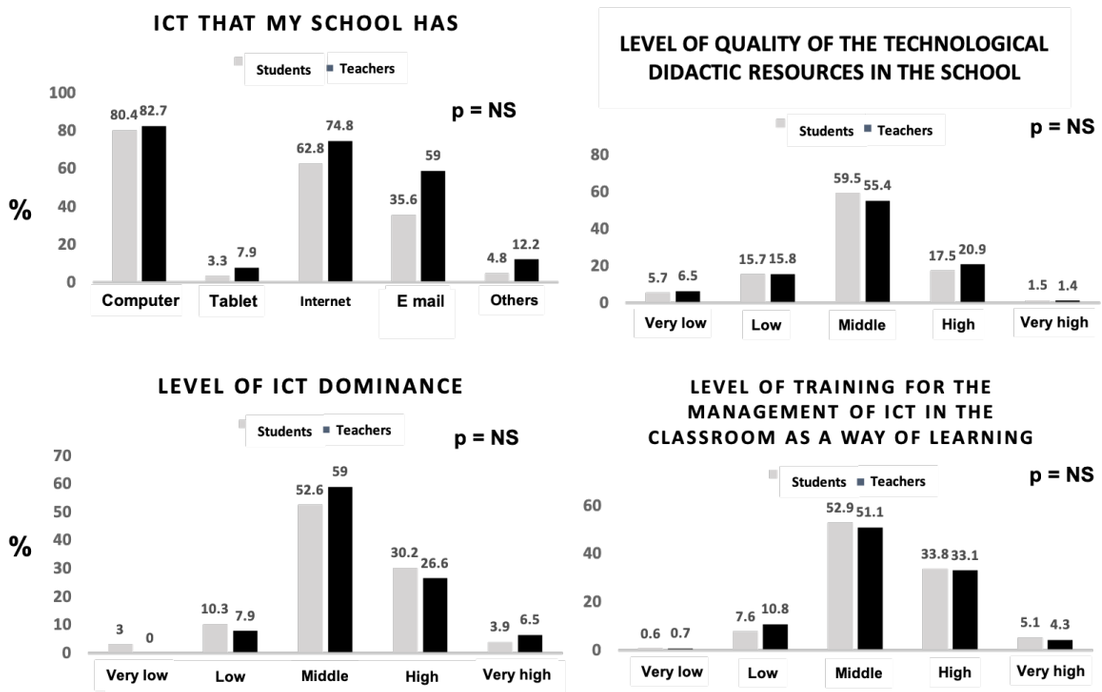

Figure 2. *ICTs at schools and skills using ICTs by students and teachers: difference of perception between teachers and students. x^2 = Chi-square test. NS = not significant. Images generated in Excel.*

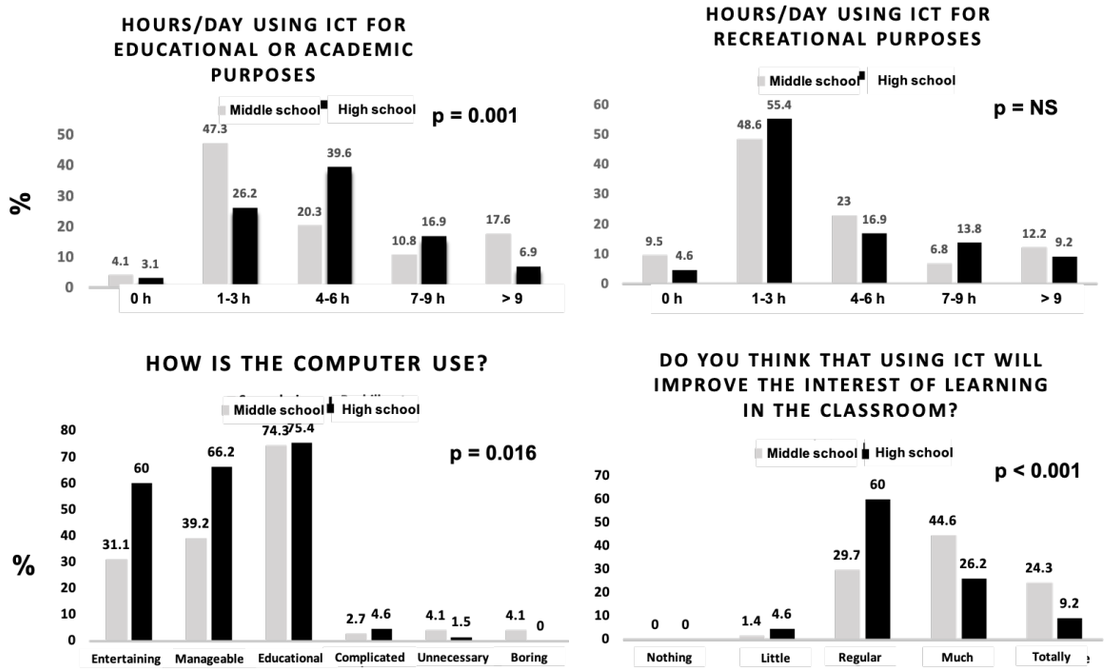

Figure 3. *Attitudes of teachers in using ICTs: difference between educational levels. x^2 = Chi square test. NS = not significant. Images generated in Excel.*