DIGITAL LITERACY SKILLS FOR INSTRUCTION IN A CROSS-CULTURAL CONTEXT

COMPETENCIAS DIGITALES PARA LA DOCENCIA EN UN CONTEXTO INTERCULTURAL

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RESUMEN

Alumnos de licenciatura en educación, quienes tomaron un curso en línea sobre alfabetización digital y competencias para la docencia, fueron estadísticamente analizados usando SPSS y M-Plus. Una prueba piloto, con 117 participantes en una encuesta en línea, sirvió para seleccionar sujetos de estudio e inscribirlos en grupos geo-lingüísticos con distinta modalidad formativa. La recolección de datos fue obtenida a lo largo del año escolar 2015-2016. La muestra final de 55 sujetos constó de una sub-muestra A (28 alumnos hispanófonos cursando en línea) y una sub-muestra B (27 alumnos anglófonos cursando en persona). Pudo notarse que sujetos en la sub-muestra B se complicaron al realizar actividades en MOODLE sin supervisión y mostraron preferencia por el uso de las TIC para la comunicación más que para la educación; mientras que sujetos en la sub-muestra A manifestaron pertenencia digital y el uso prominente de las TIC tanto para su formación como para enseñar.

Palabras clave: alfabetización digital, competencias docentes, educación internacional, educación superior, formación docente, interculturalidad

Abstract

Bachelor alumni from curricula in education (pre-service teachers), who attended a courseware about digital literacy skills (competencies) for instruction, were statistically analyzed using SPSS and M-Plus. A pilot test (online survey), with 117 participants, was made to filter a selection of subjects and as a preliminary activity. The selection consisted of two geo-linguistic groups of pre-service teachers whose training is achieved through different modalities. Data collection was made along school-year 2015-2016. The final sample of 55 subjects was formed by sub-sample A (28 Spanish-speaker alumni attending online training) and sub-sample B (27 English-speaker alumni attending blended training). It was found, in sub-sample B, that most of subjects struggled to perform into MOODLE without supervision and preferred ICT use for communication rather than for education; while in sub-sample A most of subjects manifested digital belonging and proficient ICT use in education, for self-training and for teaching.

Keywords: digital literacy, teaching competencies, international education, higher education, teacher education, cross-culturalism

INTRODUCTION

There are several reasons for getting familiar with the level of digital literacy among people who share the vocation to teach, to learn how to teach properly, and to help others to learn; some of those include the nowadays requirements for teacher education as well as teaching/instructional competencies, international higher education, and cross-culturalism. On one hand, undergraduate students pursuing a bachelor degree in education are known in English as pre-service teachers from the cultural-political context of the European Union; on the other hand, university alumni pursuing equal degree are called in Spanish as "maestros en formación" ('teachers in training') from the cultural-linguistic context of Latin American countries such as Mexico.

Rodriguez and Padilla (2007) analyzed the level of digital literacy (Gilster, 1997) in 860 teaching staff members (in-service teachers) from the Mid-high Education System at the University of Guadalajara (UDG); these authors conducted a printed survey and used hypothesis testing to provide validity for their analyses, and research variables consisted of 43 questions over labor/leisure use of ICT: desktop computer with or without internet connection. Later on, Schleicher and Rétfalvi (2014) implemented strategies to foster media literacy, another one from the so called 21st Century Literacies (NCTE, 2013:02). On the basis of the above information, the following research questions arise: Why is it important to know digital literacy level of pre-service teachers in education? What can be analyzed from a cross-cultural research sample? How can this study foster the professionalization of teachers, so they can help others to learn?

This contribution is aimed to statistically analyze the digital teaching competencies among pre-service teachers from UDG in Mexico, attending a courseware to support a curriculum subject implemented for undergraduate international students in education at the University of Szeged (SZTE) in Hungary. Data collection includes a pilot test using an online survey to be set up as the courseware preliminary activity, as well as the MOODLE platform to run the courseware itself. Data analyses are done using statistics software: SPSS for the pilot test, and M-Plus with courseware activity records for structural equation modelling.

THEORY BACKGROUND

Digital Literacy, one of those 21st Century Literacies for reading and writing (NCTE; 2013:02), is the set of personal abilities (teaching ones included) related to the understanding of information, its assessment, and its integration (Figure 1); which are needed on the use of several formats that a computer equipment can deliver (Gilster, 1997). Based on the above, all digital literacies can be understood as a joint set of social and individual competencies which are required to interpret, administrate, share and create meaning effectively through a growing range of digital communication channels (Dudeney, Hockly & Pegrum; 2013).

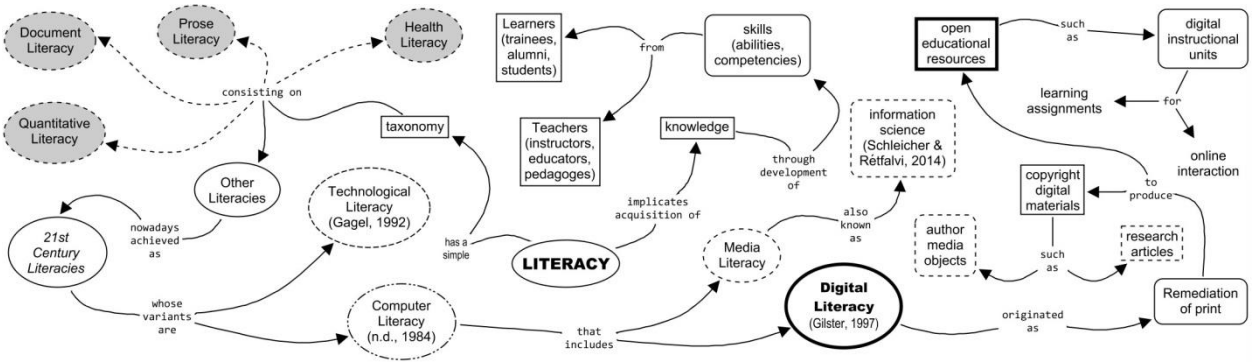


Figure 1. Concept map of digital literacy within the global context of literacy (own work)

Among several issues in education science related to the development of digital literacy skills, it is imperative to notice the impact of STEM instruction in North America or the European Union where both teachers and learners must develop digital competencies (Author, 2014) in Science, Technology, Engineering and Mathematics; however, the cognitive development of actors involved in the teaching and learning process would face the attitude of certain technophobic or technophilic teachers, as well as different degrees of acceptance by learners when training supported by Information and Communication Technologies (ICT) simultaneously.

According to Freire (1998), the set of contemporary literacies is classified in two main levels: essential literacy and functional literacy; although a division of the functional exposes three sub-levels:

under the level, in standard level, and above the level. Later on, another study (Hall, Nix and Baker; 2013) proposed to group the 21st Century Literacies in two branches: Information Literacy (Olevnik, 1991) on one hand –that is needed to search, assess and reference information– and the set of competencies in ICT use, on the other hand, to organize and share such information through digital devices with specific software applications. In this sense, the 21st Century Literacies comprise Information Literacy (Olevnik, 1991), Science Literacy (Sapp. 1992), Technological Literacy (Gagel, 1992), Digital Literacy (Gilster, 1997) and Media Literacy (Schleicher and Rétfalvi, 2014); all together.

Cross-cultural study –sometimes referred as holocultural or comparative– is a specialization in social sciences that uses field data taken from two or more societies to examine the scope of human behavior and to test certain hypotheses over culture, attitude and language. The cross-cultural studies have to do with international education; those are one among three ways to compare different cultures: the first one is the comparison of case studies; the second one is a controlled comparison of variants in a common derivation; and the third one is a comparison within a case sample (Otterbein, 1969). Unlike comparative studies, which examine similar characteristics of a few societies, the cross-cultural studies use a large enough sample making possible statistical analyzes to show relationships or the lack of such among traits/variables in question; such studies are surveys of ethnographic data (Ben-Zaken, 2010).

Pre-service teacher education (Willis, 1997) has documented worries about ICT integration in teachers training, whose unique requirements distinguish it from traditional teacher education (Hasselbring, 1991). One of such worries comes from alumni who manifest a strong necessity for computer supported education as an integrative part of teachers training, particularly through courses including curriculum aspects and implementation strategies in the classroom (Oliver, 1994). Likewise, Willis (1997) stated that, in ICT integration into pre-service teacher education, strategies are shaped based on what the teacher trainer does and says as well as in how observes and acts (or imitates), in order to show undergraduates in education the appropriate methods to be used in their own future classrooms; for instance, instructional techniques, professionalism, moderate use of humor and laughter, respect, persistence (never to give up a goal), perseverance (persisting the difficulties, oppositions, setbacks or obstacles), and patience.

In a similar way, earlier/initial teacher education (Rodriguez and Diez, 2014) can be understood as a synonym for pre-service teacher education; although scholars who refer this way highlight the importance of education models and competencies in the training process. Likewise, Rodriguez and Diez (2014) refer to "contemporary alphabetisms" instead of referring 21st Century Literacies. Alphabetism and literacy are synonyms in certain contexts such as those referring to social and cognitive effects of reading and writing (Garcia, 2005). Even though literacy refers to social level of learning and essential knowledge curriculum -associated to reading and writing, didactic content, psych-pedagogic sources, methodology and assessment (functional, critical, etc.,) - alphabetism refers mostly to competence on skills.

THE CONTEXT

Spanish is still at this moment the 'de facto language' in the Republic of Mexico, which means there is no law establishing it as the main official but as the national one; it is the mother tongue for most of population (INEGI, 2010), and shares recognition as a linguistic right along with 67 Amerindian dialects (Art. 4th General Law of Linguistic Rights for Mexican Amerindians). In contrast, each of the member countries into the European Union (EU) has at least one official language and Magyar is the only official one in Hungary (Szijjártó, 2014:07); while English has the status of linguistic right for foreign students (Fernandez, 2012).

The use of English as a foreign language in Mexico has been for commercial purposes mainly, and at the UDG it has not been implemented for instructional purpose in local Spanish speaking alumni beyond certain linguistic curricula such as the one offered online by the Language Centre in the Virtual University System (VUS) from UDG. Due to this, non-Spanish speaking alumni from abroad must learn the local language whenever they intend to study at UDG; either attending intensive courses at UDG's College of Spanish and Mexican Culture, or at some other institutions of higher education inside or outside Mexico, regardless the modality of instruction (face-to-face, virtual, blended) they would find or chose.

The VUS from UDG has been offering eighteen disciplinary schooled programmes online described as 'educational programmes' (not precisely related to education sciences) in rector's report 2016: a general baccalaureate by interdisciplinary areas; eight bachelor curricula; seven master's degree

programmes; and a doctoral programme. The Bachelor on Educational Development (BED) was launched in 2001 as the first UDG disciplinary schooled programme online and by formerly named General Coordination of Systems for Innovation of Apprenticeship (INNOVA), predecessor of VUS.

In a similar way, the University of Szeged from Hungary (SZTE) has a Faculty of Education (JGYPK) where a bachelor curriculum is offered to full-time undergraduate students (mostly locals coursing on the basis of Magyar) as well as to part-time undergraduate students (foreigners which are coursing on the basis of English, from ERASMUS mobility program). SZTE's Institute of Education does not depend from JGYPK but from the Faculty of Arts (BTK) and there are offered postgraduate curricula in education. There are not schooled programmes online, and ICT use at the Institute of Education is aimed to didactic support in classroom for teaching staff members; there is a computer lab where alumni learn on basic and specific software.

UDG and other public universities in Mexico have not financial nor physical capacity for most of their local applicants (Garcia, 2012; Servin, 2014), enrolment decision criteria do not depend from federal government, and the active alumni are required to pay for tuition fees as well as for voluntary contribution fees; there are no scholarships for locals to study at UDG, and stipends are eventually offered for active alumni to study in another Mexican university or abroad (UDG, 2009).

Contrarily, SZTE and other public universities in the EU have financial and physical capacity for most of their local applicants; since EU citizens are exempt from paying tuition fees at universities of their home country, and they receive mobility scholarship such as ERASMUS which allows European Commission of Higher Education to distribute its university population in a measured way along most of European countries and Turkey during periods from three months up to one schoolyear (ERASMUS, 1987).

In retrospective, VUS into UDG counteracts the aforementioned lack of institutional capacity to provide a physical place for all applicants; particularly, for those applying in social sciences: bachelor degree programmes on digital journalism, organizational management, cultural gestation, citizen security, library science, technologies & information, management of solidarity organizations, and in Educational Development; master's degree programmes on gestation of management innovation, learning management within VLE, transparency & protection of personal data, high-school teacher education, public services management within LMS, and in valuation; as well as a doctoral degree programme on educational systems & environments.

METHODOLOGY

This contribution is presented as a descriptive study (Lahitte, Sánchez y Tuhague, 2011) since it allows researcher to show the preferred focus and intends to demonstrate a null hypothesis as well as to reject an alternative one, or vice versa. Development of digital literacy competencies for instruction requires, on the basis of this contribution, a formative instructional module comprising four training stages: the use of elemental software (Rodriguez and Padilla, 2007); the digital information mapping (Novak, 1991); the digital online language teaching and learning (Andrade and Bunker, 2009); and the online instructional design (Baturay, 2008).

A pilot test was made in order to identify and select the subjects of study, that consisted of a survey online responded by 117 university community members; from which, 87 participated from Mexico and 30 participated from the EU. Statistical variables analysed from the pilot test are shown in Figure 2.

	Name	Type	↔	oo	Label	Lost	‖	Measure	Role
1	Case	String	50	0	Participant details and/or IP address	None	35	Nominal	Input
2	Gender	Numeric	8	0	Sex of participants (qualitative nominal)	None	8	Nominal	Input
3	Context1	Numeric	8	0	Role at the university (qualitative ordinal)	None	8	Ordinal	Input
4	Pgrowth2	Numeric	8	0	Have access to PC? (qualitative nominal)	None	8	Nominal	Input
5	Tphobia3	Numeric	8	0	Identify the types of PC(s) you use (quantitative discrete)	9999	8	Scale	Input
6	T_filia4	Numeric	8	0	Usage of PC by types of task (quantitative discrete)	None	8	Scale	Input
7	PreServ5	Numeric	8	0	Knowledge on software apps (quantitative discrete)	9999	8	Scale	Input
8	InServM6	Numeric	8	0	Have students in charge? (qualitative nominal)	None	8	Nominal	Input
9	Pgrowth7	Numeric	8	0	Teaching experience or expectation (qualitative ordinal)	None	8	Ordinal	Input
10	Context8	Numeric	8	0	Feedback on survey's format (qualitative ordinal)	None	8	Ordinal	Input
11	Time2res	Date	8	0	Time to respond to the survey (quantitative continuous)	none	8	Scale	Input

Figure 2. List of variables (dependent and independents) analyzed in SPSS

Later on, the pilot test survey was included as the preliminary activity for the first stage (unit) of the formative instructional module: a curriculum subject, whose purpose was to observe before and after the training process. From 11 record types in Figure 2, only 9 of those are indeed statistical variables (2-10). Variable 2 recorded 77 female participants (59 in Mexico) and 40 male participants (28 in Mexico). Variable 3 recorded 28 part-time undergraduates from bachelor curriculum in education (exchange alumni), from which, 27 correspond to the EU; 76 full-time undergraduates, from which, 68 correspond to Mexico; and 13 teaching staff members (11 in Mexico) who declared to be a teacher as well as a student by shift.

Table 1 shows former knowledge of survey participants, in pilot test, over the four most common types of computer equipment corresponding to variable 5. Since it is a sub-variables correlation, preliminary data are not shown as frequencies but as percentages; there are no missing values and its statistical validity is 100% by default.

Table 1.
Linear correlation of correct responses in variable 5

Identified PC types	Percentage of correct identification				
	desktop	touchpad	pocket	laptop	valid/lost
Personal computer conceived for static use	87.85%	2.80%	0.94%	8.41%	100%
Multi-size devices without a physical keyboard	2.86%	68.57%	20.95%	7.62%	100%
Device with a writing recognition system	7.62%	20.00%	61.90%	10.48%	100%
PC whose weight is between 1 and 3 kg	5.26%	6.14%	0.88%	87.72%	100%

Table II arranges the use that participants give to their most commonly used computer equipment; word processor leads as the most important for any purpose, and it is assumed that participants did not distinguish between having internet connection or not. This central tendency corresponds to variable 6 in Figure 2, where maximum participation was 104 occurrences from 117 expected; so there were 13 missing values equal to 5.13% of computer task with more occurrences, and such percentage is higher than 5% of error margin expected. Moreover, taking into account the occurrences in each of the two sub-variables separately (geographic context), the statistical mode is even lower than the percentage of values obtained.

Table 2.
Central tendency over the use given to computer equipment

Context	Finding info	Text compos.	e-mailing	Having leisure	Present slides	Doing calls	Filling in database	Making calculus	Drawing	statistical mode
Mexico	83	84	79	28	79	18	49	35	21	79
EU	28	20	19	19	18	11	7	7	5	7[a]
Percentage	94.87%	88.89%	83.76%	40.17%	82.91%	24.79%	47.86%	35.90%	22.22%	sample

a. There is more than one mode (19, 7). The smallest value is displayed.

Table 3.
Linear correlation of correct responses in variable 7

Software description	Basic Software Apps Identified by Participants						
	e-mail client	web browser	spread sheet	slide show	data base	word proc.	Valid /lost
Used to read and send text messages and / or static image asynchronously.	86.96%	3.47%	0.86%	2.61%	1.74%	4.34%	99.98%
It enables the access to the WWW, interpreting information in many ways.	4.38%	92.98%	0%	1.75%	0.87%	0%	99.98%
It manipulates numeric / alphanumeric data organized in bi-dimensional matrix.	0.87%	0.87%	88.59%	0.87%	7.89%	0.87%	99.96%
It exposes a series of schematized information in more than one view.	0.86%	4.34%	3.47%	89.56%	0%	1.73%	99.96%
It categorizes info in different ways, but sharing relationship with other banks.	2.63%	2.63%	6.14%	0.87%	85.08%	2.63%	99.98%
It is aimed at the creation or modification of written documents.	2.61%	5.21%	2.61%	2.61%	0.86%	86.08%	99.98%

Table III shows former knowledge of survey participants over six elemental software applications. Contrarily to variable 5 (Table I), there is an error margin in sub-variables within variable 7 (Table III) between 0.02 and 0.04 percent; which represents almost a 100% of statistical validity.

Table 4.
Selection of study subjects

Affiliation, experience and expectative	Frequencies and percentage		
	Mexico	EU	Sample
"I do not instruct (or teach) by now, but I have done this at a school, college, etc."	9	3	10.26%
"I am currently teaching a group of students at a school (temporary plan of curricular activ.)"	13	3	13.66%
"I am not instructing or teaching yet, but I will do it later on"	34	10	37.61%
"I am a teacher/lecturer with a definite contract in a specific institution" (or other situation)	3	-	2.56%
"Not sure whether I will teach or not.	28	14	35.90%
Total	87	30	100%

Table IV is perhaps the most relevant in methodology, based on the pilot test, since it consists of combining variables 8 and 9 in Figure 2; which allows to identify distant undergraduates from bachelor curriculum in education as well as to discard the rest of survey participants.

From participants' universe (pilot test) and preliminary data collected, a selection of study subjects was done. From 117 survey participants, 42 were left aside for not fulfilling study requirements due to unexplained reasons (no-accrediting other curriculum subjects, drop-out tentative, etc.); as exposed in Table IV. Likewise, from 75 pending participants, 13 were also discarded in order to study two cross-cultural groups as equal as possible; therefore 62 study subjects were enrolled: 30 from UDG (online) and 32 from SZTE (in classroom). These pre-service teachers attended the curriculum subject Development of Digital Literacy Skills for Instruction that was offered for both semesters of school year 2015-2016.

HYPOTHESES

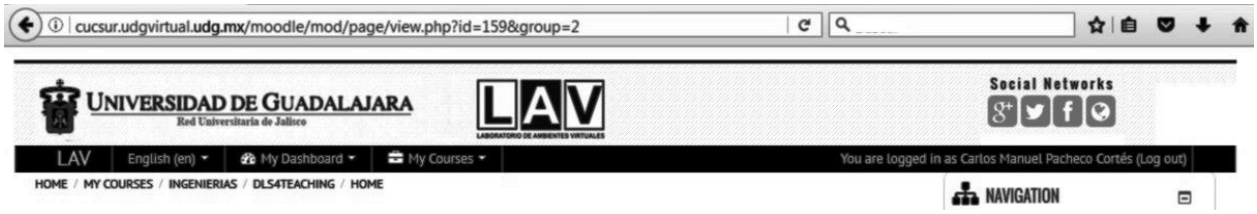
From the results of the sampling, some relationships were evidenced between variables; therefore, some hypothesis tests were designed to verify descriptive findings.

H0 “Pre-service teachers within a cross-cultural context Mexico-EU are utterly using ICT to develop digital competencies for instruction, being supported with educational technology that can be used to help others to learn as well as to increase their own digital literacy level”

Ha “Pre-service teachers within a cross-cultural context Mexico-EU are not using ICT to develop digital competencies for instruction, struggling with low or null support from educational technology that could help others to learn or to support their own training”

PROCEDURE

Data collection was done through a set of activity modules implemented for the courseware in the MOODLE platform as illustrate in Figure 3.



Syllabus:
Topic 1 - Use of basic ICT software
- 1.0 Preliminary activity: detection of former knowledge and skills
- 1.1 Academic work plan
- 1.2 Problem tracking in school or academia
- 1.3 ICT use in education
- Integrative assignment 1: the learning networks online

Topic 2 - Information mapping in education
- 2.0 Reading: techniques of information mapping in education
- 2.1 Mind Maps - discussing a definition
- 2.2 Concept Maps - discussing a definition
- 2.3 Information-mapping exercise
- Integrative assignment 2: mapping of educational information through teaching

Topic 3 - Language acquisition through ICT use
- 3.0 Willingness for digital learning of a second language
- 3.1 Reading-comprehension skills
- 3.2 Listening-comprehension skills
- 3.3 Speaking skills
- Integrative assignment 3: necessities of digital linguistic instruction

Topic 4 - Education design and social media
- 4.0 Instruction unit within social networking sites
- 4.1 Online instructional Design
- 4.2 SNS for education and research: enter LinkedIn
- Integrative assignment 4: create an open educational resource

Final assessment

Figure 3. Screen capture of courseware syllabus and its web location.

Selection of 62 study subjects enrolled into the aforementioned curriculum subject was distributed in two linguistic groups (Table V), which required distinctive characteristics.

Table 5.
Characteristics and differences of study subjects in a cross-cultural context intended

Subsample A	Subsample B
30 full-time alumni in education at the University of Guadalajara (UDG);	32 part-time alumni in education at the University of Szeged (SZTE);
Course was offered as extra-curricular being issued a digital certificate;	Course offered as curricular elective being granted 4 credits (ECTS);
Modality of training: online (MOOC), self-guided and peer supported;	Modality of training: blended (lectures and practices in a computer lab);
Training language: Spanish (mother tongue);	Training language: English (second language);
Schedule: at least 2 hrs per week.	Schedule: Wednesdays 16:00-18:00 hrs.

With the purpose of interpreting the expected results, the Structural Equation Modeling (Kaplan, 2000) was adapted as illustrate in Figure 4.

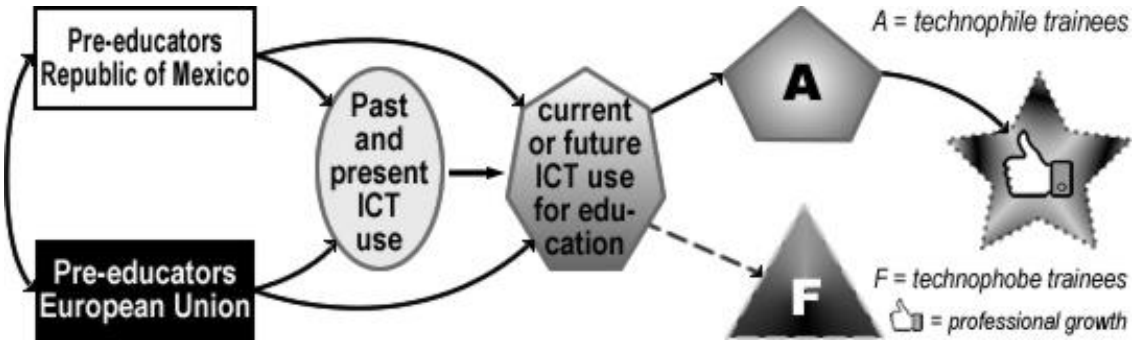


Figure 4. Adapted representation of Kaplan's SEM.

The structural equation model (SEM) in Figure 4 predicts that there will be a linear correlation of two groups of study subjects: pre-service educators (teachers in education) from the Republic of Mexico and from the European Union as representative cross-cultural groups, which probably will vary on subjects quantity at the beginning and till the end of the school year as a whole. It is not likely to analyze each semester separately because the nature and conditions of an elective curriculum subject might not allow obtaining a meaningful sample of analysis.

Both groups share a common past-to-present (pilot test and initial stage of enrollment), where individual attitudes for training were observed along the course (present or future ICT use in education) which make possible the achievement of the main objective intended from curriculum subject (goal) regarding the individual capability to self-adapt and/or to self-perform in the student role of a Virtual Learning Environment (VLE) as well as in the peer role of the same VLE; that is to say, to figure out if *technophilia* is notorious in study subjects for carrying out courseware tasks and assignments, or if *technophobia* as the counterpart is more notorious due to inadaptability for online didactical activities.

Technophilia and technophobia are Greek etymologies conformed by τέχνη (technē) "art, ability or job" and φιλία (philia) "friendship" or φόβος (fobos) "fear" (Perez & Garley, 2014). Technophilia refers to the affinity for technology or the use of digital devices generally related to computer, informatics or mobile equipment, while technophobia refers to the physical or intellectual inability to manipulate such computer equipment. Some authors consider that technophilia means 'technology abuse' lacking of practical use or without profit at all, however, other authors distinguish technomania as the proper negative utmost (μανία = madness, insanity) while technophilia is just a moderate / accurate affinity for technology into human daily life.

Contrarily, technophobia should not be considered as the opposite negative utmost, since there are different capabilities and learning styles (Aragon and Jimenez, 2009). For instance, it is possible that an elder who never had technology supported learning (even if by obsolete one) cannot retain any long-lasting apprenticeship from the same teaching repeated over and over of how to plug and manipulate a digital television, home-theatre, etc.

RESULTS

It was raised, in the methodology, a possibility that the initial amount of 62 study subjects would vary throughout and until the end of the data collection process; ie, not all of them would conclude the curricular subject where they got enrolled, or at least, not keeping the same level of performance / punctuality. Table VI exposes the composition of the final sample of analysis.

Table 6.
Final sample of analysis, in a random ID order and by affiliation

Subsample a = 28 UDG (Virtual University System, VUS)	212424876 (MX); 211237746 (MX); 087305694 (MX); 210209188 (MX) 211238467 (MX); 093020448 (MX); 212224036 (MX); 212223595 (MX) 091370514 (MX); 209199799 (MX); 214245928 (MX); 210386012 (MX) 210211972 (MX); 210846498 (MX); 214527435 (MX); 210846692 (MX) 207635745 (MX); 210385806 (MX); 210846803 (MX); 209199322 (MX) 211239188 (MX); 091574063 (MX); 089737095 (MX); 084556572 (MX) 091659468 (MX); 082347453 (MX); 079702711 (MX); 212047980 (MX)
Subsample b = 27 SZTE (ERASMUS mobility program)	ALGXAAF.SZE(TR); ARSYAAF.SZE(HE); CAMXAAF.SZE(IT); CEMXAAF.SZE(IT) CEMYAAF.SZE(CZ); COMYAAF.SZE(DE); DEKXABF.SZE(RO); DOEXABF.SZE(IT) ESCXAAF.SZE(ES); FEJXAAF.SZE(RO); GAMXABF.SZE(ES); GOSYAAF.SZE(TR) IVSYAAB.SZE(SR); JADYAAB.SZE(SR); JUIYAAB.SZE(RO); JUMXAAB.SZE(FR) KOKYAAB.SZE(TR); MAZXACF.SZE(FR); MEMXAAF.SZE(ES); PEBXAAB.SZE(ES) SAMXABF.SZE(IT); SAEXAAB.SZE(ES); SCMXAAF.SZE(DE); SHEYAAF.SZE(TR) VAHYAAB.SZE(RO); VESXABB.SZE(TR); ZABVAAB.SZE(HU)

MX=Mexico HU=Hungary IT=Italy CZ=Czech Republic DE=Germany ES=Spain FR=France RO=Romania SR=Serbia TR=Turkey HE=Israel n=55

Table VI shows that, from 62 selected trainees enrolled into the course, only 55 concluded it; having done at least 60% of activities designed for the syllabus: 2 subjects out of 30 in subsample 'a' did not completed such minimum (a = 28), and 5 out of 32 in subsample 'b' simply dropped-out along both semesters (b = 27). As mentioned before, each of four topics in the course syllabus contained a preliminary activity, two learning tasks, one exercise, and one integrative assignment.

Based on the results, topics 1 and 2 were more essential than 3 and 4 considering the particular curriculum orientation of the pre-service teachers in education. Topic 1 was based on the study made by Rodriguez-Armenta and Padilla-Muñoz (2007), topic 2 was conceived from the theory stated by Buzan (1997) and Novak (1991), topic 3 was conceived from research conducted by Dudeney et al (2013), and topic 4 was conceived from research conducted by Baturay (2008). Likewise, a final assessment was designed –and applied, according to each training modality– to measure the 'before the course' (stage one) and the 'after the course' (stage two) of data collection, as exposed in table VII.

Change over time, observed along school year 2015-2016, was recorded into the MOODLE activity management system for the courseware implemented. The importance of analyzing motivation as a numeric descriptor lies on theory according to which "when attitudes towards a subject are favorable, the subjects of analysis are motivated to learn what did not attract attention to them"; they strive and concentrate intensely; have clearer, more stable and more pertinent ideas of securing membership; and that on the contrary, if the attitudes are negative, the circumstances go toward the opposite direction (Ausubel, Novak and Hanesian; 1983).

As exposed in Table VII, each statistical variable (quantitative or qualitative) is accompanied by a reasoning or explanation whose approach is merely qualitative; although for some experts, Table VII might not be detailed enough. In a given case, implementing the structural equation modeling allows to interpret the results obtained in greater detail, but from a more quantitative approach. To model linear structural relationships between latent (unobserved) and manifest (observed) variables, the application of statistical software M-plus version 5 was used in this study to analyze, for instance, students' scores (partial or total) obtained through the courseware in a digital document of numbers separated by commas (Annex 1) that can be read with MS Excel; although it is not properly an Excel spreadsheet with XLS(X) extension.

Table 7.
Synthesis of changes observed in study subjects before and after the course

Variable and reasoning	Before			After		
The subject is able to use computer devices and to distinguish each other	$^{a}24/28$	$^{b}20/27$	$^{n}39/55$	$^{a}26/28$	$^{b}27/27$	$^{n}53/55$
Reason: wrong responses include those who still do not identify which device is a touchpad and which is an older PDA; 2 occurrences believe that a personal digital assistant lacks of physical keyboard.						
The subject is able to perform digital tasks using basic software (word processor and filling in database)	$^{a}24/28$	$^{b}20/27$	$^{n}39/55$	$^{a}27/28$	$^{b}27/27$	$^{n}54/55$
*almost everyone was able to submit an essay made with a word processor and to fill-in a database.						
Subject is able to give a numeric response in a lesson activity module (l) or the quiz activity module (q)	$^{a}28/28_{l}$	$^{b}27/27_{l}$	$^{n}55/55_{l}$	$^{a}28/28_{q}$	$^{b}3/27_{q}$	$^{n}31/55_{q}$
Reason: before the course, some of the subjects were not able to distinguish between database and spreadsheet; after the course, only 3 subjects from subsample 'b' presented their final assessment.						
The subject is able to create a digital information map (c) and to distinguish among 3 different types (d)	$^{a}21/28_{c}$	$^{b}11/27_{c}$	$^{n}32/55_{c}$	$^{a}28/28_{d}$	$^{b}2/27_{d}$	$^{n}30/55_{d}$
Reason: subjects in subsample 'a' were already familiar with digital mind maps and digital cmaps while subjects in subsample 'b' able to draw random info-maps on hand but were not able to distinguish.						
The subject knows ICT tools for e-language learning (k) and he/she is motivated to implement them (m)	$^{a}3/28_{k}$	$^{b}16/27_{k}$	$^{n}19/55_{k}$	$^{a}9/28_{m}$	$^{b}5/27_{m}$	$^{n}14/55_{m}$
Reason: subjects in subsample 'a' do not know ICT tools for e-language learning, neither motivated to implement them; while subjects in subsample 'b' prefer traditional language learning in a classroom.						
The subject has fair experience with instructional design (f) and/or e-instructional design (e)	$^{a}11/28_{f}$	$^{b}13/27_{f}$	$^{n}24/55_{f}$	$^{a}25/28_{e}$	$^{b}0/27_{e}$	$^{n}25/55_{e}$
Reason: subjects in both groups have fair experience with common instructional design, although subjects in subsample 'b' are not familiar with e-instructional design at all.						

n = final simple total a/b = sub-samples l/q = activity module records x/y = frequency (occurrences) / subtotals

Based on the Theory of Structural Equation Modeling (Byrne, 2012), statistical variables can be estimated from the elements illustrated in Figure 4. The M-plus application is useful in databases with categorized output variables; therefore, the numerical data imported from the courseware and illustrated in Annex 1 were arranged into a digital raw file (Figure 5) for M-plus.

Figure 5 shows that the column headers in Annex 1 were omitted since they are not necessary and would cause a calculation error by the M-plus application; likewise, the first column from the left does not represent resultant numerical data and it is only an ascending sequence of study subjects. After arranging MOODLE output information into the raw data file (.DAT) aforementioned, calculation commands were set up into a second inputs file (.INP) that will run the M-Plus using the calculation method in order to generate a third outputs file (.OUT) as presented in Annex 2. The syntax of execution indicates which is the raw file and where is its location in researcher's computer (hard disk); then, how to define variables (based on activity headings in Annex 1); furthermore, specifying whether all variables will be estimated or just a few of those; later on, analysis type, estimator, itineration, convergence and coverage; and thereupon, the model syntax (based on syllabus topics); and, output final adjustments.

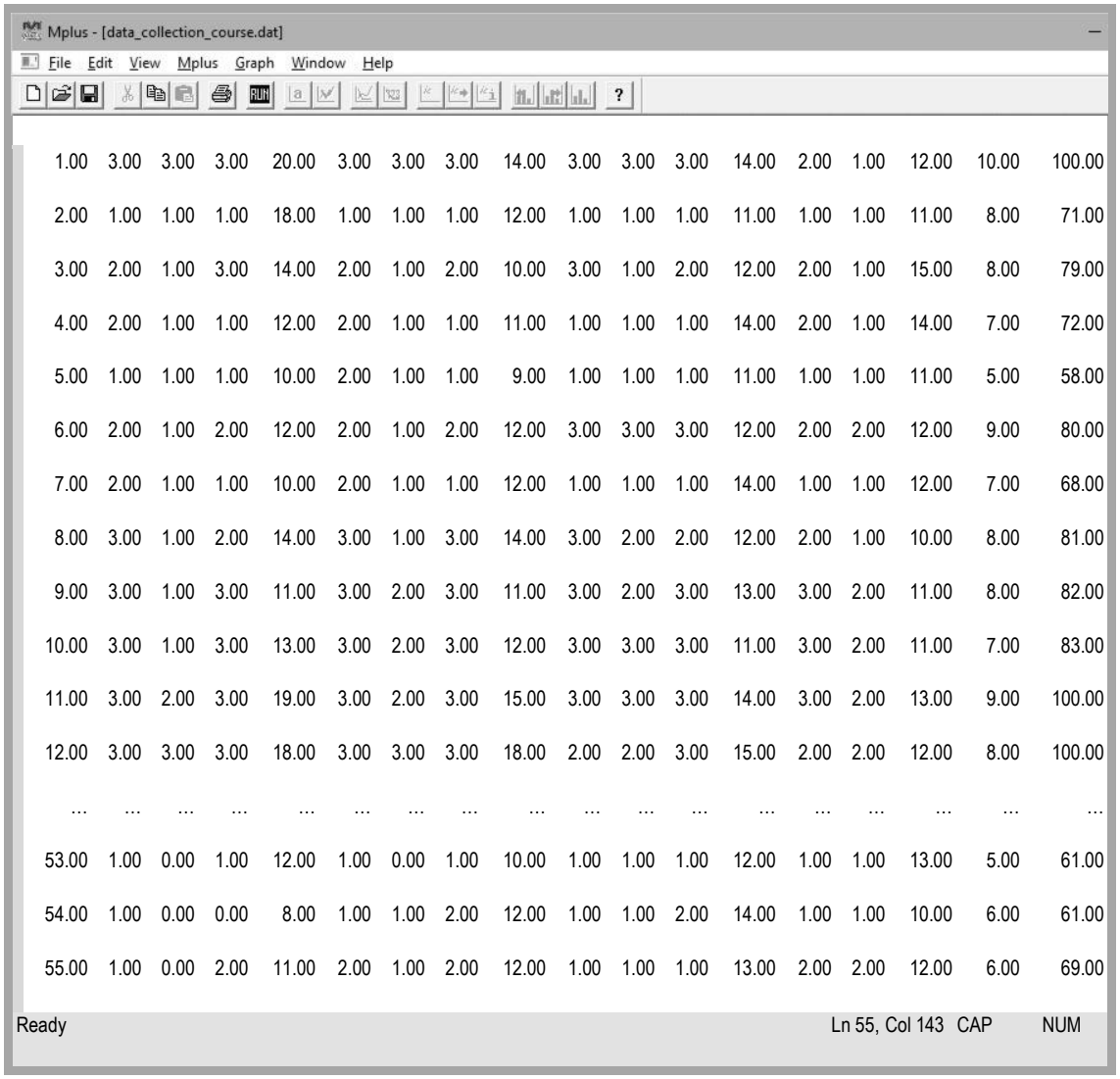


Figure 5. Arrangement of MOODLE output data into an M-plus raw file

ANALYSES

The first analysis illustrated in Annex 2 is the estimated statistics of sample, i.e. means, covariances and correlations of the four didactic topics which were addressed in the courseware syllabus (Figure 3, in the Procedure). It should be noted in output file that the whole syntax of input file was incrusted at the top of resultant schematization, but above all, that the statistical estimation process performed by M-plus was done with no syntax errors from raw data file nor from the input one ('the model estimation terminated normally'). After the successful estimation statement, statistical analyzes that were expected are listed in detail.

Covariance coverage of the four topics (ICT_USE1, INF_MAP2, LANG_TR3, SOC_NET4) is an integer by default (1.000). Their four statistical means oscillate between 4.177 and 4.964 being Topic 3 with lowest alumni participation, and Topic 4 with the highest; however, it is imperative to make clear that Topic 4 just consisted of two quick tasks and one integrative assignment, while Topic 3 implied more complexity for understanding and alumnis' achievement. The correlation is linear in each topic against themselves, but each one against the other three topics is not linear and do not reach the integer (< 1.000); for instance, Topic 3 (LANG_TR3) with Topic 2 (INF_MAP2) is higher (0.547) that correlation with Topic 4 (0.371).

Statistical correlation indicates strength and direction of a linear (integer) relations, and proportionality (<1.000), between two variables (Croxton y Cowden, 1939); it is assumed that quantitative variables (discrete, as the topics analyzed on the basis of SEM) are correlated when the values in one of those vary systematically in relation to the homonym values in the other one: like in the same (LANG_TR3 and INF_MAP2) there is correlation if decreasing of LANG_TR3 values are also

decreasing INF_MAP2 values, and vice versa. Correlation of variables does not imply, by itself, any relation of causality. Statistical correlations are important since those can indicate a latent relation that would be exploited in the practice.

Moreover, Annex 2 contains other statistical analyses estimated by M-Plus application such as tests of model fit; including test of $\chi 2$ or Chi-Square Test of Model Fit for the Baseline Model based on $\chi 2$ distribution (used for goodness of fit, of an observed distribution to a theoretical one, the independence of two criteria of classification of qualitative data, and in confidence interval estimation for a population standard deviation of a normal distribution from a sample standard deviation), and likelihood-ratio test (Loglikelihood) that is used for comparing the goodness of fit of two models, one 'null model' -that is a special case of the other- the 'alternative model' (note the similarity with hypotheses).

Likelihood-ratio test is based on likelihood ratio that expresses how many times more likely the data are under one model than the other; this likelihood ratio, or equivalently its logarithm, can then be used to compute a p-value, or compared to a critical value to decide whether to reject the null model in favor of the alternative model. In statistical hypothesis testing, the p-value is the probability for a given statistical model that, when the null hypothesis is true, the statistical summary (such as the sample mean difference between two compared groups) would be the same as or more extreme than the actual observed results.

Annex 2 shows in model results that two-tailed p-value is 0.000 for most of the means, intercepts, variance, and residuals; and for the interval [0, 1] it is assumed that such value is continuous. Thus, the p-value is not fixed; this implies that p-value cannot be given a frequency counting interpretation since the probability has to be fixed for the frequency counting interpretation to hold, i.e. if the same test is repeated independently bearing upon the same overall null hypothesis, it will yield different p-values at every repetition. It should further be noted that an instantiation of this random p-value can still be given a frequency counting interpretation with respect to the number of observations taken during a given test, as per the definition, as the percentage of observations more extreme than the one observed under the assumption that the null hypothesis is true. This demonstrates that in interpreting p-values, one must also know the sample size, which complicates the analysis.

CONCLUSION

Regarding alumni worries about ICT supported education, identified by Willis (1997), it is noticed in this contribution that a courseware with curriculum aspects had put through paces implementation strategies to adapt instruction and training for a cross-cultural context of teacher education. In response to research questions, it is concluded that:

1. It is important to know the level of digital literacy of pre-service teachers, because teaching goes hand in hand with research as essential functions in most institutions of higher education; and in this sense, research adapts the exercise of teaching in accordance with the contemporary needs of society. If education has become dependent on technology, this means that teaching requires the implementation of ICT into the formative and instructional processes;
2. From a cross-cultural sample of pre-teachers, it was possible to analyze different individual postures: attitude, motivation, collaboration, co-assessment and overall participation reflected in each of the didactic activities (preliminary, socializable, and integrative) under a qualitative and descriptive focus (Table VII), as well as under a discrete quantitative approach (Annex 2). It is noticed that there are no bilateral inter-institutional collaboration agreements between the University of Guadalajara (Mexico) and the University of Szeged (Hungary) regarding student exchange, and specifically, teacher training, up to the time of this study; and
3. This contribution marks a starting point for the rapprochement of UDG with non-Ibero-American universities in view of future collaborative teacher training and further research in English as a lingua franca between the Republic of Mexico and the European Union (of which Hungary has been a member country), in order to promote the professionalization of future teachers in the respective local contexts and for teachers in service to help others to learn beyond the geographical and cultural limitations of the mother tongue nor de facto language.

Regarding the hypotheses, it is assumed from the results that [H0] is acceptable for sub-sample A (UDG-VUS-LDE) where most of 28 study subjects are utterly using ICT to improve, update and

facilitate their traditional styles / techniques of instruction, despite having shown very few interest linguistic training and subsequent second-language based teaching; while that for sub-sample B it suggests to accept [H1] instead, since most of 27 study subjects do not implement ICT beyond self-training, i.e. they do not demonstrate interest for online instructional design and nor for virtual instruction / teaching, in part because the face-to-face education in the European Union does not demand the implementation of virtual or blended modalities as a preventive or corrective measure of educational coverage.

LIMITATIONS

Despite the fact that English serves as a world standard of scientific research, it has not been promoted as a lingua franca of student exchange with the University of Guadalajara, nor much less of teacher training within intercultural contexts beyond Castilian as mother tongue; and although it may be the only limitation from the geographic-linguistic context of the Mexican Republic, it was observed that the same limitation also occurs from the geographic-linguistic and cultural context of Hungary where the knowledge of English is so low (13% national) as well as low in Mexico (20% national) based on educational access to language in either public or private sector institutions (British Council, 2015; Van Parys, 2017).

In addition to the linguistic and geographical barriers in ICT-supported teacher training, it is also pertinent to note a generational and individual learning gap between subjects in both sub-samples of analysis; Since the statistical universe of pre-teachers in education is usually older in the UDG (alumni who are family heads and up to 60 years old), than in SZTE (mostly single people, such as undergraduate students oscillating between the 18 and 21 years old).

Before deciding whether to launch a courseware for attending an elective subject or not, it was necessary to consider the possibility of implementing a Massive Open Online Course instead; however, a study made by Li, Verma, Skevi, Zufferey, Bloom, and Dillenbourg (2010) showed that participants prefer face-to-face interaction within a classroom, than online self-guiding; therefore, if having made analyzes based on MOOC data collection, it would have entailed to not compiling sufficient data; there would be no certainty of substantial participation to figure out if there were any progress of attendants as well as the efficiency of the courseware implementation.

Finally, this contribution hopes for providing continuity on future attempts to expand international education through cross-cultural instruction as it was experienced here. Universities which have not been linked to each other in the past are now proof of globalization in learning and instruction; it is a matter of time to consolidate interinstitutional agreements of collaboration, to foster the development of teaching competencies using ICT and to satisfy current needs of professional growth overseas.

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Annexe 1. Matrix of alumni records imported from courseware in MOODLE platform

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Affiliation ID	1_1	1_2	1_3	Int1	2_1	2_2	2_3	Int2	3_1	3_2	3_3	Int3	4_1	4_2	Int4	F. A.	T. C.	T. C. %
2	UDG-VUS	3	3	3	20	3	3	3	14	3	3	3	14	2	1	12	10	100	118.6 %
3	UDG-VUS	1	1	1	18	1	1	1	12	1	1	1	11	1	1	11	8	71	84.2 %
4	UDG-VUS	2	1	3	14	2	1	2	10	3	1	2	12	2	1	15	8	79	93.7 %
5	UDG-VUS	2	1	1	12	2	1	1	11	1	1	1	14	2	1	14	7	72	85.4 %
6	UDG-VUS	1	1	1	10	2	1	1	9	1	1	1	11	1	1	11	5	58	68.8 %
7	UDG-VUS	2	1	2	12	2	1	2	12	3	3	3	12	2	2	12	9	80	94.9 %
8	UDG-VUS	2	1	1	10	2	1	1	12	1	1	1	14	1	1	12	7	68	80.7 %
9	UDG-VUS	3	1	2	14	3	1	3	14	3	2	2	12	2	1	10	8	81	96.1 %
10	UDG-VUS	3	1	3	11	3	2	3	11	3	2	3	13	3	2	11	8	82	97.3 %
11	UDG-VUS	3	1	3	13	3	2	3	12	3	3	3	11	3	2	11	7	83	98.5 %
12	UDG-VUS	3	2	3	19	3	2	3	15	3	3	3	14	3	2	13	9	100	118.6 %
13	UDG-VUS	3	3	3	18	3	3	3	18	2	2	3	15	2	2	12	8	100	118.6 %
14	UDG-VUS	2	1	2	13	2	1	2	11	1	2	2	13	2	1	11	7	73	86.6 %
15	UDG-VUS	2	1	3	15	2	1	3	14	1	1	3	14	3	2	12	8	85	100.8 %
16	UDG-VUS	2	1	2	16	3	1	3	13	2	2	2	12	3	3	11	8	84	99.6 %
17	UDG-VUS	1	1	3	15	2	1	3	11	1	1	2	13	3	2	10	8	77	91.3 %
18	UDG-VUS	3	2	3	20	2	1	3	18	1	2	3	17	2	1	13	9	100	118.6 %
19	UDG-VUS	2	1	3	17	2	1	3	15	1	2	2	13	2	1	12	8	80	94.9 %
20	UDG-VUS	2	1	3	18	2	1	3	16	1	1	1	12	2	1	14	8	86	102.0 %
21	UDG-VUS	2	1	3	19	2	1	2	17	0	1	2	13	1	1	16	6	87	103.2 %
22	UDG-VUS	3	3	3	20	3	2	3	16	1	1	2	10	3	2	18	10	100	118.6 %
23	UDG-VUS	1	1	1	15	2	1	2	11	1	1	1	11	2	1	15	8	74	87.8 %
24	UDG-VUS	0	1	2	9	1	1	1	7	0	1	1	8	1	0	10	7	50	59.3 %
25	UDG-VUS	2	1	3	14	2	1	2	13	1	2	2	11	2	1	11	7	75	89.0 %
26	UDG-VUS	1	1	2	15	2	1	2	20	0	1	2	14	2	1	12	8	84	99.6 %
27	UDG-VUS	2	1	2	13	1	1	2	10	1	2	3	12	2	1	13	7	73	86.6 %
28	UDG-VUS	2	1	3	11	1	1	1	9	1	1	1	10	1	1	10	6	60	71.2 %
29	UDG-VUS	2	1	2	14	1	0	1	10	0	1	1	9	2	1	9	6.5	61	72.4 %
30	ERASMUS	1	0	1	12	1	0	3	11	1	2	2	11	2	1	10	6	64	75.9 %
31	ERASMUS	1	0	0	10	1	0	1	13	0	1	2	13	2	1	11	6	62	73.5 %
32	ERASMUS	1	0	1	10	1	1	0	11	1	1	1	12	2	1	14	6	63	74.7 %
33	ERASMUS	1	0	2	11	1	0	1	10	1	1	2	14	2	1	12	6	65	77.1 %
34	ERASMUS	1	0	1	13	2	1	1	11	1	1	1	10	2	1	15	6	67	79.5 %
35	ERASMUS	1	0	0	14	1	0	2	10	1	1	3	15	1	1	10	6	66	78.3 %
36	ERASMUS	1	0	1	10	1	2	3	12	1	1	1	12	1	1	12	6	65	77.1 %
37	ERASMUS	1	0	1	11	1	0	1	10	1	1	1	13	1	1	11	6	60	71.2 %
38	ERASMUS	1	0	0	10	1	1	2	11	0	1	1	12	2	1	9	7.5	60	70.1 %
39	ERASMUS	3	1	3	20	2	1	3	18	1	2	3	16	3	1	15	8	100	118.6 %
40	ERASMUS	1	0	1	9	1	0	1	10	1	1	2	10	2	1	12	10	62	73.5 %
41	ERASMUS	1	0	2	14	1	1	1	12	1	2	2	11	1	1	10	6	66	78.3 %
42	ERASMUS	1	0	1	12	1	1	2	10	1	2	2	12	2	1	9	6.5	63.5	75.3 %
43	ERASMUS	1	1	2	16	2	1	2	14	1	1	1	10	3	1	6	7.5	70	83.0 %
44	ERASMUS	1	0	1	14	2	1	2	12	1	1	1	14	1	1	12	5	69	81.9 %
45	ERASMUS	1	0	1	9	2	1	2	15	0	1	1	11	1	0	10	6.9	62	73.5 %
46	ERASMUS	1	0	1	11	2	1	1	10	1	1	1	10	1	1	10	8	60	71.2 %
47	ERASMUS	2	0	3	18	2	2	3	16	1	1	2	14	2	1	12	6	85	100.8 %
48	ERASMUS	3	1	3	20	3	3	3	20	1	1	1	16	2	1	14	8	100	118.6 %
49	ERASMUS	2	0	3	18	2	1	3	16	1	1	1	14	2	1	15	10	90	106.8 %
50	ERASMUS	1	0	1	13	1	0	2	15	0	1	1	11	1	1	10	9	67	79.5 %
51	ERASMUS	2	0	2	16	2	1	3	18	1	2	2	13	2	1	14	6	85	100.8 %
52	ERASMUS	1	0	0	8	1	1	2	11	1	1	2	12	1	0	12	7	60	71.2 %
53	ERASMUS	1	0	1	6	1	1	2	11	1	2	1	11	2	1	13	6	60	71.2 %
54	ERASMUS	1	0	1	12	1	0	1	10	1	1	1	12	1	1	13	5	61	72.4 %

55	ERASMUS	1	0	2	11	2	1	2	12	1	1	1	13	2	2	12	6	69	81.9 %

Annex 2. Digital OUTPUT file created by M-plus estimation software

Mplus - activity_model.out

File Edit View Mplus Graph Window Help

activity_model.inp

```
TITLE: Cross-lagged panel model with observed variables
```

activity_model.out

```
SUMMARY OF ANALYSIS

 Number of observations                                          55
 Number of continuous latent variables                            0

SUMMARY OF DATA

     Number of missing data patterns             1

COVARIANCE COVERAGE OF DATA

     PROPORTION OF DATA PRESENT


           Covariance Coverage
              INF_MAP2      SOC_NET4      ICT_USE1      LANG_TR3
 INF_MAP2       1.000
 SOC_NET4       1.000         1.000
 ICT_USE1       1.000         1.000         1.000
 LANG_TR3       1.000         1.000         1.000         1.000

SAMPLE STATISTICS

     ESTIMATED SAMPLE STATISTICS


           Means
              INF_MAP2      SOC_NET4      ICT_USE1      LANG_TR3
              ________      ________      ________      ________
      1         4.414         4.964         4.464         4.177

           Covariances
              INF_MAP2      SOC_NET4      ICT_USE1      LANG_TR3
              ________      ________      ________      ________
 INF_MAP2       1.205
 SOC_NET4       0.436         0.682
 ICT_USE1       1.156         0.621         1.883
 LANG_TR3       0.447         0.228         0.537         0.554

           Correlations
              INF_MAP2      SOC_NET4      ICT_USE1      LANG_TR3
              ________      ________      ________      ________
 INF_MAP2       1.000
 SOC_NET4       0.481         1.000
 ICT_USE1       0.767         0.549         1.000
 LANG_TR3       0.547         0.371         0.526         1.000

     MAXIMUM LOG-LIKELIHOOD VALUE FOR THE UNRESTRICTED (H1) MODEL IS    -262.148

THE MODEL ESTIMATION TERMINATED NORMALLY

TESTS OF MODEL FIT
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Chi-Square Test of Model Fit for the Baseline Model

          Value                             73.688
          Degrees of Freedom                    5
          P-Value                          0.0000

Loglikelihood

          H0 Value                       -262.148
          H1 Value                       -262.148

Information Criteria

          Number of Free Parameters             14
          Akaike (AIC)                     552.296
          Bayesian (BIC)                   580.398
          Sample-Size Adjusted BIC         536.406
            (n* = (n + 2) / 24)

MODEL RESULTS
                                                    Two-Tailed
                    Estimate       S.E.  Est./S.E.    P-Value

 INF_MAP2 ON
    ICT_USE1           0.530      0.078      6.761      0.000
    LANG_TR3           0.293      0.145      2.025      0.043

 SOC_NET4 ON
    ICT_USE1           0.294      0.079      3.713      0.000
    LANG_TR3           0.126      0.146      0.861      0.389

 INF_MAP2 WITH
    SOC_NET4           0.040      0.063      0.634      0.526

 ICT_USE1 WITH
    LANG_TR3           0.537      0.156      3.453      0.001

 Means
    ICT_USE1           4.464      0.185     24.125      0.000
    LANG_TR3           4.177      0.100     41.629      0.000

 Intercepts
    INF_MAP2           0.822      0.523      1.573      0.116
    SOC_NET4           3.125      0.528      5.918      0.000

 Variances
    ICT_USE1           1.883      0.359      5.244      0.000
    LANG_TR3           0.554      0.106      5.244      0.000

 Residual Variances
    INF_MAP2           0.461      0.088      5.244      0.000
    SOC_NET4           0.470      0.090      5.244      0.000

TECHNICAL 4 OUTPUT

     ESTIMATES DERIVED FROM THE MODEL

            ESTIMATED MEANS FOR THE LATENT VARIABLES
               INF_MAP2      SOC_NET4      ICT_USE1      LANG_TR3
               ________      ________      ________      ________
      1          4.414         4.964         4.464         4.177

            ESTIMATED COVARIANCE MATRIX FOR THE LATENT VARIABLES
               INF_MAP2      SOC_NET4      ICT_USE1      LANG_TR3
               ________      ________      ________      ________
```

INF_MAP2	1.205			
SOC_NET4	0.436	0.682		
ICT_USE1	1.156	0.621	1.883	
LANG_TR3	0.447	0.228	0.537	0.554

ESTIMATED CORRELATION MATRIX FOR THE LATENT VARIABLES

	INF_MAP2	SOC_NET4	ICT_USE1	LANG_TR3
INF_MAP2	1.000			
SOC_NET4	0.481	1.000		
ICT_USE1	0.767	0.549	1.000	
LANG_TR3	0.547	0.371	0.526	1.000