

10-1-2017

Developing ICT Skills of STEM Teachers in Mexico: The Key Role of the Tutorial Function

Alexander N. Chen

University of Central Arkansas, achen@uca.edu

David McCalman

University of Central Arkansas, davidm@uca.edu

Mark E. McMurtrey

University of Central Arkansas, MarkMc@uca.edu

J. Gabriel Domínguez Castillo

Universidad Autónoma de Yucatán, Mexico

Victor Manuel Cab Pech

Universidad Da Vinci

Follow this and additional works at: <http://scholarworks.lib.csusb.edu/jitim>

 Part of the [Communication Technology and New Media Commons](#), [Digital Communications and Networking Commons](#), [Educational Methods Commons](#), [Information Literacy Commons](#), [Management Information Systems Commons](#), [Other Teacher Education and Professional Development Commons](#), [Science and Technology Studies Commons](#), [Secondary Education and Teaching Commons](#), and the [Technology and Innovation Commons](#)

Recommended Citation

Chen, Alexander N.; McCalman, David; McMurtrey, Mark E.; Domínguez Castillo, J. Gabriel; and Manuel Cab Pech, Victor (2017) "Developing ICT Skills of STEM Teachers in Mexico: The Key Role of the Tutorial Function," *Journal of International Technology and Information Management*: Vol. 26 : Iss. 3 , Article 5.

Available at: <http://scholarworks.lib.csusb.edu/jitim/vol26/iss3/5>

This Article is brought to you for free and open access by CSUSB ScholarWorks. It has been accepted for inclusion in Journal of International Technology and Information Management by an authorized editor of CSUSB ScholarWorks. For more information, please contact scholarworks@csusb.edu.

Developing ICT Skills of Stem Teachers in Mexico: The Key Role of the Tutorial Function

***Alexander N. Chen**

***David McCalman**

***Mark E. McMurtrey**

****J. Gabriel Domínguez Castillo**

*****Víctor Manuel Cab Pech**

***University of Central of Arkansas, U.S.A.**

****Universidad Autónoma de Yucatán, Mexico**

*****Universidad Da Vinci**

INTRODUCTION

According to UNESCO (2002), distance education is a factor that contributes to social and economic development, and it has become a crucial piece in current education systems. Nowadays, this approach often focuses on the widening of access to education services and information, which enables those who want to be educated to overcome limitations imposed by space and time. Since it offers manifold flexible learning opportunities, it has been gaining acceptance within the traditional systems both in developed and in developing countries, but particularly in the latter.

In that sense, distance education, as an alternative or complementary option of education, attains a certain importance not only domestically but also internationally. Two of the factors that have raised interest in distance education are: 1) the growing demand for continuous education programs and work capabilities; and 2) certain relevant technological developments (González & Wagenaar, 2007; Cabero, 2007; Irigoín, Tarnapol & Faulkner 2002). A fitting example of this is the importance that the Higher Education World Conference convened by UNESCO gives to it. This body highlights the role of open and distance education and the new information technologies supporting the creation of new pedagogic environments which can solve distance limitations, the creation of new education methods, the quality of that education, the investigation and the resultant outcomes.

According to literature specializing in distance education, one of the factors that is considered essential for the design, implementation, and consolidation of an online

course is the tutorial function. The orientation and guidance from the tutor function assumes the biggest piece of the cake in the online education, and it is indispensable (see Ardizzone and Rivoletta 2004; Denis, Watland, Pirotte & Verday 2004). The tutor-student relationship regarding the understanding of the contents, the interpretation of the descriptions (instructions), the moment and the manner or how it is done, appropriate for the work performance, exercises or auto evaluations, and in general for the solving of any doubt or question is key for the success of any program. Important illustrative cases at international level, where there is the presence of the importance that the tutorial function undertakes are numerous (García Nieto, 2005). In the United Kingdom, the Open University, which is considered one of the biggest distance education universities in the world, had almost 200,000 students all over the world in 2005. In China, the Open University of China (OUC), carries out the modern education of the country, through different communication channels, such as, printed materials, audiovisual appurtenances and multimedia articles. The OUC offers 75 careers in 9 disciplines and 24 specializations, and during the fall of 2008 had 3,090,000 active students. In Australia, the Open University of Australia (OUA) previously known as the Open Learning Agency of Australia, offers more than 170 majors available online. In Spain, there is the National University of Distance Education (UNED) and the Open University of Cataluña (UoC). In Africa, the African Distance Learning Program (ADLP) delivered by the Economic Commission for Africa, the University School of Open Education and Distance Education of Botswana (BOCODOL) which currently offers distance courses to students seeking to obtain the “general certificate of secondary education” (GCSE). The above cases provide evidence that the virtual tutor is essential to guarantee the quality and efficiency of the process carried out through the web, as well as a crucial factor in achieving success in a distance education program.

The Tasmanian University in Australia defines online facilitation as a helping process to spread interaction with and among students throughout their learning activities in a supportive manner, making the use of the technology easier, and potentially directly benefiting them in their learning opportunities and development (DEST 2002). According to Salmon (2013) the use of the word “facilitation” is useful since it promotes a view of teaching focused on active learning, rather than on students’ being passive receptors of information (see also Hrastinski 2009). The US Department of Education (2009) and Yin, Urven, Schramm & Friedman (2002) claim that the students who complete an online course achieve better levels of performance than do campus students on average. However, other statistics also show that the withdrawal rate among online students is higher than among those in conventional classroom settings.

Such authors as Arranz, Aguado and Beatriz (2008) document the competencies of the virtual tutor and arrange them in four main functions: information, supervision, learning and collaboration. These, together with the administration of an online learning tool that has the proper requirements, are expected to have a great impact toward course execution and the degree of learning achieved. In this sense, the tutor's role contributes to the creation of specialized knowledge, and focuses discussion on critical points, answers questions, responds to student contributions and synthesizes material and concepts. The authors also favor a collaborative atmosphere online among all participants. Such an approach promotes independent learning, assigns participation and collaboration roles and establishes rules within the formative process (Hrastinski 2009; Tait 2003).

THEORETICAL BACKGROUND

Salmon (2013) proposes a five-stage model. The first stage refers to *access and motivation*, in which the tutor provides the student with support for the appropriate use of the available system tools. At the same time, she/he also needs to be responsible for creating a respectful environment with trust, and for considering the different learning styles or methods of the students. The second stage, called *socialization*, refers to the interval within which the tutor promotes familiarity and coexistence of the new students, learning atmospheres and available resources. The tutor presence is key in this stage since this agent must promote a sense of belonging throughout the group, consider students with similar interests and attend to the individual necessities as well. The third stage, called *information exchange*, is considered the most important for the purpose of learning enhancement. The tutor assigns the development of learning activities (ADAs) individually or collectively, supervises the progress of these activities, guiding their construction, and offers the students the necessary input to achieve their goals. The tutor also establishes designated times to provide feedback during activities. The fourth stage, called *knowledge building*, is when the activity period comes to its peak. The tutor selects the best works, and these get discussed and analyzed in order to improve the building of their learning activities (ADAs) and also allows them see where they need to improve. During this stage, meetings can be assigned through some communication tool to dig further into some issues and to develop superior cognitive abilities (critical thinking, analysis). In the last stage, called *development and evaluation*, the tutor is less necessary since the students are already familiar with the working environment, know how to guide each other, and are able to address doubts and begin to make efficient use of the skills learned during the development and building of their knowledge.

METHOD

In the community of Mérida and its environs, there are 17 secondary schools (46%) belonging to the Federal system and 20 secondary schools (54%) belonging to the State level. From the 37 secondary schools that exist in the municipality, the authors of this study worked with 9 Federal secondary and 10 State secondary which together comprise the 19 schools that were accessed to take part in the study.

The study population was represented by 70 STEM teachers that teach at the secondary level (1st, 2nd and 3rd year) from the 19 Federal and State secondary schools from the town of Mérida, Yucatán. Table 1 sums up the features of the schools that participated in the study.

Table 1: Characteristics of Participants' Schools.

N	School	System that It Belongs To	System of the School	Invited Faculties	Faculties Who Started DICUTICDS
1.	SBB	Federal	Urban	6	1
2.	JV	Federal	Urban	3	1
3.	REBP	Federal	Rural	2	1
4.	EVR	Federal	Urban	5	2
5.	ABV	Federal	Urban	4	0
6.	JEVG	Federal	Urban	4	3
7.	EAG	Federal	Urban	5	3
8.	JRH	Federal	Urban	4	1
9.	TEC13	Federal	Rural	1	1
10.	GNB	State	Urban	4	3
11.	SR	State	Urban	6	4
12.	AVC	State	Urban	3	2
13.	GSA	State	Urban	4	2
14.	LAB	State	Urban	4	0
15.	RM	State	Urban	3	0
16.	CCA	State	Urban	3	1
17.	BJG	State	Urban	3	1
18.	HLyL	State	Rural	4	2
19.	ACC	State	Urban	3	1
Total:				70	30

As shown, from the 70 teachers that applied to answer the diagnostic instrument, 34 work in Federal schools and 36 work in Regional schools. The teachers in the study teach STEM subjects that include biology, physics, chemistry and math. The ages of the teachers vary from 22 to 61 years old, and the average working years is 21. It is also important to consider that the majority of them (69%) are licensed, followed by the ones who have postgraduate titles.

From the 70 participating teachers, 30 formally initiated the program. It is also important to consider that the beginning of this course took place during a difficult time for education in the state and country, since during that time work strikes began, with walkouts and protests in all the national territory over the implementation of the secondary laws of the Educational Reform of 2013. These laws ostensibly sought an improvement in the quality of education although this was not necessarily the perception or view teachers actually had of the legislation.

Despite these setbacks, the beginning of the project was coordinated with the Secretary of Yucatán State Government Education (SEGEY) and the Secondary Education Directive of the city, and the project was initiated during the month of September. The program duration was four and a half months, with a total of 80 hours of independent study dedicated for the achievement of the tasks. The course distribution was 80% online and 20% by conventional instruction, and included 13 competence units aligned with the diagnostic stage and supervised by five students from the 9th semester of the Information Technology Administration (LATI) from the Yucatán Autonomic University (UADY). These worked as online tutors for the teachers. The principal functions that tutors carried out included: development of confidence among students; facilitation of socialization within the work environment with agreement on functions and responsibilities; support and guidance in any situation related to the course that students requested; and support for the knowledge construction (see Figure 1). Such functions correlated with Salmon's model, particularly with the second (socialization function), third and fourth stages.

In order for the tutors to provide a good support level, it was required that they had good skills with ICTs (Information and Communication Technologies) and that they complemented their training with a process focused on enhancing empathy, mediation strategies, and selection of material depending on the population and communication techniques. They furthermore addressed enthusiasm, confidence, sureness, and motivation, as well as the importance of expertise in using

technological tools. According to Pagano (2008), these are the most important areas to consider during the online tutor training.

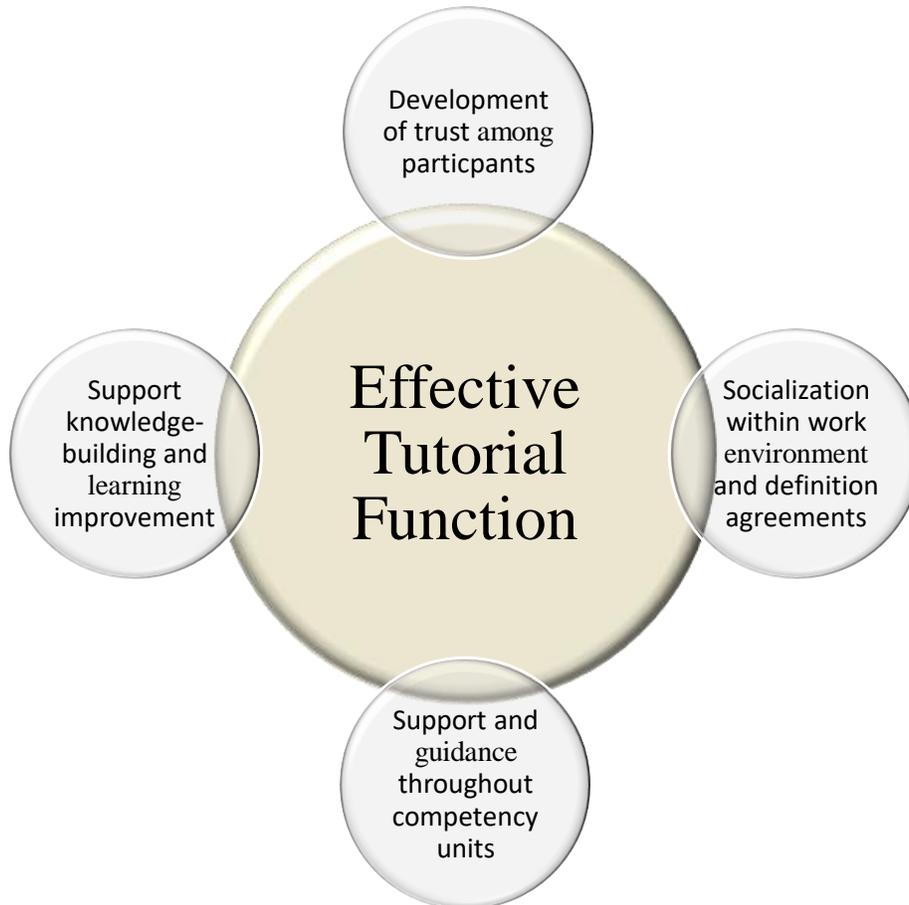


Figure 1: Key Functions That Tutors Developed in the Formative Program.

From the 30 teachers that initiated the training program for competences using ICT's, 25 fully concluded the program. Their comments related to the tutor functions in the training program were very satisfactory (these appear in the results section).

INSTRUMENT

In the construction of the instrument, three sections were devised: two of main data relevant to the study (subject and intuition) and one section for the tutorial function. This last one utilized a Likert scale, which involved three domains: support and attention; tutor performance; and support resources provided by tutor.

The competencies section for ICT use had questions to be approached with a Likert scale with a collection of one-step main data and five levels in order to ascertain in what level one has achieved competence (Figure 2). The answer was using an ascending numeric scale 1-5, where 1 meant “never” and 5 meant “always”, which allowed the researchers to locate the answers precisely. This procedure allowed the participants’ answers to be transformed into intervals for analysis. The instrument technical indicator for measuring was .822.

Type of Reaction	Scale Code				
Reaction of primary data in one step and five levels that show significance in the competition.	1. Never 2. Rarely 3. Sometimes 4. Often 5. Always				
Example	Scale				
Provided help and advising over the use of technology in different course units.	1 Never	2	3	4	5 Always

Figure 2: Example of Enunciation and Answer Scale Format.

PROCEDURE

During the first stage, the one with the diagnostic, the instrument for the pre-test was administered to 70 teachers to ascertain the areas that needed improvement and the methodology used. A course in a learning administration system was implemented for STEM teachers named Competencies Development in the Use of Communication and Information Technologies for Secondary Students (DICUTICDS), which included a) a program for the improvement of the

competencies that obtained the lowest score; and b) the reinforcement of the competencies that were in an average domain level.

The design and construction of the training program in Moodle took six months. The course program was integrated by an interphase formed by 10 icons that showed to the teacher all the tools available as support for the course. The included tools described the welcome to professors, the course presentation, the proposed methodology, and the main competency of the course, as well as the modules (competences) and evaluation procedures. In the same manner, a set of support aids was available for the professors, including such elements as a photo gallery, suggested links, bibliography, and support videos.

The training program included thirteen modules. Each module involved a consistent competency with the diagnostic in which 70 science teachers participated. The competencies explored were the ones described in Table 2. It is important to highlight that the competencies that took longer were the ones where, as a diagnostic result, the teachers were shown to require more support. These cases needed as much as double the time.

Table 2: Description of ICT Competencies Involved in the Program.

Module	Name of Module	Competition Elements	Number of Hours
I.	Knowledge of information systems	4	5
II.	Use of Operation System	6	5
III.	Search and selection of information through the internet	4	5
IV.	Interpersonal communication and network	3	5
V.	Text process	7	5
VI.	Image treatment	2	5
VII.	Application of calculation sheet	2	5
VIII.	Use of databases	4	10
IX.	Entertainment and learning with ICT	2	5
X.	Procedures through the internet	2	5
XI.	General attitudes toward ICT	3	5

XII.	Technological Platforms	8	10
XIII.	Web tools	8	10
Total		55	80

During the second stage, after the termination of DICUTICDS, the teachers were asked to respond to the instrument again, in order for the researchers to observe whether the action plan that was implemented had garnered positive changes among the faculties. Since according to the UNESCO (2008), Claro (2010), Supata (2010), Driscoll (2007), and Zounek (2005), it is necessary to enhance the development and use of ICT's in education systems. With the goal of supporting the teachers' performance, it is necessary to measure their skill level and improvement in the students' learning. The most significant findings are shown in the results section.

During the third stage, once the results from the pre- and post-test were obtained, the science teachers were asked to evaluate the tutorial function they received during the program development. The results obtained were compared to the post-test in order to know the effect/implications of the work done by the tutors in three explored areas: support and attention (Domain 1), knowledge and performance (Domain 2) and the support resources provided by the platform (Domain 3).

RESULTS

In Figure 3, one can view the average enhancement in skills that are linked to the usage of ICT by all faculties. In all thirteen analyzed ICT skills (from the thirteen modules), there is a significant increase across all skills between the pretest and posttest. In Figure 3, according to the scale used by the teachers, it is readily observed that in the first attempt (before the intervention of tutors) none of the skills were found to be at a high competitive skill (i.e. above 4.0), and that after the second attempt (after the intervention of tutors) 77% of the skills were found to be at a high competitive skill level. This scale result lies between 4 (passably understood it) and 5 (completely understood it). The results display a few features that are noteworthy to highlight. First, the scores given by the faculty usually remained above 4.6, which according to the scale is a good standard competitive score (between the 4th interval- usually and the 5th –always). Secondly, the behavior seen by the distributions is a great indicator that the function was performed at a high standard, given that 10 out of the 13 skills were assessed with a greater score than 4 in the posttest.

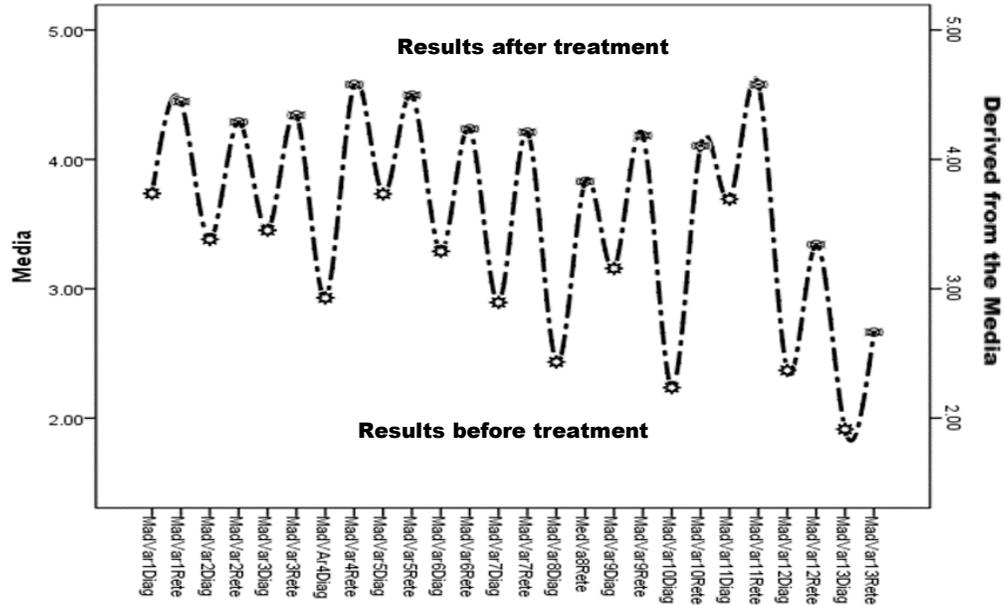


Figure 3. Results of Pretest and Posttest of the Intervention of the Tutors in the 13 Competencies.

The graph illustrates the scoring scale on the Y axis and the thirteen modules on the X axis. The dots shown in the bottom of the graph are the scores before the tutoring and the dots on top show the scores after the tutoring. On average, it is clear that the tutorial task was effective.

Figure 4 shows the analysis of the three domains used, specifically, support and care, performance and knowledge of the tutor, and supporting materials provided through the platform which include the device used for the evaluation of the tutorial function. This figure shows many features that are important to be highlighted. First, the simple line graph allows us to see the supremacy of the highest score, support and care (MedDom1) with X=4.94, follow by performance and knowledge (MedDom2) with X=4.93, and supporting materials provided through the platform (MedDom3) with X=4.92 which received the lowest score.

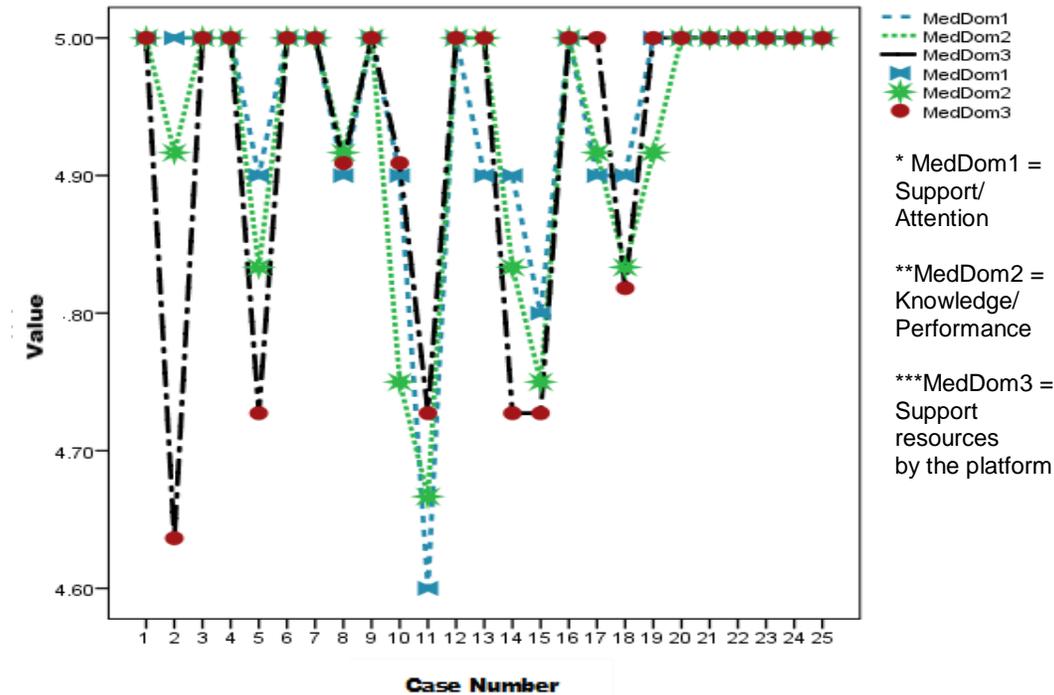
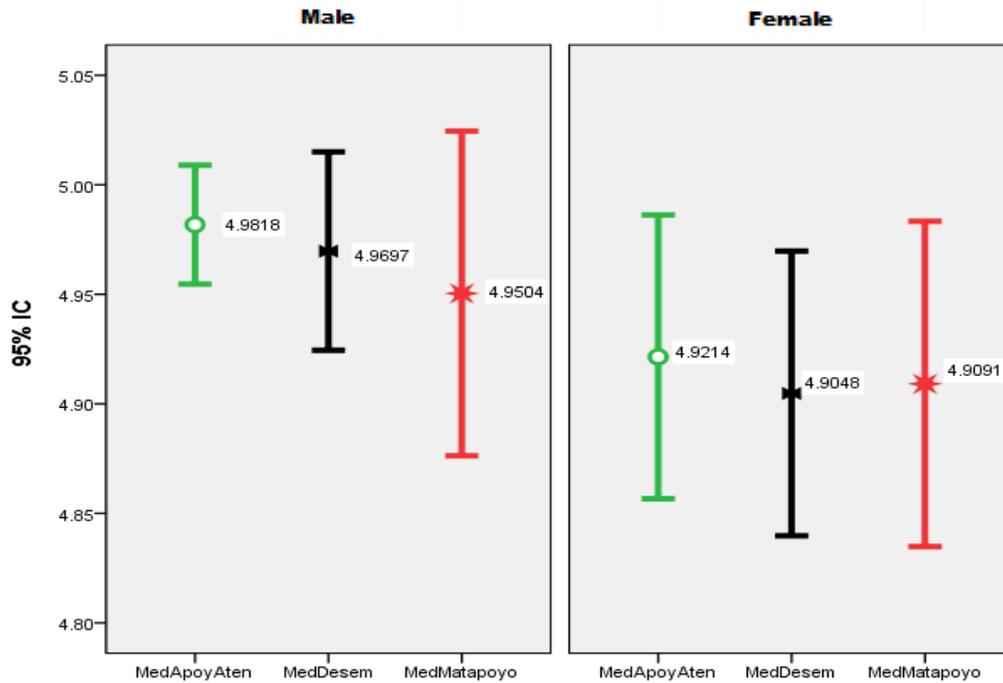


Figure 4. Distribution of Scores in the Three Domains.

The Y axis on this graph is the value or score, and the X axis illustrates the number of cases. The lines, dotted lines, and dots inside the graph show the different types of approaches. For example, - - - equals MedDom1 or the asterisk figure * equals MedDom2.

Second, even though there are differences in the scoring domains, all three of them were evaluated with ratings that match the scale used and therefore all are found to be at high standards of performance. These differences can be found in the cases where the scores are low. Such is the case of (#11) where the score was 4.60 and case (#2) where the score was 4.64. Nonetheless, these scores are still a good indicator that the tutorial functions in all areas of performance was beneficial.

Third, the minimum scores in all three domains consistently show similar results (MedDom1=4.60; MedDom2= 4.67 and MedDom3=4.64). It should be clarified that despite being the lowest registered scores, they are categorized at a good competition level. Likewise, it can be seen that of the 25 analyzed cases, 17 of them (68%) rated in the highest performance level.



* MedApoyAten = Support/attention

**MedDesem = Knowledge/performance

***MedMatapoyo = Support resources by the platform

Figure 5. Error Bars for the Gender Variable and Their Comparisons with the Three Domains.

Figure 5 focuses on the essential aspects of the theoretical model of planning and structuring of virtual courses which are subject to each approach and motivation, socialization, exchange of information, contractual knowledge, and development that any virtual tutor must assume. It is observed that, despite not having another variable to analyze in this study, the gender behavior was regarded in the tutorial function. Figure 5 shows the mistake bar and the results for each of the domains. The results allow us to observe interesting findings.

The Y axis for this graph shows the scale or scoring use and the X axis shows the 3 domains (MedApoAten, for support/attention; MedDeserm for Knowledge/performance; MedMatapoyo for Support resources associated with the platform). The first graph of labeled Masculine (which translates to males) shows

the results for the men and the second graph labeled Feminine (which translates to females) shows the results for the women.

Figure 5 shows the error (95% confidence interval) illustrated by bars, for the gender variable and its comparison with the three domains. Relatively, males have higher scores than females.

DISCUSSION

The literature focusing in the use of technology in education state that the role of a tutor is a very effective tool to use to facilitate learning in the virtual environment when the conditions for student motivation are guaranteed. Hence the idea that strategic, well designed, and well-executed actions by the tutor in an online program will match and support the learning process of the student, constitute one of the success factors on the achievement and developmental progress for each student (Arranz, V.; Aguado, D.; Lucia, B., 2008). In this paper we analyzed the importance of the tutorial function and its effect on the development of skills by ICT use by STEM teachers in public secondary schools in Mexico. Tutors provided support for the teachers throughout the course.

The impetus for this work arose against the backdrop of the (2003-2018) National Development Plan of Mexico, but especially arose from faculty who include ICT as a standard in competition (UNESCO, 2008). Faculty have realized that they play a major role in the task of helping students acquire important skills in the use of ICT. They are responsible for designing learning opportunities that enable students to learn and communicate in the classroom environment. However, unlike the guidelines established internationally in the design of a working model for ICT use that included standards, connectivity, and the classification of responsibilities to achieve. In Mexico, it is still very early to develop standard manuals for ICT competition. This differs from the situation in some countries like the United Kingdom. (*ICT Competency Standard for Teachers*) (UNESCO, 2008); Australia (*Teacher ICT skills*) (Department of Education and Training, 2006); China (*China Educational Technology Standards*) (UNESCO, 2007); Cameroon, Congo, Burkina Faso, Senegal, Angola, Namibia, Mali, Madagascar, Ghana, and Guinea (*ICT-Enhanced Teacher Standards of Africa- ICTeTSA-*) (UNESCO-IICBA, 2012); Chile (*Estandares TIC para la formacion inicial docente*) (OREALC/UNESCO, 2008).

Globally speaking, there is copious evidence regarding the benefits and the potential for the use of such technology, including factors for obtaining the maximization of its effectiveness, but it's still too early to define the guidelines

which will be the models for virtual tutors so that they succeed in their course implementation. It is also still too early to state which aspects should be considered throughout the training process and which strategies are most effective in the learning process. There is no doubt that tutoring is an essential element in the development of a virtual program. Therefore, understanding its importance is a priority for achieving successful virtual programs because the consequence of this understanding may be to identify good practices for developing the greatest potential (McPherson & Nunes, 2004). Meanwhile Swan (2001), states that only three factors significantly influence the satisfaction of students in online programs, which are clarity of design, interaction with tutors, and discussion among peers.

The 3.1.4 National Development Plan 2013-2018 for Mexico only contains three sentences that are dedicated towards promoting the incorporation of new technologies and communications in the teaching-learning programs. However, the document contains no language urging the development of distance education criteria and standards of quality or innovation, let alone the need for training for tutorial roles. Such would allow educators the ability to provide the necessary tools to fulfill their role in the new competitive environment of learning.

This study intends to raise the issue of the impact of tutorial function in the development of skills in the use of technology for science and mathematics teachers on a basic level. It is not the authors' intent to diminish the scientific skepticism that is requisite in evaluating the educational quality. Nor would we hope to forestall the refinement process of assessing the value to measure and of defining the impact of a tutorial function in developing skills in the use of ICT. The noted differences between male and female results mirror findings in other research endeavors, and suggest direction for further research, especially for policy prescriptions.

Given the results observed in this work, it is essential that Mexican educational institutions (national, regional, or local) who have or offer a *massive open online course* (MOOC), just as the new Universidad Abierta y a Distancia de Mexico (Open and at a Distance University of Mexico) (UnADM) and other Mexican public universities like UNAM (CUAED), UAT (online campus), UDG (UDG Virtual); and the UADY (UADY virtual) empower their tutors through training programs with high academic rigor that adds quality for competitiveness. This will also increase skills and facilitate student learning because as seen here, teachers present a high percentage of the success in these programs. These programs will not only contribute toward the professionalizing of the tutorial function field, but will also strengthen the quality of education through the management and incorporation of

ICT, which Mexico so desperately is seeking, along with international standards (UNESCO, OCDE, BM, BID).

This work lays the foundation for studying other models of planning and structuring courses detailing the functions and roles to be assumed by the tutor. It builds upon the work of Chen, McCalman, Dominguez, Ligon, and McMurtrey (2016). These models should be comprehensive and should establish protocols for the use of innovations based on the type of learning that allows students to keep up with the rapid changes happening in our global evolution and in light of new technological innovations. Likewise, it should cast serious doubt on the old practice of training teachers in a classroom environment, through a qualification of one or two weeks, which then automatically makes them online tutors. As noted in previous scientific literature, to be a teacher in a regular classroom does not guarantee success or the same results in virtual environments (Garrison and Anderson, 2005, Silva 2011). Salmon (2000) also asserts that the efficacious skills of a teacher in a classroom environment are not guaranteed to succeed in virtual environments.

REFERENCES

- Ardizzone, P. y Rivoletta, P. (2004): *Didáctica para e-learning. Métodos e instrumentos para la innovación de la enseñanza universitaria*, Málaga, Ediciones Aljibe.
- Arranz, V.; Aguado, D.; Lucía, B., (2008). The influence of the e-tutor on an e-learning program. Follow-up: Guidelines from a working environment. *Revista de Psicología del Trabajo y de las Organizaciones*. 24(1). pp. 5-23. Recuperado el 24 de Abril de 2010, de la base de datos EBSCOHOST.
- Asociación Nacional de Universidades e Instituciones de Educación Superior. (2001). *Plan Maestro de Educación Superior Abierta y a Distancia*. México, D. F.
- Denis, B., Watland, P., Pirotte, S., & Verday, N. (2004). Roles and Competencies of the e-Tutor. Networked Learning Conference.
- Cabero, J. (2007): *New Technology Applications in Education*, Madrid, McGraw-Hill.
- Chen, Alexander N.; McCalman, David; Dominguez, J. Gabriel; Ligon, Katherine; and McMurtrey, Mark E. (2016, in press). Information and

Communication Technologies (ICT): Components, Dimensions, and Its Correlates. *Journal of International Technology and Information Management*

- Claro, M. (2010). La incorporación de tecnologías digitales en educación. Modelos de identificación de buenas prácticas. Naciones Unidas. Recovered from: <http://www.eclac.org/publicaciones/xml/8/40278/tics-educacion-buenaspracticass.pdf>
- DEST (2002). Higher Education Review Process. Striving for quality: Learning, teaching and scholarship. Department of Education, Science and Training. Retrieved November 18th, 2009, from: http://www.backingaustraliasfuture.gov.au/publications/striving_for_quality/
- Driscoll, D. (2007). Technology in Massachusetts schools. Massachusetts Department of Education. 350 Main Street, Malden, M.A 02148-5023. Recovered August 3, 2011, from the EBSCOHOST database. [ED508403].
- García Nieto, N (Dir.) (2005): Programa de Formación del Profesorado universitario para la realización de la Función Tutorial dentro del marco del Espacio Europeo de Educación Superior (E.E.E.S.), on www.mec.es/univ/proyectos2005/EA2005-0027.pdf, (April 2007).
- Garrison, D. R. y Anderson, T. (2005): El e-learning en el siglo XXI. Barcelona: Octaedro.
- González, J.; Wagenaar, R. (2007): *Tuning Educational Structures in Europe*, España, Socrates-Tempus
- Hrastinski, S. (2009) A theory of online learning as online participation. *Computers & Education*, 52, 78-82.
- INACAP (2007): *Procedimiento plataforma ambiente. Aprendizaje docentes*, Santiago de Chile, Inacap Sede Virtual.
- Irigoin, M; Tarnapol, P; Faulkner, D.; COE, G (Editoras) (2002): Mapa de competencias de la comunicación para el desarrollo y el cambio social: conocimientos, habilidades y actitudes en acción, Bellagio, Italia, *The*

CHANGE Project/ Agencia de los Estados Unidos para el Desarrollo Internacional.

- McPherson, Maggie, Nunes, Miguel Baptista, & Zafeiriou, Georgia. (2003). New tutoring skills for online learning: are e-tutors adequately prepared for e-learning delivery? Paper presented at the EDEN Annual Conference, Rhodes, Greece.
- Morris, L., Finnegan, C., & Wu, S. (2005). Tracking student behaviour, persistence, and achievement in online courses. *Internet and Higher Education*, 8 (2005), 221-231.
- Salmon, G. (2000): *E-Moderating. The Key to Teaching and Learning Online*. London, Kogan Page.
- Salmon, G. (2004): *E-actividades. Factor clave para una formación en línea activa*, Bcelona, Editorial UOC.
- Salmon, G. (2013). *E-tivities: The key to active online learning (2nd ed.)*. London and New York: Routledge.
- Swan, K. (2001). Virtual interactivity: design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education*, 22 (2), 306-331.
- Secretaria de Educación Pública [SEP] (2007). Programa Sectorial de Educación 2007-2012. México; D.F.
- Silva, J. (2011). *Diseño y Moderación de Entornos Virtuales de Aprendizaje*. Barcelona: Editorial Universidad Oberta de Cataluña.
- Sutapa B. (2010). Enabling Secondary Level Teachers to integrate Technology through ICT integrated Instructional System. India. Recovered June 11th, 2011, from the database EBSCOHOST. [ED511722].
- Tait, Alan (2003). Reflections on student support in open and distance learning. *International Review of Research in Open and Distance Learning*, 4(1).
- UNESCO (2002). *Aprendizaje abierto y a distancia. Consideraciones sobre tendencias, políticas y estrategias*. [Versión electrónica]. Recovered on April 10th, 2010.

<http://www.unesdoc.unesco.org/images/0012/001284/128463s.pdf>

UNESCO (2007). ICT in Teacher Education. Case Studies from the Asia-Pacific Region. Bangkok Thailand. www.unescobkk.org/education/ict

UNESCO (2009). *Declaración mundial sobre la educación superior-2009: La nueva dinámica de la educación superior y la investigación para el cambio social y el desarrollo*. París.

http://www.unesco.org/education/WCHE2009/comunicado_es.pdf

UNESCO (2012). ICT-enhanced Teacher Standards for Africa (ICTeTSA). International Institute for Capacity Building in Africa. Addis Ababa, Ethiopia. <http://unesdoc.unesco.org/images/0021/002161/216105e.pdf>

Universidad Autónoma de Yucatán [UADY] (2002). *Modelo Educativo y Académico*. Mérida. Dirección General de Desarrollo Académico de la UADY.

U.S. Department of Education (2009). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. Office of Planning, Evaluation, and Policy Development. United States Department of Education, Retrieved November 18th, 2009 from: <http://www.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf>

Yin, L.R., Urven, L, Schramm, R., & Friedman, S. (2002). Assessing the consequences of online learning: Issues, problems, and opportunities at the University of Wisconsin-Whitewater. *Assessment Update: Progress, Trends and Practices in Higher Education*, 14 (2), 4-5

Zounek, J. (2005). ICT and learning-and teaching-friendly environment in contemporary Czech school. Conference paper presented at the European Conference on Educational Research, University College Dublin, 7-10 September. Recovered on March 12 2011, on EBSCOHOST.