A mobile educational learning experience:

From digital illiterate pre-service teachers to digital literate pre-service teachers

Author´s name given name: **Catalina**

Author´s Family name: **Rodriguez-Pichardo**

Author´s affiliation addresses: ITESM, Eugenio Garza Sada 2501, Office 4-223. C.P. 64849

Monterrey, N.L., México. E-mail: cmrodrig@itesm.mx

Abstract

Teachers have to be aligned with the new educational demands, so integrating technology in a mobile educational system and applying self-regulation competence appear to be the solution for pre-service teachers willing to become digital literate pre-service teacher that includes Information and Communication Technology (ICT) into their educational practices. The purpose was to describe what self-regulatory and technological skills use some mobile learners from the Caribbean, South, Central and Northern America for being high achiever in this educational system that enable them to apply technology into their own practice. After the ethic code was followed and a validated instrument was applied, the data was processed using descriptive and inferential analyses. Some of the factors that were found to be relevant for being high achievers and being advanced technology users were: self-efficacy (p=0.011); task persistence (p=0.049); self-esteem (p=0.013); and having computer experience (p=0.007). Some academic reflections are included too.

Keywords: mobile learning, self-regulation, teachers in training, ICT

1. Introduction

More than 15 years ago Mason, Berson, Diem, Hicks, Lee & Dralle (2000) mentioned that as teacher educators, one of their roles is to model the appropriate uses of technology. However, many teachers neither use advanced technology nor include it into their practice (Coronado, Cantu & Rodriguez, 2014).

The ICT has not been well accepted by some members of the educational community (Hicks, 2011). It is possible that not all the teachers feel confident at including technology in their practices. Then, integrating technology in the teacher formation, will enable teacher to include digital media, literacy and technology in their own classrooms (Gibbons & Redmonds, 2013; Wankel & Blessinger, 2013). Additional to that, Sad & Goktas (2014) recommended that mobiles should be used for didactic reasons and apply these devices for teacher preparation.

Some universities have focused on the mobile learning (m-learning) environment because it allows to incorporate in the curriculum components where the students use their personal mobile devices to do the planned activities at home or outside of the classroom and it makes 24 hours available the emergent learning (Looi & Wong, 2014). Moreover, if the mobile technology is integrated appropriately and purposefully, it provides educators with educational tools to enrich the teaching and learning process (Kukulska-Hulme & Traxler, 2013; Prieto, Migueláñez & García-Peñalvo, 2013).

Mobile devices use some learning technology such as PDAs, laptops, smart phones, etc. that make learning portable because they foster real time communications and learn across multiple contexts (Kukulska-Hulme, Traxler & Pettit, 2007; & Berge & Muilenburg, 2013). Additional to that, m-learning is used in developing countries because many students cannot afford expensive computers, so they use the mobile technology for incresing access to their technological training (Ally, 2013).

Some authors (Squires, 2014; and Tabuenca, Kalz, Drachsler & Specht, 2015) have explained that m-learning is transforming the way of learners' access and manage their learning content due to the

mobility, the instantaneous feedback and the reflection on their own learning progress. However, it has been found some contradictions related to m-learning. Some authors (Fuegen, 2012; Sølvberg & Rismark, 2013; Gikas, & Grant, 2013; Abachi & Muhammad, 2014) have found some advantages of m-learning such as flexibility of studying at any time and any place, fast communication and better opportunity for collaboration, but some problems like security and difficulties for training. So, the m-learning mobile technology might not always be an educational panacea, but it can support education in ways not possible before (Traxler & Vosloo, 2014).

There is still a great need to prepare teachers for integrating technology in their practice because it is a way to prevent a mismatch between teachers and their students where they could be seen as illiterate teachers trying to teach literate students (Polly, Mims, Shepherd, Inan, 2010; Kivunja, 2013). Moreover, Knowles, Holton & Swanson (2015) explained that self-regulatory competence under Technological educational framework is a way of facing new pedagical challenges.

Considering the aforementioned observations from the mentioned authors, it is important to obtain data from student teachers enrolled in a mobile learning (m-learning) system that use technological skills as a way of enabling them to change their technological illiterate to technological literate. Also, the results from this study, would be useful for all the teachers in training who are willing to apply technology into their own practice as a way of facing the new 21st Century demands.

Being part of the m-learning educational environment, has also some psychosocial consecuences. It has been reported some educational challenges that mobile learners (m-learners) cannot handle very well such as: adjusting to new boundaries; new demands from the user's socio-cognitive; and accelerate technological learning demand; (Chu, 2014; Terras & Ramsay, 2015). Considering these psychosocial challenges, the self-regulation competency could be a way of facing these challenges because it enables them to use their own resource for organizing and responsabilizing for their own learning (Sha, Looi, Chen, Seow & Wong, 2012).

Many authors (Sha et al., 2012; Crisp, Taggart & Nora, 2014; Terras & Ramsay, 2015) have affirmed that more studies about regulation of internal factors that underlie student-centered of m-learning environment are still needed. Additional to that, Frohberg, Göth & Schwabe (2009) reviewed 102 mobile learning projects and they mentioned there are some gaps in m-learning research related to provoke deep reflection for applying knowledge and not just consuming it.

Specifically, this study focuses on some attributes of self-regulation such as planning, problem-solving, and evaluation of the self. Planning is the first phase for reaching goals and mastery goal emerged as a positive predictor of deep learning (Schunk & Zimmerman, 2012; and Burnette, O'Boyle VanEpps, Pollack & Finkel, 2013). The problem-solving help learner to be aware of their responsibilities and take control of their own learning because they monitor their learning and include effort management strategies as persistence predict positive academic performance (Wigfield, Hoa & Klauda, 2008; Yukselturk & Bulut, 2007). Zimmerman & Schunk (2008) explained that self-evaluation components such as positive self-perception, motivation, and personal efficacy contribute to student to success.

Considering the previous authors, in this study the planning factor is clustered by three components: goal setting, time management and outcome-expectation. The problem-solving factor, it is composed by discipline, task-management and task-persitence. The self-evaluation factor, it is clustered by three components: Self-motivation, self-esteem, and self-efficacy.

2. **Problem/Purpose of the study**

This study focuses on answering the following research questions:

1) What component of self-regulatory competence (planning, problem-solving and self-evaluation) help teachers in training under m-learning environment to apply technology into their own practice?

2) What components of technological factors (accessibility, technological attitude, computer experience, Internet efficacy, and previous ICT experience) help teacher in training enrolled in an m-learning system to apply technology into their own practice?

The answers to these questions will guide students teachers to become technological literate. Also, the findings might lead educational administrators for taking decisions about the mobile-learning offers and guide teachers and researchers about class planification.

The objectives of this study were:

1. Identify if there is a significant relationship between any self-regulatory components (goal setting, time management, outcome-expectation, discipline, task-management, task-persistence, self-motivation, self-esteem, and self-efficacy) and applicaton of technology into the pre-service teachers' practice.
2. Identifiy if there is a significant relationship between the technological components (accessibility, technological attitude, computer experience, Internet efficacy, and previous ICT experience) and application of technology into the pre-service teachers'practice.

The following hypotheses were developed:

H_0: The success of a pre-service teacher enrolled in a mobile learning that apply technology in their practice is not significantly related to any attribute of self-regulatory competence or technological skill.

H_A: The success of a pre-service teacher enrolled in a mobile learning that apply technology in their practice is significantly related to at least one attribute of the self-regulatory competence or technological skill.

These hypotheses provide a tentative explanation for the phenomenon under investigation.

The results from this study could be used as a reference for innovating in the educational field. Also, they might guide student teacher to feel confident in this educational system. Additional to that,

administrator, stakeholders and teachers might use the findings for planning and taking decisions about educational offers and services that help student teachers to improve their own practice.

3. Methodology

A descriptive methodology for explaining adult learners' profile of student teachers that applied self-regulatory competence and technological skills for reaching high academic achievement and apply technology in their own practice.

The participants were part of a Master Educational Program of a virtual private Northern Mexican University that offer some courses under m-learning environment. They were from the Caribbean, North, Central and South America. The criteria for selecting the participants were: They were part time teachers and part time graduate students; they were self-evaluated at the beginning of their master as digital illiterate; they self-evaluated as digital literate when they agreed to participate in the study; they have been implementing technology in their practice at least one year; and they have kept a GPA (>3.7/4) at least two semesters.

As part of the m-learning system, the adult learners had a forum to discuss about how to construct educational projects for their communities using Blackboard Mobile Learn Features and other technology features; they used and produced cloud based resources (youtube and google docs) through mobile devices as paths for constructing and applying new knowledge.

In order to offer the teachers in training the opportunity to open up technological learning experience and developing self-regulation, some recommendation from previous authors were considered (Carneiro, Lefrere, Steffens & Underwood, 2012; Benlamri & Zhang, 2014) :

- M-learners did individual learning and cooperative learning using their personal devices (iPhone, Android, or iPod Touch) and/or mobile tablet (iPad, Android tablet, or Kindle Fire);

- Student teachers did individual logins, it gave them the chance to work at their own pace with the most of course activities;
- Teachers in training listened and viewed podcast and they used websites that allowed them to be involved in a more interactive manner;
- Student teachers were asked for responses by texting others;
- Teacher in training created and shared media;
- They coordinated scheduled activities and connected information to the clouds;
- Student teachers did peer-to-peer learning activities in order to practice their technological and social skills;
- They did activities that enable them to the technological environment to train and evaluate the real-world observation skills.

For the data collection, the researchers sent a validated online instrument to 44 students teachers that accomplished the research selection' mentionated criteria, considering the 90% confidence level. Finally, 43 students responded, but one of them did not complete correctly the instrument and the another one, not responded during the range time assigned by the researchers.

It was reviewed and followed the Code of Research Conduct. So, this study was managed considering it and the ethic principles, the educational authorities and participants received a cover letter explaining the purposes and procedures of the study; then, they consent to participate. Also, this study apply the principle of respect for people's rights and dignity.

The instrument used was Questionnaire of Self-regulation and ICT mobile (CPIE-AM). It is an adaptation of CPIE (Rodríguez, Ávila, González, & Heredia, 2008). A factor analysis was performed to validate the constructs of the self-regulation scale and technological scale. The CPIE-AM was developed in Spanish, including 40-items with a five-point Likert-type response format.

To ensure face validity of the CPIE-AM, a content validity was performed by checking the operationalization variables considering the relevant content domain of self-regulatory competence,

and technological usage of previous literature (Zimmerman & Campillo, 2003; Pintrich, Smith, Garcia & Mckeachie, 1993; Roblyer, Davis, Mills, Marshall, & Pape, 2008; and Barnard, Lan, To, Paton, & Lai, 2009). In addition, an email soliciting expert opinions on the test items was sent out to to a total of eight experts in the field of Self Regulation. As a result, three experts replied to the request and provided the feedback.

The reliability of the CPIE-AM was achieved when pilot tested using 33 sample student under m-learning modality, test entries rated as Cronbach's alpha (0.84). The content and the language in the statements were adapted based on the feedback from the experts and the results from the pilot.

The CPIE-AM has two scales and some sociodemographic questions. The Scale 1, includes learners' experiences related to self-regulatory competence. The subscale of planning measures goal-settings, time-management, and outcome-expectation. The subscale of problem-solving measures discipline, task management, and task persistence. And the subscale evaluation of the self, measures self-motivation, self-esteem, and self-efficacy.

The second scale of the CPIE-AM consists on technological usage (accessibility, technological attitude, computer experience, Internet efficacy, and previous ICT experience). The items were designed on terms of the learner behavior in the m-learning environment.

4. Result and Discussion

The first analysis was descriptive because it analyzes the data that help to describe and understand the results in a meaningful way. For example, this study describes some demographic aspects such as participants' gender, age, academic level, location, marital status, employment status, and parent's educational level.

Data collected from the CPIE-AM indicated some interesting findings related to sociodemographic aspects, self-regulatory competence and use of technological skills. First it all, in the following paragraphs are described (Table 1) the sociodemographic aspects from the participants.

Table 1

Sociodemographic aspects

Sociodemographic aspects	Categories	Percentages
Gender	Male	51%
	Female	49%
Age	16-20 years old	0%
	21-25 years old	5%
	26-30 years old	7%
	31-35 years old	23%
	36-40 years old	18%
	more than 40 years old	47%
Marital Status	Single	34%
	Married	45%
	Divorced	19%
	Widowed	2%
Employment status	Employed	90%
	Unemployed	10%
Student educational level	Graduate	100%
Nationality	North American	76%
	South American	17%
	Central America	5%
	Caribbean	2%
Father's educational level	*Master's and/or Doctorate*	17%
	Bachelor degree	29%
	Community college	34%
	High school or lower level	20%
Mother's educational level	*Master's and/or Doctorate*	19%
	Bachelor degree	19%
	Community college	41%
	High school or lower level	21%

As shown in table 1, regarding to the sociodemographic information, the most of teachers in training are older than 40 years old; are married; are from North America; and their parents have completed the community college.

Some descriptive features related to planning, problem-solving, self-evaluation, self-regulatory competence and technological skills are shown in the Table 2. The measures of central tendency described the central position of a frequency distribution for a group of data, this central position use a number of statistics, including the mode, median, and mean.

Table 2

Descriptive Features of Self-regulatory competence and technological skills

Categories	M-learning			
	N	Mean	Median	Mode
Planning[1]	41	5.6	5.0	5.0
Problem-solving[1]	41	6.1	6.0	5.0
Evaluation of the self[1]	41	5.4	5.0	4.0
Self-regulatory competence[2]	41	17.1	17	16
Technological[3]	41	6.3	6.0	5.0

Note: 1 Excellent: 1-4; Good: 5-8; Average: 9-12; Fair: 13-16; Poor: 17-20
2 Excellent: 1-12; Good: 13-24; Average: 25-36; Fair: 37-48; Poor: 49-60
3 Excellent: 1-5; Good: 6-10; Average: 11-15; Fair: 16-20; Poor: 21-25

According to the table 2, evaluation of the self, got the highest scores. The students' attitudes and behaviors related to self-regulatory competence is in the range of good. None of them self-evaluated as average, fair or poor.

The teachers in training who were enrolled in the m-learning, they were self-assessed considering their self-regulatory competence and technological skills. For the planning component, the participants assessed establishing outcome-expectation-visualization as a very important for being successful in the m-learning environment. It means, they consider as vital to establish what to achieve and to define well steps that transcend to gain specific goals.

Related to the problem-solving factor, discipline and task-persistence are evaluated as very important tool for this environment. Both of them are considered by the participants as the most useful skills for being successful in this modality. It means, they considered as relevant create new habits toward improving oneself. Also, it is essential to make effort toward task accomplishment and maintenance of activity despite any emotional fluctuation.

Referring to self-evaluation component, self-efficacy, self-motivation, and self-esteem were considered by the participants as very important qualities for being successful. Then, it is relevant for the participants to belief in one's ability, be able to organize actions to attain the goals, and execute behaviors towards the management of different academic situations.

According to the results, it was considered as foremost that teachers in training be self-confident and have the feeling of worthy. In addition to that, it was found vital that student teachers have the ability

to do what they need to be done with enthusiasm in an autonomous way.

For the technological section, some aspects were considered as very important for becoming technological literate: accessibility, computer experience, technological attitude, and ICT experience. It means that student teachers evaluated as relevant to have mobile devices' access for academic duties; have a positive attitude related to use of the technology; have a domain of computer usage for some years; and have experience with ICT learning environment.

The second analysis consisted of testing the null and alternate hypotheses. In this study, the information was collected from 41 questionnaires, data were exported to SPSS 21 software and it performed the corresponding analyzes. After Chi-square test was applied, the results showed significant values the participants. According to these findings, teachers in training enrolled in this system, might manage three aspects of self-regulation and one factor of the technological dimension in order to be academic successful and be able to apply technology in their practice.

The significant variables are showed in Figure 1. Specifically, self-efficacy (p=0.011); task persistence (p=0.049); and self-esteem (p=0.013).

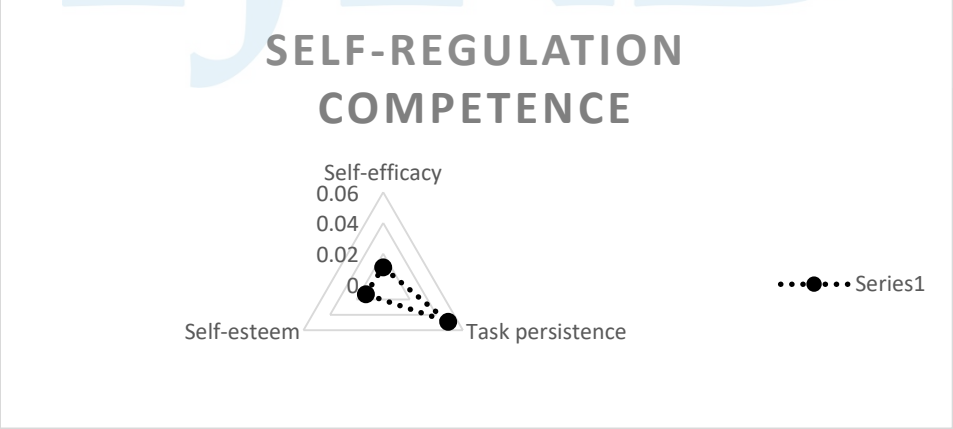

Figure 1. Significant self-regulatory competence

As shown in the Figure 1, at least one of the self-regulatory component is significant related to academic success and integration of technology in their practice under m-learning modality. So, the alternate hypothesis was accepted and the null hypothesis was rejected.

Self-regulatory competence impacts positively for mobile learners willing to be successful in this system like showed before. Three possible explanations are because m-learners take responsibility for their own success; they change their role from passive learners to engaged learners; and adult learners use tools to record, organise and reflect on their m-learning experiences emerging their awareness of themselves (Wang, Shen, Novak, Pan, 2009; Kearney, Schuck, Burden & Aubusson, 2012; & Pellas, 2014).

Task-persistence is a key factor for being successful in the mobile learning system according to the results maybe it is because m-learning support new ways of learning and engaging conducts that enhance persistence (Berge & Muilenburg, 2013).

Attributes such as self-efficacy and self-esteem appear to contribute teachers in training to become high academic achiever. These results are similar to others (Sang, Valcke, Braak & Tondeur, 2010), ICT users with high levels of self-efficacy set higher goals for themselves and they are more resistant to failure than others whom not do it.

In case of technological skills, only one skill was found significant, the computer experience ($p=0.007$). A possible explanation is because ICT users in developing countries are not as familiar with technology as users in developed countries (Bhuasiri, Xaymoungkhoun, Zo, Rho, & Ciganek, 2013). Also, mobile learning is better address by more advanced technological learners (Frohberg et al., 2009).

Previously technological attitude was found to be significant determinants of users' acceptance of mobile application technology (Chen, Sivo, Seilhamer, Sugar & Mao, 2013); this attribute was evaluated as relevant for applying technology in their own practice, but not significant. So, more studies related to technological attitude are still needed in the educational field.

The findings from this investigation showed how important are self-regulation and technological skills for applying technology in their own practice. As mentioned by previous authors (Kramarski & Michalsky, 2015) technology pedagogical content knowledge integrating self-regulated learning into

training for being teachers, allows participants to show strong beliefs in their own technological self-efficacy and enable them to apply the adequate technology.

5. Conclusions

Student perspectives are an important issue when adopting the new technology like in m-learning environment (Mac Callum & Jeffrey, 2013). So, this study tried to describe student teacher profile that use self-regulation and technological skills for becoming a digital literate und in the m-learning environment and being capable to apply technology in their own practice.

The research questions were answered, they were found three significant attributes: self-efficacy, task-persistence, and self-esteem, but only one of the technological attribute was significant, the computer experience.

The objectives of this research were accomplished too. They were found that there were significant relationship between some pre-services' self-regulatory attributes, technological skill and the use of technology into the classroom.

This research had some limitations. First, the data were collected from only one university; however, successful students from different countries were invited to participate. Second, this study is not generalizable to adult learners in other institutions and/or countries until this study is replicated to other universities from different countries; but this study might serve as reference.

Even though this study had some limitations, it might help educational researchers and practitioners to design more effective mobile-assisted seamless learning; guide student teachers in the inclusion of technology in their own practice as a way of facing new pedagogical and technological challenges.

These findings shall assist educational administrators to take decisions about helping the student teachers to success. Also, this study might serve as reference for counselors eagle to advise their

students teachers about how to apply some self-regulation component for increasing their possibilities to be successful as digital literate.

Future research should consider replicating the results of the current study with respect to m-learners from other continents. Also, it is recommended to do more research about technological skills of adult learners like teachers who are not familiar with technology.

It will be interesting to compare the low-achiever profile versus high-achiever profile of adult learners under the m-learning educational modality in order to support the first group and to avoid dropout. The desertion phenomenun is also important to study because many adult m-learners have faced academic attrition problems. So, more research about this issue, would be beneficial for adult learners.

For future studies, it could be benefitial to compare the student profile from different learning systems such as face to face, blended learning, electronic learning, mobile learning and ubiquious learning in order to offer to student teachers more pedagogical tools for designing their future courses.

It is probable that in upcoming years, some further technological development will be advanced and they will be used for educational context; so, the results from this study could help foster teacher to gain some technological skills for reaching good practice using technological devices on daily basis. Being familiar with the technology, it is a way of helping student teacher to improve their technological skills.

References

Abachi, H. R. & Muhammad, G. (2014). The impact of m-learning technology on students and educators. *Computers in human behavior*, 30, 491-496.

Ally, M. (2013). Mobile learning: From research to practice to Impact Education. *Learning and Teaching in Higher Education*: Gulf Perspectives, 10 (2), 1-10.

Barnard, L., Lan, W. Y., Crooks, S. M., & Paton, V. O. (2008). The relationship of epistemological beliefs with self-regulatory skills in the online course environment. *Journal of Online and Learning Teaching, 4*(3), 261-266.

Benlamri, R., & Zhang, X. (2014). Context-aware recommender for mobile learners. *Human-centric Computing and Information Sciences*, *4*(1), 1-12. doi:10.1186/s13673-014-0012-z

Berge, Z. L. & Muilenburg, L. (2013). *Handbook of mobile learning*. New York: Routledge.

Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A. P. (2013). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education 58*(1), 843–855.

Carneiro, R., Lefrere, P., Steffens, K., & Underwood, J. (2012). *Self-regulated learning in technology enhanced learning environments: A European perspective* (5). Springer Science & Business Media.

Chen, B., Sivo, S., Seilhamer, R., Sugar, A. & Mao, J. (2013). User acceptance of mobile technology: A campus-wide implementation if Blackboard´s mobile (TM) learn application. *Journal of Educational Computing Research*, 49 (3), 327-343

Chu, H.-C. (2014). Potential Negative Effects of Mobile Learning on Students' Learning Achievement and Cognitive Load—A Format Assessment Perspective. *Educational Technology & Society, 17 (1),* 332–344.

Coronado, E., Cantú, M., & Rodríguez, C. (2014). Diagnóstico universitario sobre el uso de la TIC en el proceso de enseñanza-aprendizaje bajo la modalidad educativa presencial en Santo Domingo. *Edutec. Revista ElectróNica De TecnologíA Educativa*, *0*(50).

Crisp, G., Taggart, A. & Nora, A. (2014). Undergraduate Latina/o Students: A Systematic Review of Research Identifying Factors Contributing to Academic Success Outcomes. *Review of Educational Research, 85(2), 249-274. doi:* 10.3102/0034654314551064

Deyoe, M. M., Newman, D. L., & Asaro-Saddler, K. (2013). Moving from Professional Development to Real-Time Use: How are we Changing Students?. *Literacy Enrichment and Technology Integration in Pre-Service Teacher Education*, 160-170.

Frohberg, D., Göth, C., & Schwabe, G. (2009). Mobile learning projects–a critical analysis of the state of the art. *Journal of computer assisted learning*, *25*(4), 307-331.

Fuegen, S. (2012). The impact of mobile technologies on distance education. *TechTrends, 56,* 6, 49-53.

Gibbons, D., & Redmond, T. (2013). Investigating Cultural Models of Technology and Literacy Integration in Pre-Service Teacher Education. In J. Keengweg, G. Onchwari & D. Hucks. *Literacy Enrichment and Technology Integration in Pre-Service Teacher Education* (75-90). Hershey, PA: IGI Global.

Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *Internet and Higher Education,* 19, 18–26.

Handal, B., MacNish, J., & Petocz, P. (2013). Adopting mobile learning in tertiary environments: Instructional, curricular and organizational matters. *Education Sciences*, *3*(4), 359-374.

Hicks, S. D. (2011). Technology in today's classroom: Are you a tech-savvy teacher?. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *84*(5), 188-191.

Kearney, M., Schuck, S., Burden, K., & Aubusson, P. (2012). Viewing mobile learning from a pedagogical perspective. *Research in learning technology, 20. doi: 10.3402/rlt.v20i0.14406*

Kivunja, C. (2013). Embedding Digital Pedagogy in Pre-Service Higher Education to Better Prepare Teachers for the Digital Generation. *International Journal of Higher Education*, *2*(4), 131-142.

Knowles, M. S., Holton III, E. F., & Swanson, R. A. (2015). *The adult learner: The definitive classic in adult education and human resource development*. New York, NY: Routledge.

Kramarski, B. & Michalsky, T. (2015). Effect of a TPCK-SRL Model on teacher's pedagogical beliefs, self-efficacy, and technology-based lesson design. *Technological Pedagogical Content Knowledge*, 89-112.

Kukulska-Hulme, A., Traxler, J. and Pettit, J. (2007). Designed and User-generated Activity in the Mobile Age. *Journal of Learning Design, 2*(1), 52-65.

Kukulska-Hulme, A., & Traxler, J. (2013). Design principles for mobile learning. In H. Beetham & Sharpe, R. *Rethinking pedagogy for a digital age: Designing for 21st century learning* (244-258). New York, NY: Routledge.

Lee, Y., & Lee, J. (2014). Enhancing pre-service teachers' self-efficacy beliefs for technology integration through lesson planning practice. *Computers & Education*, *73*, 121-128.

Looi, C.K., & Wong, L. H. (2014). Implementing Mobile Learning Curricula in School: A Programme of Research from Innovation to Scaling. *Educational Technology & Society, 17* (2), 72–84.

Mac Callum & Jeffrey, L. (2013). The influence of students' ICT skills and their adoption of mobile learning. *Australasian Journal of Educational Technology, 29*(3), 303-314.

Mason, C., Berson, M., Diem, R., Hicks, D., Lee, J., & Dralle, T. (2000). Guidelines for using technology to prepare social studies teachers. *Contemporary issues in technology and teacher education*, *1*(1), 107-116.

Pellas, N. (2014). The influence of computer self-efficacy, metacognitive self-regulation and self-esteem on student engagement in online learning programs: Evidence from the virtual world of Second Life. *Computers in Human Behavior*, 35, 157–170.

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement*, *53*, 801-813.

Pegrum, M., Howitt, C., & Striepe, M. (2013). Learning to take the tablet: How pre-service teachers use iPads to facilitate their learning. *Australasian Journal of Educational Technology*, *29*(4), 464-479.

Prieto, J. C. S., Migueláñez, S. O., & García-Peñalvo, F. J. (2013). Understanding mobile learning: devices, pedagogical implications and research lines. *Teoría de la Educación; Educación y Cultura en la Sociedad de la Información*, *15*(1), 20.

Polly, C. Mims, C.E. Shepherd, F. Inan (2010). Evidence of impact: transforming teacher education with preparing tomorrow's teachers to teach with technology. *Teaching and Teacher Education, 26*, 863–870.

Roblyer, M. D., Davis, L., Mills, S. C., Marshall, J., & Pape, L. (2008). Toward practical procedures for predicting and promoting success in virtual school students. *American Journal of Distance Education*, *22*(2), 90–109.

Rodríguez, C. M., Ávila, A., González, M. & Heredia, Y. (2008). Perfil psicosocial y uso de las tecnologías de la información y la comunicación de alumnos con promedios académicos altos

y mínimos de la modalidad educativa presencial en un contexto mexicano. *Revista Electrónica de Investigación Educativa, 10*(2) 1-19.

Sad, S. N. & Goktas, O. (2014). Preservice teachers' perceptions about using mobile phones and laptops in education as mobile learning tools". *British Journal of Education, 45*, 4, 606-618.

Sang, G., Valcke, M., van Braak, J., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education, 54*(1), 103-112.

Schunk, D. H., & Zimmerman, B. J. (Eds.). (2012). *Motivation and self-regulated learning: Theory, research, and applications*. New York, NY: Routledge.

Sha, L., Looi, C-K, Chen, W., Seow, P. & Wong, L-H. (2012). Recognizing and measuring self-regulated learning in a mobile-learning environment. *Computers in Human Behavior*, 28, 2, 718–728.

Sølvberg, A., & Rismark, M. (2012). Learning spaces in mobile learning environments. *Active Learning in Higher Education, 13*(1), 23–33. doi:10.1177/1469787411429189

Squires, D. R. (2014). M-Learning: Implications in Learning Domain Specificities, Adaptive Learning, Feedback, Augmented Reality, and the Future of Online Learning. *i-Manager's Journal of Educational Technology, 11*(3), 1-10.

Tabuenca, B., Kalz, M., Drachsler, H., & Specht, M. (2015). Time will tell: The role of mobile learning analytics in self-regulated learning. *Computers & Education, 89*, 53-74.

Terras, M. M., & Ramsay, J. (2015). The Psychological Challenges of Mobile Learning. *Encyclopedia of Mobile Phone Behavior. Hershey: IGI Global Publishing*.

Traxler, J., & Vosloo, S. (2014). Introduction: The prospects for mobile learning. *Prospects*, *44*(1), 13-28.

Wang, M., Shen, R., Novak, D. & Pan, X. (2009). The impact of mobile learning on students' learning behaviours and performance: Report from a large blended classroom. *British Journal of Educational Technology*, *40,* 673 - 695.

Wankel, L. A., & Blessinger, P. (2013). New pathways in higher education: An introduction to using mobile technologies. *Cutting-edge Technologies in Higher Education*, *6*, 3-17.

Wigfield, A., Hoa, L. W., & Klauda, S. L. (2008). The role of achievement values in the regulation of achievement behaviors. *Motivation and self-regulated learning: Theory, research, and applications*, 169-195.

Zimmerman, B. J., & Campillo, M. (2003). Motivating self-regulated problem solvers. In J. E. Davidson & R. J. Sternberg (Eds.), *The psychology of problem solving* (pp. 233–262). New York: Cambridge University Press.

Zimmerman, B. J., & Kitsantas, A. (2014). Comparing students' self-discipline and self-regulation measures and their prediction of academic achievement. *Contemporary Educational Psychology*, *39*(2), 145-155.

Zimmerman, B. J., & Schunk, D. H. (2008). An essential dimension of self-regulated learning. *Motivation and self-regulated learning: Theory, research, and applications*, 1-15.