Administrators' technology leadership: Its influence on teachers' technology proficiency

Ma. Teresa E. Mendoza[1], Glenn Erick B. Catiis[2]

[1] Taliptip National High School, Philippines
[2] Balagtas National Agricultural High School, Philippines
Corresponding email: glennerick.catiis@deped.gov.ph

ABSTRACT

The educational system of the world has reached the 21st century. Teachers and principals have to adopt the immense changes brought by technological advancement. Teachers are equipped with 21st-century tools thanks to the administrators' technological expertise and their own; however, the intensity is only a possibility waiting to become a reality upon integration. At the height of the 2020 educational set-up brought about by the COVID-19 pandemic, the skills of positive technology integration for both administrators and teachers are needed to actualize and harmonize their respective areas. On this premise, a descriptive-correlational research design was conducted to assess the influence of administrators' technological leadership on teachers' technology proficiency in public high schools in the District of Bulakan and Sta. Maria, Bulacan, Philippines. It administered survey questionnaires to 16 administrators and 285 junior high school teachers during the school year 2020–2021. The data was analyzed using descriptive and inferential statistics. The results indicated that administrators possess a high level of technological leadership. This implies that they are ready and have full knowledge and practical know-how on the utilization and application of technology. On the other hand, teachers also possessed a high level of technological proficiency. This indicates that they are adept at utilizing technology to aid in the teaching and learning process. It comes to the conclusion that teachers' technological aptitude is not much impacted by administrators' technological leadership. This means that teachers can be more proficient; they upskill themselves since this is the demand of 21st century learning. Recommendation includes the implementation of educational reforms that support the new normal in education through programs that improve the quality of instruction and delivery, particularly during times of emergency or state calamity when classes are suspended or interrupted.

INTRODUCTION

School leaders face a difficult role of integrating technology in the classroom to improve the teaching and learning process in 21ˢᵗ century classrooms in this age of digital technology, technological leadership is essential to encourage and motivate teachers to integrate technology (Thannimalai & Raman, 2018). According to Anderson & Dexter (2005), It is the responsibility of technology leaders to comprehend how educational technology can help teaching and learning in classrooms. Due to Corona Virus (Covid-19), people from different sectors were all affected. Schools were not spared from this pandemic. From the traditional face-to-face interaction, schools worldwide shifted to contactless means of delivering the instruction to the learners. Within a few weeks, the COVID-19 epidemic forced teachers to teach online (Arum and Steven 2020). Due to school closings, teachers were forced to adapt, innovate, and use online education, even though the majority of them did not feel sufficiently prepared or had little experience with it (Hechinger & Lorin, 2020).

Before the COVID – 19 pandemic, the world is transitioning to Industrial Revolution 4.0. Thannimalai and Raman (2018) stated that as a consequence of improvements in digital technology, artificial intelligence, automation, and robots, the occupations that will soon be accessible in the market are a direct outcome of the Fourth Industrial Revolution, which today's global education system must embrace. Similarly, in facing the twenty-first century, Chang (2011) highlights the need for innovation and change to provide excellent education in the majority of schools throughout the world due to the advent of technology. As technology advances and becomes more digital, leaders must acquire technological leadership skills in order to achieve the ultimate goal of increasing learners' potential. Globally, the education system must assume responsibilities in the technical aspect of the enormous changes.

The Department of Education (DepEd) implements the K–12 Basic Education Program in response to the request to educate 21st-century skills. On this matter, principals must act as technology instructors and leaders in order to help students develop the knowledge and skills necessary for 21st-century learning (Roblyer & Doering, 2014). The pace of technological change exceeds that of other industries. In the past, computer laboratories were an indication of a school that was technologically competent. Students now a days carry computers in their pockets that are far more powerful. Digital technologies may significantly increase student learning and engagement, but especially in the classroom, schools want solutions that are user-friendly while still offering thorough classroom management.

The teaching and learning process has become more challenging for instructors as a result of the quick growth of technology. Finding better methods to incorporate technology into classroom activities in the twenty-first century is a challenge for teachers and principals (Afshari et al., 2009). Teachers who utilize technology in the classroom and claim to be constructivist and student-centered are still seen as capable or innovative enough (Cuban et al., 2001; Ertmer et al., 2010). Thus, technology-savvy teachers are required. On the other hand, in order to inspire and guide teachers in incorporating technology into teaching and learning processes, as well as school administration and management, principals need to be well-versed in ICT skills and expertise (Thannimalai & Raman, 2018).

The principal has a significant impact on the school's effectiveness (Anderson & Dexter, 2005). Principals confront greater hurdles in embracing change in leadership and management in this era of globalization and rapid technological progress. It is undeniable that technology has an impact on leadership. Thus, leaders must give importance to technology in the high visioning performance of the school (Hamza et al., 2014). This could be attained when (Daniels, 2009) found that school transformation and administrators' decisive leadership have a good influence. Technology leadership refers to school-related technology activities such as policies, decisions, and technology implementation in the classroom (Anderson & Dexter, 2005; Dexter, 2011). However, a study revealed that technology leaders faced a number of challenges, including a lack of funding, opposition, bureaucracy, poverty, and lack of training, but the researcher offered solutions to the problems (Sincar, 2013). Despite the hindrances, Celikten (Banoglu, 2011) principals are aware of the need to use technologies in education. However, (Esplin, Stewart, & Thurston, 2018) find that school principals' preparedness to lead as technology leaders is still insufficient. But (Beytekin, 2014) argues that the study revealed that principals' readiness as technology leaders was high in the

subscale of visionary leadership. More so, researchers (Eren & Kurt, 2011) also indicated that the principals' technological leadership utilizing educational technologies was high. Many pieces of data suggest that administrators' leadership conduct has an impact on school technology use. The findings of Anderson and Dexter (2005), backed up the idea that principals affect technology outcomes through their leadership behavior, as described by the International Society for Technology in Education.

Teachers' Technology Proficiency plays a vital role in achieving the DepEd's goal for the 21st-century learners. Technology must be included into the teaching and learning process, as required by DepEd. Teachers must be proficient in technology to adhere to this mandate. An individual must be capable of utilizing a variety of technological tools to address issues, make wise judgments, and produce new information (Raob et al., 2012). With this idea, teachers must constantly find means to improve their skills with essential pedagogies and how technology can be infused with these pedagogies. Due to increased usage of technology in education, the position of a classroom teacher must undergo major change (Koc & Bakir, 2010). Moreover, With the advent of technology, both the learners of the twenty-first century and the learning environment have changed. For this aim to be successful, teachers must have extensive training, enough time, and continual support to ensure they have the knowledge, abilities, and confidence to teach with ICT. For teachers to stay current and be effective in using technology every time they are teaching, it is imperative to provide teacher education programs and professional development facilities for in-service teachers and pre-service teachers.

Many studies have shown that the principal's technological leadership has dramatically influenced the teacher's technical proficiency. Findings from Chang's (2011) study indicated that principals' technological leadership had an effect on teachers' technological literacy and actively encouraged teachers to incorporate technology-based learning into their classrooms. Principals' technology leadership also makes teachers more effective. This was supported by Omwenga et al., (2015); the findings of their study's hypothesis testing showed a substantial direct correlation between teachers' use of ICT in the classroom and the principal's ICT proficiency. Moreover, according to Raman's (2017) research, there is a correlation between teachers' ICT proficiency and technological leadership.

On the contrary, some researchers disagree with these claims. According to Domeny's (2017) research, there is a weak association between teachers' adoption of digital technology and principals' digital leadership. The similar finding was made by Raman (2019); administrators' technological leadership has little impact on teachers' technological competence. This assertion was backed up by Hero (2020), who noted in his study that there was no correlation between administrators' technology leadership and teachers' technology integration competency.

Given the abovementioned ideas and conditions, the researchers are interested in assessing the effects of administrators' technology leadership on teachers' technology proficiency.

Regardless of the contradicting findings of the studies which revealed that administrators' technology leadership affects the teachers' technology proficiency positively while the others found out that there is the negative or only minor effect on the principals' technology leadership and teachers' technology proficiency, still the researchers hope that the result of this study may offer significant contributions in the academe through various recommendations and solutions to the existing problem and gaps on the different tasks and gain insights on the educational implications for further improvement of the administrators' technology leadership and teachers' technology proficiency involving the administrators and teachers of the public secondary schools in the Municipalities of Bulakan and Sta. Maria.

OBJECTIVE OF THE STUDY

The objective of the study was to assess the influence of administrators' technology leadership on teachers' technology proficiency.

MATERIALS AND METHODS

DESIGN

The descriptive-correlational quantitative research design was employed within the study. This research method is the means to assess if administrators' technology leadership significantly influence teachers' technology proficiency which served as the variables of the study and measured using instruments and analyzed with the appropriate statistical treatment.

RESPONDENTS

The respondents of this study were the principals, assistant principals, officers in charge – head teachers, representing the administrators and teachers. There are 16 school administrators and 285 out of 841 high school teachers of secondary public high schools in the Municipalities of Bulakan and Sta. Maria, Bulacan, Philippines.

Table 1. Respondents of the Study

Municipalities	Administrators	Teachers
Bulakan		
A	1	18
B	1	7
C	1	16
D	1	14
Sta.Maria		
A	1	33
B	2	48
C	3	66
D	1	38
E	1	27
F	1	2
G	1	8
H	1	7
I	1	1
Total	16	285

The researchers have utilized Slovin's Formula to determine the number of teacher-respondents and proportional stratified random sampling technique to have the exact number of teachers per school. Slovin's Formula is used to compute for the sample size of a large population. On the other hand, the proportional stratified random technique divides the population into strata like gender, educational qualifications, and other possible criteria, and then sampling follows. The sample size is also proportional to the sub-group members (Frey, 2018). In this study, the researchers used the schools where the teachers are currently teaching as the strata.

INSTRUMENT

This study utilized two adopted instruments in assessing the influence of administrators' technology leadership on teachers' technology integration. The Principals Technology Leadership Assessment (PTLA), developed by the University Council for Educational Administration (UCEA) Center for the Advanced Study of Technology Leadership in Education (CASTLE) and based on the 2009 National Education Technology Standards for Administrators, was adopted by the study to determine the administrator's leading technology (NETS-A). The aforementioned PTLA survey offers 35 statements on the five different degrees of leadership engagement and the six NETS-A performance indicator categories. The survey questions were examined by specialists in educational

technology and school leadership, who then verified them. The overall dependability of the PTLA was outstanding. Researchers used The Educational Technology Standards Scale, a validated scale from Coklar and Odabasi (2009), to evaluate the instructors' technological ability (ETSS). This scale will make it easier to determine how closely instructors' instructional technology adhere to international standards. The 41-item ETSS is trustworthy and contains six elements (Cocklar & Odabasi, 2009). On a five-point scale, the ETSS for teachers' technological competency and the PTLA for administrators' technological leadership were individually evaluated.

DATA ANALYSIS

The results of the test were collated and analyzed using descriptive and inferential statistics. Statistical Packages for Social Sciences (SPSS) software was used to analyze and interpret the data. The study's variables were measured using the weighted mean, spearman rho, and regression analysis.

DATA GATHERING

The researchers sought permission from the Schools Division Superintendent about the conduct of the study from different district. Upon approval, survey questionnaires were distributed to 16 administrators by personal contact and questionnaires in google forms was sent to 285 teachers through messenger. The confidentiality was provided, as the respondents' personal information was not needed.

RESULTS AND DISCUSSION

Teachers assessed the technology leadership of their administrators. The table below is the summary of administrators' technology leadership.

Table 2. Administrators' Technology Leadership

Administrators' Technology Leadership	Mean	Interpretation
1. Leadership and Vision	4.35	High
2. Learning and Teaching	4.42	High
3. Productivity and Professional Practice	4.38	High
4. Support, Management, and Operations	4.28	High
5. Assessment and Evaluation	4.33	High
6. Social, Legal and Ethical Issues	4.40	High
Average	4.36	High

The tabular presentation of the data reveals the technology leadership of the administrators of public secondary schools in the district of Bulakan and Sta. Maria, Bulacan. As can be noticed, learning and teaching recorded the highest weighted mean of 4.42, interpreted as high among the indicators of administrators' technology leadership. The result is enormously high about the data, which means that the respondent–school administrators are well informed on technology leadership in terms of learning and teaching. As earlier stated in this study, the findings of Hamzah et al., (2014), suggest that principals must serve as critical roles in advocating technology in schools and hoping that their study will enhance the practice of principals and offering that more studies should be conducted. In support of the findings, the principal's role as a technology leader in the integration of technology at schools was shown to have a significant influence on the quantity of technology use throughout the teaching and learning process, according to Brockmeier, Sermon, and Hope's (2005) study.

In general, as assessed by the teachers on the technology leadership of their principal obtained an average of 4.36, interpreted as high. From the data, it may be inferred that the school principals are up to date on the most recent developments in school leadership with the knowledge of technology. This outcome is also consistent with research by Macaulay (2009, as referenced in Alkrdem, 2014), who found that, on the whole, school administrators consider

themselves adept at exhibiting technical leadership behavior and to the result of another study carried out by Kozloski (2007, as cited in Alkrdem, 2014), who stated that school principals consider themselves as technology leaders.

The teachers assessed their technological competency based on the knowledge and skills through their experiences in the profession. The graph below depicts the level of proficiency in using technology in the teaching and learning process.

Table 3. Teachers' Technology Proficiency

Teachers' Technology Proficiency	Mean	Interpretation
1. Technology Operation and Concept	4.10	High
2. Planning and Designing Learning Environments and Experiences	4.08	High
3. Assessment and Evaluation	4.00	High
4. Productivity and Professional Practices	4.26	High
5. Social, Ethical, Legal and Human Issues	3.91	High
6. Planning and Teaching According to Individual Differences and Special Needs	3.98	High
Average	4.06	High

Table 2 presents the level of technical proficiency of public high school teachers in the district of Bulakan and Sta. Maria, Bulacan. It could be gleaned that productivity and professional practices recorded the highest weighted mean of 4.26, interpreted as high. The outcome suggests that teachers are computer literate. The results are expected of them, especially in the public schools where the agency ordered that document processing be controlled by technology, starting with the school administration, and working down to the teachers. Also, with the learning delivery modalities being implemented by DepEd during this pandemic, teachers must be technologically proficient. Teachers were able to survive the demands and needs in the education system amid a pandemic because they are knowledgeable and capable of using technology. It might be credited to DepEd's initiative to organize a series of webinars and training sessions on various ICT skills, which had the goal of enhancing teachers' abilities and knowledge of additional digital teaching resources, systems, and strategies that are helpful in providing high-quality instruction.

As viewed in the table, teachers' technology proficiency was interpreted as high as manifested by the weighted mean of 4.06. The result shows that teachers are confident in using technology in the teaching and learning process because they possess the skills and knowledge. The results of a research by Leong et al. (2016, as quoted in Thannimalai & Raman, 2018) revealed that school heads had demonstrated a high degree of technological leadership. Teachers also gave themselves excellent marks for ICT proficiency.

To determine the nature and magnitude of the influence of the administrators' technology leadership on teachers' technology proficiency, the data were subjected to regression analysis, and the results are summarized in Table 3.

Results of the correlation analysis revealed that all the administrator's technology leadership factors are correlated with teachers' technology proficiency to varying extents. The nature of the relationship for the three elements (learning and teaching, productivity and professional practice, social legal and ethical) is positive. At the same time, the other three factors (leadership and vision, support management and operation, assessment and evaluation) have negative nature of the relationship. The relationship's positive nature suggests that teachers' technical competency rises in direct proportion to an administrator's level of technological leadership. On the other hand, teachers' technological aptitude declines in proportion to the level of technology leadership among administrators.

Table 4. Influence of Administrators' Technology Leadership on Teachers' Technology Proficiency

Variables	Unstandardized Coefficients	Standardized Coefficients

	B	Std. Error	Beta	T	Sig.
(Constant)	3.167	-.350		9.052	.000
Leadership and vision	-.020	.063	-.130	-.313	.767
Learning and teaching	.231	.077	1.001	3.012	.030
Productivity and professional practice	.119	.063	.581	1.891	.117
Support management and operation	-.056	.078	-.315	-.716	.506
Assessment and evaluation	-.087	.074	-.622	-1.174	.293
Social, legal and ethical	.006	.085	.040	.077	.942

R-squared = .694
F-value = 1.888
p-value = .251
alpha = 0.05

On the other hand, the negative nature of relationship implies that the higher administrator's technology leadership lowers the teachers' technology proficiency. Conversely, the lower administrator's technology leadership, the higher the teachers' technology proficiency. A detailed examination of the calculated coefficients reveals a weak correlation between teachers' technological ability and all administrative leadership criteria related to technology.

To determine the magnitude of influence of the predictor variables on teachers' technology proficiency, the data were subjected to regression analysis, and the results are summarized in Table 3. Results of the regression run revealed that all factors were not a significant factor in assessing the teachers' technology proficiency. The analysis of variance of the regression of administrator's technology leadership factors on teachers' technology proficiency revealed a p-value of .251. Since the p-value is more significant than the set α of .05, this implies that we need to accept the null hypothesis. This means that the administrators' technology leadership does not significantly influence the teachers' technology proficiency. The following researchers discovered identical findings: Domeny (2017) found in his study that teachers' use of digital technology is not significantly influenced by the digital leadership of principals. There is little link between these two factors. Teachers' technological aptitude has little bearing on the principal's technological leadership, according to Hero (2020). The technology integration ability of teachers and the principal's technology leadership did not significantly correlate, according to Raman (2019).

CONCLUSION

Administrators showed high level of technology leadership, this implies that they are ready and have full knowledge and practical know-how on the utilization and application of technology. In the same vein, teacher respondents also revealed high level of technology proficiency. This indicates that they have the necessary technology skills to effectively employ it in the teaching and learning process. Furthermore, teachers' technological competence is not much impacted by administrators' technological leadership. This signifies that teacher can be more proficient, they upskill themselves since this is the demand of the 21st century learning.

Taking into account the findings of this study and in light of the conclusions the following recommendations are forwarded: That school administrators may recognize the importance of furthering their technical skills in order to fulfil their critical role as technological leaders in schools. Teachers must understand that they must adapt to the demands of change in order to face this pandemic in the classroom of the twenty-first century, which calls for them to increase their knowledge of and proficiency with electronic tools for teaching and learning. This entails effectively shifting the terrain of classroom instruction away from physical face-to-face interaction and toward a more appealing online environment. Administrators and teachers may join forces to implement educational reforms that support the new normal in education through programs that improve the quality of instruction and delivery, particularly during times of emergency or state calamity when classes are suspended or interrupted. Mobile technology, cloud technology, virtual reality, digital readers, and other learning resources in e-learning/devices are examples of online

courses and productive activities utilizing media and technology that may serve as interventions for students. Parents may also be persuaded to expand their children's knowledge acquisition with the help of administrators to the classroom. We are presently in the fourth modern transformation, and innovation education is an absolute necessity. The specialists might make an arrangement that remembers innovation education for the Qualification Standard of hopeful school heads and instructor candidates.

REFERENCES

Afshari, M., Bakar K.A., Luan W. S., Samah B.A., & Fooi F.S. (2009). School leadership and information communication technology. *TOJET. The Turkish Online Journal of Educational Technology*, 7(4).

Alkrdem, M. (2014). Technological leadership behavior of high school head teachers in Asir region, Saudi Arabia. *Journal of International Education Research*, 10(2).

Anderson, R.E. & Dexter, S. (2005). School technology leadership: An empirical investigation of prevalence and effect. *Educational Administration Quarterly*, 41(1), 49-82.

Arum, R. & Stevens, M.L. (2020). What Is a College Education in the Time of Corona virus? *The New York Times*. March 18. https://www.nytimes.com/2020/03/18/opinion/college-educationcoronavirus.html

Banoglu, K. (2011). School principals' technology leadership competency and technology coordinatorship. *Educational Sciences: Theory & Practice,* 11(1), 208-213. https://www.academia.edu/99481572

Berrett, B., Murphy, J., & Sullivan, J. (2012). Administrator insights and reflections: Technology integration in schools. The Qualitative Report, 17(1), 200-221. http://www.nova.edu/ssss/QR/QR17-1/berrett.pdf

Beytekin, O.F. (2014). High school administrators' perceptions of their technology leadership preparedness. *Educational Research Review*, 9 (14), 441-446.

Brockmeier, L., Sermon, J., & Hope, W. (2005). Principals' relationship with computer technology. *NASSP Bulletin*, 89(643), 45-63.

Chang, I. (2011). The effect of principals' technological leadership on teachers' technological literacy and teaching effectiveness in Taiwanese elementary schools. *Educational Technology & Society*, 11(4), 229-245

Chang, I.H. (2012). The Effect of Principals' Technological Leadership on Teachers' Technological Literacy and Teaching Effectiveness in Taiwanese Elementary Schools. *Educational Technology & Society*, 15(2), 328-340.

Coklar, A. & Odabasi, H. (2009). Educational Technology Standards Scale (ETSS): A Study of Reliability and Validity for Turkish Preservice Teachers. Journal of Computing in Teacher Education. *International Society for Technology in Education (ISTE)*, 25(4).

Creswell, A. (2012) Descriptive and correlational research design. https://www.google.com73

Cuban, L., Kirkpatrick, H., & Peck, C. (2001) High access and low use of technologies in high school classrooms: explaining an apparent paradox. *American Educational Research Journal,* 38(4), 813-834. doi:10.3102/00028312038004813

Daniels, D.M. (2009). Leadership, learning and school change: the elementary principal's role in teacher professional development. *ProQuest LLC, Ph.D. Dissertation, Capella University*. 172.

Domeny, J. (2017). The Relationship Between Digital Leadership and Digital Implementation in Elementary Schools. ProQuest LLC. *https://www.proquest.com/openview/2f85a858f95a8a556397f0efd146710a/1?pqorigsite=gscholar&cbl=18750*

Eren, S. & Kurt, A. (2011). Technological leadership behavior of elementary school principals in the process of supply and use of educational technologies. Spring, 131(3), 625-636.

Ertmer, P.A. & Leftwich A. (2010). Teacher technology change: how knowledge, confidence, beliefs and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255-284.

Esplin, N., Stewart C., & Thurston T. (2018). Technology leadership perceptions of Utah elementary school principals. *Journal of Research on Technology in Education,* 50(4), 305-317, DOI: 10.1080/15391523.2018.1487351

Frey B. (2018). The SAGE Encyclopedia of Educational Research, Measurement, and Evaluation. http://dx.doi.org/10.4135/9781506326139.n671

Hamzah, M., Juraime F., Hamid A., Nordin N., &Attan, N. (2014). Technology leadership and its relationship with school—Malaysia standard education quality (School-MSEQ). *International Studies*, 7(13), 2014. https://doi: 10-5539/ies.v7n13p278

Hechinger, J. & Lorin, J. (2020). Coronavirus Forces $600 Billion Higher Education Industry Online. *Bloomberg Businessweek*, March 19. https://www.bloomberg.com/news/articles/2020-03-19/colleges-are-going-online-because-of-the-coronavirus

Hero, J. (2020). Exploring the Principal's Technology Leadership: Its Influence on Teachers' Technological Proficiency. *International Journal of Academic Pedagogical Research*, 4(6), 4-10.

Koc, M. & Bakir, N. (2010). A needs assessment survey to investigate pre-service teachers' knowledge, experiences and perceptions about preparation to using educational technologies. *Turkish Online Journal of Educational Technology - TOJET*, 9(1), 13-22.

Omwenga, E., Nyabero, C. & Okioma, L. (2015). Assessing the influence of the PTTC Principal's competency in ICT on the teachers' integration of ICT in teaching Science in PTTCs in Nyanza Region, Kenya. *Journal of Education and Practice* www.iiste.org. ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol.6, No.35.

Raman, A. & Shariff S. (2017). Relationship between technology leadership, ICT facility, competency, commitments and teachers practices on implementations with effective teacher's management tasks in schools. *Social Science Review,* 3(2), 48-55.

Raman, A., Thannimalai, R., & Ismail, S.N. (2019). Principals' Technology Leadership and its Effect on Teachers' Technology Integration in 21st Century Classrooms. *International Journal of Instruction*, 12(4), 423-442. https://doi.org/10.29333/iji.2019.12428a

Raob, I., Al-Oshaibat, H., and Ong, S. L. (2012). A Factor Analysis of Teacher Competency in Technology. *New Horizon in Education*. 60(1).

Roblyer, M. D. & Doering, A.H. (2014). Integrating educational technology into teaching [Sixth Edition]

Sincar, M. (2012). Challenges school principals facing in the context of technology leadership. *Educational Sciences: Theory & Practice,* 13(2), 1273-1284

Thannimalai R. & Raman A. (2018). Principals technology leadership and teachers' technology integration in the 21st century classroom. *International Journal of Civil Engineering and Technology (IJCIET),* 9(2), 177-187

Thannimalai, R. & Raman A. (2018). The influence of principals' technology leadership and professional development on teachers' technology integration in secondary schools. *Malaysian Journal of Learning and Instruction,* 15(1), 201-226