

Teacher Technological Leadership: Realising Potentials and Practices

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Abstract—Teacher technological leadership expands upon leadership with the use of technology for education with focus on 21st century education needs. This study aims to observe the awareness, potential and practices of technological leadership of a teacher. The study focusses on the leadership standard set in ISTE Standards for Educators (International Society for Technology in Education, 2017). Through a qualitative case study conducted through an interview and observation on an ICT teacher, it was found that although the concept of teacher technological leadership is unfamiliar, but the practices of technological leadership is apparent. The teachers' technological leadership is greatly enhanced by the support of the school culture that encourages technology use. The teachers' self-leadership suited to the qualities in the ISTE standards for technological leadership. The teachers' technological leadership promotes innovative practices in teaching and learning in the school. This study contributes to the importance of acknowledging teacher technological leadership and gives insight to the vital elements that develop teacher technological leadership for school administrators, teachers and education agencies that support innovative teacher development.

Keywords—teacher technological leadership; potentials; practices

I. INTRODUCTION

As the world enters the Industrial Revolution 4.0 phase, it impacts not only the global economy in terms of how industries progress, but also the resources that support them. Human resource is the vital element that ensures the success of an industrial revolution. As education provides the future human resource to fulfill the needs of an economy, it has continually changed its' dynamics as can be seen through 21st century education practices, that inculcates the need for pupil-based learning through collaboration, communication, critical thinking, creativity, along with the application of values and ethics [1]. Align with this, the use of technology in education has further progressed to mirror the realistic needs of the society as technological integration is a step in education innovation [2].

However, the success of education does not rely on technology alone. The key elements to a 21st century education is the teacher and technology [3], moreover the concept of Teacher 4.0 refers to teachers who are able to adapt new technology efficiently to their teaching [4]. Thus to fulfill the needs of 21st century education, teachers need to not only have

technological knowledge but exert leadership. Teacher leadership is able to impact the effectiveness of learning by 68.9 percent [5] and effective technological integration in teaching and learning can encourage pupils' creativity [6].

II. LITERATURE REVIEW

The International Society for Technology in Education (ISTE) Standards for Educators [7] noted that one of the seven roles of a 21st century teacher is as a leader who is able to support pupil learning empowerment and improve teaching and learning. This includes leadership characteristics including: (1) actively shaping, advancing and accelerating a shared vision of empowering learning with technology together with stakeholders; (2) advocating equity in access to technology for pupils' diverse needs; and, (3) becoming a model in identifying, experimenting, evaluating, curating and adopting new digital resources and tools for learning among colleagues.

The policies and plans in Malaysian education are supportive of the need for teacher technological leadership. The National Transformation 2050 strategy, envisions an economically sound nation with a high quality technologically-enhanced education and the Malaysian Education Blueprint 2013-2025 emphasizes the importance of the impact of teacher leadership on pupil learning [8]. This is further supported by policies and strategies such as the Science & Technology Human Resource Roadmap Plan 2020, Smart School Strategic Plan 2016-2020, and School Transformation Plan 2016. All of which focuses on the transformation of education suited to 21st century needs with the vision to improve Malaysian education in the global economy, increase employability to more than 80% and to ensure that Malaysians receive access to high education opportunities to realize their potential [9].

Currently, focus is given on the use of Information and Communication Technology (ICT) through virtual learning environment, higher order thinking skills, focus on Science, Technology, Engineering and Mathematics (STEM) education; as well as emphasis on teachers' responsibilities to provide creative and innovative teaching and learning techniques with a focus on building a culture of professional learning community [8].

Thus, teacher technological leadership is relevant to the cause in providing a 21st century education. Unfortunately, teacher technological leadership is still a rare concept in

Malaysia. This is not surprising considering the scarcity of researches on teacher leadership and its' links to technology specifically. As of yet, there is no specific module or instrument to gauge Malaysian teacher leadership or in-depth ICT integration for education much less a focus on teacher technological leadership.

At best is the Smart School Qualification Standards instrument [10] which is used to gauge ICT from four aspects: (1) human resource to gauge administrative, teacher and pupil ICT competency, (2) ICT integration in teaching and learning, (3) application use in the school system, and (4) ICT infrastructure availability in the school. This instrument however looks more to the surface level of technology use in the school with particular attention on pupil ICT abilities but not on the teachers' technological leadership. Currently a study has suggested a Malaysian standard for technology in education that could be used to enhance teaching and learning with technology [11] which may be more in-depth and include teacher roles in technology linking to leadership.

Research on teacher leadership in Malaysia found that teacher leadership impacts positively on pupils' achievement and a high level of teaching skills is a key element to its' success [12]. However, it has been found that the concept of teacher leadership itself is still unfamiliar [13], and rooted in the believe that it must be a formal leadership role for teachers [14] thus affecting its' practice [15] among teachers who are not in the formal leadership position.

In addition, studies show that ICT or technology abilities and integration for teaching and learning among Malaysian teachers is still low. It has been found that 50 percent of Malaysian teachers has low technological integration proficiency and only 12 percent is shown to be able to integrate technology effectively in teaching and learning [16].

Furthermore, despite efforts from governing bodies to encourage ICT use, such as through a TIMSS series of workshop for higher order thinking skills and ICT integration, only 66 percent of Malaysian teachers who were offered, attended the program [17]. This implied a lack of support from teachers which might relate to the lack of awareness on the importance of such programs. These researches support the idea that there is still a need for further studies to see how teacher leadership and their use of technology for education is happening in schools and whether there is even evidence of teacher technological leadership practices implemented.

As there is no Malaysian standard or instrument tailored to teacher technological leadership, this study uses the ISTE Standards for Educators [7], specifically the leadership characteristics and technological practices as guideline. Through a case study conducted through an in-depth interview and supported by observation, the study aims to portray the reality of teacher technological leadership from the perspective of a teacher, in its' raw and true form, help raise awareness on its' importance and suggest ways to develop it formally or informally for the benefit of teacher professionalism and pupil outcome.

III. RESEARCH METHODOLOGY

A. *Research Design*

As a fresh and nearly uncharted territory, the study aims to delve into the perspectives on teacher technological leadership through the means of a qualitative research which is suitable due to its inquiry nature [18]. A qualitative method is also most suited as this study is on a topic that yet to be explored. Through qualitative inquiry, the reality of the issues concerning the subject studied can be explored [19]. Furthermore, a qualitative study is flexible and the varied methods of collecting data using understanding, experience and different views can be used to build a collective understanding of the issue [20]. The case study was conducted in a Secondary High Performing School in the state of Selangor using the instrument of face to face interview and observation. The procedure undertaken is according to the Malaysian education rules and regulations on conducting research. Permission was obtained from the Malaysian Education Planning and Research Division, the Selangor State Education Department and the school before the study was conducted.

B. *Research Sampling*

Population in this study refers to teachers with ICT background teaching in Secondary High Performing Schools in Selangor. Purposive sampling is used to fulfill the study criteria [21]. This sampling is suitable for this study, as it allows the researcher to study a respondent who is directly involved to the subject studied and rich in information [22]. The respondent was chosen based on (1) experience: a permanent teaching staff with more than three-years of experience in teaching, has attended leadership or technology-based courses; (2) academic: is using or has used ICT in teaching and learning; and (3) agrees by choice to participate as a respondent in the study.

C. *Research Instrumentation*

The instrument used in the study is an interview protocol and an observation sheet. The interview protocol is suitable as the researcher is able to spontaneously add on, amend or disregard questions according to the progress of the interview in a natural way [23] and a face to face interview also gives room for sensitive questions to be asked [22]. The interview protocol includes three phases which are the opening questions, main questions and closing questions.

The opening questions were designed to explain the purpose, methodology, ethical regards and agreement on participation in the study. It is also used to build on the respondents' background and have an idea of the respondents' teaching responsibilities.

The main questions concerned the questions on the study mainly on practices and awareness of teacher technological leadership, teachers' experiences in using ICT in teaching and learning, and perspectives on teacher technological leadership. A checklist of ISTE [7] technological leadership characteristics is used with the questions to allow clearer perception of practices that are done by the teacher which relates to the technological leadership standard.

The closing questions was used to get further opinions on teacher technological leadership as well as to clarify any

misconceptions or misunderstandings regarding the study. The interview closes with gratitude to the teachers' participation and honest feedback.

The second instrument used is an observation sheet as it allows the researcher to view the situation as a whole [24], and see the complexity of the subject and environment in its' own context thus systematically develop meaning through interpretation of what is seen using experience, knowledge and expertise [25].

The observation is made on two main aspects which are the subject and the school environment. The subject is observed from the physical appearance, countenance and non-verbal communication. The school environment is observed from the physical and social aspects. The physical aspects are seen from the notice boards, special rooms, and ICT equipment around the school while the social aspects is seen from how technology such as social media is used by the school.

The interview protocol and observation are complimentary to each other as the observation can support the interview findings through elements that can be seen directly and indirectly. Data collected is analyzed thematically. Data is analyzed systematically using (1) data preparation through transcription and organization, (2) familiarization, (3) coding and thematic analysis, and (4) interpretation and reflection [25].

IV. RESEARCH FINDINGS AND DISCUSSION

The study looks at two main objectives which are: (1) awareness of teacher technological leadership, and (2) practices of teacher technological leadership. The respondent of this study is a teacher who has taught for ten years in the same school and is appointed formally as the Smart coordinator of the school. The teacher is thus in charge of all ICT-related tasks in the school including management, inventory, and maintenance. The teacher is an experienced Information Communication Technology Literacy subject teacher and now teaches the new subject Computer Science Foundation for forms 2 and 3 in the school.

A. Awareness of Teacher Technological Leadership

The respondent of the study was asked on teacher technological leadership as a specific concept. The respondent professes unfamiliarity with the concept of teacher technological leadership specifically, but believes that it is when

“guru tersebut menggunakan TMK dalam PdpC merekalah...dimana TMK itu dapat membantu menghasilkan PdpC yang lebih berkesan...merangsang minat pelajarlah...juga...menarik minat pelajarlah untuk menerokai ilmu pengetahuan...dengan...luaslah”

“teachers use ICT in their teaching and learning...whereby ICT contributes to a more effective teaching and learning...to inspire pupil's mind...and... attract pupils' interest to discover knowledge...widely”.

Next, when asked about ISTE, the respondent is unaware of it and thus is given explanation on what ISTE is and the

standards relating teacher technological leadership that can be seen in it. The respondent states that

“untuk subjek saya sendirilah memang saya...menggunakan teknologi dalam PdpC memandangkan silibus dan sukatan pelajaran yang memerlukan pelajar untuk akses laman...pelajar itu sendiri didedahkan dengan...bahasa-bahasa pengaturcaraan...jadi kelebihan pada merekalah untuk seawal...umur 13 tahun dah guna bahasa pengaturcaraan”

“for my own subject I definitely...use technology for teaching and learning since the syllabus and curriculum specification requires pupils to access websites...pupils themselves are exposed to...programming languages...so it is advantageous for them as early as... 13 years old they are using programming language”.

The responses show that the respondent is unfamiliar to the concept of teacher technological leadership specifically but is able to give an idea of what it might relate to from the teachers' own experience. The teachers' response also shows that the teacher sees that learning with technology is advantageous for pupils at a young age, especially when they are learning advanced knowledge such as programming language.

The teacher is unaware however of the ISTE standards which means that although ISTE is a globally recognized standard used by educators for reference in teaching with technology, it does not necessarily mean it is known by teachers who are teaching with technology despite the availability of access to the material through the internet.

B. Practices of Teacher Technological Leadership

The respondent is then given a checklist of criterion relating to teacher technological leadership taken from the ISTE Standards for Educators as listed under the leader standard. The criterion is broken into four parts: (1) technological knowledge, (2) use of ICT tools, resources, and equipment, (3) professional development, and (4) decision-making role.

The respondent has chosen from the scale of 1 to 5, an average of five or 100 percent for all five statements regarding technology use. The respondent professes to be knowledgeable and skillful in (1) identifying ICT tools, resources and equipment for teaching and learning, (2) choosing technology suited to teaching and learning, (3) creating own technological resources for teaching and learning, (4) recognizing pupils' technological skill, and (5) matching technology to pupils' level of technological competence. The respondent showcased confidence in the technological knowledge for education in the school by citing examples of technology used in the classroom such as the Protector software, IPAD and VLE Frog. In view of creating technology, the respondent explains since the subject taught is relatively new, there is not enough materials available as is therefore,

“saya perlu buat sendirilah terlebih dahulu”

“I have to prepare them first own my own”

To suit the level of the pupils. As the teacher prepares own materials, resources and technological tools for teaching and learning, the practice allows the teacher to experiment and

reflect upon the practice and consistently improve on teaching and student learning [26].

The respondent has also chosen an average of five or 100 percent for statements on usage on ICT tools, resources and equipment. The respondent thus agrees that (1) ICT is used in the classroom for teaching and learning for every class, (2) ICT materials prepared outside the classroom is used in the class, and (3) ICT tools, resources and equipment are chosen specifically to suit the classroom needs. This response is also supported by the facilities in the school that can be easily seen. Every classroom is equipped with an LCD projector including special subject rooms such as science labs, there are laptops for teachers to use, ample tablets for students that can be loaned, computer labs and there is strong Wi-Fi presence to allow for connectivity to web materials or virtual learning to be done during school hours. Teachers can request to loan tablets, laptops through online loaning system and book computer labs or special subject rooms through an online booking system as well. This clearly illustrates the government effort at providing infrastructure, facilities and tools to support technology in schools through provision of high-speed internet connectivity, and computers [27].

For the professional development aspect, the respondent also averaged at five or 100 percent for the five statements given. The respondent has (1) attended technological courses relating to teaching conducted by the school, district of education, state education department and other relevant agencies, (2) attended self-chosen self-financed technological courses, (3) gathered technological information through self-endeavors such as through the internet or books, (4) shared and transferred technological knowledge to other teachers and pupils, and (5) shared and transferred technological knowledge to the stakeholders including parents and communities.

The respondent is very active in sharing knowledge on technology and shares it through Telegram and WhatsApp applications which consists of teachers teaching Computer Science Foundation in Malaysia. The respondent is also one of the district coach for technology and is involved in district activities to mentor teachers from schools around the district. This sharing culture can improve teachers' quality as the spreading of best practices increases teachers' expertise [28].

The culture of technology can be observed in the school. This is evident from observation on the school grounds as the school has a special area where pupils can make use of computers during their free time in an open area, with access to the internet. ICT-related workshops are done yearly either conducted by the teachers, outside agencies or special invitations. The workshops done annually include for Frog Virtual Learning Environment which is an online platform for learning used by teachers and pupils, and is accessible to parents. The VLE Frog platform is the government initiative that aims to provide systematic and innovative learning experience that pupils, teachers and parents can access [17] in and out of the school.

Community involvement particularly for parents are also evident. Parents are given a short workshop on how Frog VLE is used for teaching and learning, and parents can monitor their children's progress as well. Teachers also conduct workshops

for each other under professional learning community activities. The school is also known for partaking and winning in ICT related competitions nationwide as well as internationally such as Hour of Code that makes use of programming skills. The schools' success is showcased all over the school on walls and notice boards as well as special galleries that celebrate achievements. The schools' successes underline the leadership of the school as there are proper conditions, opportunities and experiences for development and mutual learning [28] for the teachers in the school.

Finally, the aspect of decision-making role in the school. The respondent has also averaged five or 100 percent for all six statements. The respondent answered in the capacity of the school Smart ICT coordinator, a role which is formally designated by the school. The respondent agrees that full participation in the decision-making process including giving opinion, choosing, managing and executing tasks. Teachers' active role in making decisions in the school showcases, to an extent, leadership qualities as they share the power to decide what goes on in the organization [29].

The respondent therefore is fully involved in (1) fulfilling the schools' mission and vision, (2) making decisions on choosing and purchasing ICT tools, resources and equipment for pupils, and (3) teachers, (4) managing ICT tools, resources and equipment including schools' social networking sites and data, (5) making decisions on ICT programs for teacher development in the school, and (6) executing ICT-related programs for teachers and the community.

The respondent believes that in the role as a Smart coordinator, the teachers' voice is heard and opinion is asked before decisions are made on choosing and purchasing ICT tool, resources and equipment as the teacher is the person-in-charge of maintaining it. This shows that there is a respect for the opinion of the teacher in the role of a Smart coordinator in the school and there is also trust in the teachers' judgement. Teachers' participation in decision making to fulfill the schools' mission and vision allow them to contribute to the schools' effectiveness and improvement [28].

V. CONCLUSION

Teacher technological leadership is a term that should be made publicly aware. In 21st century education, teachers in Malaysia particularly are expected to integrate technology and exercise their leadership especially concerning teaching and learning. The study has found that in the context of the respondent, teacher technological leadership according to the ISTE standard is practiced even if it is not formally recognized. This implies that given the environment where there is a culture of technological use and teacher leadership is encouraged, teachers are able to practice technological leadership for the benefit of their students.

The role of the school administration is definitely impactful. Although the respondent is in a designated role, but the culture described of the practices of using technology in the classroom for almost all subjects in the schools, the ICT workshops conducted for all teachers, the availability of facilities such as laptops, IPAD and LCD projectors encourages teachers to make use of the technology. The

respondent also mentions that decision making involves teachers and not just the administration, this implies that the teachers' voice is to an extent valued and teachers' need taken into account.

The principal in particular also makes the effort of putting the teachers forward by encouraging teachers to mentor other teachers through professional learning communities not only in the school but also outside such as becoming a district coach. The principal also plays the part in finding financial resources to support the school endeavors including for workshops and competitions. Furthermore, the principal's own technological capabilities and interest empowers the teachers to improve on theirs.

Clearly, there is still room for further study to be done especially involving more teachers as this respondent may be a beneficiary of a particularly well-equipped school with excellent technological culture. But what about schools that lack resources and are not supported in technology use? At present, there is no clear indication of whether technology use impacts pupils' learning academically compared to before technology is used extensively as technology is for many pupils in this day and age, a norm. It would be interesting to see if in any marked changes can be seen if technology is introduced in a setting where teaching and learning is still done conventionally.

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