Teachers' Successful Information and Communication Technology Integration in Primary School:
A Malaysian Cultural-Historical Case Study

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ABSTRACT

Despite extensive research on ICT integration among teachers, limited knowledge was given to understand ICT's successful integration among teachers. For those purposes, a single-case study aimed to explain the successful integration of ICT by teachers into teaching in one national primary school in Malaysia. Data were collected using a multi-method of data collection, including in-depth interviews, non-participants observations, and document analysis. The results discovered three models that led to teachers' successful ICT integration in teaching, explaining how the interactions between the contradictions, causes of contradictions, and resolutions of contradictions have hindered or influenced the teachers to integrate ICT in their teaching. The findings indicate that the activity system of department and school (prior activities) affecting the classroom activity system (recent activity) led to the successful integration of ICT by teachers in teaching.

KEYWORDS

Activity Settings, Case Study, Contradictions, Cultural-Historical Activity Theory Approach, Teachers' Successful ICT Integration

INTRODUCTION

The rise of information and communication technology (ICT) integration in education indicates the emergence of a knowledge society to improve human conditions as education is a channel for change. According to the United Nations Educational Scientific and Cultural Organization (UNESCO) (2003), ICT is considered an essential tool for creating a knowledge society by preparing students for the future workplace. A knowledge society is defined as how institutions and citizens organize the acquisition, assurance, utilization, and distribution of knowledge through knowledge-based systems (Meier, 2012). The citizens in the knowledge society require new jobs and new skills to compete globally (Commission of the European Communities [CEC], 1998; Kivunja, 2014). According to the CEC (1998) and Kivunja (2014), the new skills are interaction with technology as the lack of

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such talents will reduce an organization's effectiveness in achieving its goal. Thus, ICT integration is a step towards creating a knowledge society to improve their lives, in parallel with the emerging technology, particularly through interventions in educational systems.

The study aimed to explain the successful integration of ICT by teachers into teaching in one national primary school in Malaysian successful ICT integration school. The government constructed this school as a national school in 2000. The school was established to serve as a Smart School Model. The school motto of being "the quest for success," all the communities then worked towards realizing the implementation of a smart school as the country's showcase. During the investigation period, the school equipped with 30 classes, and every classroom had a maximum of 35 students. The school has 1058 students, approximately 82% were Malay, from preschool to standard six. The headmaster operates the school along with seventy-three teachers, four ICT teachers, and ten support staff. CHAT by Engestrom (1987) employed to answers the two research questions: 1) how did the contradictions, causes of contradictions, and resolutions of contradictions within the activity systems hinder or influence the teachers to the success of ICT integration in their teaching?; and 2) how did the contradictions, causes of contradictions and resolutions of contradictions across the activity systems hinder or influence the teachers to the success of ICT integration in their teaching?. A single-case study was adopted to explain how the selected school teachers have integrated ICT in teaching at one successful ICT integration primary school in Malaysia.

BACKGROUND

ICT integration in teaching in Malaysia manifests through the implementation of the 21st-century learning program, also known in Malaysia as *Pembelajaran Abad Ke*-21 (PAK21) (MOE, 2013). The PAK21 emphasis on student-centered learning is based on four skills: communication, collaborative, critical thinking, and creativity. These skills can be achieved with the help of ICT to support teachers in their teaching. MOE has launched the pilot of the PAK21 program in 2014. In 2015, the successful PAK21 scaled-up nationwide. For implementing the PAK21, the first effort by Malaysia's ETD is providing the material for EduWebTV in 2008. To date, there are 865 programs TV has produced for teaching purposes, consisting of 440 for secondary school and 425 for primary school. The producers for education programs are about 50, comprising 20 from MOE; 15 from Astro Tutor Channel; and 15 from other freelance production houses, namely World Summit on Media for Children Foundation. The learning management system (LMS) was also introduced to schools in 2008, a web-based application to support teachers' teaching. In 2013, there are 120 schools ware used digitized material in LMS for integrating into teaching.

Available literature in the context of primary school in Malaysia emphasizes that ICT integration can support teachers' teaching, leading to meaningful learning, including challenges. For example, a quantitative study on the perception of students and teachers toward the Virtual Learning Environment Frog (VLE-Frog) and Learning Management System (LMS) in three types of public primary school, namely national schools, national-type Chinese school, and national-type Tamil school, revealed that the use of digital materials by teachers enhance the students' interest. The students also understand the topic that teachers taught in a classroom (Malaysia's ETD, 2017). This study also revealed that teachers perceived EduwebTV content is in demand and positively impacts student learning. This study further emphasizes the students need a guide on the upload and download procedure and improve user-friendly aspects for the quality of VLE-Frog. Another study in Kuala Lumpur's primary schools revealed that teachers' challenges in using EduwebTV are less EduwebTV browsing, less PlayList, lack of skills for video clips downloading, and editing, and unfamiliar with all EduwebTV functions (Keling, Madar, & Salam, 2013). For LMS impact, Malaysia's ETD study revealed that the LMS is still suitable to use in the classroom. However, the interface's content and visual arrangement, and the quality of the image resolution need improvement. The challenges that teachers faced are assessment

and lack of skills in using LMS. The Internet connection also interrupts teachers from using LMS in teaching (Malaysia's [ETD], 2017; Razak, Jalil, & Ismail, 2019).

Malaysia's ETD also investigates the students' satisfaction with learning through the use of an interactive whiteboard (IWB) in the teaching of Bahasa Malaysia. A qualitative methodology was employed to understand the perception of 15 students and two teachers toward IWB in a Malaysian national-type Tamil school. This study indicated that the integration of IWB in teaching brings active learning among students in a classroom. The study also revealed that the students' attracted to the use of IWB in the classroom as this technology is equipped with multimedia elements such as text, images, audio, and animation (Malaysia's ETD, 2017). The use of IWB also facilitates teachers in preparing the teaching materials and helps them convey the lesson content or concepts effectively and attractively. Radzak and Noh (2017) reveal that IWB can retain students' focus throughout the teaching and help teachers manage the classroom.

Problems

Based on the impact of ICT integration in teaching, as discussed in the introduction and background sections, it brings to the global issue that focused on the investment of ICT integration in schools. Although high investment issue debated internationally (Lim, Zhao, Tondeur, Chai, & Tsai, 2013; Tay, Lim, & Lim, 2015), this study's context focuses on Malaysia's national primary school as this country has one of the highest ICT integration investments among the schools in Asia-pacific countries (Ministry of Education [MOE], 2013, 2018). In fact, the investment does not guarantee that teachers would integrate ICT into their teaching process. For example, a UNESCO report, the integration of ICT by teachers in schools in Malaysia, has not progressed much further than using the word-processing application as a teaching tool (Educational Technology Division of Malaysia [ETD], 2017; MOE, 2013, 2018). Recent studies in Malaysia also confirmed minimal ICT integration in schools (Radzak & Noh, 2017; Salleh, 2014; Umar & Hassan, 2015).

Previous studies show that an organizational change does not always bring the school's success if the school's community fails to understand the root causes of the problems and resolve the issues for achieving the school's objective (Tay & Lim, 2016; Yamagata-Lynch, 2010). In November 2018, Malaysia's Educational Technology Division (ETD) had endorsed a list of schools with different levels of ICT integration, ranging from 1-star (lowest) to 5-star (highest) to portray the implementation of ICT integration in each school based on the Smart School Qualification Standards (SSQS). Adopting the cultural-historical activity theory (CHAT) perspectives, missing from the Malaysian education system, understand the contradictions notion to explain the root causes of the problems that hinder teachers' ICT integration. This study also uses contradictions notion to explain how the school community' resolved the issues which can lead to successful ICT integration in a school. Therefore, there is a need to understand why some teachers are more successful than others in integrating ICT in teaching in Malaysia as limited knowledge was given to understand the successful ICT integration school. The findings could offer an answer to the minimal teachers' ICT integration in teaching.

THEORETICAL FRAMEWORK: CULTURAL-HISTORICAL ACTIVITY THEORY (CHAT)

This study was employed CHAT to understand the cultural diversity in one Malaysian national primary school. For explaining cultural diversity issues, Engestrom (2001, pp. 135-136: see also 2015) emphasized CHAT can use as an application of activity systems analysis (ASA), involving the conceptual tools for understanding the dialogue, multiple viewpoints, and networks of interacting activity systems in the investigation. Engeström and Kerosuo (2007) and Daniels (2007) urge the unit of analysis in CHAT is two or more interconnected activity systems, as in Figure 1. According to Yamagata-Lynch (2010, pp. 1-2), CHAT has helped researchers analyze the historical relations among multiple activities by identifying how the results from a prior activity affect recent activities.

For those purposes, this study used CHAT to understand contradictions, object-oriented activities, and historical development within and across components of the collective activity systems that facilitate teachers successful' integration of ICT in teaching.

Figure 1. Two interacting activity systems as a minimal model (Engestrom, 2001, p. 136)
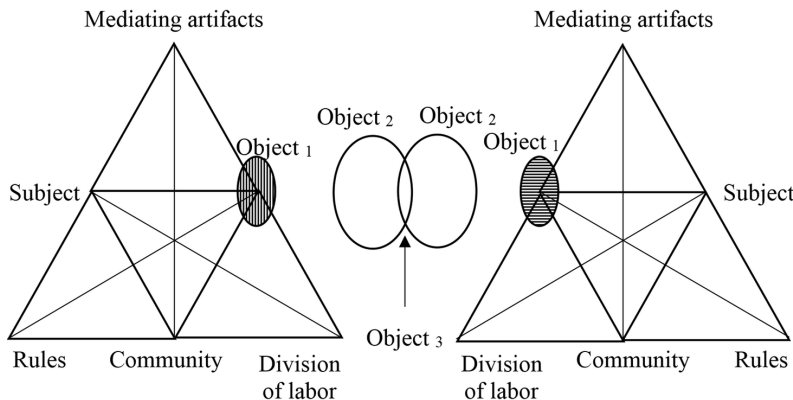
Activity System

This study was conceptualized the activity system as a framework to analyze and explain the relationships within and across components of the collective activity systems that bring to the teachers' successful ICT integration in teaching. Table 1 indicates six components of activity systems in this study.

Table 1. Description of the components of an activity system

Component	Description
Subject	The teachers are conducting ICT integration in their teaching or the teachers in a school participating in the ICT integration activities.
Tool	The technical tools are Internet connection, hardware, and software, whereby teachers use ICT integration activities in school. The psychological tools refer to teachers' perceptions of ICT integration activities such as the school's vision, frequent ICT training, and peer sharing.
Object	The objective or tension to achieve or resolve that motivated the teachers and the school's communities to participate in the ICT integration activities.
Rules	Anything either explicit or implicit, including norms, school's regulations, and policies, can constrain and facilitate actions and interactions within the activity system.
Community	The school community, such as teachers, ICT teachers, and the headmaster, shares a common object in a similar place and time.
Division of labor	The shared tasks (e.g., among teachers) and the status relations among a school community with variations in power and status participated in the activities, such as among teachers and heads of unit.

Using CHAT to Study the Teachers' Successful ICT Integration in Teaching

In the past decade, researchers have used CHAT to explain teachers' ICT integration in teaching (Divaharan & Lim, 2010; Laferrire, Hamel, & Searson, 2013; Lim, 2007; Razak, Jalil, Krauss*, & Ahmad, 2018). For instance, a Singaporean secondary school study discovered the schools must act as learning organizations to successfully integrate ICT among teachers (Divaharan & Lim, 2010). Another study in rural schools in Canada examined obstacles to the successful implementation of technology and conceptualized them as "tensions that pulled constituents of an activity system or activity systems in opposite directions" (Laferrire et al., 2013, p. 463). They contended that the way toward conquering barriers while underlining CHAT's contradicting notion prompts successful ICT integration. Other studies uncovered the contradictions that happen in the activity systems help to comprehend the disturbances in the relationships in which the contradiction's principles might change the individual action leads to successful ICT integration in the schools (Demiraslan & Usluel, 2008; Murphy & Rodriguez-manzanares, 2008).

Contradictions

According to the prominent scholars of CHAT, contradictions comprise a prime concept in the CHAT and are the characteristics of activity systems, which struggle to resolve the pressures within and across activity systems, creating cycles of change where each process delivers new contradictions (Cole & Engestrom, 1993; Engestrom, 2001; Engestrom, 1993; Engestrom, 1987; Lim et al., 2011; Yamagata-lynch, 2003). Engestrom (2001) claimed that even though contradictions occur in activity systems to generate tensions, disturbances, and conflicts, the contradictions also serve as innovative attempts to change and develop activity in positive ways. Therefore, a 'contradiction' is considered as a significant aspect to explain how the interaction and changes within and across activity systems affect the subject's ability to resolve the tensions for accomplishing an object. In this sense, when the 'contradiction' takes a role as an obstacle, it makes it hard for the subject to achieve the object while the 'contradiction' takes a position as an enabler; it influences the subject to accomplish the object (Yamagata-Lynch, 2010). For those purposes, it is substantial to identify contradictions, causes of contradictions, and resolutions of contradictions and explain how activities in a particular context (prior activities) affect one activity (recent activity) lead to ICT integration among teachers.

By identifying the contradictions, causes of contradictions, and resolutions of contradictions related to ICT integration activities in collective activity systems, the researchers can discuss the changes in the classroom, department, and school activity systems to bring new pressures to the current activities of the subjects. For instance, teachers are not given guidance or exposed to the relevant ICT related pedagogical training (prior activity) to conduct their lesson would be demotivated to integrate ICT in teaching (recent activity). On the other hand, tensions occur within the classroom's activity system components as the school's activity system does not provide relevant ICT training for teachers (subjects) to integrate ICT in their teaching (object). To resolve this contradiction, the school must re-evaluate and redefine its activity system components to accomplish the object.

METHODOLOGY

According to Tharp and Gallimore (1988), an activity setting is a location and situation where school's communities have common objectives and are bound together by the actions and activities in which they participate. The bounded system of activity settings must be identified by researchers, which illustrate the relationship among participants and the social environment to keep away from overpowered by relevant data that might be irrelevant to ponder (Yamagata-Lynch, 2010). Activity settings can differ based on the objective of an individual, who is a primary participant in the particular activities amongst the group arrangement of the activity involved, such as whole group activity, small group activity, and individual activity (Fleer, 2014; Lippard, Choi, & Walter, 2019). The activity

settings also must at least two, for using CHAT as an analytic lens as Engestrom and Kerosuo (2007) assert that the CHAT involved at least two interrelated activity systems as a unit analysis (Solomon, Croft, Duah, & Lawson, 2014). Therefore, three activity settings applied to the three types of analysis units in three intertwined activity systems. The first activity system has incorporated the classroom as the unit of analysis of ICT-integrated teaching. This classroom activity system aims to limit the investigation on the ICT facilities and equipment in the classroom during a teacher integrating ICT for understanding and explaining the contradictions, causes of the contradictions and resolutions of the contradictions that impede or enhance students' access to knowledge. The second activity system has incorporated the department as the unit of analysis of the teachers' relationship with the subject coordinator, peers, and other participants who supported them. The third activity system has incorporated the school as the unit of analysis of the teachers' relationship with the principal, ICT coordinator, subject coordinators, and other teachers in the ICT and other subject departments. The school activity system focused on the role of the administrative staff, PTA, alumni, and local business owners who supported teachers in integrating ICT in teaching. The analysis of the activity system of department and school focus on the contradictions, causes of the contradictions and resolutions of the contradictions influencing the successful integration of ICT among teachers in their teaching. Thus, these three activity settings assisted the researchers in interpreting how the social environments hindered or influenced the success of teachers' ICT integration in teaching.

Case Selection

This study adopted a method of purposive sampling with criterion-based case selection to select the schools. The main selection criterion of sampled was that the schools achieved the highest level or 5-star ranking in ICT integration, as reported in SSQS. A 5-star school is a school recognized by the MOE as a school that has demonstrated successful ICT integration (MSC, 2009). The SSQS indicators are aligned with the international standards as Malaysia's MSC developed the SSQS based on a benchmark of performance indicators for ICT in education from other international organizations and countries, such as the Organization for Economic Co-operation and Development (OECD), UNESCO's Asia and Pacific Regional Bureau for Education, UNESCO's program in Africa, and Canada's Second Information Technology in Education Study (SITES), (MSC, 2009). Therefore, one national primary school with the pseudonym, namely School K, was selected based on Malaysia's SSQS that achieved the highest level of ICT integration or 5-star. Based on the list of Malaysia's ETD in 2018, this school is the only one awarded as 5-star in the study's selected location. The location was selected is an urban area in the federal territory of Peninsular Malaysia and it is selected with the notion that the technological aspects such as ICT facilities in the schools were provisioned completely by the government.

School K

Since 2001, the school was recognized as one of the best pilot project schools in technology integration by Malaysia's MOE. At the beginning of the establishment, the school's biggest challenge was having some teachers and members of the management team inept in information technology. Several teachers were first exposed to the smart school system before being appointed as media teachers in the school. The school then devised a short-term plan to provide awareness, knowledge, and skills of a smart school system for the teachers. Consequently, all the teachers were exposed to or at least aware of the need to realize a Malaysian Smart School. In 2003, almost all the school's community, including the teachers, students, and support staff, were exposed to information technology in their school's routine activities. Finally, this school was awarded the highest Star Ranking in technology integration, namely 5-star in 2007 onwards.

Participants Selection

To select the participants, the researchers divided the selection into two categories: (i) primary participants and (ii) secondary participants. The primary participants were teachers who are the main implementers of ICT-integrated teaching and, therefore, can claim a significant stake in the success of the process. The secondary participants consisted of the headmaster, ICT coordinator, head of units, and ICT teacher as these participants were the communities that could influence or hinder ICT-integrated teaching. The point of data saturation determined the number of participants. The study reached saturation when no new themes emerged from data collection analysis (Lincoln & Guba, 1985; Merriam & Tisdell, 2016). Therefore, the researchers have interviewed seven participants. Demographic information about the participants is given in Table 2.

Table 2. Demographic information about the participants

School Type	Pseudonym Name	Position	No. of years of experience	Specialization	Qualification
National Primary K	Mrs. Habsah	Headmaster	16	Geography	Master
K	Mr. Halim	ICT coordinator	15	IT	Degree
K	Mrs. Hanan	Head of the unit (Science)	20	Science	Degree
K	Mr. Abim	ICT teacher	21	Malay Language	Diploma
K	Mrs. Asmah	Science teacher	12	Science	Degree
K	Miss Ani	Malay Language teacher	2	History	Degree
K	Mr. Hassan	Math teacher	15	Math	Degree

METHODS OF DATA COLLECTION

Towards answering the research questions, the researchers used a multi-method data collection. The main data collection method was an in-depth interview as interviewing is "one of the most common and powerful methods in which we try to understand our fellow human beings" (Fontana & Frey, 2003, 62). The purpose of the interviews was to understand the process of ICT integration activities related to teachers' teaching from the school's community based on experiences and perceptions due to the different scope of job responsibility towards the phenomenon (Denzin, 1978; Moustakes, 1994). In conjunction with the CHAT perspective, the school's community incorporated in one of an activity system components, namely 'community' and have a status relation with 'division of labor'(Engeström, 1993; Yamagata-Lynch, 2010). Other methods used as a triangulation process was non-participant observations and document analysis known as the multi-method approach of data (Gillham 2000; Yin 2013). The triangulation process is key to enhance the trustworthiness to ensure the rigor and robustness of this study. The school and the Ethics Committee of the researchers' university-approved data collection.

The in-depth interview involves conversations with the headmaster, ICT coordinator, ICT teachers, head of the unit, and teachers to collect different viewpoints on the teachers' successful

ICT integration in teaching. The interviews were carried out after the observations for one particular subject in a class. These interviews were helped the researchers to probe the questions for clarifying the information when they found a new issue during observations. The interviews held in an area within the school suggested by participants, and a semi-structured interview protocol were used to guide the researchers in conducting the sessions. Each interview finished among 60 to 90 minutes. The participants have preferred the interviews conducted in the Malay language. This study adopted Brislin's (1970) back-translation technique to translate the data from Malay into English and English to Malay. The researchers had revised some of the questions after the initial interview sessions for ensuring enough depth and richness of data. The researchers immediately transcribed the interviews after the interview sessions. The research team members have kept confidential the name of the selected school and participants by employing pseudonyms.

During fieldwork, the researchers observed activities engaged in implementing ICT integration, such as classroom environment during teachers were conducting ICT-integrated teaching and special events related to ICT integration activities hosted at schools. The classroom observation was carried out before and after the interview sessions for one particular subject in a class, in which the researchers sit at the back of the classroom during the teachers' conducting ICT-integrated teaching. The researchers also observed for evidence of ICT facilities in the classroom, such as the Internet connection and software and courseware, and observed the students' activities during the teachers' conducting ICT-integrated teaching.

There were limitations in using the information gathered, as some documents of the school sources were confidential and disallowed from direct reporting. The researchers only reviewed documents that accessed via Malaysia's MOE official website, schools' official website, schools' shared video on YouTube, and the participants' shared documents. The researchers also reviewed other documents such as school handbooks, strategic plans, and information on school vision, mission, rules, and regulations that governed ICT integration in the schools. Other documents included ICT policies and ICT integration implementation strategies in the school. Participants also share documents. One of them gave the documents as he was received when he attended the ICT integration training at a national level organized by Malaysia's MOE. This document illustrated the breadth of ICT facilities provided by the Malaysian government to all schools in Malaysia. Two of the participants gave a few pictures they captured during ICT-integrated activities in their teaching. ICT teacher also shared the images of ICT training, a seminar with parents about VLE-Frog, and teachers' teamwork on shared information among peers and leaders. The final data collected are listed below, with the data and types of data collection in Table 3.

Table 3. List of data collected

No.	Data	Types of data collection
1.	Adequate ICT facilities in the classroom and outside the classroom, computer labs, and access center.	Interviews with all participants ii. Observations iii. Document analysis
2.	Utilization of web-based resources	Interviews with all participants ii. Observations iii. Document analysis
3.	ICT training to provide exposure to various teaching methods and strategies.	Interviews with the ICT coordinator and teachers ii. Observations
4.	Sharing ideas - peers and leaders	Interviews with the head of unit and teachers
5.	School's vision	Interviews with the teachers iii. Document analysis
6.	Encouraged teachers to become a leader	Interviews with the headmaster, ICT coordinator, head of the unit. and teachers ii. Observations
7.	Students can access the Internet provided by the school in an open area	Interviews with the headmasters and ICT coordinator Observations
8.	All the teachers are required to install the School Management System	Interviews with the headmasters, ICT coordinator, and teachers
9.	Advised teachers and parents to register for VLE-Frog	Interviews with the headmasters, ICT coordinator, ICT teachers, and teachers Document analysis
10.	Teachers were required to create and use their website	Interviews with the headmasters, ICT coordinator, and teachers
11.	IT savvy teachers' engage in peer-sharing	Interview with the teachers and ICT coordinator
12.	ICT coordinator should monitor the web-based system and be involved in the ICT planning at the school	Interviews with the headmasters and ICT coordinator
13.	Strong leadership	Interview with the teachers, head of the unit, and ICT coordinator
14.	Special events hosted at schools related to ICT integration activities.	Interviews with the headmasters and ICT coordinator Document Analysis

METHODS OF DATA ANALYSIS

A computer-assisted qualitative data analysis software (CAQDAS), namely ATLAS.ti version 7.5, was used to organize all the documents. All the documents in hard-copy were scanned and transformed into the soft-copy in the PDF format. The researchers gathered all the information sources, such as transcriptions derived from the participants' interviews, observations' field notes, and relevant documents for document analysis in a hermeneutic unit. The researchers noted the idea in a memo

Figure 2. Contradiction for teachers' successful ICT integration in teaching (subject-tools-object)
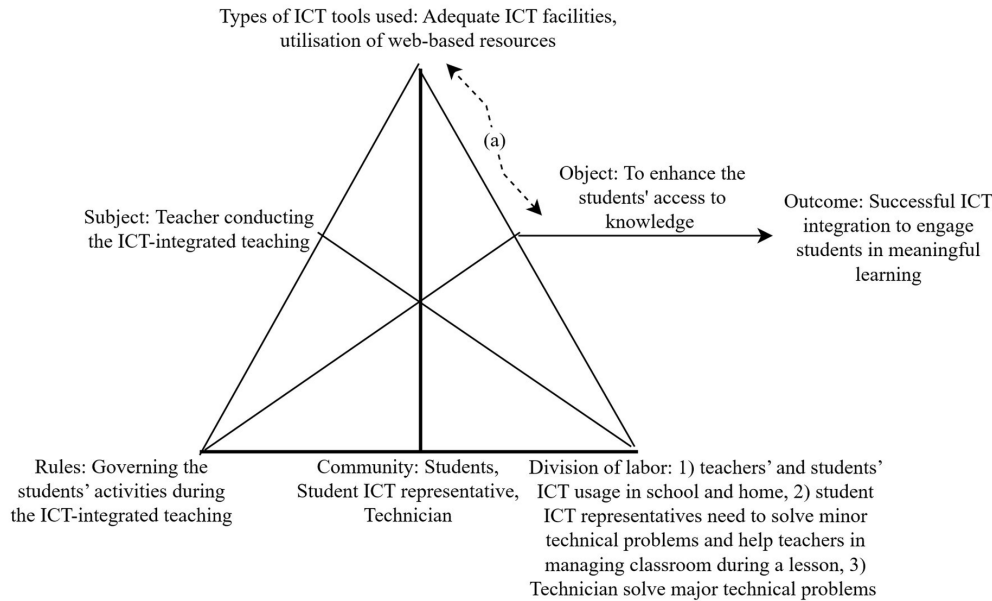
icon in a hermeneutic unit of ATLAS.ti or margin note on the paper to code the data if the researchers have any idea for coding at that time. The researchers continue the same process for the rest of the interviews' transcripts, observations' field notes, and relevant documents, compare the data segments for each component of different activity systems and the research questions, and code them.

To construct a narrative of this qualitative study, the researchers used CHAT as an analytic lens and applied the ASA approach to analyze activity systems. The researchers employed Mayring's (2014) qualitative content analysis to navigate data for explaining the interaction of the components of an activity system, which were constituted and resolved within and across the activity systems. The researchers incorporated the inductive category formation technique to respond to the research questions. This technique emphasizes "the level abstractions or theme of categories to be developed must be defined previously" (Mayring, 2014, p.80). For those purposes of the research question, the categories were contradictions, causes of contradictions, and resolutions of contradictions.

For identifying which categories the activity systems fell into, the researchers read and reread the texts and consider all the aspects of the data. If changes in the activity systems occur, the researchers recheck the texts and revise the activity systems until no new texts are obtained on the categories' definition. The researchers also carefully read the text line by line even if they do not relate to the category definition as it provides an essence of the ICT integration activities and discovers something that can be used to explain the interaction and relationship of the components that hinder or influence the teachers' ICT integration. The storyline developed to elicit the meanings of teachers' successful ICT integration in teaching. The narrative presented explains how the three intertwined activity systems' theoretical components influence the successful integration of ICT among teachers in teaching in a Malaysian national primary school.

FINDINGS

For answering two research questions, three models of activity system were developed to manifest the contradictions, causes of contradictions, and resolutions of contradictions within and across activity systems that influenced the successful integration of ICT among teachers in teaching. The three intertwined activity systems of School K—classroom, department, and school—are presented as follows:

Activity System of Classroom

Note: The arrow with '(a)' reflects that tension exists among tools and object

As illustrated in Figure 2, tension occurred among the tools and object (a) within the subject-tools-object triangle of the activity system. The teacher (subject) could not accomplish the object (enhance students' access to knowledge) due to inadequate ICT facilities and web-based resources in the school (prior activity), which were the results of budgetary constraints. The teachers demanded technology resources due to their salient role in executing ICT-integrated teaching. This tension would limit the capacity of the teachers in using the resources available in the school. Adequate ICT facilities and web-based resources would ensure that the teaching objective of the teachers can be accomplished. For instance, it was difficult to ensure that the students could gain access to knowledge without an Internet connection due to the lack of such facilities, which caused them difficulty searching for immediate information.

A Math teacher, Mr. Hassan, reflected on his experiences a few years ago when he brought his students to the computer lab once a week. Sometimes he failed to do so due to the computer lab was full. He added that "as time goes by, there is no issue to give the students access to the Internet as there are many places in the school that provide the computers and WIFI to students such as the access center and open area."

The solution that Mr. Hassan pointed out was the initiative of the school's community members (prior activity) to resolve the conflicts in ICT-integrated teaching (new activity). All the school's community members of the school activity system were involved in solving this matter. The ICT coordinator, particularly, assisted the teachers in finding technology developers who can deliver ICT facilities and resources within the budget. This view can be interpreted from the interview with the headmaster as she explained:

Our ICT coordinator, Mr. Halim, helped a lot. He found the supplier and worked with them to introduced new teaching methods and strategies to other teachers. He also planned and conducted ICT workshops with their team.

The headmaster also addressed how she managed the system despite the budgetary constraints with the alumni, PTA, and local business owners who collaborated with the school in several actions, including facilities rentals and services such as using the hall, generate revenue. In other words, resolving the tensions involved the interactions across the activity system of a classroom (recent activity) and the school's activity system (prior activity), which influenced the successful integration of ICT among teachers in teaching.

Activity System of Department

Note: The arrow with '(b)' reflects tension exists among rules and object

Figure 3. Contradiction for teachers' successful ICT integration in teaching (tools-rules-object)
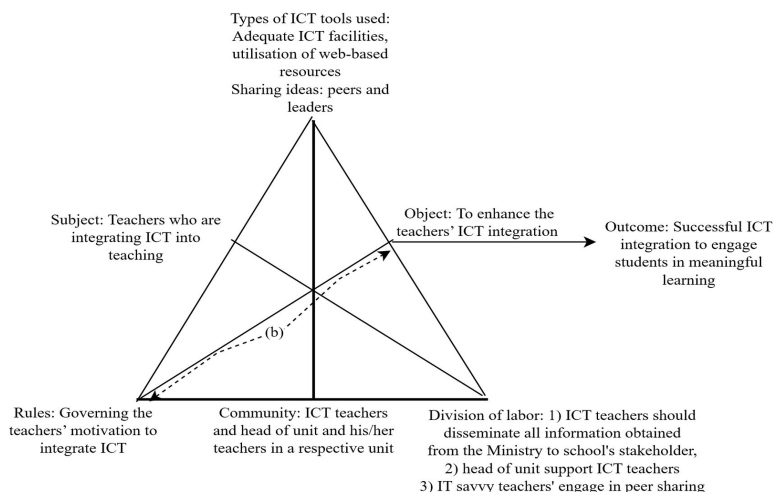
Tension occurred among the rules and object (b) within the tools-rules-object triangle (Figure 3). The object of this activity system was to enhance the teachers' ICT integration. The school has various tools, including ICT facilities and web-based resources, and sharing ideas in a respective department, to accomplish this object. Nevertheless, the community members set the rules for ICT teachers to follow for accomplishing the object of this activity system.

Tension occurred when the teachers were required to deal with the rules whereby they were not convenient following time constraints. In this activity system, the rules were established to govern teachers' motivation to integrate ICT in their teaching. Because the ICT teachers were not convenient to implement their tasks, teachers' motivation to integrate ICT in their teaching decreased (prior activity) to a low level, which affected the classroom activities (recent activity). In the interview with the head of the unit, Mrs. Hanan, she recalled the following:

Sometimes teachers claimed that they did not get the information they were supposed to get. Sometimes the teachers told that they also received late information. We discussed this issue in a meeting, but the ICT teachers claimed that another task burdened them caused them to be late in delivering information and completing other activities.

The activity system of school (prior activity) resolved the tension when the school management established developed the department's rules, which initiated to increase the motivation among teachers in integrating ICT in their teaching. Motivation (formal rules) among teachers to integrate ICT in their teaching (object) was organized by the school management (school's activity system division of labor) when continually reminded the head of units to support the ICT teachers in every department, particularly by disseminating information. In such a situation, the head of the unit played

a good example as a leader by sharing ideas with the teachers to show others by sharing ideas. This example can be interpreted from Mrs. Hanan's remarks as the head of a unit:

I always emphasize to teachers in my department that we have to make full use of our opportunities. Right now, we have the VLE-Frog, and we also have teachers who are experts in VLE-Frog. So, I encouraged them to use this VLE-Frog as a platform to share the information with other teachers. For the first time, I do it myself; then, I trained other teachers who become IT savvy to help share information online. So, it is faster and effective than when we do seminars and talk to educate them. We need to use this platform the best that we can.

To strengthen the teachers' professional development, the head of units requested that ICT training improve teachers' ICT competency. The purpose of the training was to provide exposure to various teaching methods and strategies. As mentioned by Mrs. Hanan, the head of a unit, "We made much effort to improve teachers' skill and competent, which can effectively leverage ICT to enhance the teaching and learning process." This statement implies that the activity system of a classroom (recent activity) was affected by the department's activity system and school activity system (prior activities), which led teachers to integrate ICT in teaching.

Activity System of School

Note: The arrow of (c) and (d) reflect that the tension is interconnected with each of the components in a triangle (among rules and objects and rules and division of labor).

Figure 4. Contradiction for teachers' successful ICT integration in teaching (division of labor-rules-object)
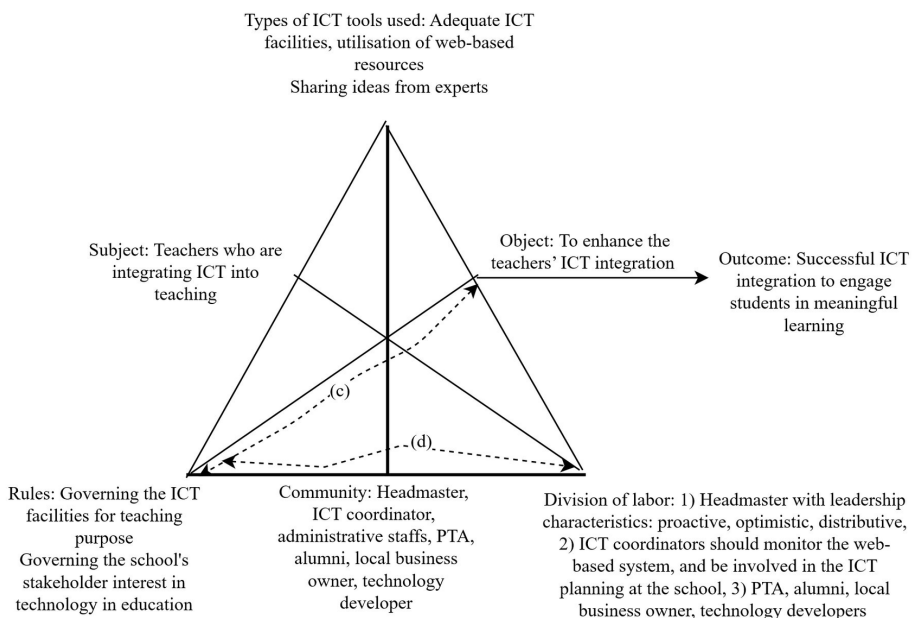
In this activity system, the tension occurred within the division of labor-rules-object triangle (as illustrated in Figure 4). This tension was interconnected by the rules and object (c) and rules and

division of labor (d), which led to the failure to accomplish the object if the school's community and the subject could not resolve the tension. Tension occurred when the individuals who share the object in this activity system could not comply with the school's regulations. At the same time, tension occurred when individuals in the community ignore their respective roles in implementing the school's rules. The community for this activity system includes the headmaster, ICT coordinator, administrative staff, a society, including PTA, alumni, local business owners as well as the technologies developers. Not all of these individuals seem to be willing to accomplish the school's objective (to enhance teachers' ICT integration). The researchers interpreted this situation from the interview with the headmaster, who mentioned:

It is not easy to handle various positions and roles by making them follow what we have planned. Recently, I had to face administrative staff who is addicted to online purchasing. I was busy promoting ICT for teaching and learning purposes; they were busy buying a cheap product online. The administrative staff issue is one example; actually, there are many issues that I faced. Most of the problems are related to all parties' difficulties in complying with the school's regulations. They always say that it is difficult to integrate ICT in teaching, but they do not try to use it. They use it, but not for teaching and learning purposes.

In the above case, governing the ICT facilities for teaching purposes (explicit rules) could not be exercised to enhance ICT integration by teachers (object) as the activity system's community members resisted the change. To resolve these tensions, every community member should play his or her role, and this necessity is even more so for those in the top management, who would embrace strong leadership skills and act as a role model to their subordinates.

In integrating ICT into teaching, the ICT coordinator requires high commitment. The ICT coordinator claimed that other than being involved in the school's ICT planning, he was also committed to his routine activity of monitoring the web-based system, including VLE-Frog, School Management systems (i.e., ASC EduPage), and the school's blogs and websites. He worked along with the headmaster to manage the interests of the community in technology in education, particularly by giving (i) constant advice to teachers and parents on how to register the VLE-Frog, (ii) constant reminders to teachers to create and use their website in teaching, and (iii) effort to change the teachers' perspective regarding the ICT integration in the classroom. The headmaster would also monitor the school management in administering all the procedures involving ICT facilities such as the students' ICT access procedures, computer lab, access center procedures, and the school's management system procedures.

Although the headmaster was not an ICT expert, she did not let the ICT coordinator work alone. In fact, she made herself part of the ICT integration activities. The headmaster also encouraged teachers to become a leader. She preferred to transfer the duty to teachers who are eligible to help her. For instance, she appointed a teacher to manage the sound system services and hall's rental as the teacher was an event management expert. In this regard, the activity system of school (prior activity) directly affected the activity system of a classroom (recent activity) without the intervention of the activity system of the department (prior activity) to manage the ICT facilities for teachers integrate ICT in teaching. In this case, the ICT coordinator and the headmaster's role in the school's activity system affected the classroom's activity system.

DISCUSSION

The findings of this study revealed that the contradiction exists in the forms of 'tensions' in the activity system of the classroom (recent activity) was affected by the activity system of the department and school (prior activities), and this tension had been impeding the success of ICT integration among teachers in their teaching (outcomes of those activities). These tensions can be solved when the school's communities (prior activity in the school activity system) executed their duties in resolving the tensions. The findings were supported by (Engeström, 2001), who claims that tensions, disturbances,

and conflicts can be sources of change and development to achieve the desired outcome. Additionally, CHAT has helped researchers analyze the historical relations among multiple activities by identifying how the results from a prior activity affect recent activities (Yamagata-Lynch, 2010).

From the researchers' reflection and observation, incorporating CHAT and ASA is appropriate for a qualitative case study as the researchers need to identify the unit of analysis within the bounded system of activity setting for applying the ASA. As explained in the activity settings' section, this study identified three activity settings related to the teachers for the three types of unit of analysis in three intertwined activity systems: classroom, department, and school. By using CHAT as an analytic lens, the findings were found to be comprehensive and meaningful, compared to the results obtained from conversational qualitative research as the CHAT managed to assist the researchers in developing models that can communicate the dynamic processes of human interactions, within and across activity systems in a real-world setting. It was also interesting to note that collaboration and teamwork are the keys to teachers' successful ICT integration in teaching. After the data were collected and analyzed, the researchers realized that support from the school's communities is more crucial than individual intervention. The efforts made by the communities managed to resolve the tensions positively, thus facilitating the achievement of a positive outcome. Through the construction of models, the researchers can distinguish, in narratives, the tensions uncovered and to explain how the changes within the context of prior activities produced the tensions to a recent activity that would affect the outcomes of those activities, eventually change to the desired outcome with the presence of contradictions concept in CHAT.

CONCLUSION

This paper aimed to understand the successful integration of ICT by teachers into teaching in one national primary school in Malaysian successful ICT integration schools. Adopting CHAT by Engestrom (1987), this study's findings revealed the three models of activity system to manifest the interaction within and across activity systems that influenced the successful integration of ICT among teaching teachers. Based on this study's findings, the researchers suggest that this study's models can provide exemplar other schools in strategizing ICT integration for teachers into teaching.

The limitation of this study is that ICT integration activities involve various communities directly and indirectly. For instance, the headmaster, the ICT coordinator, and the ICT teachers in ICT integration activities can potentially influence teachers' ICT integration into teaching both directly and indirectly as MOE has an integral role in ascertaining that schools adhere to the stipulated education policies. Nevertheless, according to Yamagata-Lynch (2010), researchers must identify the activity setting involved to abstain from being overpowered with relevant data that might be irrelevant to the examination. As such, this study drew upon CHAT as an analytic lens by employing the Activity Systems Analysis (ASA) to assess the school community's roles in three activity settings that project their direct involvement.

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