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Doing what works: A grounded theory case study of technology use by teachers of English at a Korean university

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ABSTRACT
Despite considerable effort and expenditure by the Korean government and universities to promote technology use in tertiary education, few teachers of English in Korea regularly and consistently employ technology in their teaching. Moreover, research into the hindrances and enablers of technology use in English education in Korea has been limited for primary and secondary schools and conspicuously absent on the tertiary level. This case study examines what teachers in a general English department at a private university in Seoul undergo as they consider the use of technology both in and out of classrooms. It attempts to provide a holistic look into teacher decision-making in this context. It employs a grounded theory of investigation underpinned by a close reading of the diffusion of innovations theory by Rogers (2003). Data for the study involves three main techniques: semi-structured interviews, a survey questionnaire, and classroom observations. Analysis follows an iterative, grounded method and includes use of both qualitative and quantitative software programs (Atlas.ti 5.0 and SPSS 16.0 respectively). Results from the study form a substantive theory entitled "what works" which helps explain the myriad of decisions that teachers make while trying to manage personal (internal) and administrative (external) goals and aims. Further, all decisions within this system are underpinned by "what works" for teachers in any situation both in terms of reliability and consistency. Implications suggest that the use of technology in the classroom exacerbates preexisting pedagogical and infrastructure issues, leading to inconsistencies in representation and application, as well as an overall limitation of potential use by teachers.

Keywords: Classroom teaching; Pedagogical issues; Post-secondary education; Teaching/learning strategies; Lifelong learning

1. Introduction

Extensive investment in educational technology in all levels of education continues to spur research throughout the world (Al-Mansour & Al-Shorman, 2012; Baek, Jung & Kim, 2008; Ertmer, Ottenbreit-Leftwich, Sadik, Senddurur, & Sendurur, 2012; Eteokleous, 2008; Kirkwood & Price, 2013; Mueller, Wood, Willoughby, Ross, & Specht, 2008; Son, 2004; Teo, 2011). This is particularly salient in South Korea where trillions of Won were invested in information and communications technology (ICT) in education by The Ministry of Education & Human Resources Development (MOE & HRD) from 1978 to 2001 through major policies such as the "Beginning Stage", "Rolling Out Stage", "Evolving Stage" and "Expansion Stage" which sought to modernize and globalize the education system (MOE & HRD, 2006). Concurrent and subsequent measures such as "The Comprehensive (or 'Master') Plan for Developing ICT Use in Education" (KEDI, 2007; MOE & HRD, 2003, 2006) in the 1990s attempted to improve infrastructure in schools as well as provide teacher training and promote research. Another substantial plan, "Brain Korea (BK21)", involving a two-phase process, was considered so successful that the first phase (1999 to 2005) budget of US $1.34 billion was raised to US $2.03 billion in the second (2006-2012) phase (Brender, 2006). Perhaps more significantly, during this time, the government body that oversaw education in Korea (MOE & HRD) changed its name to the "Ministry of Education, Science and Technology (MEST)" to better reflect the growing interest in technology in education

(MEST, 2009). However, more recently, the government was able to successfully divide these areas in a controversial move to expressly promote job creation in the information technology (IT) and communications sectors (Yonhap News Agency, 2013). Significant investment in IT in Korean education continues unabated but with more emphasis on ICT to acquire employable skills deemed essential to new industries and new media communication (Chung, 2013; Ministry of Science, ICT and Future Planning [MSIP], 2014).

The shift in emphasis to more vocational aims for technology use may represent recognition of the lack of success of more academic or pedagogical goals. During the decades of investment in technological infrastructure in education by the Korean government, few attempts were made to support teachers with classroom implementation. Suh (2004), for instance, surveyed 161 primary and secondary English teachers in the Gangwondo province and found that, of the 90% who reported having had technology training, most did not use or seldom used a computer in the classroom owing to a lack of time. Likewise, Jo (1995) found that overall Korean schools had considerable hardware and software resources owing to strong government support. However, the primary and secondary teachers in the study expressed discontent with the government mandates on computer use in the classroom, which lacked proper logistical support or provisions for training (Jo, 1995). Another study by the Further Education Funding Council (FEFC, 1998) reported that Koreans had pride in and placed a high emphasis on education, and devoted a considerable proportion of the gross domestic product (GDP) to education, including a substantial investment in technology when compared with the United Kingdom. The report, however, like many subsequent studies, did not conduct teacher interviews or surveys on implementation or training and so failed to provide a richer account of the situation. Again, the lack of holistic studies on classroom implementation points to one of the biggest impediments to ICT integration in English programs in Korea: an overall lack of information and verifiable research in the area (Hampel & Stickler, 2005; Kim, J., 2004; Kim, S. & Bagaka, 2005; Kim, D. & Margolis, 2000). As Suh (2004) puts it, "[o]ne of the major challenges facing educational policy in the information age is how to integrate computer technology into the English language learning curriculum" (p. 1040). Significantly, the scarcity of studies into classroom technology integration and particularly on the tertiary level parallels the deficiency of support by the Korean government in this regard.

Moreover, the pattern of considerable initial investment without support followed by lament at the lack of quantifiable results perhaps reflects the persistent international concern that computers are essentially incompatible with teaching in areas not specifically related to technology (Becker, 2000; Cuban, 1997; 2001; Cuban, Kirkpatrick & Peck, 2001). Contributing to this misperception is an overemphasis on studies showing the negative or inconclusive effects of technology use on student standardized testing achievement such as the large-scale investigation conducted by the United States Department of Education in 2007. Additionally, other more general research has highlighted the possible dangers of using technology including the degradation of society's morals and culture (Bowers, 1998), potential psychological damage for children (Healy, 2004), or even hyperbolic attempts to inextricably link investment in computers to the failures of TV and film use in education (Oppenheimer, 2003). However, a more objective and extensive review of the literature by Schmidt et al (2014) recently found that technology is "demonstrably playing an important role in improving pedagogy" (p. 286). Consequently, Schmidt et al recommend that researchers focus more thoroughly on analyzing instructional factors in order to have the greatest impact on research and practice.

1.1 Teacher decision-making

Two key areas for theoretical exploration of teacher decision-making relate to contextual beliefs and beliefs about personal empowerment. Ford (1992) referred to these as "context" and "capability". Context, for Ford, comprises the effects of the external environment together with the individual's beliefs about other people. The second and more significant of the two, capability, is similar to Bandura's (1977) notion of "self-efficacy", which involves a person's ability to be successful in organizing and executing actions toward a specific goal. This further echoes Rotter's (1966) theory of internal and external control, albeit, with more emphasis placed on the external factors affecting teachers' educational influence on students. Another closely related theory, the integrated model of behavioral prediction (Fishbein, 2000; Fishbein & Yzer, 2003), developed from previous

work by Ajzen and Fishbein (1980) and Fishbeing and Ajzen (1975), is underpinned by "behavioral", "normative" and "control" beliefs which, similar to Ford's (1992) and Bandura's (1977) models, help identify the internal beliefs and mechanisms as well as the external factors that guide an individual's decision-making.

When any of these models is applied to teacher decision-making, a host of concerns come to light related to teachers' internal beliefs about personal and professional goals and aims, external factors in and out of the classroom including administrative and educational dictums, and the practical processes by which these often disparate factors are resolved on a day to day basis. Kelchtermans (1996) attempts to untangle these teaching predicaments by viewing the teacher's professional conceptions of her/himself ("professional self") through five introspective components. These can be expressed as five self-applied questions for educators: (1) What kind of teacher am I? ("self-image") (2) How well do I think I am doing as a teacher? ("self-esteem") (3) Why did I choose this?/What motivates me? ("job motivation") (4) What must I do to be a good teacher? ("task perception"); and, (5) What do I expect of my future professional situation? (Future perspective) (Van den Berg, 2002, p. 604). Another aspect to research in this area involves decision-making in terms of adaptations to emergent information (Fogarty, Wang, & Creek, 1983; Mullock, 2006). Findings from these studies reveal teachers to be proficient experts who "rather quickly access an appropriate solution path based on mental representations of the domain" (Fogarty, Wang, & Creek, 1983, p. 23). Other studies conclude that teachers are motivated by a variety of aims which are central to their choices (Issacs, 1994), or that teachers generally try to convey passion for their subject in hopes of propagating student interest (Sutherland & Badger, 2004). In short, as is evident from the literature on teacher decision-making, any new studies that hope to galvanize opinion would necessarily need to employ a theoretical framework with a wide scope rather than simply attempt to isolate individual causal factors.

1.2 Barriers to and enablers of technology use in education

For decades, researchers (e.g., An & Reigeluth, 2011; Franklin, 2007; Pelgrum, 2002; Shedletsky & Aitken, 2001; Venezky, 2004) have continued to add new findings to the long list of factors that either hinder or facilitate technology use. While helpful on the whole, the resulting overabundance of specific barriers to and enablers of integration in practice that have amassed over the last three-plus decades can prove daunting. For example, Becker's (2000) salient observation of the necessary factors for successful integration resulted in a list of over ten variables including items related to teacher comfort and technology training, student-centered, constructivist pedagogy and, an academic atmosphere "where the school's daily class schedule permits allocating time for students to use computers as part of class assignments, where enough equipment is available and convenient to permit computer activities to flow seamlessly alongside other learning tasks" (p. 29).

The suggestion to expand the scope of investigation beyond lists of isolated variables has been implied by Becker (2000) and other researchers (e.g., Rogers, 2003; Van Den Berg, 2002; Venezky, 2004) interested in a more holistic understanding and application that might prove more feasible in the classroom. One such study by Zhao, Pugh, Sheldon and Byers (2002) discovered eleven primary factors categorized into three interactive domains, "the teacher, the innovation, and the context" (p. 482). However, the researchers realized that the social and pedagogical aspects of the setting were largely unrepresented in their findings and that, in reality, the teacher largely governed the other two domains (i.e., the innovation and the context). This is similar to Budin (1999), who believed that institutions frequently mixed up their priorities by being "more concerned with acquiring equipment and software than emphasizing teacher development and planning for the integration of technology" (Kotrilik & Redmann, 2005, p. 205). Watson (2001) likewise expressed consternation in the failings of studies and technology training for teachers that lacked a comprehensive or functional approach to teachers and pedagogy. However, more recently, Porter, Graham, Spring and Welch (2014) saw the need to develop an instrument to explore and measure how implementation could be aided on the institutional level, and others such as Mama and Hennessy (2013) and Prestridge (2012) have begun carefully studying more practical considerations of technology use from teachers' perspectives.

1.3 Rogers' (2003) diffusion of innovations theory and Strauss and Corbin's (1998) grounded theory

Three of the most prevalent frameworks used to study the process of diffusion of innovations include the concerns-based adoption model (Hall & Hord, 1987), social learning theory (Bandura, 1977), and the theory of reasoned action (Ajzen & Fishbein, 1980). However, all of these models in one way or another lack the scope and rational explication of Rogers' (2003) diffusion of innovation theory. Hall and Hord's (1987) theory, for instance, centers on the process of innovation, Bandura's (1977) model highlights social learning and observational aspects, while Ajzen and Fishbeing (1980) focus primarily on behavioral factors. Rogers' theory, on the other hand, encompasses all of these areas, enabling researchers to explore not only the perceived attributes of and process involved with an innovation, but also the adopters and their characteristics. Simply put, Rogers' 551-page treatise of straightforward prose and essential diagraming seems to provide the most practical guidelines for investigation owing in no small part to its sensible conception and long history of application and modification. The continued popularity of Rogers' theory and book among scholars is underpinned by his humble scientific neutrality, which includes explicitly recognizing shortcomings in his own theory within the text. One such shortcoming provided the impetus for the current study's conceptual framework:

> It should be acknowledged that rejection, discontinuance, and reinvention frequently occur during the diffusion of an innovation and that such behavior may be rational and appropriate from the individual's point of view, *if only the diffusion scholar could adequately understand the individual's perceptions of the innovation and of the individual's situation*. (Rogers, 2003, p. 114; *emphasis added*)

Case studies allow a more holistic look at the context of particular situations to be explored and so are preferred by researchers who wish to provide a more realistic account that is 'rich' in description (Nisbett & Watt, 1984; Stark & Torrance, 2005; Sturman, 1994; Yin, 2009). One method of case study first proposed by Glaser and Strauss (1967) and further developed by Strauss and Corbin (1998) is a grounded theory approach that employs inductive, iterative and participatory techniques. This method more than any other provides a fuller description of the context and participants' perceptions, and results in "an integrated theoretical formulation that gives understanding about how persons or organizations or communities experience and respond to events that occur" (Corbin & Holt, 2005, p. 49).

2. Research aims and questions

This study considers the issue of technology use in teaching from the perspective of tertiary teachers of English in Korea. It qualitatively investigates the teachers' decision-making in order to accomplish four aims: (1) provide background into the perceptions of the teachers which may have a direct or indirect effect on their decision making; (2) identify the main impediments to technology use for the participants; (3) correlate findings with Rogers' (2003) diffusion of innovations theory; and, (4) discover insights into teaching methodology and practices as they relate to technology use in tertiary English language programs in Korea. The following three specific questions provide the conceptual framework for data collection and analysis:

1. What relationships exist among teacher background, beliefs, setting and classroom practices?
2. What are the main hindrances to technology integration in the classroom?
3. To what extent can Rogers' (2003) diffusion of innovations theory explain these relationships and hindrances?

3. Methods

3.1 Context and participants of the study

The study setting is a women's university in Seoul, Korea. The general English program at the University employs a varying number of full-time and part-time instructors to teach three required freshmen English courses as well as additional upper-level elective classes within the General Education Department. Curriculum, materials and assessment for the required courses are prescriptive and shared among the entire faculty while

most elective courses are designed and conducted autonomously by various full-time instructors. At the time of the study, most full-time instructors taught four classes a week that met twice a week for 75 minutes in classrooms located throughout one large building on campus, while part-timers taught one to two classes each within the same building. For theoretical reasons, full-time instructors took part in all four strands of the study, while part-time instructors participated only during second strand surveys. A total of 13 of 16 full-time teachers (81.3%) were available and willing to participate in interviews during the first strand of the research. Among them, eight teachers (61.5%) were male and five teachers (38.5%) were female, having an average age of 40 years. Five nationalities were represented including American, Canadian, British, Australian and Korean, with nine teachers (69.2%) speaking only one language (English) fluently. Ten teachers (76.9%) had over 10 years of teaching experience, while six (46.2%) had taught at the University for five or more years. During the second strand of the study (a questionnaire), 14 of 16 available full-time instructors (87.5%) were able to take part. They all had earned masters' degrees in varying fields, with two (12.5%) also possessing doctorate degrees. All full-time teachers taking part in the survey reported that they had had some degree of experience with using technology in their teaching prior to the study, and 12 (75%) said that they liked to use technology in their daily lives for various professional and personal reasons such as internet searching, word processing and emailing.

All 34 part-time instructors who took part in the second strand survey were Korean females, mostly between 30 to 40 years of age (63.63%) who spoke two or more languages fluently. Their teaching experience ranged from less than five years (21.21%) to 15+ years (24.24%). All part-time instructors had various masters' degrees with 10 (30.30%) also having completed doctoral degrees. Like full-timers, prior to the study, all part-time instructors had also had previous experience with using technology both in their teaching and personal lives with 28 (84.84%) professing satisfaction with its use. Classrooms employed by teachers in the Department at the start of the study were equipped with a teaching computer and liquid crystal display (LCD) projector, although the quality, age, and setup of each classroom varied. A mid-study move to a new building provided new classrooms with more uniform setup of teaching computers and LCD projectors.

3.2 Methodology

This study was organized into four strands of data collection: interviews, a questionnaire, classroom observations and follow-up interviews (see Table 1). The initial semi-structured interviews were used to help identify issues from the perspective of the full-time instructors that would help guide the study's direction. The questionnaire employed in the second strand was used to determine the reliability or extent that issues identified by individual full-time instructors in the first strand were applicable to other full-time and part-time instructors. Third strand observations helped verify or cross-reference teachers' reported actions as well as to provide nuances and insights into teacher motivations in the classroom. The final strand post-observation interviews allowed participating teachers the chance to react to their performance in order to provide a more valid, reliable, and thorough account of their decision-making in action.

Table 1
Details of the Research Strands and Participants

Research Strand	Technique	Purpose	Participants (*n*)	Population (*N*)	Participation/ Response rate
1	Semi-structured interviews	Identification of main issues	13 full-time instructors	16 full-time instructors	81.3%
2	Questionnaire	Determination of the reliability and validity of issues	14 full-time instructors; 34 part-time instructors	16 full-time instructors; 49 part-time instructors	73.8% overall: 87.5% of full-time instructors; 69.4% of part-time

					instructors
3	Classroom Observations	Verification of interview data; Discovery of nuances/insights into teacher decision-making	5 full-time instructors	16 full-time instructors	31.3%
4	Post-observation semi-structured interviews	Provide participant perspective of lessons; Discovery of nuances/insights into teacher decision-making	5 full-time instructors	16 full-time instructors	31.3%

In the first strand, 13 full-time instructors took part in semi-structured interviews. Interview items were grouped around four question types ("sensitizing", "theoretical", "practical and structural", and "guiding") following Strauss and Corbin's (1998, pp. 77-78) recommendations. Questions used as springboards for various aspects of the interviews evolved during this phase of interviews but were initially based on a thorough review of the enablers of and barriers to technology use found in the literature along with the personal experiences of one of the authors. Nine key areas explored included:

1. Professional background (e.g., How long have you been living/teaching in Korea/Seoul?)
2. Beliefs about Koreans/foreigners/students (e.g., My university students are…?)
3. General beliefs about teachers/teaching (e.g., What usually motivates your teaching decisions?)
4. Thoughts about schedule/time management (e.g., How do you feel about your work week?)
5. Your university, department office and faculty (e.g., How do the resources at your current university compare with other universities you have taught at or know about in Korea/Seoul?)
6. Computer knowledge and beliefs (e.g., Have you ever received any formal training in using any technologies, including computers?)
7. Use of technology in teaching (e.g., What resources in the classroom do you usually use - chalkboard, OHP, computer, CD/DVD player, etc.?)
8. Comparisons of technological resources (e.g., What is the difference between: the Department homepage and the University website?)
9. Thoughts on the future of education (e.g., What skills will teachers need in the future?)

Information garnered from the first strand was then used to form a questionnaire that was administered in the second strand to the entire department faculty with an overall response rate of 73.8% (14 of 16 full-time and 34 of 49 part-time instructors). An initial group of four full-time instructors was then selected to take part in the third-strand classroom observations to provide a "theoretical sample" (Strauss & Corbin, 1998, p. 73), in which emerging concepts are explored through selective sampling. All observations were recorded using a digital video camera for use during the final fourth strand. Each instructor was observed and digitally recorded twice to inform and verify aspects of the evolving theory. As per grounded theory, an additional participant was added later during this phase (five total participants) as necessary to reach "theoretical saturation" (Strauss & Corbin, 1998, p. 143), in which no new significant data are found during analysis. The final, fourth strand involved a follow-up "think aloud" semi-structured interview after each of the two lessons based on stimulated recall (Fogarty, Wang, & Creek, 1983; Paterson, 2007) in which each of the five participants from strand three and one of the authors viewed the observation videos together and discussed significant events.

3.3 Data analysis

Three types of coding ("open", "axial", and "selective") were employed throughout the study in order to form and evolve a series of relationships into a theoretical framework (Strauss & Corbin, 1998). This began with open coding of concepts, attributes and relationships, which were teased out to form dimensions "along a continuum or range" (Strauss & Corbin, 1998, p. 117). These continual iterations throughout open and selective coding (termed "constant comparisons" and "theoretical comparisons") led to the formation of conceptual families and categories, which in turn (during "axial coding") revealed connections among categories including the identification of an underpinning central category. This category continued to be explored to improve its "density" by adapting subsequent interview questions to help provide information to fill in the gaps among concepts and to probe relationships. During this process, the questionnaire was equally engaged as a general qualitative measure following Glaser and Strauss' (1967) guidelines for qualitatively analyzing quantitative data. Eventually, however, quantitative measures were additionally applied in order to help reveal statistically significant relationships to aid in overcoming "analytical blocks" (Strauss & Corbin, 1998, p. 88). Specifically, analysis using Kendall's tau (τ) was recommended over Spearman's coefficient owing to the small data set that proved to be non-parametric (by design and verified using Q-Q plots) (Field, 2005). Further, Cronbach's Alpha and other similar tests of reliability were not performed owing to the focus on theoretical exploration (Glaser & Strauss, 1967).

Log notes from observations and subsequent interviews in Strands Three and Four were likewise employed in order to add density and explanatory power to the developing theory. The last strand of the research was an open-ended exploration that continued for as long as significant data were obtained. This process as Dewey (1910) described was not unlike how children learn: "Objects are sucked, fingered, and thumped; drawn and pushed, handled and thrown; in short, experimented with, till they cease to yield new qualities" (pp. 31-32). More specifically, Strauss and Corbin (1998) refer to the practice as reaching "theoretical saturation", which is arrived at by collecting and analyzing data until it seems counterproductive "or the researcher runs out of time, money, or both" (p. 136). A final, vital element of analysis is the copious use of "memos" ("code", "theoretical", and "operational notes") that serve as explicit means to conceptualize raw data throughout the coding process (Strauss & Corbin, 1998).

4. Results

A list of 132 frequently occurring codes were found and then reorganized into a smaller set of 45 categories of code families during open coding of the initial semi-structured interviews. As expected, many of the concepts identified in the initial set concern attitudes and uses of technology but likewise involve other concepts related to class organization, adapting class materials, teaching beliefs, and idiosyncratic ideas that affected teaching behavior. This then led to the development of 13 categories or axes that reflected the most frequently identified patterns of concern for teachers when considering technology use (see Table 2). Concurrently, conditional matrices (Strauss & Corbin, 1998) and diagrams were employed which helped identify the unifying central category in the data that emerged.

Table 2
Thirteen Categories and Sample Quotations

Category	Sample quotation
1. Risk taking: How much willingness is there to take chances in their teaching?	"This is the first semester that I've started using that…and I'm quite pleased with that." (SSI 4, Russ*)
2. Image: How much concern is shown about their image as a teacher?	"But if I had to do a lot of writing on the blackboard, it's much better if I do it in PowerPoint. It's much better to read, it's much faster for me to write, and looks more professional." (SSI 11, Martin)

3. Seeking learning: How much effort is spent on learning new teaching ideas?	"That's my biggest problem with it. Even with this new University site system, you can't trust that students will be able to logon to it when they want to because the system gets overrun or breaks down for some reason" (SSI Interview 7: Sarah)
4. Univ. site use: How much and in what way is the Univ. site employed?	"Because, as I said, you can post….Especially, it's reduced my workload because I can post activities on the University website, I don't have to make like a million copies and that sort of thing." (SSI 12, Ian)
5. Sociability: How important is the teaching community to their teaching?	"You know most of the foreign staff here, they feel comfortable around another and I don't think they'd feel…they'd have any problem with going up to anyone and asking them for help." (SSI 2, Craig)
6. Efficiency: How prominent is efficiency in their teaching beliefs?	"No…actually, I also like to figure things out on my own sometimes – it takes longer I know, but..." (SSI 6, Tina)
7. Cultural alignment: How aligned are their teaching ideas and methods with the school culture?	"…our minister of education is very unpredictable – we don't know what will happen. So we don't know what will happen within the year or within the next years, so 10 years time, we can never predict." (SSI 3, Val)
8. Real materials usage: How much concern is shown for authentic materials usage?	"And so they sounded really, really authentic because these were good voice actors working with a loose script that they then reproduced. So…I really enjoyed teaching that kind of stuff and as far as speaking and listening is concerned I feel very strongly that that's the type of language that they should be exposed to." (SSI 1, Jerry)
9. Student-centered ideas: How aligned are their teaching ideas and methods with student-centered ideas?	"The students aren't focused on the teacher and the teacher's lecture; they concentrate on speaking to other students, they have a lot more opportunities and then the teacher can walk around as a facilitator – I try to do that as much as possible." (SSI 12, Ian)
10. Influence of learning experiences: How aligned are their teaching ideas and methods with their own learning experiences?	"And that's also one thing I learned from the training I had when I was working at * is the fact that people have different learning styles. So when I'm in class I try to use different learning styles." (SSI 8, Stephen)
11. Technology use in class: How often and in what way do they employ technology in their classroom teaching?	"…ah, for example, the PowerPoint stuff that I've been doing is for writing…ah, to give them instructions about like the process of writing – the steps of writing an essay. And um…this is stuff that I can use in both levels. So I can use this stuff in all my classes. So I do a presentation once…and then I get to use it four times…which…in the long run, makes my life easier." (SSI 1, Jerry)
12. Technology training: How much informal and formal technology training have they had and what value do they place on it?	"Yeah, I'm self-trained; I figure out what I need and I figure out how to do it, so I have big gaps because ah…I never had to do that – I don't know how to do it! So I'm self-trained; I play with it and figure out what happens." (SSI 7, Sarah)
13. Attitude toward technology: How important do they consider technology in education to be today and in the future?	"Yeah, and I read newspapers, email of course, and then teaching. I'm on the computer too much really. Yeah, I'm trying to cut back right now." (SSI 9, Scott)

Note: *All teachers' names are pseudonyms.

The 13 categories were fundamental to the formation of the main category involving three teacher-centered domains: one internal ("teacher psychodynamics"), one external ("administration & infrastructure (A&I)/student variables/teacher community"), and a final third ("what works") that includes the categories related to how teachers reconcile the constraints of the former two domains (see Figure 1). The three domains of 24 categories form the "what works" substantive theory. To explain the interrelationship of these three domains and their related categories, a teacher brings with him/her certain beliefs and experiences (teacher psychodynamics) that affect how he/she wants to teach in the classroom. However, teachers are rarely able to directly apply their preferred approaches to their teaching, so they learn how best to adapt to external demands from the university's culture and setting (A&I/student variables/teacher community) in order to heighten their internal sense of satisfaction while simultaneously taking their external image into consideration to varying degrees. Furthermore, the perception, incidence, and degree of adaptations necessary in the classroom are to various degrees unique to each teacher, group of students, individual classroom and even lesson necessarily including the deliberation on use of any technology in and/or out of the classroom.

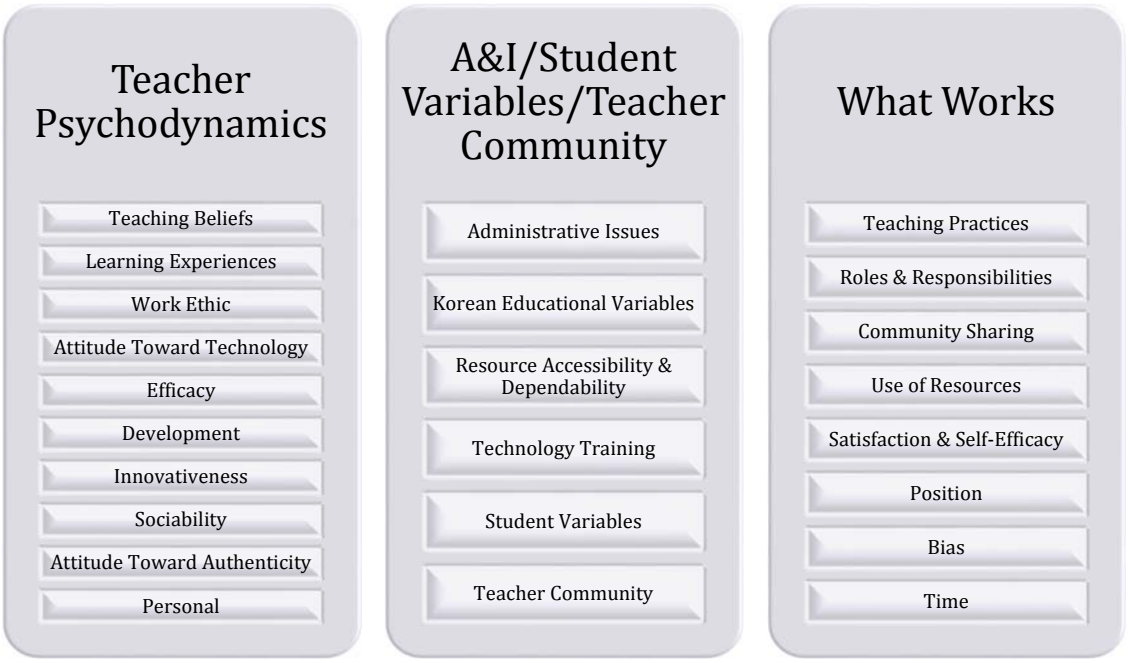

Figure 1. The three domains and related categories of the substantive what works theory (adapted from Author1, 2011).

4.1 The what works processes and related properties

Each of the eight categories within the third (what works) domain discussed above can be thought of as a process that informs teacher decision-making (see Table 3). Together, the processes detail the complex environment through which decisions about if, when, and how to use technology are entertained. Although only one process is exclusively devoted to technology use ("relying"), the other seven processes include various aspects that help explain otherwise perplexing or inconsistent decision-making in this area.

Table 3
The Eight Processes (and Related Categories) of What Works

Process (Category)	Properties	Sample Quotation

Adapting (Teaching Practices)	Changes; Refinement; Teaching style; Kinetics; Risk taking; Orientation; Authenticity; Technology use	"And I know that for me one thing with books: if you have a good book, you don't need the worksheets" (Tina, SSI).
Controlling (Roles & Responsibilities)	Teacher role; Alignment; Risk-taking; Image; Test teaching; Pair/group work; Customization; Contingencies; Class size; Crowdedness	"So, in some cases, I do things, you know, I used to want to be more creative with randomizing groups and now I'm much more, 'You, you, you, you; this is the group'" (Rich, SSI 5).
Sharing (Community Sharing)	Position; Orientation; Separation; Dependence; Style dependence; Image; Training desire; Restrictions	"But I think it's good to know what other teachers are doing so if you have good materials you're sharing" (Amy, SSI 10).
Relying (Use of Technology)	Tech orientation; Tech training; Practicality; Authenticity; Teaching style; Teaching novelty; Risk; Image; Learning Bias; Work ethic; Tech workload; Preparation; Chalkboard use; Satisfaction; Maintenance; Future tech use; Tech culture	"That's my biggest problem with it. Even with this new University site system, you can't trust that students will be able to logon to it when they want to because the system gets overrun or breaks down for some reason" (Sarah, SSI 7).
Satisfying (Satisfaction & Self-Efficacy)	Self-efficacy; Security; Local Experience; Influence; Teaching style; Image; Tech belief; Tech knowledge; Word use	"We just got our schedule for the next semester – and most people are unhappy. It looks like there was some sort of…just some things missing. I think the person who did the scheduling tried her best and tried to keep certain things in mind, but forgot about some of the important things that could've made people happier" (Martin, SSI 11)
Growing (Position)	Position; Growth; New methods; Tech belief; Teamwork; Adoption; Alignment; Korean education; Administration; Control; Turnover; Curriculum; Tech satisfaction; Website use; Benefits	"I think in teaching experience is very important. So it's not necessarily that you're a good or bad teacher, but having a lot of experience in teaching is very important. Ah…very important – in a way, a requirement" (Val, SSI 3).
Living (Bias)	Demands; Idiosyncrasies; Sociability	"…all I was doing was writing and enjoying….I mean you had to go to school for these hours and you did it, but then get on with the rest of your life" (Scott, SSI 9).
Investing (Time)	Priorities; Need; Efficiency; Effectiveness; Task delay; Re-use; Teaching focus; Test teaching; Speaking activities	"And um I spend a lot of time preparing actually. I probably spend another 12 hours a week just in preparation. And then on top of that there's marking and so on, so, you know, it's a full-time job" (Russ, SSI 4).

Among these processes and categories, five features stood out as reliable predictors of the level of technology use in the classroom: personality factors, previous learning experiences, teaching beliefs, beliefs about technology, and the willingness or aptitude of teachers as lifelong learners. However, the overarching desire to make things work in the classroom underpinned all decision-making both in terms of planning and execution. With few exceptions, teachers who used technology did not use it in all areas of their teaching but for specific and well-defined purposes that helped make that part of their teaching more effective, efficient, relevant or interesting. Further, the main factors that hampered teachers' desire to use technology related to the lack of dependability of computers and other peripherals owing to a perceived lack of support and the absence of maintenance.

4.2 Teacher perspectives on the theory processes

During Strands Three and Four, five teachers ("Tina", "Amy", "Jerry", "Craig", and "Stephen") participated in further developing and assessing the overall solvency of the theory as applied to the study context. At the onset,

it became clear that certain processes (categories) directly influenced decisions to use technology while others had more tenuous relationships. Two such categories with indirect (as well as unconfirmed direct) connections were controlling and sharing. Although teacher control in the classroom held a prominent position in determining why and how teachers made decisions, there were no causal relationships with technology that could be posited for the group as a whole. However, it is important to remember that this understanding of teacher control is not referring to the teacher's ability to control the technology per se, but rather his/her desire to have more control over their lessons. In short, teachers who liked to have more control over their classrooms were not more or less likely to use technology than teachers with more student-centered approaches. Similarly, the amount of sharing that teachers desired and took part in was also a significant part of teachers' decision-making but no direct technology-related relationships could be established. Therefore, the focus in the final two strands of the study was limited to assessing the fit of the other six processes of the theory to the study setting and participants.

Comparisons using the remaining processes indicated that two teachers' level of use fit well with the theory's axioms without qualification, while the remaining three teachers' levels of potential did not match their current levels of use. Possible explanations were suggested by the data, including a possible lack of accuracy and/or inclusiveness of the properties for each process. However, both cases could equally be explained by changes in teacher opinions and external factors. For example, one teacher, Tina had a higher potential than her level of use, but, over the course of the study, she became much more willing to rely on technology in her teaching owing mostly to relocation to newer, more suitable classrooms. If realized in the long term, this would bring her potential for use and actual level of use into better alignment. Similarly, a second teacher, Craig also had a lower level of use than his potential from the theory determined. However, owing to the same changes to new classrooms with clear glass walls that allowed more observation of other teachers' methods, he became more optimistic about the usefulness of and necessity for technology use in his lessons. This move toward more technology use as a result of increased "observability" (the degree of positive influence from viewing peers' use of technology) also seemed to corroborate one aspect of Rogers' (2003) theory. Thus, as predicted by the theory, Craig was beginning to realize his higher potential for technology use owing to external changes in the setting. Finally, although the third teacher, Stephen's level of technology use was the highest in the study, the theory once again suggested a much higher potential for use. It was posited that he had essentially maximized his practical use of technology in the setting, and so his higher potential was most likely not fully realized owing exclusively to external hindrances. In short, despite some minor discrepancies between participants' potential and realization primarily based on external barriers, the theory proved itself to be a reasonable predictor of teacher decision-making involving technology use in this setting.

4.3 What works theory and Rogers' (2003) theory

Overall, Rogers' (2003) theory was only moderately helpful in explaining teachers' decisions about technology use for the setting of this study. As described above, Rogers' aspects related to adopter personalities were particularly relevant to the study, as were general concepts such as "de-centralized diffusion systems" (a system where innovation originate from local sources), "compatibility" (the consistency of the technology with previously introduced ideas and user needs), and "optional innovation-decisions" (independent adoption or rejection decisions made by individuals). However, it was evident throughout the comparison that Rogers' theory was not well-designed for adoption decisions made by individuals who attempted to meet particular needs rather than as a consequence of influence from their peers, organizations or other change agents. The wide scope of Rogers' (2003) theory was able to cast a net over a wide variety of decisions about technology made by teachers in the study, but holes in the concepts proved to make it ineffective in application. For instance, once it was determined that teachers' decisions to use technology were optional innovation-decisions within a de-centralized diffusion system, a dead-end was reached.

Aspects related to "relative advantage" (the perception that adoption of an innovation is better than not adopting) and the decision making process were then explored but only certain isolated concepts seemed to apply such as compatibility, "disenchantment discontinuance" (rejection after experiencing poor performance),

"dissonance" (an uncomfortable state of mind related to use), "radical innovations" (technologies which cause serious disruption or confusion in practice), and "overadoption" (when users adopt a technology when expert observers feel it is unwarranted). However, each of these concepts ended with simple relational statements rather than providing more details related to its properties, aspects or dimensions. Similarly, the final chapter of Rogers' (2003) book on the consequences of innovations addresses concepts that are relevant to the current study such as "cultural relativism" (the need to make judgments based on the values of a particular culture), the "form", "function", and "meaning" of an innovation, and "achieving a dynamic equilibrium" (p. 453) (when the rate of technological change is equal to the social system's ability to cope with it), but all likewise end with short, general statements framed within a decidedly economic viewpoint.

Furthermore, by considering some of Rogers (2003) concepts in isolation, there seems to be a contradiction on certain values and the classification therein. For instance, in the area of relative advantage, Rogers stated: "The individuals' perceptions of the attributes of an innovation, not the attributes as classified objectively by experts or change agents, affect its rate of adoption" (p. 223). However, within the same section dealing with overadoption, he seemed to state the opposite: "Most individuals perceive, or at least report, their actions as rational. Our main concern is with objective rationality in the present case, rather than with subjective rationality as perceived by the individual" (p. 232). If understood correctly, this seems to claim that the reasons given by those who adopt when experts felt that they should reject were not credible as they involved "subjective rationality". Further, Rogers subsequently discloses that these adopters in fact lacked adequate knowledge, could not predict the consequences of using the innovation beforehand or were simply "suckers for change" (p. 232). However, if this logic were applied to the present study, all innovators and early adopters would need to be considered over-adopters, which would make their self-reports unreliable. In other words, all the teachers in the current study who chose to use technology in their teaching lacked sufficient knowledge about the technology that they used, and owing to external factors such as the lack of maintenance and counter-intuitive setup in the classrooms, they could not accurately predict the consequences of its use. There was also evidence of overadoption by adopters in certain circumstances with little relative advantage that Rogers might just as easily have classified under the effects of observability. Therefore, studies such as the current study that involve the perceptions of its participants can be hamstrung by Rogers' categorization system and post-positivist devaluing of self-reported data as it relates to rational assumptions about research participants and content experts.

5. Discussion

The main aim of this study was to discover insights into teacher decision-making as they relate to the consideration of technology use as well as the identification of possible hindrances. It was approached through a conceptual framework that placed teachers and their perceptions at the center of a qualitative and quantitative case study. An iterative, grounded-theory approach was employed based on Rogers' (2003) recommendation that future technology research provide sufficient scope to take into account users' perceptions and the holistic context. The use of constant- and theoretical- comparisons of the data negotiated between the researcher and participants (Strauss & Corbin, 1998) first produced a set of 132 open codes that were subsequently reorganized into a list of 45 code families. More iterations and theoretical comparisons of the data eventually produced a set of 13 concerns that had direct bearing on teachers' decisions involving technology, which included: risk taking, image, seeking learning, Univ. site use, sociability, efficiency, cultural alignment, real materials usage, student-centered ideas, influence of learning experiences, technology use in the class, technology training, and attitude toward technology.

The what works substantive theory that formed was then outlined, which includes three main domains that underpin the theory: the internal domain (teacher psychodynamics), the external domain (A&I/student variables/teacher community) and the interplay between the two (the what works domain). The interaction or balance between teachers' internal factors, and external concerns and demands was revealed in the theory to form the basis on which teachers made decisions about their teaching. Eight processes or categories reflected in the main category of the theory were shown to include: adapting, controlling, sharing, relying, satisfying,

growing, living, and investing. In subsequent tests involving classroom observations and follow-up interviews, the theory was largely able to predict teachers' current level of technology use as well as to offer insights into their decision-making. The secondary aim of employing Rogers' (2003) diffusion of innovations theory to predict teachers' use revealed that it lacked precision in treating the perceptions of individual teachers and his/her decisions about technology use in the study setting. Specifically, individual concepts related to optional innovation-decisions within a de-centralized system were applicable, as were various ideas about various degrees and forms of rejection, cultural relativism, and overadoption, but all lacked further explication that might have proven more insightful.

This study provides a corpus of information to educators in their attempts to understand and integrate technology in classrooms in the Republic of Korea. Through the descriptions of the patterns and relationships that relate to all tertiary English teachers, overall practice will be significantly informed. Expressly, the development of a substantive theory with practical implications based on authentic data garnered through a grounded theory methodology will help promote the effective use of technology in English programs in Korea. It is hoped that both teachers – through insights into more efficiency in teaching – and students – through teacher use of more media rich and authentic materials – will benefit from this study. Moreover, it is also hoped that studies such as this will provide the foundation for a move toward more student-centered or constructivist teaching methods in Korea, where currently, and in keeping with Cuban, Kirkpatrick and Peck's (2001) observation in Californian high-tech high schools 10 years ago, "Few fundamental changes in the dominant mode of teacher-centered instruction [have] occurred" (p. 825). Likewise, contributions to the literature on Rogers' (2003) diffusion of innovations theory as well as grounded theory application have been made.

The study has some limitations owing mainly to its design, exploratory nature, and limited scope. The first explicit limitation arises from the small number of participants involved in the case study. It is a common limitation of case studies and grounded theory research, which limits generalization to other settings (Stark & Torrance, 2005; Stoynoff, 2004). However, by presenting a full disclosure of the steps in the collection and analysis of data, readers could better assess the decisions and framework that emerged (Goldacre, 2008; Strauss & Corbin, 1998). The second limitation involves the limited scope and depth of the properties in the eight categories of the theory. Owing to the fact that this study followed a grounded theory methodology, only those properties, aspects, and dimensions found in the data became part of the resultant categories and substantive theory. This limitation can be overcome in future studies which could begin with the eight category framework and focus on exploring properties related to a single category to provide a more detailed and accurate representation. The third limitation relates to the narrow role that the part-time teachers and the survey played in the study. Although not part of the initial scope of the study, issues related to the differences between full- and part-time teachers and their cultural backgrounds proved to be significant but were not able to be developed. Finally, as mentioned above, owing to the grounded theory methodology employed in the study, a complete comparison with many of the components of Rogers' (2003) theory was not possible. To provide a more accurate comparison, a future study could directly apply Rogers' theory to this or a similar setting and then compare with the results of the study in order to provide insights into the relative usefulness of each approach.

In terms of future studies, Wolcott (2001) suggests that one of the best but most neglected ways for a researcher to improve upon practice is to revisit or extend their own previous research. Therefore, a subsequent study in the same setting could begin with the what works theory and develop aspects based upon a larger and/or more varied sample of participants in order to verify aspects and further extend properties. Moreover, other researchers could attempt to replicate the study and/or apply the theory into other similar tertiary settings either domestic or international. Subsequent studies could be also compared in order to form a series case study on the tertiary or even primary and secondary levels. Another approach would be to alter the conceptual framework of the current study by substituting Rogers' (2003) theory with other theories such as the concerns-based adoption model (Hall & Hord, 1987), social learning theory (Bandura, 1977), or the theory of reasoned action (Ajzen & Fishbein, 1980). Alternatively, a competing grounded theory method such as that of Glaser (1978) or Charmaz (2000) could be employed as part of the current study's framework or independently to reveal inherent biases.

6. Conclusion

It was apparent throughout the study that teachers more often than not struggled to put into practice what their education, training and experience had taught them to do. They were, in short, doing what works rather than what they knew works best. It also seemed clear that antiquated educational and managerial dictums implicitly prompted many, if not most of the problems that they encountered. The focus on technology use by teachers only served to highlight the observation that "education is still firmly geared towards the needs of the Information Age, a quickly disappearing era" (Jones, 2012, para. 7). As discussed above, technology and innovations are pervasive in the lives of teachers and students alike and have been shown to have pedagogical benefits for education (Schmidt et al, 2014). However, teachers in higher education classrooms in Korea continue to follow essentially the same practices that their teachers used to teach them decades before. That is, teaching and learning in Korea continue to take place in an academic world separate from the technological reality that students live in and will rejoin once their time at university is complete. This is problematic as it interferes with the basic concept of continuity in learning for students as Dewey (1938) stressed, and Lankshear and Knobel (2003) concur, "School learning is at odds with authentic ways of learning to be in the world, and with social practice beyond the school gates" (p. 31).

During classroom observations, it was noted that students ubiquitously used their Smart Phones to text (e.g., Kakao talk) with friends or to view various forms of media directly from the Internet while on the way to their classes. However, once they entered the classrooms, they were usually told to turn off their electronic devices, to open up their textbooks, and to listen for an hour and fifteen minutes to a teacher in front of a chalkboard. It was as if they had been transported back to the 1950s (or earlier) whenever they entered a classroom. The relief on many of their faces as they turned on their phones upon leaving and checked messages seemed like divers taking their first breaths again after plunging into the depths. Although recent studies (e.g., Hayati, Jallifar & Mashadi, 2013: Hsu, Hwang & Chang, 2013) have begun more detailed investigation of mobile devices in various EFL contexts, results have thus far been mixed suggesting a need for future studies in this area. In conclusion, as teaching and education are future-oriented endeavors, it seems imperative that researchers, teachers and administrators re-examine the relationship of technology to education through studies such as this case study in order to engage in and help realize a more equitable balance between the real, technology-laden world that students and teachers inhabit and the learning environment that we use to prepare students for tomorrow's world.

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