Increasing the impact of ICT in language learning:

Investigating the effect of teachers' ownership of microblending CALL in the classroom within the WST model of ICT use.

Submitted by David William Bish to the University of Exeter

as a thesis for the degree of Doctor of Education in TESOL, April 2017

I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other university.

Signature: ……………………..

Abstract

This thesis aims to address why the adoption of CALL (Computer Assisted Language Learning) within the language classroom is so varied, and its success so unclear, despite fifty years of investment and research.

The huge promise of ICT (Information and Communications Technology) driven results has created an imbalance in language teaching, where initiatives are brought about from outside the classroom, with teachers held accountable for their adoption. My reading of the literature is that lack of consideration of the teacher's role in implementation of classroom technology has led to mismatched expectations and performance. If the nature of the teacher's contribution is recognized, I believe that this can lead to more effective use of ICT, which I have set out to show.

My study, based on a survey of 319 EFL (English as a Foreign Language) teachers across the international group of 31 schools in which I work, seeks to put the teacher back into the picture by examining where their enacted beliefs in social constructivist pedagogy best align with classroom use of digital technology. I coin this emerging praxis 'microblending', a pedagogy rooted in Second Language Acquisition (SLA) theory and contemporary methodology, and I seek to demonstrate its relevance in this study

I test the viability of measuring teacher's microblending readiness through application of Technology Acceptance Modelling (TAM) in an EFL setting to produce a model that explains the variation in classroom use of ICT. My model is based on a critical replication of the WST ('Will, Skill, Tool') model, a TAM model which has so far only been used in mainstream classroom teaching.

I have updated, created and piloted new instruments within the scope of the study, which are now already in use within the institution where I carried out my investigations.

Using both linear regression and Structural Equation Modelling (SEM) techniques I explored how these measurements of the learning environment can explain a teacher’s application of technology.

This first attempt appears to explain over 89% of the variation in classroom use of technology, which already exceeds the predictive power of several contemporary models in use in parallel fields of education.

Given further work to refine and apply the model, a valuable improvement could be made in how teachers work with ICT in the language classroom for improved learning outcomes.

Acknowledgements

I am grateful to my employers, EF Education First, for supporting my doctoral endeavours and allowing me access to sensitive data and to contact our teachers for the basis of this study. None of this would have been possible without Dr Christopher McCormick, who ensured I got started on the doctoral journey I had only talked about for a couple of years and has supported and guided revisions of my work as it has developed.

I am indebted to Dominik Petko of the Pädagogische Hochschule Schwyz, who not only inspired my study with his work but also readily shared invaluable insights into the basics of constructing a statistical model of technology acceptance.

James Gaskin of Brigham Young University was helpful not only in the sheer wealth of open access Structural Equation Modelling training material and procedural advice he makes available online but also in responding to my forum questions and providing access to the resources through his StatWiki and StatTools package of Excel macros for data preparation and matrix output as well as the Pattern Matrix builder plugin for AMOS that takes Exploratory Factor Analysis data from SPSS to create an initial Confirmatory Factor Analysis model in AMOS, a function oddly missing in the software.

Finally and not least I am grateful to all of the EF teachers who have given their time and views in the pilot and main studies, especially those who have taken the trouble to add additional thought-provoking comments. I value their input just as much as my aims are to value the contribution of teachers through this study.

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1. Introduction

1.1. Nature of the problem

The use of technology in language learning is nothing new. The field of Computer Assisted Language Learning (CALL) began with ‘Language Laboratories’ in universities and military language institutes in the late 1950s, predating the emergence of today’s private language teaching industry.

This long history does not mean that CALL and language teaching, in particular TESOL (Teaching English to Speakers of Other Languages), are an easily wedded couple. The adoption of individual educational technologies remains a turbulent affair, as wryly illustrated by the Gartner Hype Cycle shown in Figure 1.1.

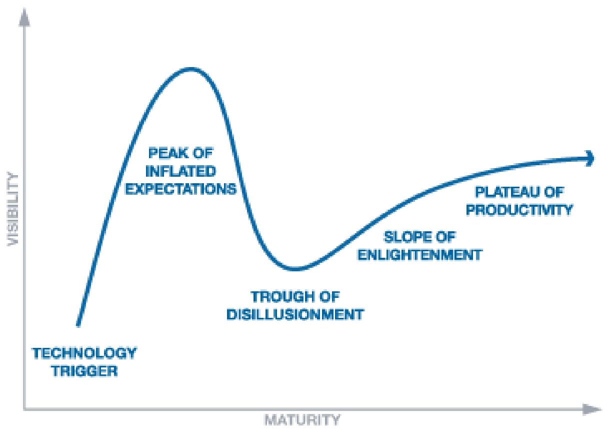


Figure 1.1. Gartner’s Hype Cycle for Emerging Technologies (2013)

Although somewhat critical, this curve of adoption describes many fully successful integrations of equipment into the classroom such as the rapidly-adopted CD player or more gradual uptake of video as well as ultimately less successful innovations such as the language laboratories I mentioned above.

The rise of those language laboratories was triggered by reel-to-reel tape in the technologically charged time of the cold war and space race when the methodology of the day, Audio Lingualism, with its listen and repeat type approach, fitted their adoption well (Pritchard, 1975). Nonetheless despite huge investment and repeated technological refinement, the systems failed to bring either students or teachers fully onboard, with results ultimately falling short of expectations (Keating, 1963; Lorge, 1964; Green, 1972). The laboratories never reached the final plateau of productivity in the mainstream (Rivers, 1989), instead becoming what teachers refer to as ‘a flash in the pan’.

Leaving aside for now precisely why the language labs fell short of expectations, they represent a familiar story, where claims for the use of ICT (Information and Computer Technology) offer the promise of faster progress for language learners, but results are unclear, repeatedly leading to controversies rooted in mismatched objectives of institutions, teachers and students.

Cuban (2001) suggests that the drive for technology in schools is due to three factors:

1. A desire to keep the classroom in step with industry
2. An expectation of efficiency
3. A constructivist pedagogical orientation

Since the first introduction of computers, CALL has evolved through several paradigm shifts. Thus the technology is no longer simply something to copy as with the language labs but more where students are provided opportunities to formulate their own ideas about language based on their experience of using it in alignment with constructivist pedagogy (Dewey, 1938). These have resulted partly from changes in language pedagogy but more often where the evolving capabilities of technology trigger new innovations.

The promise of technology driven results is as strong as ever (Blake, 2008), creating a climate in language teaching of continued change, usually with initiatives brought about from outside the classroom but one where teachers are increasingly held accountable for the adoption of the latest tools they are given and the outcomes from teaching with them. The most high profile examples today stretch beyond TESOL but include provision for migrant ESL (English as a Second Language) teaching, as in the unified school districts of LA where a $1.3bn iPad implementation was thrust upon ill-prepared teachers in 2013 (Blume) in a resource-poor district where less than half of the students were making progress in English Language proficiency (LAUSD, 2013) as well as international aid-sponsored programmes such as the more ESL-specific $35m Jordan Education Initiative (Kozma, 2011).

These huge investment programmes focus on hardware and training whilst simultaneously the latest CALL software tools are being designed for a student-centred marketplace, where computing power in the form of small mobile devices places accessible learning into the hands of students who are evolving different learning habits than teachers in dealing with this new media (Prensky, 2001; Ito et al., 2008; Jarvis & Krashen, 2014).

As with the language laboratories, we hear of talk of delivering learning which is far more tailored and personalized. There is a state of tension between delivery on one hand and autonomy on the other. Here, e-learning in general and more specifically on a mobile device, being a transformative tool, has given rise to a situation where:

> *Perhaps individual learners will create their own ontologies on-the-fly as they navigate through a personalized learning journey. (Traxler, 2009, p. 15)*

This is not something the students are likely to do in isolation; such learning may well be with equipment or software provided by the school and intended to augment the existing syllabus where the language they have learned is put to use in a social classroom setting. We should also remember the connected aspect of the devices being used – students can recommend sources or software to each other (Ito et al., 2008) in a social community of practice where the teacher is a legitimate participant, the classroom existing as a nexus and learning arena but less of a physical or temporally bound space.

Some observers are bold enough to claim that our previous concept of CALL has become obsolete, with powerful mobile and distributed technology facilitating natural acquisition outside the classroom ‘silo’ (Jarvis & Krashen, 2014). This evolution of CALL towards use under less formalized frameworks comes parallel to the notion that adherence to any language teaching method is itself passé (Kumaravadivelu, 1994). Whether or not we accept either of these controversial perspectives, the teacher is far from a redundant actor in the system/network but rather one who is essential in bringing the students to appropriate learning with ICT through the ways described above, a process I call microblending. Simply put, microblending is the teacher’s informed selection of which classroom ICT tools should be used when, this includes their making the choice open to students (a broader definition is given in section 3.6)

1.2. **Rationale for the study**

This study aims to recognize where teachers can be most successful in bringing computer technology into the English as a Foreign Language (EFL) classroom. I hope to demonstrate the degree to which teachers are the agents of change in the classroom and recognize the stance taken by practitioners who successfully adopt classroom technology.

The initial intention to employ CALL in the classroom seldom resides with the teacher and is not always rooted in pedagogical considerations. As I shall explain below, the onus is on teachers to deliver technology enhanced learning from other stakeholders in the commercially operated EFL environment. A teacher who is able to meet the needs of their students through an approach that is both theoretically justified and allows them to retain a measure of ownership over their teaching with technology in the classroom is in a position to bring about this commercial imperative.

The EFL business' customers are almost by definition mobile (Graddol 1997, 2006), and as such, will seek out the best value for their money. The promise of technological innovations easing learning is attractive and novel. I find that students are results-oriented and want achievement fast. While some improvements can be made quickly, progression through multiple levels takes hundreds of hours work over months of study so schools have to offer intrinsic as well as extrinsic motivation to stop students giving up and leaving (Davila, 2017).

Contemporary methodology in TESOL is fluid, with language classrooms being far from traditional. A teacher-centred 'chalk and talk' modality has been replaced by a negotiated, student-centred learning arena where lesson outcomes are recognized to be unpredictable (Ellis, 2003; Breen 2009).

Introduction of mechanical systems into this, complex, socially-constructed classroom reality is not always successful (Cuban, 1986, 1993a). Moreover, where it is, it does not always seem to bring the expected results (Elstad, 2016; Marcario, Handle and Walters, 2012), so although CALL is both novel and attractive to schools and students alike (British Council, 2006), long-term results may not be manifest.

If integration of ICT does lead to improvement, what aspects of classroom practice or school policy can be changed to smooth its path? If, on the other hand, uptake does not lead to improved results why should we push for it?

Existing studies of technology acceptance and usage have tended to be confined to other professions. In education most existing work has been done in distance education or self-study in the tertiary sector (Schepers & Wetzels, 2007, Yousafzai; Gordon, Foxall & Pallister, 2007; Šumak, Heričko & Pušnik, 2011). A recent trend towards applying technology acceptance modelling within mainstream education (Voogt & Knezek, 2008) has advanced our understanding but although this is classroom teaching, it differs markedly from the EFL context. I define mainstream in the same way it is used in by Lightbown (2008) to describe general 'school' education such as in the state compulsory sector. I summarise these differences in Figure 1.2 below, echoing comparisons made in Graddol (2006) and Lightbown (2008):

Mainstream education		**EFL**
Compulsory	→	Voluntary
Usually free	→	Purchased

Children	→	All ages
Long-term	→	Short-term
Multiple subjects	→	Single subject
Content based	→	Competence based
Near home	→	Overseas
Teachers qualify in a minimum of one year	→	Teachers qualify in four weeks

Figure 1.2. Differences between mainstream and EFL contexts

1.3. **Situation of study in a critical research paradigm**

General technology acceptance models seek to use various independent measures to explain a user's uptake of ICT. In the classroom however, this single user is less easy to define – are we talking about a teacher managing classroom ICT use by proxy or is the user the student? The subtle interplay between these two actors has not yet been considered in TAM nor, it seems, in development of CALL technologies, which are, as the acronym implies, learner tools, not teacher ones.

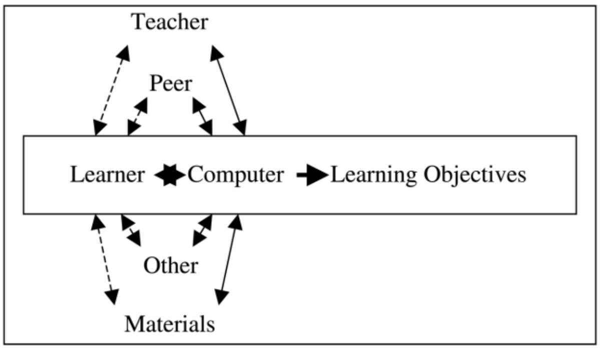


Figure 1.3. A conception of CALL (Levy, 2007)

In Levy's model (Figure 1.3), the teacher is a facilitator, competing with the other peripheral social affordances in the learning ecosystem for the learner's attention (see Conole, de Laat, Dillon, & Darby, 2008). I contend that such a conception is outmoded in that it assumes the learning objectives are met entirely 'through' the computer.

This is where I problematize the situation: the very tools the teacher is supporting are not teaching tools, they are learning ones designed without considering the teacher's role. In ESOL's current 'postmethod condition' (Kumaravadivelu, 1994) where implementation through bricolage requires learning to depend on a teacher's commitment to a constructivist approach, the teacher has all of the accountability and responsibility for integration but is not afforded ICT tools that lend them any measure of control (Cowan and Butler, 2013).

As far back as the language laboratory, it was recognized that a skilful teacher was essential to make the learning technology viable (Rivers 1989; Pritchard 1975), in which case a critical approach would view, with some suspicion, technologies designed with no role for the teacher. While it might seem efficient to produce software intended for the classroom simply for student use, the disempowerment of the teacher within a system that depends on them is naive. While learner-centred tools have become the default, disenfranchised teachers actively resist the adoption of technology when that occurs (Cuban, 1993b).

This marginalization of the teacher is, in effect, a cultural hegemony which awakens the emancipatory interest in this study (Crotty, 1998). I feel that it should be possible to make more effective use of a teaching professional by inclusivity rather than the disenfranchisement that comes from assigning practitioners a merely technical role. If the teacher is recognized as a more important actor in the social ecology of the classroom I believe the language learning outcomes will improve.

1.4. **Significance of the study**

As highlighted in my brief exposition of the fate of language laboratories, any investment of time, money, or effort into technology not commensurate with the TESOL educational ecosystem is a poor investment. In my view, teachers form a crucial part of this ecosystem but one where their presence and contribution are often overlooked at the design level and only considered when it comes to implementation. If software designers and investors are more aware of the teacher's role and what practitioners need of a system that will help them guide students' learning, the injection of technology is more likely to meet with success.

This study will provide a model against which proposed developments can be mapped following a structured, close examination of preconceptions behind blended learning and the top-down CALL software design in which I am personally engaged in my working context. This builds on work I have previously undertaken on CALL systems, including adaptations of 'self-study' Virtual Learning Environment (VLE) work to make it more teacher-dependent. Paradoxically perhaps, this is requested by students in a study abroad environment and required by teachers who need a clear role, without which they offer only 'token compliance' (Cuban, 1986, 1993a) with the implementation of the technology.

In preceding studies, I have looked at how notions of teacher control and their microblending of ICT tools into the classroom can bring about discerning use of technology at point of need in the language classroom. This can be considered an individual teacher-centred equivalence of school-wide ICT adoption state models (for example in Dwyer, 1994) which the latest work in school TAM moves away from.

In this way, the study is giving some element of voice to teachers who can be ignored when the focus is on student tools, and as such, is an awareness-raising exercise for fellow materials-designers of the need to include teachers in the system in design, training and implementation of ICT in ESOL.

This work may highlight a way to predict which teachers are currently more likely to assimilate ICT in their classroom through microblending, providing a useful assay of the teaching team in an institution and the institution's state of teacher-centred readiness for microblending.

1.5. **Contribution to knowledge**

I hope to build on work in Technology Acceptance Modelling (TAM), a management tool used to predict the anticipated use of computer systems and software based in part on psychometric measures (defined in detail in 3.5.). In particular the application of an alternative to the classic TAM model, the 'Will, Skill, Tool' (WST) model (defined in detail in 3.5.4) which has already been applied in secondary education, both refining and re-applying it in the EFL context. This further refinement is required as existing models rely on assumptions which do not include the duality of the teacher and student roles together in the classroom which is a key feature of EFL. As such, this work, including the social context of a classroom, will contribute to studies considering use of ICT in a general educational setting as well as being particularly useful to the EFL field where it goes beyond anything carried out to date. As the first iteration of a WST model for EFL it will open up new discussions and contribute a fresh platform on which others can build.

Evolving methodologies have brought us to the currently popular blended learning solution (Gruba & Hinkelman, 2012; Tomlinson & Whittaker, 2013) where out-of-class student ICT use is coupled with in-class study (Sharma & Barrett, 2007). This neat answer to the question of who uses the technology is, in part, an avoidance strategy and sidesteps some of the issues I wish to address. As a counter-suggestion for describing the emergent adoption of ICT in language teaching I propose a notion of microblending, I define microblending as teaching with both ICT and non ICT tools where the teacher selects ICT tools for appropriate student use inside classroom time (see section 3.6. for a more detailed explanation). This represents a direct attempt to fulfil the need for a 'mature' theory of CALL, suggested in Golonka, Bowles, Frank, Richardson, & Freynik (2014), which considers:

> *…when and how different technologies can best be used to support learning.* (2009, p. 93)

I hold that in technology acceptance models for teaching in (as explored in section 3.5) whether focussed primarily on the teachers' attitude to technology or their perception self-efficacy, such a theory needs to account for a teacher's belief in how learning takes place.

Quite specifically, in the TESOL field, a teacher's commitment to a constructivist approach is a pre-requisite for a principled blended ICT implementation. I define a constructivist approach in Language Teaching as one where affording students the chance to experience and experiment with language allows them to form their own rules. Moreover while this interactionist approach follows the thinking of Dewey (1938) who's 'learning by doing' is a foundation for language tasks, the social turn in second language acquisition adds the notion that language knowledge can only be constructed in a social group. It is such a group that is unique to the communicative classroom setting.

Any qualitative evaluation of learning outcomes in the TESOL field is difficult due to the huge number of external factors which cannot be controlled (Golonka et al., 2014). Through a close examination of the effect of varying levels of technology use on measurable language learning outcomes I hope to highlight the likely effect size of such innovation. This can demonstrate the value of technology where coupled with a suitably prepared teacher.

I aim to arrive at a model against which proposed developments can be mapped which will include a refinement of linear state models of adoption (as criticized by Pynoo et al., 2011; Petko, 2012) which figure in many Technology Acceptance Models applied in education.

1.6. Research question

Any model I can apply will need to answer a fundamental question:

RQ 1. *What factors can best account for the variation of use of ICT in the EFL classroom?*

This variation in use is primarily under a teacher's control (Blake, 2008) and thus such a model must consider the teachers' role. However, I am not talking about the teacher's own use of the ICT in question as they may simply be encouraging or facilitating this use rather than actually being hands-on with the technology. In other words the amount that a teacher is microblending.

1.7. Structure / organization of the thesis

My study is organized into seven chapters. This chapter (1), the introduction, is intended to acquaint the reader with my interest and purpose in completing this stufy. In the context chapter (2) I will expand on specific ESOL situations I intend to investigate, the forces at work and various social or stakeholder groups whose interests are represented in the study.

Having established my purpose, my literature review (3) I detail key language acquisition theories and their application in teaching with technology as well as relevant approaches to modelling technology use before outlining the practical classroom technology use I term microblending.

This sets the theoretical framework for my empirical studies which are explained in detail in the methodology chapter (4). Due to the iterative and experimental nature of Structural Equation Modelling (SEM) analysis I present the results of multiple comparisons of models in several stages in my results chapter (5), briefly outlining key features of the final model, before going on to a discussion (6) where I will critically consider how my results relate to each other in the light of other relevant work from the literature. This will enable me to draw conclusions and highlight the most important findings in a final chapter (7). I close with an epilogue sharing my reflections on the personal learning journey this study has taken me on. The study is followed by a bibliography with appendices (A to M) used to show supporting documents and screen shots, including the data-gathering instruments developed and used in this study.

2. Context

2.1. Introduction

The amount of teacher ownership of their own classroom practice is heavily dictated by their working context. In this chapter I shall describe the environment and parameters within which EFL schools operate, highlighting stakeholders and some of the mechanisms by which this heterogeneous field is drawn together.

It is my view that published EFL materials and examinations have particular bearing on methodology in practice, particularly the introduction of ICT, which is increasingly a pre-requisite for delivering the latest materials, facilitating staff development and preparing for the latest innovations in testing. Therefore, I shall touch on this significance to foreground later discussion alongside other market forces that promote or inhibit innovation in school classroom beyond purely academic considerations.

I will outline the typical school environment, student body and the teachers themselves, in particular seeking to locate practitioners amongst the challenges of change during ICT integration.

Before a final summary, I shall provide a more detailed sketch of EF International Language Schools, the institutional context I will be working within for my empirical study, highlighting its suitability as an analogue for the industry as a whole.

2.2. EFL Study abroad programmes

Study abroad programmes (referred to conventionally as English as a Foreign Language or EFL as opposed to ESOL or ESL) are a major global industry, worth

$12bn annually (Norris, 2014), bringing $4bn a year into the UK alone (English UK, 2014b).

The EFL industry is most commonly a voluntarily regulated one. Unlike the state sector or private educational institutions delivering compulsory education, there are no international standards on what constitutes a bona-fide institution, a course, a finishing qualification or the pre-requisites for a teaching position (Graddol, 2006).

An estimated 1.6 million students travelled abroad in 2013 to English Language speaking countries for immersion language courses (Norris, 2014). The top eight destinations account for over 90% of these students, as shown in Figure 2.1:

Study destination	**EFL students**	**Weeks studied**	**Est. market value***
UK	780,672	3,200,755	$ 4 bn
USA	241,898	3,410,760	$ 4 bn
Canada	152,593	1,831,116	$1.5 bn
Australia	147,828	1,912,031	$1.5 bn
Ireland	109,263	611,872	$0.5 bn
Malta	74,992	233,834	$0.2 bn
New Zealand	32,403	268,937	$0.2 bn
South Africa	18,243	108,652	$0.1 bn

*Market value estimates allocated proportionally

Figure 2.1. Number of EFL students by destination 2013 (Norris, 2014)

Around 60% of those travelling are adults, on whom this study focusses. Their courses are typically twice as long as those of younger learners at five weeks (English UK, 2014a).

Most students are self-funding, or in the case of younger learners are paid for by their parents. A typical all-inclusive course will cost $2,000 per month (Norris, 2014), so students travelling to study English abroad have a considerable disposable income with purchasing power to buy a costly course abroad.

2.3. **Course content**

While there is no standard EFL course, shorter courses abroad are often seen by students as a supplement to longer-term English study in their own country in order to 'activate' the language knowledge they have learned at home (Graddol, 2006). Demand for these courses peaks in summer during mainstream school holidays (Graddol, 1997), giving rise to EFL providers who temporarily mushroom into existence only for these students. Such students particularly value communication classes and oral interaction through immersion (IALC, 2017). This is done in the context of a motivational visit of 'cutural exploration' to countries where the language is used (Allen, 2010; Banov, Kammer & Salcuite, 2017).

By way of contrast, more 'Instrumental Motivation' (Dörnyei, 2009) is clearly seen in students selecting longer EFL courses. Here, the most popular courses are those leading to internationally recognized language proficiency examinations (IALC, 2016). Those administered by Cambridge University from the UK, the IELTS (International Language Testing System) or TOEFL (Test of English as a Foreign Language) exams in particular, as the higher levels of these examinations, are pre-requisites for university entry, working visas and citizenship in English speaking countries. All of these examinations can now be taken in a computer based format.

2.4. **The influence of the ELT publishing industry**

According to Ambient Insight (2013), ELT publishing accounts for a third of the value of the entire TESOL industry. Alongside this economic stake in English language teaching, the materials in use in schools create a degree of standardization, making publishers a key driver of what happens in the classroom, Pennycook (1989) contends that this is nothing new. The curriculum offered by a school becomes the product of the syllabus and focus of each series it uses. Beyond simple course books, EFL series are typically sophisticated, integrated multiple level courses, with a main course text and supplementary resources which typically include multimedia and CALL materials.

I find that course and reference book authors are treated as celebrities in the EFL world, commanding high appearance fees for professional development workshops and large social media followings. I attribute this to the relatively short training period of the typical EFL teacher, necessitating rapid and uncritical adoption of materials in use and their writers.

The recent trend towards more cost-effective digital publishing has implications for technology use in EFL classroom practice. The 2014 annual reports of the largest six publishers (Pearson/Longman, Macmillan, Cengage, Harper Collins, Oxford University Press and Cambridge University Press), all talk of increasing their focus on digital publishing in the TESOL arena. Pearson is cutting jobs in its ELT print division in the UK, Cengage is pursuing a ‘digital first’ strategy, and Macmillan, an early ICT innovator through its One stop English VLE in 2000, has opened a new division to foster startup ICT innovators in the education sector.

In supporting their shift to digital, publishers provide free teacher development and support materials through online media as well as political lobbying for change in classroom infrastructure as shown in this report from McGraw-Hill:

> *Throughout the year we've been busy advocating to improve school access to ed-tech, learning from and promoting successful models worldwide, and re-imagining the use of data to create our industry-leading personalized and adaptive learning solutions. (2014)*

2.5. **The Ed Tech industry**

What was once a handful of suppliers of educational hardware and software is now also a fledgling global industry which, including the digital educational publishing mentioned above was worth around $121.53bn in 2014 (Research and Markets, 2014). The possibility of educational technology to reach students in school and at home in their own country and abroad makes this a huge potential market. This is an industry which promises governments and educational institutions alike improved results based through increased focus on ICT (Cuban, 2001; Elstad, 2016; Singh & Reed 2001).

This adoption of ICT is certainly led by mainstream education where lagging standards in science and maths have been typically targeted by Edutech companies (Moe, Hanson, & Pampoulov; 2012, Vander Ark, 2014) but these firms are increasingly moving into the language, ESOL and EFL markets to provide blended learning solutions (Research and Markets, 2014). Hardware companies such as Promethean and HP in the interactive whiteboard sector, Apple with its iPad tablet, and recently Google with its Chromebook PC all market specifically to EFL institutions backing studies and whitepaper information on the promise of Ed Tech as well as free teacher resource platforms to get educators on board.

Potentially, in my view, even more than in the mainstream, EFL ICT implementations can benefit from BYOD (Bring Your Own Device) solutions where the mobile adult EFL student arrives at their school with their own hardware, be it a laptop, tablet or mobile phone (Bannister & Wilden, 2013; Motteram, 2013). Schools then only need to provide wireless internet access and software rather than invest in costly hardware. This move to working with a variety of different devices in the classroom is already in recent research into

CALL software which works on '*multiple device ontologies'* (Mercurio, Torre, & Torsani, 2014).

2.6. **International levels and standards**

Levels of EFL study are not harmonized internationally (Graddol, 1997), although the CEFR (Common European Framework of Reference) has come to be used by many examination boards, publishers and institutions alike in Europe and Asia and the Americas. The CEFR does not define a curriculum but rather defines functional levels, largely based around communicative competence defined within operational areas of fluency.

Using the CEFR's six stages A1 to C2, it is possible to map the numbers of students travelling to their typical level on departure:

Student origin	**Percentage of overseas students**	**Average student level**
Italy	10.70%	Mid B2
Korea	8.66%	Mid B2
Japan	7.52%	Mid B2
Switzerland	6.98%	High B2
Brazil	6.86%	Low B2
Spain	6.20%	Mid B2
Saudi Arabia	5.32%	A2
France	5.27%	Mid B2
China	5.19%	Low B2
Colombia	1.49%	Low B2

Figure 2.2. Top ten origins and typical level of EFL students 2013 (Norris, 2014, EF, 2014)

As figure 2.2 illustrates, few students travel abroad at an absolute beginner level nor seek overseas courses at the higher C1 and C2 bands of the CEFR but tend to begin their courses at an upper-intermediate or B2 level.

The industry has evolved national and international standards of best practice with self-regulating professional accreditation bodies which have arisen amongst schools existing largely to represent quality to the consumer but also to develop the profession itself as described in section 2.8.

In some cases, such as the UK, where non-EU long-term students on ESOL programmes require a student visa, the schools are required to become accredited in order to sponsor these visas. Such accreditation schemes usually require the institution to have specific levels of staffing and maintain robust internal quality control procedures (such as ISO 9001:2008 in the USA, the Edutrust scheme in Singapore, and English New Zealand's approval programme), but these do not dictate that any specific methodology is used.

In effect, this means that schools are free to innovate in terms of course design and delivery. They enjoy academic autonomy in the right to exploit methodologies which the institution believes will benefit its students. Some degree of the blended learning I described in Chapter 1 is typical in most EFL providers (Tomlinson & Whittaker, 2013; ICEF, 2016).

2.7. **EFL Schools**

Purpose-built EFL schools are a new development among the more well-established providers. The industry came into being partly by making use of empty state school buildings during the holidays, staffed by vacationing teachers and university students (Griffith, 2014). Well-established, year-round schools are often in office spaces or converted buildings which dictate smaller classrooms than might be found in a high school or university. Group class sizes are typically somewhere between 10 and 20 alongside 1:1 private lessons.

As the industry has matured, schools have had to adopt standardized equipment suggested by accreditation bodies and expectant students (Bish, 2013). From around the year 2000 it seems no school brochure was complete without a picture of a computer lab (Bigum, 1997), just as in mainstream education:

> *A "good" school has become a technologically equipped one. (Cuban, 2001, p. 159)*

However, given massive investments in technology in the state sector, some year-round EFL schools are less extensively equipped with interactive whiteboards, wifi and staffroom PC provision than state schools.

2.8. **The EFL profession**

The debate of whether TESOL or EFL is a profession (Richards, Tung, & Ng, 1996; Sachs, 2001) is beyond the scope of this thesis, although EFL teachers currently seem comfortable to describe themselves as such (Bish, 2013). As professional bodies and standards exist which are useful in describing the EFL context, I shall retain the term here.

Many native EFL teachers originally train in order to travel; a 120-hour CELTA (Certificate of Language Teaching to Adults) course can guarantee a native English speaker work overseas (Lightbown, 2008; Maxom, 2012). This work abroad becomes an unofficial apprenticeship and gateway into the industry (Griffith, 2014).

Accreditation bodies recognize that this is a low threshold to join a profession. The British Council, for example, refers to such teachers as being 'initially qualified' (TEFL-I in their terminology), while English New Zealand, who allow for 20% of a school's EFL teachers to be unqualified, hold that:

> *By its nature the ELT industry has high numbers of novice teachers who require support and development in order to become effective professional teachers. (2011, p. 3)*

Aside from the larger chain schools and franchises, the typical workplace is a small, owner-run operation (Griffith, 2014). This places many EFL teachers in some isolation, with limited contact with fellow practitioners. Although not unionized in most countries, EFL teachers connect with their community of practice in local or national associations, such as IATEFL and TESOL International, formed ostensibly for professional development. Outside annual conferences of these organizations both now offer regular webinars for special interest groups while peer-support for this disparate community has increased hugely in the last five years with the rise of social networks and initiatives and online communities of practice in blogs and webchats (Hayes, 2014). Here, technology affords the often isolated teaching diaspora both resources and kinship.

2.9. **The Climate of Change**

An issue constantly faced by institutions and teachers is the climate of change in EFL (Kumaravadivelu, 2006; Tribble, 2012). As I have hinted above in section 2.6, there is no requirement for methodology to be static and this young but high-stakes industry is at least as influenced by market forces and available materials as it is by theoretical shifts in the field (Pennycook, 1989) (outlined in more detail in Chapter 3).

Each change requires new adjustments on the part of the institution and new learning and adaptation on the part of teachers, as this teacher I interviewed put it:

> *'Sometimes we feel like stuff's coming from on top and we have to implement it and we can't always do it. …in the end as we move along things are just changing and I don't think we can stop but we would like to slow it down sometimes'. (Bish, 2012, p. 18)*

While teachers can be tech-savvy, aware of the latest theoretical developments and indeed enthused by new opportunities, there is tangible frustration at having to regularly cede any academic autonomy and re-adapt to top-down change. It is teachers who ultimately have to change their classroom behaviour to implement any innovation with their pedagogical practices being actively 'disrupted' by the latest teaching technologies (Hedberg & Freebody, 2007). Often alongside their efforts to make these changes comes blame levelled at these teachers from the other stakeholders, as Selwyn, Dawes & Mercer provocatively put it:

> *…teachers have long been seen by educational technologists to exhibit a range of obstructive behaviours from incompetence to sheer bloody-mindedness, doggedly resisting change in educational computing. (2001, p. 4)*

2.10. The institutional context – EF International Language Schools

This study is set in EF Education First's International Language Schools (from now on referred to in this thesis as ILS). As one of the largest names in the industry (Marsh, 2015), ILS represents the industry well. Its 31 English schools, located across the largest eight EFL destinations, serve an international student body well aligned with that described above.

The ILS schools share a common EFL curriculum with standardized materials and methodology, although given the size of the organization the implementation of new techniques and tools is not instant across all schools and will exhibit the same issues of uptake mentioned in Chapter 1. There is also some local variation in the teaching where national regulations on teachers' working conditions or study dictate. For example, the visa attendance requirement for a full-time student in Singapore is 90% (CPE, 2017) where it is 80% in most other countries, and in Australia time students spend studying with a computer, whether or not supported by a teacher, does not count towards the number of 'contact hours' needed for a student visa (NEAS, 2010).

2.10.1. **ILS Students**

Students come to ILS schools from 135 countries worldwide (EF internal company data, financial year 2014–15).

At ILS, the average student in 2015 was a young adult studying at B1 level. The student body is split between those studying on typically 2–3 week short courses and those studying on longer-term six– or nine–month 'gap-year' type programmes with the expectation of progressing through several levels of the CEFR (EF internal company data, financial year 2014–15).

Students completion of mid-and final course feedback (scoring items on a 5 point likert scales) shows that although students are buying a blended learning course at ILS, they consistently rate teachers higher than any course materials or resources. At the end of their courses almost all ILS students feel they have met their learning goals and are prepared to recommend the school to others (EF ILS student final evaluation data, financial year 2014–15).

2.10.2. **ILS Teachers**

These will be the primary participants in my study. All are professionally trained with the minimum of a standard TESOL course, a 120-hour intensive course which includes assessed teaching practice. A ILS teacher survey in 2013 showed that most ILS teachers are in at least their second job in the profession, having on average seven years' TESOL experience with three at ILS. A teacher will have either one or two general English groups who they work with daily for two and a half hours each, for five days a week.

The teaching body is international with both native and non-native teachers employed on equal standing where local regulations permit. School policies actively encourage teachers to develop professionally, and consider career opportunities which may take them to another ILS school.

2.10.3. **ILS Academic Management**

Each ILS school has a local academic manager, a professionally qualified DOS (Director of Studies) who usually has no teaching load but is responsible for syllabus delivery. The DOS recruits and manages teachers and is responsible for arranging their initial training in use of the school's materials and ongoing professional development.

The DOS creates the academic schedule for the school and correspondingly the makeup of classes stemming from students' initial placement test and other factors such as nationality mix and age. They are a key point of contact for students to seek academic support if they would like to adjust their learning programme in any way.

The DOS manages the school's academic resources from teacher reference material to computer labs. They have oversight of teachers' lesson planning and regularly conduct classroom observations. As such, they have the most complete insight into teaching and learning at any one school and are key gatekeepers to my research.

A central academic team, to which I belong, oversees the curriculum taught in ILS schools and provides support and guidance to each school's DOS.

The central academic team has a variety of research initiatives both inward and outward focussed.

One atypical aspect of ILS is that unusually in EFL it produces all of its own materials for English language learning. The central academic team commissions and oversees production of this material as well as being responsible for training the schools in its use and ongoing monitoring of the use and effectiveness of the material.

2.10.4. **ILS Teaching Materials**

These are designed round a CEFR-based syllabus. The work at each level is split into weeks of integrated language skills and task-based learning based on a notional weekly theme for each level.

Students begin their course with a placement version of EF's standard EFSET test (EF, 2014) and also take a final version of the same test at the end of their course for certification.

For general English classes, the students have a main course book, a level guidebook with reference material and supplementary work plus weekly material they access online through a proprietary Virtual Learning Environment (VLE) with a teacher's support in a computer lab, PowerPoint based material delivered by the teacher, teacher-led networked iPad lessons and communication workshop activities.

There are additional materials for specific areas that students can select for elective classes ranging from various industry-specific business English topics, exams and language specific areas such as pronunciation or lexis. These materials are also available in a blended format with book-based and ICT-based work.

Although material is provided, ILS expects that teachers will take some ownership in supplementing, extending and personalizing the content to keep it contextually relevant to the students. Each staffroom has a library of teacher resources and reference material for this and teachers are encouraged to use 'authentic media' (i.e. media not designed for language teaching), particularly through the Internet in iPad-based lessons.

When students leave the school they have continued access to their work on the VLE in order to actively review and consolidate the language they have met on their time abroad.

2.10.5. **ILS School environment and facilities**

All ILS schools are permanent year-round centres in English language speaking countries with a permanent administrative and management staff. The schools offer a full service including student residence style accommodation (usually offsite) as well as family homestays. Students are mixed by nationality in their accommodation in order to maximize their need to use English in the immersion environment.

A complete programme of optional activities including weekend trips away provides engagement with the target culture and opportunities to acquire and practise language in context.

The schools are in modern or heritage buildings, remodelled to provide a spacious learning environment which is intended to feel different and more contemporary than a typical ‘school’.

Inside the schools, standard classrooms, mostly equipped with media projectors, are supplemented with a lecture hall, computer labs and a studio style space used for a weekly communication workshop.

Classroom sets of iPads are used to ensure that each student has access to a tablet when the lesson requires it.

Every area of the schools has broadband wifi access.

2.10.6. **The support role of ICT in ILS schools**

Students are given access to an online portal when they first book their course which provides personalized information about the course and gives access to an online pre-course and pre-arrival placement test taken online. Once at school the students use this to access their schedule and online learning aspects of their course. They are regularly contacted through this system, email or Facebook on administrative matters.

iPads are used in most of the schools for administrative tasks including checking in new students, taking the register and recording tutorials. A 2013

ILS survey found that 66% of teachers owned a tablet or smartphone, which has risen to 85% in 2015 (based on the results of this thesis).

Student administration is entirely carried out through an online database system used by all staff across the organization including teachers who enter bi-weekly grades for students using PCs provided in the staffroom. This system produces all paperwork such as attendance registers (where iPads are not used) and end of course certificates.

Schools have a part-time onsite IT support officer with 24/7 support available online for software issues.

2.11. Summary

EFL study abroad programmes are a specialist branch of ESOL based in the private sector. English language travel is a costly investment (IRO $2,000 p/w) resulting in an industry of considerable size ($12bn p.a.) which makes a significant contribution to the economies of destination countries.

Most of this teaching is in the UK, USA and Australia, along with five other countries altogether holding 95% of the market.

The bulk of students are adults, although EFL school numbers increase seasonally in school holiday season with young learners on short courses.

Students travelling are from a fluctuating range of countries where government initiatives in their country of origin may temporarily swell their numbers. The EFL student is typically an adult starting their 2–5 week study abroad at an ‘Intermediate’ (CEFR mid B2) English level.

Within EFL teaching, there has been little mandatory regulation for short-term students but government scrutiny is applied where student visas are required. Accreditation bodies that initially arose as collegiate enterprises in standards raising and joint marketing are now being used by governments as gatekeeper bodies (Bish, 2013).

As private, semi-regulated schools, institutions enjoy considerable freedom in curriculum and staffing. Teachers can start working in EFL with as little as a four-week training course. This workforce is predominantly female and may be native or non-native, typically remaining in the industry for five to ten years (Bish, 2013; Johnston, 1997; Tasker, 2014). During this time teachers seek out professional development opportunities, often joining a professional body (Bish, 2013).

While schools are free to innovate, this is done as much to set them aside in the market as to follow best practice in the field. Changing trends in methodology and method (Chong, 2016; Kumaravadivelu, 2006; McGrath, 2016) lead to schools offering a broad and fluid range of academic directions (Kumaravadivelu, 2006).

Lack of an external international regulatory framework has led to de facto standards being set by international examinations boards and course book producers (Mc Grath, 2013). Both of these branches of the publishing industry exert considerable influence over schools (Mc Grath, 2013; Pennycook, 1989). As cost-saving initiatives in publishing shift output towards digital, the availability and price of digital materials, including free teacher resources, is driving schools to consider greater use of ICT in the classroom. Similarly, the growing Ed Tech industry is a key promoter of increased use of ICT in schools (Warchsaur, 2000).

These contextual factors can be polarized into those which promote or inhibit the increase use of ICT in EFL as summarized in Figure 2.3. Professional bodies and teachers fall into both of these camps, an analysis of their beliefs being a key part of this study.

For increased use of ICT • Schools wanting to demonstrate innovation • Students wanting an updated learning experience • EFL publishers • Examinations boards • Educational equipment manufacturers
Against increased use of ICT • Accreditors focussing on traditional teaching • Student travel grant awarding bodies • Students wanting teacher attention

Figure 2.3. Summary of change drivers for ICT in EFL

This study is set in EF ILS, a multinational chain of language schools, company owned and operating under the same syllabus with the same materials. They are a large although typical provider with the standardization aspect providing a ‘typical case’ on which to base a study of the classroom integration of ICT across a large sample of teachers (up to 700 at peak) and schools (31 plus).

Innovation and use of technology in teaching is not new to this group of schools or their teachers; nonetheless, I anticipate attitudes and skill levels to vary across the sample given the variety of locations and individuals involved.

3. Literature Review

3.1. Introduction

This literature review is in three main sections, firstly I shall deal with the SLA theory that underpins ESOL praxis and the subsidiary field of CALL that puts us at the point where computers are used in the language classroom, describing the methodological status quo in order to highlight why microblending is an apt description of what happens in the EFL classroom.

In the second I shall consider how general technology acceptance has been modelled through the psychologically based TAM, more refined approaches that consider the educational context and the WST model which has been constructed and used specifically to examine classroom based ICT implementations.

Finally, as my intention is to further ‘sharpen’ application of the WST model in TESOL classrooms I shall look at some of the measures and assumptions in existing models and highlight where the literature has suggested their revision.

Finally, I return to the areas of SLA that suggest the mode of technology use which I have coined ‘microblending’, I shall highlight how previous authors and studies have laid out a justification for what I see as the underlying principles of microblending and how teachers’ adherence to these principles can potentially lead to effective integration of ICT in the ESOL classroom.

By the end of the chapter I should arrive at a point where I am able to justify a synthesis of the Will, Skill, Tool (WST) model of technology acceptance in schoolteachers with my own EFL situated microblending to a model which can potentially demonstrate the value of fostering a microblending approach in the EFL classroom.

3.2. ESOL Theory and Practice

The literature illuminates several paradigm shifts in second language acquisition and underlying learning theories which have affected ESOL classroom practice. While these are fundamentally about what it means to learn a language they have repeatedly re-appraised the role of classroom learner and teacher as well as the other affordances in the learning environment.

3.2.1. Second Language Acquisition Theory: The social turn

Language acquisition theory in the latter part of the 20th century focussed on a very machine-like language processing model which implied a role for computers in the classroom as accuracy-based tools.

At the start of the millennium, the iterations of cognitivist SLA have been re-appraised in the light of an ontological shift known as the 'social turn' (Firth & Wagner 1997; Johnson, 2006; Lantolf & Thorne, Ortega; 2009, 2011). This current thinking holds that language only meaningfully exists within a social context and, as such, cannot be regarded as an absolute, internalizeable to any one individual. The prevalent theory, Vygotsky's 1920 theory of mind, conceptualizes cognition itself as fundamentally social, mediated through the use of language as a tool. This shift in the way language is regarded as a tool must also apply to the use of ICT in the classroom as a sociotechnical affordance.

Thus while language processing and acquisition was once modelled on the way computers work, now the way computers are applied in the classroom can echo human interaction and the social construction of knowledge.

3.2.2. **Language Teaching methodology: The social turn**

Given this epistemological model of both language as an emergent social phenomenon and its acquisition as an aspect of the negotiation of a group identity, *'to speak is to create oneself'* (Swain & Deters, 2007, p. 830), alongside this negotiation of self, we see negotiation of language form (Lyster, 1994). That this calls for a constructivist perspective on methodology almost goes without saying.

An important assumption of the pedagogy I term microblending is that this output and interaction, in the form of negotiated languaging, is of value to acquisition. Swain provides evidence for how such languaging precedes emergent language use in her own studies and those of others (Swain, 2006).

This performative dialogue is also described in theories of dialogic education where learning stimulus can be provided by bringing a computer into the dialogic space (Wegerif, 2013) into which the students formulate knowledge together (Littleton & Mercer, 2013).

3.2.3. **Language Teaching methodology: Task based Instruction**

Since before the social turn, empirical work in the field of ESOL had been pointing the way from a synthetic structuralist approach, typically embodied in the PPP (*Presentation*, *Practice*, *Production*) formula, towards the more authentic, pluralistic and situated Task Based Instruction (TBI) (Richards, 2006). This Task Based methodology has since been adopted wholesale in state language teaching in several countries, such as the Netherlands, Hong Kong and India (Nunan, 2004; Van den Branden, 2006; Thomas & Reinders, 2010).

Rather than being a prescriptive framework however, TBI began as a description of emerging praxis from teachers reacting to the inefficacy of the preceding methodology (Ellis, 2003; Nunan, 1991, 2004). Further endorsement came from proven successes in research studies (Bygate, Skehan & Swain, 2001; Prabhu 1987).

There is no single accepted definition of a pedagogic task: Ellis (2003) gave nine competing versions while Nunan writing a year later provided five. In the interests of simplicity, I offer the following from Nunan which repeatedly appears in other works:

> *A piece of classroom work which involves learners in comprehending, manipulating, producing or interacting in the target language while their attention is primarily focused on meaning rather than form.*
> *(Nunan, 2004, p. 9)*

While several alternative frameworks have been posited (Long & Crookes, 1992; Ellis, 2003; Richards, 2006), a common denominator of TBI procedures is that they include a reflective examination of forms which emerge from language use. Depending on the task construction this deductive focus on form can happen at various times, creating a very flexible framework for the teacher to employ (Richards, 2006).

The options of when to focus on form and exactly what constitutes a task procedure can present the novice teacher with the problem that their tasks could include almost any classroom activity as long as there is a focus on form. This is a potential issue with the descriptive nature of TBI frameworks rather than their being a simplistic prescriptive method.

The emergent nature of TBI gives ownership of the methodological agenda to classroom practitioners themselves, a facet recognized by Willis and Willis in their 2007 update on Jane Willis' earlier work. In *Doing Task-based Teaching*, the Willises put out a call to teachers worldwide for their interpretations of TBI, with the resulting work comprising the voices of thirty- five language teachers working over twenty countries and TESOL contexts.

3.2.4. **Language Teaching methodology: Postmethod**

Kumaravadivelu (1994) boldly suggested that TESOL has stepped even beyond the multiple frameworks of TBI into a 'postmethod condition' where teachers exercise a principled eclecticism (Larsen-Freeman, 2000) rather than adhering to any single method. This echoed Pennycook's earlier argument that these methods had become *'such loose constellations of techniques that they have little coherence'* (1989, p .611).

In settings where the teacher has autonomy, this 'pick and mix' approach may in theory be a refreshing alternative to mechanistic procedures and synthetic packaging of forms. Nonetheless this *'smorgasboard conception'* (Mellow, 2002) is full of pitfalls for the unwary or novice teacher. The case in point being how easy it has become for an overzealous teacher in the technology enhanced classroom to simply have students use technology for technology's sake without a careful focus on monitoring and fostering language improvement.

TESOL technology advocates have responded with frameworks such as the reconceived ‘Bloom’s Digital Taxonomy’ (Churches, 2016), a quintessentially constructivist framework which ensures that lessons contain a balance of thinking and communication skills advanced by a technology enhanced learning process, while more recently the SAMR framework (Puentedura, 2014) encourages the teacher to look to create tasks which are transformed or redefined in ways impossible without the use of technology.

3.3. **Language Teaching methodology: CALL**

As I shall show below, CALL is a disparate field (Chapelle, 2007) and may well have outgrown its moniker, there is however strong evidence in the literature for an ontological perspective on the use of ICT in language teacher providing the context in which I situate microblending.

3.3.1. **Stages of CALL**

Warschauer & Healey (1998) advanced an oft-cited evolution of CALL that echoes the shifts in pervading language teaching methodology already described from an initial Structural/Behaviouristic CALL to what they term ‘Integrative CALL'.

The earlier stage was said to depended on highly specialized classroom software, such as the Language Laboratories I mention in the introduction. It depicts a very individualised, student-centred, accuracy based type of teaching well suited to work on pronunciation or grammatical accuracy.

By way of contrast, Integrative CALL is seen in a teaching environment where regular use of a variety ICT for different skills is integrated into teaching often on devices including the student’s own both in school and at home rather than occasional visits to the language lab.

In criticising this simplistic evolution Bax (2002), suggest that rather than a historical evolution, there is plurality where all of Warschaur’s stages exist in different institutions and ESOL contexts (Ioannou-Georgiou, 2006) .

Warschaur’s stages may simply be seen to depend on software and hardware complexity and availability, as such the stage of Integrative CALL is analogous to the state of immediate computer access, described by Dwyer (1994) as a pre-requisite for his fifth and final stage of institutional computer adoption as shown in Figure 3.6. Such clear location of CALL in this final stage of adoption is the premise for teacher focussed studies such as Kesseler and Plakans (2008).

3.3.2. The end of CALL

At the time of writing, the CALL community is undergoing a period of critical reflection as seen conferences and papers emerging in the last ten years. Potentially CALL as an independent discipline has been either outmoded, superseded or assimilated into TESOL where the technology is no longer seen as a tool in its own right but a medium (Chapelle, 2000; Kozma, 1994; Jarvis & Achilleos, 2013; Wegerif 2013).

In 1998 Warschauer suggested that the next stage of CALL would be Intelligent CALL (ICALL) based on the potential of natural language processing technology to allow the computer to become an intelligent agent supporting learning which offers:

> *…a potentially more central role for the computer as a tool for authentic language exploration and use in the second language classroom. As our focus of attention gradually shifts from the computer itself to the natural integration of computers into the language learning process. (Warschauer & Healey 1998, p. 67)*

Here the underlying premise is that the classroom as the setting in which ICAL software is integrated into tasks that to allow for language exploration, as such offering tools that teachers can deploy and integrate.

While ICAL's assimilation of Artificial Intelligence (AI) software is now a major strand in CALL research, this does little to switch the focus from the computer to a socialized classroom context. To myself and others this appears to be reproducing the 'thinking machine' envisaged back in the 1960s (Schulze, 2008). The dangers of such an opportunistic approach aside, in ICAL the teacher is now liberated from a frontal machine-minding role to one where, in theory, they can facilitate student learning in more efficient ways.

By 2000 Warschsauer had come to regard Network-based Language Learning (NBLL) as the successor to CALL (Warschauer and Kern, 2000). Here the technology has become a transparent delivery mechanism through which the learner accesses information and communicates with others, including teachers.

In Network-based Language Learning, the emphasis is on creative expression, communication and investigation of authentic media, or simply using the computer as a 'socialized' distributed teaching channel as seen with Networked Learning or Massive Online Open Courses (MOOCs).

3.3.3. **The absence of the teacher in CALL**

While I am comfortable with plurality of CALL implementations and designs I side with Chinnery (2006) in taking issue with the nomenclature of suggested successors to CALL, almost all of which omit the teacher, for example:

- *Mobile Assisted Language Use* (MALU) Jarvis and Achilleos (2013)
- *Network-based Language Learning* (NBLL) Warschauer and Kern (2000)

- *Technology Enhanced Language Learning* (TELL) Bush and Terry (1997)
- *Web Enhanced Language Learning* (WELL) (Allodi, Dokter, and Kuipers, 1998)
- *Web Based Language Learning (*WBLL) (e.g. Son, 2007)

Unlike broader SLA methological terms like CLT (Communicative Language Teaching) or TBI, these suggested methodologies/pedagogies emphasis the role of the technology and language learners while omitting the teacher, teaching or instruction from the premise. While this suits a learner-centred approach in EFL it does little to illuminate what the teacher's role should be in practice. If, as Warschauer states (2000), the student now has 'agency' the role of the teacher is in question.

A very clear example of this was the exposition in a recent graduate School of Education conference where a colleague shadowing her daughter at school over a variety of ICT based lessons showed that teachers were very unclear of their role or how they were 'teaching'.

This is also apparent in Levy's 2007 article 'Why call CALL CALL?' – an effort to reclaim the acronym under threat from Chapelle and others. At the time, Levy analysed many aspects of the term but neglected to question the validity of that final 'L'.

Beatty (2013), in examining the absence of the teacher in methodological categorizations of CALL, finds only peripheral mention of teachers in terminology. Even though he claims to have found the acronym CALI

(Computer Assisted Language Instruction) and CALT existing to refer to Computer Assisted Language Teaching, as well as the non-ESOL specific CAI (Computer Assisted Instruction), in the recent literature I have found CALT an anachronism which most authors now use only in passing. It does seem to linger in papers from China (Xie, 2006, 2007; Yang, 2010), although the focus on the teacher in this context is not unusual and echoes the Sinocentric retention of the 'T' in TBLT (Task Based Language Teaching) adopted as a national modus operandi in China since 2001 (Hu, 2013).

The marginalization of the teacher in what was considered to be a classroom setting is clear in Levy's conception of CALL in Figure 1.3. where learning objectives are met purely through interaction between student and machine.

It is possibly only when we get to current methodological terms such as 'Blended Learning' (Sharma & Barrett, 2007; Tomlinson & Whittaker, 2013) or the 'Flipped Classroom' (Bergman & Sams, 2012) that in the use of the passive voice the hidden actor, the teacher, becomes most conspicuous by their absence.

3.3.4. **Blended Learning**

Blended Learning has come into CALL from both industrial and mainstream educational training contexts (Sharma & Barrett, 2007). While it can be used to describe any blend or variety of teaching and learning formats used within an institution (Claypole, 2003; Balci, 2017), the term is most often currently used to characterise a course that is delivered partly through classroom teaching and partly through self-study with ICT-based media (Singh &Reed,

2001). The use of the term Blended Learning in EF, the institution under study, is itself a blend of these two usages.

One key pedagogic driver for Blended Learning is its potential to extend the amount of ‘contact time’ students receive on a course through ICT-based self-study. I would agree with Sharma and Barrett (2007) that this is also potentially cheaper than extending that time through face-to-face classes although Tomlinson and Whittaker (2013) feel that maintenance and setup costs make this questionable in the TESOL context.

Course-providing institutions now talk of their ‘blend’ in terms of the proportion of a course delivered online or face to face (Tomlinson & Whittaker, 2013). The extreme example of this is the Massive Online Open Courses (MOOCs) or Schools in the Cloud (Mitra, 2014) such as Futurelearn, the platform used by the University of Exeter, to run free ‘teacherless’ courses. Successful MOOCs are heavily supported through social interaction features (Yousef, Chatti, Schroeder & Wosnitza, 2014), largely student to student following a framework similar to that demonstrated by Levy in Figure 1.3. or in the socioculturally inspired digital didactic design advanced by Jahnke and Kumar (2014) below. Here, as hotly debated in the recent conference hosted by Cambridge University press: ‘Schools in the cloud: Learning without teachers: It couldn’t happen, could it?’ (2014), the teacher becomes redundant in the model.

While Blended Learning need not be so extreme and as Bergman & Sams (2012) demonstrated with their ‘flipped classroom’, where students are required to do their ‘homework’ by watching a plenary video online before a more hands-on class, this still offers a way for a teacher to regain control over the syllabus.

Tomlinson & Whittaker (2013), who provide an excellent overview of blended learning in ESOL, reproduce the following taxonomy of proportions of blend based on terms from Smith and Kurthen (2007):

Term	**Definition**
Web-enhanced	Minimal online materials, such as posting a syllabus and course announcements.
Blended	Some significant online activities in otherwise face-to-face learning, but less than 45%.
Hybrid	Online activities replace 45–80% of face-to-face class meetings.
Fully online	Conducting 80% or more of learning materials online.
School in the cloud	Conducting 100% of the course online.

Table 3.1. Taxonomy of terms related to blended learning
(after Tomlinson and Whittaker, 2013)

While such taxonomies speak in terms of percentage of blended format of materials delivery, they sidestep the pedagogic principles involved or the role of the teacher, if any. In particular the focus is on an institutional or course level blend rather than recognizing that a teacher themselves might own the blend. Nor do they consider that with a classroom based hybrid ‘delivery’ blended learning could be in effect 100% face to face as the teacher is present. Here the inclusion of Microblending would recognise the teacher’s contribution in selecting how much ICT to use in so called ‘face to face’ learning.

3.4. Locating the teacher and their voice in CALL

This thesis aims to recognize how much current teachers are engaged with ICT in a phenomenological sense and to offer some advocacy for increased engagement. So here I turn directly to how the teacher's role is seen in the literature. A socially deterministic view of classroom use of ICT (Bigum, 1997) sees the teacher's role as a driver of classroom ICT use. Since Karen Johnson's seminal TESOL quarterly 2006 article, '*The Social Turn'*, highlighted how teachers' knowledge and beliefs are crucial to an understanding of the learning engendered in any ESOL classroom, it should have been impossible to conceive of ICT use without considering teachers.

Although teachers may be seen as a pre-requisite for learning with ICT (Stepp-Greany, 2002; Conole et al., 2008), the teacher is regarded by many to have moved from the role of expert to that of a facilitator where they compete with the other social affordances in the learning ecosystem for the student's attention (Conole et al., 2008).

Even where a teacher is not leading the class from the front, they are accountable for what is happening on an ESOL course. Here an expectation of 'syllabus delivery' and the implementation of CALL resides with the teacher (Blake, 2008). Learners may be granted a degree of autonomy by the teacher whilst the teacher retains responsibility for dealing with many of the practical issues (Mayora, 2006, 2009; McGrail, 2006). Winner (1978) goes so far as to say that in accepting the technology into their realm teachers are in effect relinquishing control and surrendering their freedom.

More recently, Cañado (2010) suggests that things have now gone so far towards promotion of technology in the university sector that student and teacher roles are now reversed. Where once there was talk of a move to empower students with 'Emancipation Through Learning Technology' (the title of the EUROCALL 1993 Conference) to enable their autonomy, practitioners themselves now consider their own situation. Supporting self-emancipation has proved popular in conferences (Vye et al., 2012). Working from the earlier 'Shizoa' conference definition of Teacher Autonomy, the JALT conference 2002 recognized that a teacher lacking the resources to gain personal autonomy from within may well become a 'powerless victim' in certain settings of educational change.

3.4.1. **Teacher Autonomy**

Despite much discussion, the notion of Teacher Autonomy is a slippery one to define especially as it is usually considered apposite to Student Autonomy (Yan, 2010; Barfield et al., 2002; Johnston, 2003), as Barfield suggests:

> *Because society confers teachers and learners with different roles, rights and responsibilities, it is not possible to identify a perfect match between the processes of teacher autonomy and learner autonomy. (p. 210)*

For the teacher, those rights and responsibilities may be held in tension in what Johnston (2003) calls the paradox of 'Solidarity and Authority'; however, the autonomy of teacher and student are not mutually exclusive, in fact the most fulfilled teachers might be those working in settings where both they and their students enjoy autonomy.

Beyond the socially constructed classroom, the right to teacher autonomy is not conferred by students (Drexler, 2010) but by the establishment in which they work and the socio-economic norms of the society in which that institution is embedded. In his article ‘Negotiating autonomy and control’ Steen-Olsen (2010) talks about the economic impingement on teacher autonomy as evidenced by the way a teacher’s use of their time is controlled.

3.4.2. **The teacher as an actor**

If the classroom has been ‘flipped’ or the teaching is ‘blended’, no matter how student-centred the classroom may be, the student is not the driver of these aspects of enacted methodology, but the teacher, who after all is accountable for what happens in the classroom and the eventual results no matter how much the students are considered to be autonomous learners (Alsied & Pathan, 2013). Here the teacher’s responsibility is to set up what Dewey called the ‘environment’ (Hansen, 2002).

Those teachers granted sufficient autonomy coupled with sufficient skill and access to technology are in a position to direct use of technology in the learning environment if they are sufficiently self-actuated, as Bergman and Sams (2012) did in the USA with their application of the flipped classroom.

While Bergman and Sams are now famous, even idolized for their innovation, many such enthusiastic classroom practitioners in ESOL can be seen amongst the public professionals sharing their experiences with technology enhanced learning online (e.g. Kathy Schrock, Lisa Nielsen, Marissa Constantides, Sean Wilden, Todd Beuckens and Kieran Donaghy, to name a few). These all exemplify John Dewey’s ideal of the reflective teacher (Dewey 1933) in extending their own learning and experience much as they expect their students to (Mezirow, 2000).

Several organizations have published new recommended standards for teachers to aspire to but recognize the importance of the teacher as a driver in the classroom:

> *Teachers have always held the key to student success. But their role is changing. The ISTE Standards·T define the new skills and pedagogical insights educators need to teach, work and learn in the digital age. (International Society for Technology in Education (ISTE), 2015)*

While in the student-centred classroom a facilitator role is required, the teacher still needs a focus on teaching and direction. Students cannot necessarily learn to use ICT autonomously and when they can use the ICT they may still not be equipped to learn with it. Moreover, they may not be motivated by use of ICT based self-study learning environments (Conole et al., 2008), which is something frequently heard from students at ILS who prefer teacher mediated student to student interaction. As both Selwood and Cojocnean pointed out in a recent MALL symposium (Bárcena et al., 2015), their students, supposedly digital natives, may come equipped with mobile phones that they are expert in using but these same students do not necessarily want to use the phones for learning in class or completing homework. A teacher’s guidance and support can be imperative in bridging the skills gap and even gender divide when it comes to ICT usage (Hanor, 1998).

3.4.3. **Discourses of deficiency**

While investment in classroom technology continues, researchers have sought to find why the expected benefits have been so limited. These

‘Discourses of Deficiency’ (Selwyn, 2007) are typically levelled at teachers, as already mentioned in Chapter 2.

Teachers, who are not all early adopters in this technological turn, can be both bitter and self-critical. They themselves will readily identify reasons for not being able to effectively adopt technology in their teaching, often citing:

- Lack of technical support
- Lack of training
- Lack of time

For CALL trainers, such as myself, it soon becomes clear that teachers do have sufficient of these resources already (Blake, 2008) and these are often only perceived psychological blocks or needs (Skinner & Green, 2008). The three reasons I have given above all point to an external locus of control (Rose & Medway, 1981) or lack of taking ownership. They are not excuses as such, but the underlying reasons are more difficult for an individual to grasp and articulate.

3.4.4. **Comparing Teacher and Student ICT Competence**

Enshrined within the ground-breaking *Apple Classrooms of Tomorrow* (ACOT) project in the 1980s and 90s led by David Dwyer (Dwyer, Ringstaff & Sandholtz, 1990) is what is what Staines (2006) called e-maturity which considers a learning individual’s evolving command and control of ICT resources. Much as their autonomy is interrelated, I believe the e-maturity of the student and teachers should be considered mutually co-dependent and reciprocal. Some CALL researchers are going beyond this in analysis of combined pedagogic and ICT competency (as measured by the TPCK tool, Schmidt et al., 2009) which when applied to students as well as teachers highlights a lack of knowledge of how to make pedagogic use of ICT in learners who may be apparently competent users of the software itself. I have crudely represented this relation in Figure 3.2. below.

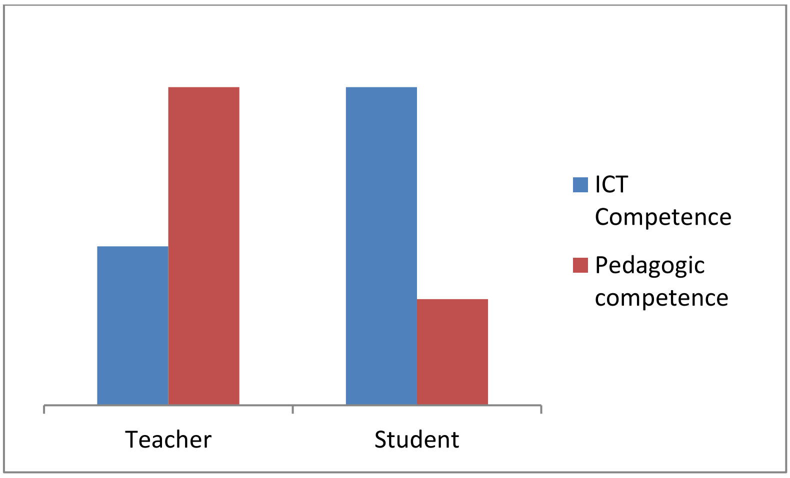


Figure 3.2. Illustration of opposed competencies of students and teachers

This juxtaposition was identified and leveraged over twenty years ago by the ACOT team:

> *By the end of the second year of the project, even the school district valued the high school students' technological expertise. The district hired students as technical support people and as teaching assistants in summer courses for district personnel. Teachers at the high school level began taking students' technological expertise for granted, forgetting that student-led classroom presentations on computer applications were not commonplace. (Ringstaff, Sandholtz & Dwyer 1991, p. 7)*

More recent insights into the shortcomings of learners on the aspect of pedagogic awareness suggest that learner training in how to benefit from semi-autonomous ICT use is just as valid an approach as building teacher competency with software (Stockwell & Hubbard, 2013) and that also the logical person to provide such training is the teacher.

3.4.5. Building Teacher ICT Competence

Two often cited reasons for teachers lacking computer savvy is their age and what they will call 'technophobia' (Lam, 2000, Rosen & Weil, 1995, Yildirim, 2014). Both of these popularist notions have been shown to be interdependent in the phenomenon of Computer Anxiety (Chua, Chen & Wong, 1999) which applies both to real computer use and the contemplation of computer use and so a concept which inhibits the teacher as facilitator as well as user.

Chua, Chen & Wong (1999) suggest that computer anxiety is strongly correlated to age (including age at encountering computers), gender, education and computer experience, all reasons why in many teaching contexts students may be more adept with computers than their teachers (Ringstaff, Sandholtz & Dwyer, 1991 ;Blundell, Nykvist & Lee, 2016). While pointing out that much mention of computer anxiety in the literature is non-empirical and refuting the notion that it is correlated to gender Heinssen,Glass & Night (1997) anticipate Chua, Chen & Wong (1999) in holding that computer anxiety can be reduced by training. There is also a theme of confidence building in the work of Dwyer et al. (Ringstaff, Sandholtz & Dwyer, 1991) hence much of the teacher training mentioned above is anxiety reduction training rather than ICT skills-raising as such.

Training approaches for ICT implementation in schools commonly advocate first building teacher exposure and familiarity with the technology, an appraisal of competence and peer or expert support to build competence and confidence before technology use is expected in the classroom (Bannister & Wilden, 2013; Bish, 2015b, 2016). There is some criticism in the literature of training programmes that only build technical competency and ignore pedagogic competency (Hermans, Tondeur, van Braak & Valcke, 2008; Liu, 2012), warning that a balance must be struck.

In the US state sector, the North Carolina Impact project made specific use of the Concerns Based Adoption Model of ICT (Hord, Rutherford, Huling-Austin, & Hall, 1998) to recognize how the concerns and needs of practitioners should influence the transition from building their background technical competence to focussing on the role of the technology in class. The extended timescale prior to launch and the involvement of well-defined support with dedicated technical staff was well resourced and conceived with staged expectations of how the incorporation of ICT into the schools would grow. A comparable implementation for ESOL across three higher education institutions took place in the UAE in 2012 (Gatsaki, 2016), where iPad use was launched across all students and faculty with a lead-in of a few months. There was a period of initial teacher training from software vendors with essential infrastructure speedily installed over the summer recess and an online collaborative knowledge base of teaching ideas set up to carry the training forward. Given the speed of this change and the lack of ownership reserand involvement from teachers, after eighteen months since the start of the project there were still calls for:

- Hands-on training and time to increase their familiarity with the tablets
- Opportunities to share best practice
- Pedagogic training on how best to integrate apps into teaching

3.4.6. Teacher knowledge and practice

With the social turn in SLA comes a corresponding re-appraisal of the construction of teacher knowledge and developing praxis (i.e. their knowledge and informed practice). The evolving stance refutes earlier notions that subject knowledge and best practice techniques can be imbued during initial teacher training but that teacher expertise is in effect a professional socialization.

This sits well with the concept of new or 'transformative' professionalism (Demirkasımoğlu, 2010), which has been used to describe members of the TESOL profession as those ready to openly evolve rather than preserving an exclusive body of expertise. As I mentioned in the context chapter, initial teacher training in TESOL can be short while most professional organizations expect some form of continuing professional development.

While in-service training initiatives can be forged to capitalize on this willingness of teachers to re-appraise their skillset, TESOL teachers can be remarkably conservative, basing their 'professional knowledge landscape' on 'personal practical knowledge' (Clandinin & Connelly, 1995; Bernstein, 1996).

Studies have shown that even trainee TESOL teachers faced with techniques they did not experience themselves as students are reticent to apply them Gajek (2016).

Nonetheless even early adopting teachers find themselves working in an establishment where they are outliers from the social community of practice which causes them to conform to the institutional 'subjective norm' (Bish, 2012). This is very counter-intuitive, as the literature shows that even when a teacher demonstrates a strong intent to use a system they have decided is useful they may subsequently, even subconsciously, re-align their intentions with those of colleagues (Hu, Clarke & Ma, 2003).

This socially cohesive element of behaviour moderation regardless of personal knowledge or expertise is recognized in general Technology Acceptance Modelling (see Section 3.5). In terms of Activity Theory this can be recognised the effect of community, an extrinsic factor described as a 'risk' to innovation in implementing digital pedagogy by Blundell, Nykvist & Lee (2016).

Thus, whilst it may be straightforward to present and disseminate evidence for technology use in the classroom or techniques and tools to use either before or during training, there can be a separation of gaining knowledge acquisition and application. The application requires a social trigger for the willingness to actually perform the action (Tondeur, Valcke, & Van Braak, 2008). Where the teachers' existing beliefs correspond to any new development they are subsequently more 'ready' to engage and put it into practice (Li & Walsh, 2008).

3.4.7. **The role of Pedagogic Knowledge in technology use**

At first it is tempting to consider a teachers' pedagogic knowledge in the same way as any professional expert knowledge when it comes to using computers and their perceived usefulness in the users' realm. This is considered as 'Job-fit' in generic Technology Acceptance Modelling (Long, 2008).

While teachers may see ICT as fitting their job well, or '*enhancing his or her job performance'* (Davis, 1985, p. 25) for non-pedagogic uses of educational ICT systems such as researching, planning, report writing, these are their personal professional uses of ICT which have little to do with ICT in the classroom.

However, in the practice of teaching with ICT teachers must apply the further knowledge of what teaching approach aligns best to use of ICT and then, given the eclectic nature of ESOL, knowledge of the repertoire of activities and routines that can make effective use of ICT. Here the perceived job-fit will vary with the teachers' knowledge.

Applied use of technology in mainstream teaching has become part of the required knowledge set of a teacher and is an expected core competency of school teachers in the UK, USA and Australia (Bish, 2013). It is a base level requirement of the UNESCO ICT framework for teachers (UNESCO, 2011).

There is a growing body of research in this field under the Technological Pedagogic Content Knowledge (TPACK) (Mishra and Koehler, 2006) which builds on the work of Shulman (1986) in defining Pedagogical Content Knowledge (PCK).

The requirement on TESOL teachers is somewhat lower – the European Profiling Grid (North, Mateva & Rossner, 2013), a measurement tool, for teacher professional development in ESOL only recognizes use of technology as an enabling skill rather than a teaching skill (Bish, 2013).

I recognise that the pedagogic knowledge of a large proportion of TESOL teachers will be much lower than that of those in the mainstream given the relatively short and practical nature of preservice training in TESOL (see Section 2.8). Teachers in the field will be working with methods and using techniques aligned to an approach they are comfortable with without knowledge of the theory that underpins it. This is a case of the issue recognized by Shulman (1986) where teachers' content knowledge is dealt with separately from their pedagogic knowledge in teacher training.

We are seeing the emergence of what is becoming known as Pedagogical Content Knowledge PCK in the TPACK framework and while some observers recognize that the body of knowledge is growing in postmethod TESOL (Jarvis & Achilleos, 2013) this does not yet appear established as a core requirement in the TESOL sector.

3.4.8. **Control in the ICT Enhanced Classroom**

It is tempting to talk about control in CALL but as I have already established, CALL models themselves have marginalized the teacher and we are considered by some at least to be in a post-CALL era it seems more appropriate to write of ICT Enhanced Classrooms in this section.

Today teachers are no longer scared of losing their job to a computer but very possibly they are worried about losing that position to a proactive teacher who has a better command of technology, only adding to computer anxiety. As Shaun Wilden found in his 2009 survey of international ESOL teachers, some fear of being left behind by not taking control is evident. One key reason for using technology in those Wilden surveyed is that:

> *If we don't make use of technology our lessons risk being regarded as irrelevant. (Wilden, 2009)*

Control in the classroom is a key requirement of teachers as indicated by my earlier work in the area with practising teachers (Bish, 2012), corroborated by Jahnke and Kumar (2014) well as a correlation to locus of control as reflective practice (Potosky & Bobko, 2001). This aspect is also related to 'confidence' as explored by Kessler and Plakans (2008) and 'classroom power' articulated by Wajnryb (1992).

The notion that using a particular ICT tool would give you greater control over your work was introduced into Davis' 1989 revision of his Technology Acceptance Model under perceived usefulness. He also went on to conclude that in system design there was a potential benefit in perceived usefulness of a system if users were given some involvement in implementation.

In examining claims for the efficacy of CALL, Macaro, Handley and Walters' meta-analysis of studies over 1990 to 2012 (2012) excluded studies that focussed on teachers. While this is understandable in terms of studies that speak only to teacher training or development, as we see in Dwyer's work (Dwyer, 1994; Dwyer, Ringstaff & Sandholtz, 1990; Ringstaff, Sandholtz & Dwyer, D. C. 1991), it is the teacher who is adopting the technology used in the classroom. Set against this, Macaro, Handley and Walters' (2012) extensive work comes across as a decontextualization of the social classroom context of CALL as alluded to by Warschauer (1998). To truly examine classroom phenomena, I see a need for a meta-analysis of studies that both learners and teachers, of which there are very few (for example Mac Callum, Jeffrey and Kinshuk , 2014).

3.5. **Technology Acceptance Modelling**

Here I shall present the two main research directions being followed in Technology Acceptance Modelling studies which have been applied to leaning with technology. While both share the use of some measures and are superficially similar in application, they stem from different precepts.

Firstly, I shall outline Davis' popular Technology Acceptance Model (1989), a generic model based on psychological considerations of why an individual will use an ICT tool. By way of contrast, the second, The Will, Skill, Tool model (Knezek, Christensen, Hancock & Shoho, 2000) takes a phenomenological approach to the amount of ICT use in classrooms based on teachers' attitudes, skillset and the school environment.

Both approaches are flexible and evolving frameworks where measures used have changed to suit contexts of each study where they have been applied (Legris, Ingham & Collerette, 2003; Petko, 2012) therefore I shall also present developments of each relevant to application in the ESOL environment. These provide a theoretical basis for refinements I have taken up in advancing my own model and those alternative approaches I will return to the discussion of my results for the perspective they offer on my work.

3.5.1. **Davis' TAM: Principles**

The Technology Acceptance Model (TAM) is a generic behaviouristic model of how an individual's intent to use technology in their workplace results in their eventual system use. Fred Davis conceived the initial version of this model in his 1985 doctoral thesis by applying Fishebein and Ajzen's Theory of Reasoned Action (TRA)(1975) later adding refinements from the Cost-benefit paradigm (Beach & Mitchell 1978) and self-efficacy theory (Bandura, 1982) .

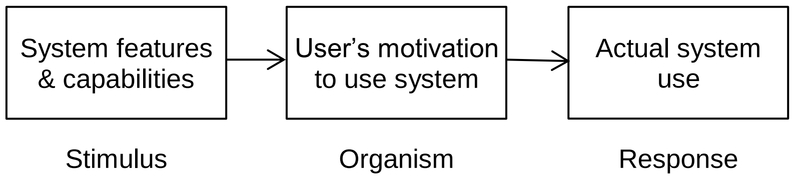


Figure 3.3. Conceptual framework of technology acceptance (Davis 1985, p10)

As Figure 3.3. from Davis' thesis (which I have cosmetically altered including changing "Users'" to "User's") shows, TAM is based on a straightforward stimulus response: If the user finds the system's functionality useful they will be motivated to use it and that rationale will lead them to make use of the system. This model can be applied to any tool or system in the workplace such as a whiteboard and board markers being introduced to a teacher who has hitherto used a whiteboard and chalk. This makes application of TRA particularly suited to modelling consumer adoption in response to advertising and public information campaigns (Rodgers & Thorson, 2012). Davis extended the TAM as just such a market research tool for IBM Canada (Venkatesh, 2000), here he included a second explanatory factor, Perceived Ease of Use, in defining an individual's attitude towards and behavioural intention to use a system in order to explain the measured system use (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989) as shown in Figure 3.4. below.

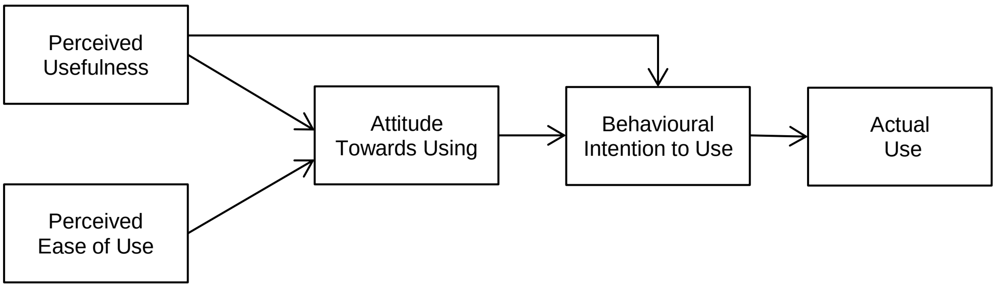


Figure 3.4. Structure of the TAM (after Davis et al., 1989)

The model gained a strong following due to its simplicity (Lee, 2003; Yousafzai, Gordon, Foxall & Pallister 2007), having been cited in over 37,000 papers (Google scholar, 2018) and applied in over 200 studies (Combined meta analysis data from Schepers & Wetzels, 2007, Yousafzai, Gordon, Foxall & Pallister, 2007 and Šumak, Heričko & Pušnik, 2011).

3.5.2. **Davis' TAM: Development**

Davis went on to produce TAM 2 in 2000, an extended model in which he unpacked Percieved Usefulness (Venkatesh & Davis 2000) as well as introducing a social element in Ajzen's Subjective Norm from his Theory of Planned Behavior (Ajzen, 1991) which Davis (1989) had discounted. The Subjective Norm is a measure of the strength of an individual's belief in the technology in having been accepted as normal practice by their colleagues. This notion of a state of normalisation was introduced to description of CALL praxis by Bax (2003) as mentioned above.

Venkatesh and Davis (2000) also removed the intermediary Attitude Towards Use leaving simply Behavioural Intent to describe actual use.

The empirical research for TAM 2 showed that the Subjective Norm had no effect on attitude voluntary settings but did apply in organisations where adoption was mandatory ones. Thus if the user is empowered to choose they appear make an autonomous choice rather than react to peer pressure.

Venkathesh (2000) went further in also investigating antecedent measures of the Perceived Ease of use construct. He identified: *self-efficay*, *perception of external control*, *computer anxiety* and *computer playfulness* as entrenched 'Anchor items' which form an individual's general attitude towards computer use irrespective of the attributes of the new system they are considering.

Davis and Venkatesh added final refinements in their Unified Theory of Acceptance and Use of Technology (2003). Here as well as broadening the Subjective Norm to a concept of Social Influence and adding facilitating conditions as proposed by Taylor and Todd (1995), they added Gender, Age, Experience and 'Voluntariness' as mediating variables to each component of behavioural intention. This model's breadth has brought it into criticism (Bagozzi, 2007) where the once parsimonious TAM now has 41 independent variables and 8 dependent variables.

These rapid developments and inclusions of concepts from different models has caused some critics to question the validity of TAM (Bagozzi, 2007; Chuttur, 2009; Lee, Kozar & Larsen, 2003; Legris, Ingham & Collerette, 2003). While Davis' 1989 TAM is undoubtedly the most accepted in the field having been cited in more studies than any other (Lee, Kozar & Larsen, 2003; Priyanka & Kumar 2013) it is important to recognise that there is variation across TAM implementations and measures used (Lee, Kozar & Larsen, 2003; Legris, Ingham & Collerette, 2003).

Although TAM is applicable to technology in many professional arenas (Venkatesh, Morris, Davis, & Davis, 2003) the complex dynamic of classroom teaching where a teacher influences student use of ICT does not suit its simple quantification (Wang & Wang, 2009; Pynoo et al., 2011). Whenever applied to teaching, TAM has required significant adaptation as I shall show in the next section.

In Schepers and Wetzels, 2007 Meta analysis of the 61 most robust TAM studies only 4 were for learning applications, although all focused on self-study use of learning management systems rather than classroom learning.

In the same year Yousafzai, Foxall & Pallister (2007) analysed 145 TAM research studies, only 5 of these can be considered to be in teaching with only one on teacher use of powerpoint based in the classroom.

By 2011, Šumak, Heričko and Pušnik' were able to identify TAM based 32 studies in educational contexts when looking at e-learning, while most studies used some form of VLE of these, two could be said be classroom based requiring teacher interaction.

3.5.3. **Davis' TAM: Pedagogical refinements**

As a generic end-used model for consumer technology, application of classic TAM in education is limited to situations such as self-study with a VLE (often described as e-learning) or teacher use of an Interactive Whiteboard (Šumak, Heričko & Pušnik, 2011). Educational variants on TAM have saught to address this limitation.

In a classroom context (as described in Chapter 2) the student rather than the teacher is often the end user. As Figure 3.4. shows, the fundamental TAM model, if applied to the teacher, does not consider students in any way.
It is possible to apply the model to a student as the user considering their classmates as peers and teachers as supervisors but this does not consider tasks where students have to act together.
Students' independent use of ICT has often been modelled separately in this way (Park, 2009; Lui et al., 2010; Sánchez & Hueros, 2010; Soleimani, Kemnoja & Mustaffa, 2014; Tsai, 2015). While use of ICT by students in an autonomous, self-study or independent way fits this model very well, the teacher's influence is undoubtedly there (Mac Callum, 2010). This isolated focus on individual actors in the learning ecology results in studies that only partially illuminate the phenomenon of pedagogic ICT use as if teacher and student were using separate systems. This was the approach taken by Mac Callum and Jeffrey (2013) and Mac Callum, Jeffrey and Kinshuk (2014) who investigated student and then teacher acceptance through TAM models in subsequent but disconnected studies. While Šumak, Heričko and Pušnik's (2011) meta analysis, points out that student ICT acceptance is a strong indicator of teacher ICT acceptance, this only measures the indirect effect of the teacher. Where classroom implementations of ICT are being considered, such independent models fail to examine teacher behaviour in any detail.

Taylor and Todd (1995) advanced a Decomposed Theory of Planned Behaviour by including measurable antecedents for Attitude (Perceived

Usefulness, Ease of Use and Compatibility) Subjective Norm (Peer Influence, Superior's influence), Percieved Bahavioural control (Self Efficacy, Resource Facilitating Conditions and Technology Facilitating Conditions). Here in terms of practicality they essentially factorised the three latent constructs making it easier to define and construct measures.

Of particular note, their inclusion of Rogers (1982) notion of Compatibility considered whether the system accorded with the user's values, previous experiences and current needs. Such an inclusion in a model for teachers is particularly relevant as it can incorporate pedagogic orientation and teaching experience. They also specifically referenced the 'influence of significant others' (Tayor & Todd, 1995, p. 4) making this the most socially situated model to date and again showing some relevance to the classroom. Their empirical study differed from several applications of TAM in that rather relying on self-reports it monitored actual use of different software and hardware tools at a campus computer centre by exit polls.

In 2004, Van der Heijden proposed that as some ICT systems were designed to fulfil emotional rather than purely utilitarian needs, 'Hedonic' considerations should be added to the TAM. Van der Heijden's Hedonic TAM (2004) included Perceived Enjoyment as a third latent construct alongside Perceived Ease of Use and Perceived Usefulness. This route has been followed in adapting TAM for the adoption of mobile devices (Wakefield & Whitten, 2006), Virtual Learning Environments (Holmberg & Huvila, 2008; Lee, Cheung & Chen, 2005) and with educational contexts that use game like tools such as second life (Holsapple & Wu, 2007, Nauman, Yun & Suku, 2009). This is seen as more applicable to private home use of technology rather that the workplace

(Van der Heijden, 2004). In this sense it is not expected to model a social classroom setting but the attention to intrinsic motivation in a task rather than efficiency of completion fits with my observations in Chapter 2 on what works in EFL (Allen, 2010).

Here, Alharbi and Drew (2014), leveraging the generic TAM model, advanced the following curious hypothesis:

> *H12) Lack of LMS availability negatively affects the perceived ease of use of an LMS (p. 146)*

This appears to be a workaround for the fact that the generic model has no objective quantification of tool availability – an addition suggested by Tondeur, Valcke and van Braak (2008) rather than indirect measurement via a subjective measure of perception.

The notions of self-efficacy and perceived behavioural control are both used in the unified TAM proposal (Venkatesh et al., 2003) but in a classroom setting which takes any consideration of students into account the teacher would need to revise their intention to use any classroom material or tool in the light of student needs and progress. Thus the teacher's own efficiency or control of their intentions could still be swayed by how ready or willing their students are to use a system at a given point.

Educational variants on TAM modelling have paid particular attention to teachers' beliefs and the social context of their work (Tondeur, Hermans, Van Braak, & Valcke, 2008; Mahdizadeh et al., 2008).

When using TAM to explain instructors' use of an online VLE, Wang & Wang (2009) felt that although their final prediction of acceptance of instructor use of the system was significant, the model was less successful than application of discrete system use in non-educational contexts. They ascribed this to the instructors' expertise and knowledge of other similar e-learning systems and that the system should include familiarity as an exogenous variable.

Mac Callum et al. (2014) incorporated skill into their enhancement of TAM enshrined within a notion of self-efficacy alongside computer anxiety and digital literacy to sharpen the model.

Tondeur, Valcke, & van Braak (2008) explored the variation in ICT use across 68 primary schools in Flanders, going beyond generic TAM in considering not only individual teacher beliefs but also contextual characteristics, including the school setting and configuration of computers used.

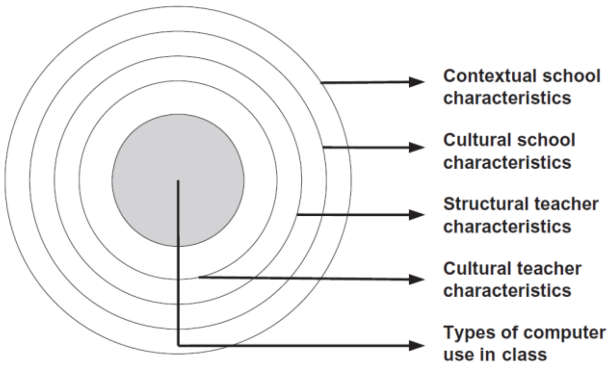


Figure 3.5. Factors influencing classroom ICT use (Tondeur, Valcke, & van Braak, 2008, p. 495)

They built their model up in these tiers through a series of multiple statistical tests layering up a multivariate regression model. Even in their comprehensively situated model, which identified significant variation attributable to teacher gender, their constructivist beliefs, type of ICT use and the school's collective attitude to innovation, the authors noted that their study would have benefited from taking student attitudes into account.

3.5.4. **Christensen & Kenzek's WST: Principles**

In contrast to the Davis' TAM, the WST was conceived purely for a school setting. Its principal aim is to demonstrate factors required to bring about improvement in student achievement through use of classroom technology. While educationally based, the WST is a management tool designed to demonstrate a return on investment just as is Davis' TAM (Knezek, Christensen & Fluke, 2003).

Rather than starting from an entirely theoretical standpoint, the WST has been created in what Glasser & Straus called a 'grounded' manner (Cohen, Manion & Morrison, 2011) being built up from what started as a measure of outcomes of teacher training (see history of TAC in Christen & Knezek, 2009) and incorporating other separately theorised measures to provide correlates in available facilities, staff preparedness, and classroom usage.

This phenomenological data based approach to investigating technology integration is clearly conceptualised by SITES project (Pelgrum and Anderson, 1999) which incorporated classroom data from 26 countries on which Christensen and Knezek drew.

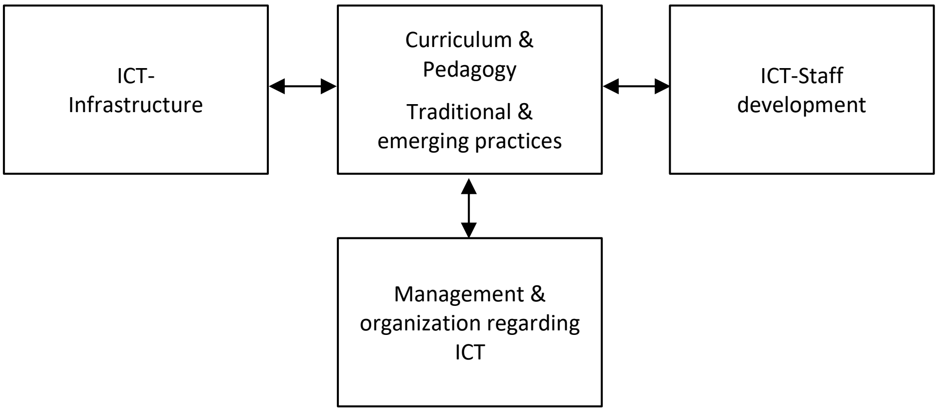


Figure 3.6. Conceptual framework of SITES (Pelgrum & Anderson 1999, P7)

As Figure 3.6. shows, this approach is not concerned with a discrete measure of adoption by end-users but takes a more socio-historic perspective of the state of the entire school with teacher behaviour and classroom practice in a central position as advocated by Bagozzi (2003) and Legris, Ingham, and Collerette (2003).

Whilst Knezek and Christensen (2000) did not use any direct measure of management or organisational preparedness, they did consider a measure of pedagogy, of either behaviourist, or constructivist nature in their initial WST model (see Knezek & Christensen, 2008 p. 325) however they had not formalised measurement sufficiently to develop a scale for the first publication.

The WST aligns with much of the conceptual framework from Pelgrum and Anderson (1999) using broader institutional basis in considering how a teacher’s aptitude (Will) and skillset (Skill) alongside available facilities (Tool) lead to classroom integration of technology corresponding to measurable outcomes (Achievement) as shown in Figure 3.8. below.

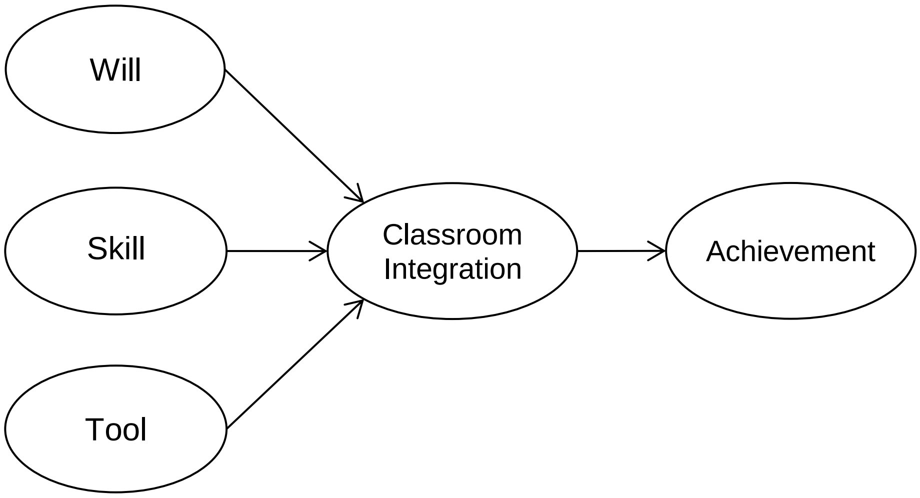


Figure 3.7. Will, Skill, Tool Model (Knezek, Christensen, Hancock & Shoho, 2000)

Kenzek et al. use ellipses in their diagram for the core concepts of their model shown in Figure 3.7. following the Structural Equation Modelling (SEM) concept of latent factors that are composed of measures of exogenous (independent) variables. The notion of measurement is central to the construction of the WST model which was formulated using accepted measures in use in education at the time (Knezek, Christensen, Miyashita & Ropp, 2000) it was also specifically designed as a parsimonious model for SEM analysis (Knezek, Christensen, Miyashita & Ropp, 2000).

As I have already mentioned above, showing tangible achievements of technological innovation in the classroom has led to very mixed results, but by adding the element of classroom integration of technology, Knezek and Christensen hoped to be able to show the positive impact of ICT in the classroom and offer clearer advice on how a better return on investment could be achieved in schools in the USA (Knezek, Christensen & Fluke, 2003).

In seeking to examine ICT adoption over across a school (Knezek, Christensen & Fluke, 2003), the WST follows Rogers' Diffusion of Innovation theory (Rogers, 1982) which forms the basis of the measure of Stage of Adoption (Christensen, 1997), is used to indicate Classroom Integration. Rogers' model advances a similar bell curve of adoption to the initial uptake shown in Gartner's Hype Cycle for emerging technologies I presented in Chapter 1, he categorises the use stages by classifying the users who adopt at each stage from the 2.5% of 'Innovators', followed by 'Early adopters' (13.5 % of the population) through to the final 16% of 'Laggards' (Rogers, 1982).

The Diffusion of Innovation theory (Rogers, 1982) has been criticised for the assumption that adoption is somehow inevitable, linear and forward moving, along a normal curve (Lyytinen, & Damsgaard, 2001), whereas Gartner's pragmatic, data-based model shows how reaction to disruption can either cause an innovation to fail or diminish while practice adjusts to incorporate it (see Chapter 1).

3.5.1. Stages of adoption

A classroom technology adoption model requires a measurement of the actual use of ICT in the classroom. This use is typically stated in terms of a discrete stage or state or model.

At the time the WST was being developed, the most prevalent work in the area of classroom technology use was that of Dwyer (1994), who took an institution-wide perspective, proposing that an establishment moves through identifiable evolutionary phases as shown in Figure 3.8., shifting from lower levels of ICT use to higher saturations and ultimately on-demand ICT use.

Figure 3.8. Stages of adoption (adapted from Dwyer, 1994)

In his observations of institutions across the USA, Dwyer (1994) holds that teachers and students are only slowly moving into the higher phases and that there are many slips back down his schema. For example he claims the biggest remaining barrier to appropriation of CALL is school assessment models.

The evolved STAGES model (Christensen, 1997) used in a number of studies from the Research and Development Centre for Teacher Education at the university of Texas Austin, focusses on the teacher in a six-point scale in which the statements are intertwined with beliefs and self-efficacy, for example:

> ***Stage 4: Familiarity and confidence:*** *I am gaining a sense of confidence in using the computer for specific tasks. I am starting to feel comfortable using the computer.*
>
> *(Christensen, 1997)*

As mentioned earlier, in the view of Petko (2012), this double measurement of self-efficacy could result in the exceedingly high prediction of self-reported use in the Texas based studies.

The alternative approach to these state models is to consider more interpretivist, process based analysis.

Some studies have come to use the more teacher-centric Concerns Based Adoption Model (CBAM-Lou), designed as a one-tick self-assessment measure based on eight levels of innovation use described by Loucks, Newlove, & Hall (See Hall, Loucks, Rutherford & Newlove ,1975). The resulting seven level scale of use is constructed from a teacher's perspective as they enter into use of computers in their teaching. It reads like a journey of professionalization from the unknowing teacher considering ICT, trying it out in a limited ways, reflecting on improving their use of ICT and finally being apace with the latest developments for selective use of ICT. To some extent this also sees them enter a community of practice of more experienced users and collaborating with colleagues.

While Petko's approach in 2012 was to focus on frequency of using different software tools, my approach (outlined in detail in Section 4.4.3) couples teacher self-reported competency scales (shown in Appendices Di-iv), with the hours per week they use different systems with their classes.

As with Davis' TAM, the level of use in WST is measured by self-report, the difference being that in Davis' model the end-user reports their own use and in Knezek, et al. (2000) the teacher is reporting how much they facilitate use by both themselves and their students in class. Later refinements of WST have added complexity to triangulate their concept of Classroom Integration by having teachers report the comparative use of different systems (Petko, 20112; Badia, Chumpitaz, Vargas & Suarez, 2016) as I do in this study.

3.5.2. **Considering attitude over behavioural intent**

The Will measures in the WST take the teacher's attitude and intent, theorised by Fishbein and Ajzen (1975), into account (Christensen 1997, Knezek & Christensen, 2008). This leads the WST to share much similarity with Davis' TAM (Davis, 1989) and even more so Taylor and Todd's Decomposed TRA (1995), the WST model differs in that it does not attempt to resolve measures towards a model of intent. Instead, it more directly considers the contribution of each of its latent factors, Will (which encompasses attitude), Skill and Tool makes to a factor of Use. This leads to an extremely parsimonious model which is readily examined in small samples by multilinear correlation (Knezek, Christensen, Hancock & Shoho, 2000) and larger studies by structural equation Modelling.

Although far less used in published research studies than Davis' TAM, the WST has been widely disseminated to education authorities following publication in the International Handbook of Information Technology in Primary and Secondary Education (Voogt & Knezek, 2008).

3.5.3. **Alternative approaches to technology acceptance**

Aside from examining the teacher's influence from an intentional perspective, a more situated explanation of the teacher's role when using ICT has been considered by Cowan and Butler (2013) through modelling a network based on Activity Theory transformed to a three-dimensional model locating the teacher at the centre, with each vertex afforded a value. Considering various modes of ICT use the model can quantify the distance or lack of control experienced by the teacher. While Cowan and Butler's model (2013) includes representation of the societal influence and role of subject studied, this 'problematization' is not unlike the notions explored in Transactional Distance Modelling where the use of different modes of computer facilitated interaction and instruction 'weaken' the transaction distance between teacher and student (Chen, 2001; Wheeler, 2007).

Given my ontological stance on the socially constructed nature of classrooms and the emancipatory interest I place behind this study, a purely qualitative approach in an interpretivist tradition might also be relevant. Such a phenomenological study into teachers' integration of iPads has been carried out through a case study approach by Jahnke and Kumar, focussing on the Digital Didactic Design shown in Figure 3.9. below:

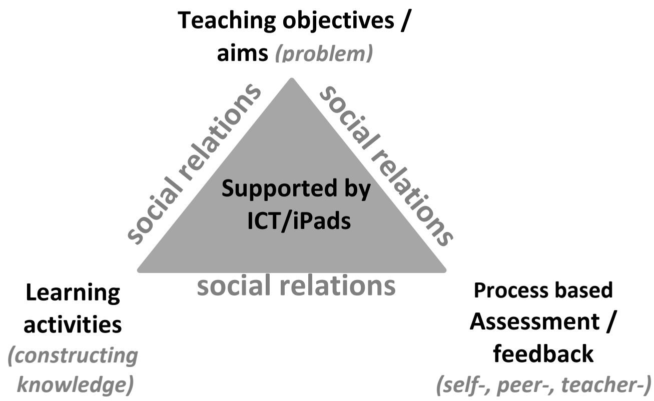


Figure 3.9. Digital didactical design. (Jahnke & Kumar, 2014, p.,81).

While these methodologies rooted in Vygotskian SCT offer an insight into the overall dynamics and highlight the need for teachers' general ownership and involvement through different perspective than the system proffered by Levy in 2007 (see Figure 1.3), they are not sufficiently focussed on individual measures to highlight how specific behavioural or environmental factors effect productive use of ICT.

It seems to me that that a complex model combining the intentions of both learners and students and how these are met with the available affordances of system design would be closer to the actual phenomenon but I have not found such a model in the literature and that is too great a departure from existing work for the current thesis. Instead I have chosen to operationalize a teacher's readiness to microblend, which takes into account their intended interplay with students, within the construct of 'Will' in the WST.

3.6. **Defining Microblending**

The theoretical thread of SLA theory and open questions posed by future directions of classroom methodology and CALL described above anticipate the emergence of new pluralistic pedagogical directions rather than a prescriptive methodology. Here teacher directed use of classroom ICT to support the micro genesis and social co-construction of language in task based and post-task based frameworks seen in EFL classrooms today (Larsen-Freeman, 2000; Richards 2006) has a theoretical basis in Swain (2006) & Swain & Deters (2007) and Ortega (200,2011) with practical justifications for the application of ICT in Wegerif (2013) & Puentedura (2014).

My previous body of exploratory work on interviews with and observations of teachers (Bish 2012, 2015a, 2015b) who appear to be comfortable, in control and effective in the ICT enhanced classroom, lead me to describe an synthesis of what these teachers do in their ESOL based ICT adoption as the phenomenon I have coined Microblending. I feel it is possible to rationalise this emergent teaching behaviour and in this short section I shall summarize the theoretical rationale for Microblending and how in this explanatory study I hope to locate it within a model that demonstrates increased integration of ICT into the English Language Classroom.

3.6.1. **The Ontological perspective: SLA Theory**

Here I follow the Vygotskian turn in SLA. This supplants the cognitive model of language processing framework as the mechanism of acquisition to one where language is considered to be an artefact constructed and acquired by the members of a social group (Swain, 2006). With this social constructivist perspective the classroom is regarded as a socially constructed ecology rather than one where learners are simply being delivered language rules and knowledge by a teacher, book or device.

Language in such a setting is emergent and it is in this dialogic microgenesis of language through tasks scaffolded or facilitated by ICT that we see microblending taking place. Here then the computer provides a tool or access to media that stimulate and support tasks where students work together.

Moreover, the socio-affective role of the teachers and their professional beliefs is a critical facet of what happens in classrooms (Clandinin & Connell,1995; Ertmer, 2005), as is the professional journey that brought them there (Johnston, 1997). The teachers' enacted beliefs are realized in the classroom as praxis, this praxis needs to include a recognition of a role for the computer in the classroom (Ertmer 2012, Hermans, Tondeur, van Braak, & Valcke, 2008). Here then the teacher needs to believe in and decide the relevance of technology to the tasks they select to stimulate learners formulation of knowledge.

3.6.2. **The Epistemological perspective: TAM Theory & Evidence Based Practice**

In research terms I have chosen to follow a largely quantitative thread. My subsequent research design can be classified in a 'hybrid paradigm' according to Grotjahn (1987 in Nunan, 1992), one which classified in his terms is: Exploratory – Qualitative – Statistical. This analytic–nomological design is not because I believe that the creative detail of teaching itself is best described in this way but that re-appraising the pre-requisites for effective implementation of ICT is dependent on analysis which institutional management can relate to. Hence while more emic participatory action-research may have been a more obvious methodological choice for such a study, there is a strong rationale for validated research that draws on accepted studies in order to effect advocacy (Duff, 2002).

If the significance of the teacher's role within the ICT enhanced classroom is to be recognized and the right teachers are to be appropriately prepared and afforded the right roles and responsibilities, institutional management will need to see a clear causal link between such an approach and corresponding results. For this to be the case, my study seeks to build on existing research and satisfy the quality criteria of being systematic, reductive, and replicable (Brown, 1998).

Much existing CALL research does not satisfy these criteria (Marcario, Handle and Walters, 2012; Jarvis & Achilleos, 2013) and as such is a weak foundation for so-called Evidence Based Practice (EBP). Nonetheless, as I mentioned in my introductory chapter, this has not slowed investment on CALL nor its adoption by institutions. As such, this research has negative connotations for teachers when it only looks simplistically at an injection of investment in technology as an input and at expected results as an outcome.

3.6.3. **The Methodological perspective: TBI & Blended Learning**

Here I am speaking about the practical implementation of this study. The work is not intended to be theoretical alone but to lay the foundation for guidance for educational managers and teachers in how to relate the use of ICT to their existing pedagogical praxis.

Here as I already began to describe in section 3.2.3 TBI offers a broad methodological framework based on tasks which promote the co-construction of language between students. These tasks are often in authentic or simulated situations which can be facilitated and supported by technology. TBI continues to evolve, encompassing CALL developments in Telecollaboration, Mobile Assisted Language Learning, and Blended Learning.

Perhaps the most authentic and generative tasks (in linguistic terms) are those where use of ICT multimedia, research and presentation tools allow students to take a productive and creative role when using ICT (Martin, 2015; Tannen & Trester, 2013). These engage the learner's higher order thinking skills as advocated at the tip of 'Bloom's Digital Taxonomy' mentioned in section 3.2.4. Here technology is typically being used for tasks in the way it is used outside the classroom to communicate, discover or create. This is distinct from the CALL specific software which as mentioned in 3.3.2 appears to be in decline.

The potential value of using technology in such tasks is outlined in Puentedura's SAMR framework (2014) which highlights where technology can redefine a task rather than simply adding technology use into a task for no effect.

Identifying any congruence between espoused beliefs and practices that lead to technology use and tangible learning results could offer teachers a further yardstick on what forms of ICT to use inside and outside the classroom and when and how to use them.

While microblending teachers may use a formal framework like SAMR to identify what is likely to work well in the classroom or more intuitively select ICT that can support tasks appropriate to their learning aims, this selection of an appropriate tools is part of their methodology. This is the micro-blending of ICT and other classroom affordances at different times in their teaching which is the key methological facet of microblending which I see emerging on classrooms.

This can be observed in the way that microblending teachers do not simply use all of the technology whenever it is available. Microblending implies judicious use of ICT tools rather than wholesale adoption of whatever ICT is available. I aim to show this in my model.

While Petko’s approach in 2012 was to focus on teachers reports of the frequency of using different software tools, my approach (outlined in detail in Section 4.4.3) couples teacher self-reported competency scales (shown in Appendices Di-iv), with the hours per week they use different systems with their classes.

3.6.4. **Constructivist Beliefs**

While constructivism is fundamental to the semi-formal interactions of modern TESOL practice such as task based learning, it is less of a given when analyzing state sector teaching. The necessity for a constructivist mindset is possibly most readily recognized when it comes to teaching with technology (Dwyer et al., 1990, Kang, Choi & Chang, 2007; Thomas & Reinders, 2010;

Blundell, Lee & Nykvist, 2016) as a tool which can be applied by learners and teachers to support the social construction of knowledge through interaction (Kern, 2006), dialogic experimentation and discussion (Wegerif, 2013).

Petko (2012) was the first to recognize the potential value of including teachers' constructivist orientation in his exploratory work on increasing the validity and accuracy of the WST model.

A strongly social constructivist element already existed in the work of Tondeur, Valcke, and van Braak (2008) and Jankhe and Kumar (2014) indicating that this is a key factor to include in a TESOL variant of the model.

There may be some apparent blurring of the lines from a purely constructivist approach where the learner is believed to creatively form their own ideas about language based on experiences and a social constructivist one where that language itself only emerges from interaction with a social group, this is not uncommon in TESOL where constructivism and social constructism may be treated synonymously (Tarnopolsky, 2012; Tondeur, Valcke, and van Braak 2008).

3.6.5. **Identifying Microblending readiness**

Within the methodological paradigm described above, I am seeking to quantify the preconditions for, and effects of, microblending. As such, the latent concept of microblending is observed only indirectly. Showing how much microblending takes place is proportional to how much classroom implementation of ICT is measurable although as I have already stated, the microblending teacher will not simply use the available technology all of the time.

In order to demonstrate the effect a teacher has on bringing about this implementation I need to measure the degree to which they are prepared for microblending. Under the Will, Skill Tool model, two aspects of this preparedness are the teacher's level of ability to use ICT in a classroom setting (Skill) and the availability of appropriate ICT (Tool) while I express the third quanta as the teacher's socio-affective 'readiness' to microblend, most closely linked to their espoused beliefs (Will). In order to evaluate this I need a psychometric measure of this microblending readiness which is in turn composed of aspects of the teacher's pedagogic beliefs and conception of the nature of language acquisition.

In order to create this tool I began by building on my earlier work on the loss of teacher control in ICT enhanced classrooms in the classroom (Bish 2012) describing a number of beliefs necessary for the teacher to be able to successfully impelemnt CALL in their classroom as seen or discussed with teachers and from the theoretical angles I have presented above. I originally formulated these in a microblending charter which included beliefs for schools and software designers interested in effective implementation of ICT in the classroom microblending (Appendix M). I developed the list through sharing the ideas for comment first on a teachers' methodology website (www.ef.com/teacherzone) and corresponding Facebook page for comment, and then in a revised form at first the LEIF conference in Boston (Bish 2015a) and finally at the EUROCALL Teacher Education Sig workshop in Cyprus for further peer comment and feedback.

Based on the feedback received I revised the charter to 20 substantive statements to which teachers could agree and categorised these equally into the following five categories as initial factors that emerged from the list:

Planning

Here at an overarching level the teacher needs some insight into how any affordances or tasks in the lesson contribute to their learning aims. This is referred to by Ellis (2003) as macro evaluation of tasks. This strategic planning is an aspect of teacher 'Skill' or at least 'Knowledge' as classically collected in the TPCK tool. As such it may be evidenced more in experienced teachers than novices.

Variety

As a pre-requisite for blending, the teacher needs to perceive a difference in the learning content and interactional stages in parts of their lesson. Thus the lesson is not simply about a type of language to be learned or studying a piece of input material but of a variety of smaller elements.

Control

Control in the classroom is a practical necessity for teachers to microblend and select tools. Where they have choice teachers can cede control to learners empowers them with autonomy, making the lessons student-centred. This has been covered in detail in Section 3.5.7 above.

Tool selection

The constructivist teacher, as Petko (2012) highlights, is going to be selecting tools to create a lesson. Methodologically this is a reflective process which requires micro-evaluation of tasks and learner outcomes (Ellis, 2003) of the learning in action (Schön, 1983).

The teacher will also be considering when to offer the student the chance to select a tool for a particular task. In implementations of Bring Your Own Device (BYOD) practice, students in the same class will often be working with multiple device ontologies.

Interaction

This factor is based in a social constructivist view of emergent language. It presupposes the pedagogic value of language microgenesis through student use of ICT together (see Ortega, 2009, Ch. 10). Pre-requisites for such are a student-centred and process based learning approach as seen in Jahnke & Kumar (2014). This dimension of pedagogic receptiveness for technology integration was described as teacher 'competence' by Yepes-Bayara (2002) in measuring the effectiveness of grant expenditure for the US department of education.

Synthesizing these factors was intended to more clearly expose the underlying drivers of effective practice rather than simply measuring a teacher's orientation towards constructivism which Petko previously found ineffective at improving the WST model.

3.7. **Summary**

In a brief, selective review of SLA and ESOL literature (section 3.2.) I highlighted pertinent developments in SLA theory and applied language teaching methodology, in particular the social constructivist epistemology in which Task

Based Instruction is situated and how some consider this postmethod due to its multiple and emergent forms.

I followed in section 3.3 with separate focus on parallel developments in CALL which is now also at a stage which defies consistent description. In response to my own critique of the absence of the teacher in CALL in section 3.5 I have indicated the difficulties teachers may encounter during CALL implementations and shown where their voice should be heard, not just in dissent, but when sufficiently empowered as an essential driver to successful use of ICT in language learning.

Turning to a review of Technology Acceptance Modelling (section 3.5), I have contrasted the generic TAM model with the WST model, justifying my reasoning in selecting the WST model over the alternatives as the theoretical framework of my empirical study even though it has not yet been used in the TESOL context. This lack of application in TESOL is the gap in the literature which my thesis will address

In the final section 3.6, I clarify the theoretical framework in which I have seated Microblending, the form of classroom CALL implementation being measured in this study before defining the factors as justified in the literature that define microblending behaviour in a teacher.

4. Methodology

4.1. Introduction

In this chapter I will describe the design of my empirical studies showing how they are based on preceding studies to validate the WST model in the EFL context.

I present the merits of the tools used in various WST models and show where they are suitable, require adaptation or are unsuitable for the EFL context.

Where I have had to develop three new measures, I present the theoretical basis for these, their development and trialling in a pilot study.

I then describe the sample and data collection used for my main empirical study carried out across 31 EF International Language Schools. Here I also cover the ethical other considerations towards the teachers who participated in my study.

At the end of the chapter I also explain the techniques I used to prepare and clean the data prior to analysis and the measures of validity and reliability I apply to the measurement data and the models I construct in my results chapter.

4.2. Research Design

My literature review indicated that the Will Skill Tool (WST) model is most suited existing model to be able to answer my primary research question:

RQ 1. *What factors can best account for the variation of use of ICT in the EFL classroom?*

However as I have indicated in 3.5, this is a flexible and evolving framework so any validation of the WST in a new context such as TESOL requires careful consideration of the measurement tools used and how constructs are composed.

4.2.1. Model to be tested

As presented in Chapter 3 (Figure 3.8.) the WST model (Knezek, Christensen, Hancock & Shoho, 2000) is composed of the following constructs. Known in Structured Equation Modelling (SEM) terms as latent variables.

1. *Will* (The attitude of the teacher)
2. *Skill* (The teacher's technology competency)
3. *Tool* (Access to technology tools)

These three independent variables combined to explain the variation in a second level (or dependent) latent variable: *Classroom Integration.* Evaluation of the final latent variable in the WST *Achievement* was not possible within the scope of this thesis. This makes the model to be tested the same as in Knezek, Christensen, Hancock & Shoho's first validation of their model in 2000:

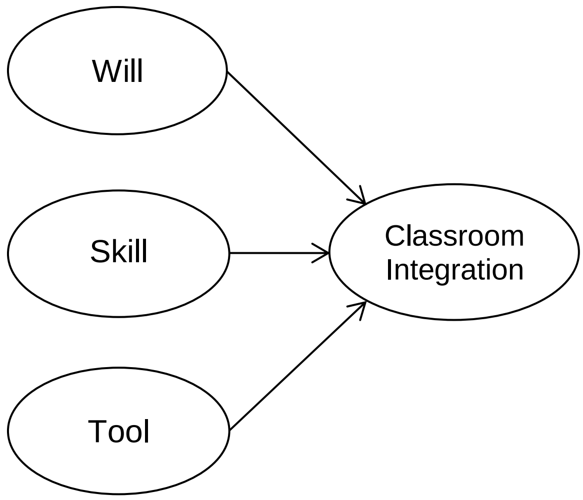


Figure 4.1. Will, Skill, Tool Model (Knezek, Christensen, Hancock & Shoho, 2000)

4.2.2. **Further research questions**

In keeping with a quantitative analysis there are two additional questions my re-creation of the WST model in the TESOL context should be able to answer:

RQ 2. *Can a reliable measure of teacher's microblending readiness be constructed?*

RQ 3. *Does a WST model for EFL better predict classroom ICT use with:*

a. A measure of teachers' constructivist beliefs?

b. A measure of teachers' microblending readiness?

4.2.3. **Procedure**

My replication of the existing WST model within the EFL context follows a primarily quantitative methodology of gathering combined measures and subjecting these to statistical analysis through a combination of multiple linear regression, exploratory factor analysis and SEM in order to explore the viability of a final predictive model.

This adaptation or replacement of measures is suggested either due to a criticism of the original instrument in the literature, its unsuitability to the TESOL context or to include the most effective measure of pedagogy as with inclusion of Constructivist Learning or Microblending.

This approach of retaining the latent variables in WST while refining the measures used has been validated in previous studies undertaken by Morales in 2005, Petko in 2009 and Agyeri & Voogt in 2011 (here I am referring to the dates of the data gathering rather than publication in order to preserve chronology).

Once measures have been assembled, adapted where required and trialled they are to be combined into a single instrument for empirical data collection amongst the teachers of the target institution.

In the data analysis stage, I will first construct a measurement model, assessing the results of each instrument using factor analysis to retain the most reliable, representative and co-related items to construct a measurement model. This model suggests the measurement factors that should be retained in future versions of the instruments and presents a series of variables for the construction of structural model.

In constructing the structural model I shall test and compare alternative configurations of the Will measure to arrive at the model which fits the data most descriptively in an attempt to explain the variance in Use in terms of Wil, Skill and Tool.

4.3. Instrument Research

To identify the instruments used, I have adopted the convention of giving the acronymic name of each instrument and the number of questions in the variation under discussion in parenthesis (e.g. TAC(248)), rather than using a version or year number. Most tools required to replicate the original WST in the mainstream education context in the USA were freely available for research work from the Institute for the Integration of Technology into Teaching and Learning (Knezek, Christensen, Miyashita, & Ropp, 2000).

Petko (2012), in running the most recent large-scale WST-based study prior to my work, had applied some of his own alternative measures resulting partly from a need for his study to be congruent with other European educational studies and partly as refinement of the model's focus. Dr Petko was gracious enough to provide me with the full question set in his study, which has greatly informed the development of my own tools.

Following extensive detailed work in compiling a battery of validated instruments from previous studies, Knezek, Christensen, Hancock & Shoho, (2000) theorized their first iteration of the Will Skill tool model based on a survey of just 39 teachers in Texas in 1998. Although this small sample size was only suitable for a linear regression model they then tested the model with data from 1,267 K-12 teachers (see Table 4.2. for more detail) validating their theory through Structural Equation Modelling (SEM) (Knezek, Christensen, & Fluke, 2003).

The resulting model that is claimed to explain up to 90% of the variation in classroom use through the Will, Skill and Tool factors was used in subsequent studies involving the original team and their students (Morales Velázquez, 2006; Morales, Knezek & Christensen, 2008; Agyei & Voogt, 2011), and popularised through their publication of the model in the International Handbook of Information Technology in Primary and Secondary Education (Voogt & Knezek, 2008).

I have charted the use of instruments across some of the main replication studies involving members of the origibal research team and their associates team in Table 4.2. below. These instruments have mostly been refined through successive studies leading to greater internal reliability but as an illustration I have shown the number of items and alpha for the instrument in its first appearance in these studies and in my own 2013 study in Table 4.3. More detail on the measures I have retained and those I have refined or dropped is given in the following section (4.4).

	Instrument	Knezek 1999* *(Dallas n=39)*	Morales 2005* *(Mexico n=978 / Texas n=923)*	Agyeri & Voogt 2008* *(Ghana n=189)*	Petko 2009* *(Schwyz n=357)*	Bish 2015* *(worldwide n=319)*
Will	CLES (Constructivist Learning Environment Survey) *Johnson and McClure (2004)*				✓	✓ (revised)
Will	TMBR (Teachers' Micro Blending Readiness) *Bish (2014)*					✓
Will	TAC (Teachers' Attitudes to computers) *Knezek & Christensen (1998)*	✓	✓			✓
Will	TAT (Teachers' Attitudes to Information Technology) *Knezek &Christensen (1998)*	✓		✓		✓
Skill	TPSA (Technology Proficiency Self-Assessment) *Ropp (1999)*	✓	✓	TECs very similar		✓ (revised)
Tool	Classroom ICT Hours	✓	✓	✓	✓	✓
Tool	School Facilities			✓	✓	✓
Tool	Home Computer Access	✓	✓	✓ (at work)	✓	✓
Classroom Integration	STAGES (Stages of adoption) *Christensen (1997)*	✓		✓		
Classroom Integration	CBAM-LOU (Concerns Based Adoption Model – Levels Of Use) *Hall, et al. (1975)*	✓	✓			
Classroom Integration	Competency Stage / LOU *Bish* (2013)					✓
Classroom Integration	Self-reported classroom use				✓	✓
Achievement	SAT (Scholastic Aptitude Test)	✓				
Achievement	EFSET (EF Standard English Level Test) *EF (2014)*					✓

* Year of study, not publication of results

Table 4.2. Instruments used across samples validating WST

	Instrument	Constructs measured	Items	Subscale reliability
Will	CLES (Constructivist Learning Environment Survey) *Johnson and McClure (2004)*	Personal relevance Uncertainty Critical voice Shared control Student negotiation	20 (18)†	α=.72 to .94 (α=.82 to .86)†
	TMBR (Teachers' Micro Blending Readiness) *Bish (2014)*	Degree of teacher control Planned use of ICT Variety of ICT use ICT Tool selection Learning interaction Teacher skill	42 (32)†	α=.62 to .70 Whole scale α=.809
	TAC (Teachers' Attitudes to computers) *Knezek & Christensen (1998)*	Interest Comfort Accommodation Interaction Concern Utility Perception Absorption Significance	51 (14)†	α=.85 to .98 (α=.84 to .89)†
	TAT (Teachers' Attitudes to Information Technology) *Knezek &Christensen (1998)*	Attitudes to: Electronic mail (teacher) WWW (teacher) Multimedia (teacher) Productivity (teacher) Productivity (students)	50 (16)†	α=.91 to .98 (α=.91 to .96)†
Skill	TPSA (Technology Proficiency Self-Assessment) *Ropp (1999)*	Technology skills in : E-mail Integrated Applications World Wide Web Teaching with technology.	20 (12)†	α=.81 to .87 (α=.71 to .80)†
Classroom Integration	STAGES (Stages of adoption) *Christensen (1997)*	Stage of technology adoption	1*	.91**
	CBAM-LOU (Concerns Based Adoption Model – Levels Of Use) *Hall, et al. (1975)*	Level of technology use	1*	.87** to .96**
	Competency Stage / LOU *Bish* (2013)	Level of technology use	4	α=.91
Achievement	SAT (Scholastic Aptitude Test)	Mathematics ability Reading ability Writing ability	N/A	.81** to .85**
	EFSET (EF Standard English Level Test) *EF (2014)*	English language level	N/A	.88** to .95**

† Adapted tool used in this study

Table 4.3. Instrument details

Most of the data used to evaluate the tool component of the model is gathered by simple demographics covering a teacher's access to technology at home and in school. Petko extended this to explore the impact of different technology configurations within the school. I applied this approach as it fits well with the EF context under investigation where a teacher has scheduled access to different types of technology in one of three formats – a room with a single PC and projector, a computer lab with a PC per student (known as iLab) and class sets of iPads brought into the teacher's regular classroom as well as a fourth case of computers in the staffroom for teacher preparation. Like Petko, I also have the number of the actual facilities in the schools in these formats which can be compared to teachers' experience of the practical availability of the equipment.

Measuring Classroom Integration

In Petko's 2009 survey, classroom Integration was measured by teachers self-reporting use across 20 different types of ICT software rather than reliance on their reporting the degree of adoption via linear stage model (e.g. STAGES or LOU). In particular he was avoiding wording within Christensen's 1997 stage model (see Section 3.5.1.) that potentially aligned it too closely to measures within the Will and Skill elements, making the WST model's extraordinarily accurate prediction of the variation in classroom adoption a consequence of the instruments used.

My conceptualisation of the degree of classroom Integration of ICT as a latent factor of Use was to consider measuring each of the three main technology formats in EF in the three different ways, as shown in Figure 4.4. The scheduled classroom hours (conventionally CHOURS) measure of each giving the variety of opportunity to use each type of ICT, then the use of each type giving a quantitative measure of the adoption of each and thirdly the level of use showing the qualitative degree to which the teacher felt they were utilising the ICT.

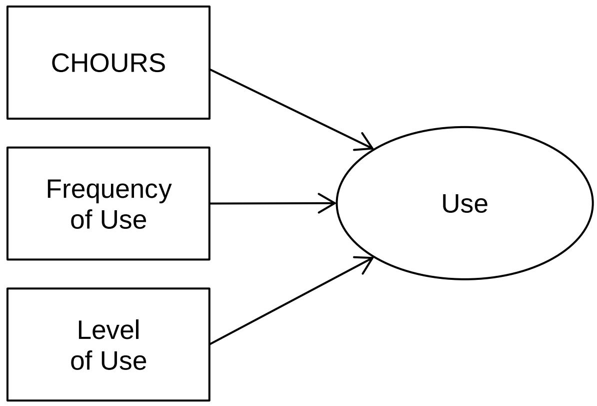


Figure 4.4. Conceptualising Use

4.3.1. **Attitude towards computers: TAC/TAT**

In the complete replications of WST shown in Table 4.2, different iterations of the TAC (Teachers' Attitudes towards Computers) or TAT (Teachers' Attitudes towards Technology) measures were used.

Knezek & Christensen compiled their initial 248 item TAC in 1995 from 14 of the most prominent existing instruments measuring teacher attitudes towards computers. They began piloting this rather unwieldy one-hour questionnaire with 118 Texan teachers, gradually refining it down to the most illustrative 51 questions by 2009 (Christensen & Kenzek, 2009).

Shattuck, Corbell, Osbourne, Knezek, Christensen & Grable (2011) have since refined this measure over several well validated iterations into the quick 10-minute combined TAC/TAT(42) instrument which better fits my purpose of something that is neither intrusive nor stressful to participants or teachers in regular use.

Given the measure's provenance and the fact that I intend changing other measures of the *Will* variable in my model I felt it was better to largely retain this highly reliable measure than the longer list of fresh questions posed by Petko.

Nonetheless, the TAC/TAT(42) questions around the area of Interest seem less focussed on using ICT tools and media in favour of computers and a general presupposition that these either present problems in themselves or relate to how a computer can be applied to solve a problem. This section assumes that teachers are not using computers and seems a little patronising, e.g:

> *The challenge of solving problems with computers does not appeal to me.*
>
> *I like to talk to others about computers.*
>
> *It is fun to figure out how computers work. (Shattuck et al., 2011)*

For my context, email, which takes two sections of TACTAT(42), is over-represented as an indicator of interaction through technology outside class. These questions are covered almost identically elsewhere in my instrument so I removed its first appearance (Part 3, Q11 – Q14) but rather than take it out completely, expanded email in the second section (Part 7, Q20 – Q30) to include other messaging. I decided not to add a dimension of social media as this stirs additional classroom controversies over privacy (Gorg 2013; Blyth 2015) which I did not want to raise in the survey.

Due to the international context with a mobile workforce of teachers often working outside their native country I changed Part 4 Q16. *'Our country relies too much on computers.'* to *'We rely...'*.

4.3.2. **Technology Proficiency: TPSA**

The Technology Proficiency Self Assessment (TPSA) (Ropp, 1999) is a well validated tool of 20 items resolving to four indices whose use has been replicated across several studies (see Table 4.1), and is retained in US based research that requires backward compatibility of results.

Nonetheless, as I wrote to Dr Ropp in seeking permission to use her measure:

> *…the specific ICT tools that formed key indicators of practice in 1999 have in some cases been superseded.*
>
> (Email correspondence with Dr Margaret Ropp, July 4, 2015)

For the TESOL context, I made Ropp's points more task based and removed items that are now made redundant or trivial by technology, replacing with similar tasks where possible. The advent of Web 2.0, mobile and cloud computing have also introduced many more possibilities and ways of interacting with a computer which are fundamentally different from tasks that could be carried out before both requiring and promoting new ways of thinking (Chapelle, 2000; Tannen & Trester, 2013). Marc Prensky (2001, 2009) suggested that 'millennials', learners born into a digital world since around

1981 (digital natives), actually process information differently in their brains than their predecessors did. While that notion is debatable, it is clear that the computer affordances have changed the way we work and communicate and any measure should include tasks which require less linear and both synchronous and asynchronous interaction. Ropp equated computer interaction with email making two of her four measures email specific. I expanded these to include more contemporary communication methods and replaced one with app use to include mobile and tablet computing use.

Some of the TPSA measures were related to teaching although indirectly relevant to TESOL. I removed these as classroom specific and facilitative use of ICT is covered in my measure of competence.

Petko's alternative measure of technology proficiency uses 12 questions which encroach on the classroom and teaching realm. Measuring skill in this way is very close to use where an epistemological problem, possibly unique to TESOL, arises: in formative assessment in TESOL a teacher often equates a student's ability to do something with language (the so-called 'Can Do' statements, I referred to earlier) with actually carrying out the action. Therefore if I had asked whether a teacher carries out an action in questions focussing on 'Skill' and again examined this as a facet of their computer 'Use', my mathematical model would have the same on both sides of the equation. For example, if I ask a teacher:

> *Can you:*
>
> *'Guide students in the production of interactive or multimedia documents (Web pages, audio files, films, etc.)'*

this is pragmatically the same as asking ‘Do you…’.

Ropp’s item responses were framed on the classic Likert scale of agreement:

SD = *Strongly Disagree*

D = *Disagree*

U = *Undecided*

A = *Agree*

SA = *Strongly Agree*

This central notion of *‘Undecided’* seems odd and out of place with other comparable competency scales; as Morales, Knezek & Christensen (2008) observed, TPSA is effectively a measure of *“confidence in one’s competence”*. The original TPSA responses highlight a scalar sense of agreement rather than an estimate of ability level. This is clearly contrasted in Petko’s comparable five point response focussed on ability and adding N/A as a final point, which I translate as:

How good are you at doing this?

I can’t do this / Basic / Fair / Good / Expert / N/A

(Petko, personal communication, 2015)

In my version of TPSA I have taken this ability-based approach with:

How well can you do the following?

I can’t do this

I can do it with difficulty

I can do it OK

I can do it with ease

I am an expert

N/A.

4.4. Instrument Development

4.4.1. An improved constructivism measure for TESOL: TESOL CLES

As shown in table 4.2, the WST studies prior to Petko (2012) did not include a measure of constructivism. Petko (2012) introduced the CLES measure into his replication of the WST model as an unsuccessful attempt to increase the accuracy of the model. I felt that the approach he had taken showed good promise for the TESOL context and that a modification of the CLES tool may succeed.

The 1997 CLES (Constructivist Learning Environment Survey) instrument (Taylor, Dawson, & Fraser), revised in 2004 (Johnson and McClure), is a quick measure of latent constructivist beliefs in school subject teachers. I needed to make substantial revisions to CLES given the uniquely situated nature of constructivist beliefs in language teaching, coupled with my desire for a consistent critical applied linguistics approach. In TESOL, the focus is skill acquisition, or communicative competence, rather than subject knowledge (Brown, 2007).

Thus far CLES had implied a default passive role to the students, possibly in part due to the assumption that learners are children but also a presupposition that a teacher is an expert in the content being handled in the lesson. ESOL is sometimes referred to as an ‘empty subject’ as the teacher is more concerned with improving how the student conveys their meaning than the content of what they are saying or writing. This difference is fundamental to the breadth of applied seen constructivism in the TESOL classroom.

The 1997 CLES locates the teacher's practice along five dimensional scales which describe the shape of the constructivist learning environment.

Scale	**Scale description**
Personal relevance	Extent to which [language] is relevant to students' everyday out-of-school experiences.
Uncertainty	Extent to which opportunities are provided for students to experience that [language] is evolving and culturally and socially determined.
Critical voice	Extent to which students feel that it is legitimate and beneficial to question the teacher's pedagogical plans and methods.
Shared control	Extent to which students have opportunities to explain and justify their ideas, and to test the viability of their own and other students' ideas.
Student negotiation	Extent to which students share with the teacher control for the design and management of learning activities, assessment criteria, and social norms of the classroom.

Table 4.5. Scalar Dimensions of the Constructivist Learning Environment Survey (after Taylor et al., 1997)

I retained these original scale descriptors as sufficiently robust and abstracted to allow a simple subject substitution in the first two scales (as bracketed in Table 4.5.) while the others were entirely portable.

Due to the expectation of reflective and constructivist nature of best practice in TESOL methodology (Mahmud, 2013) some very TESOL specific questions can be asked. I initially added three of these to avoid making the questionnaire too long in the anticipation that some of these or other questions would be removed at later design iterations.

Authentic as well as published material is used.

Students use language creatively.

Students can work according to their own learning strategies.

In order to retain the construct validity of the previous versions of CLES, I inserted these into the existing environmental dimensions rather than add any form of subject specific dimension which would have weakened the model.

I gained initial peer validation for the resulting instrument through focus group discussions with a group of six experienced TESOL researchers working within EF. This was followed by a trial of CLES alongside the TMBR tool to test reliability.

The Cronbach's Alpha for the TESOL CLES gave α=.84 which is considered to be highly reliable by Cohen, Manion & Morrison (2011) so I made no further adjustments to the tool.

4.4.2. **A new measure of Microblending Readiness – TMBR**

The new instrument is in effect exploratory measures of phenomena I have observed and examined in previous work in the TESOL context (Bish 2012). I created this new psychometric measure to quantify a teacher's aptitude for microblending. A mechanism for the construction of such a scale is proposed by Furr:

1. Articulate construct and context

2. Choose response format and assemble initial item pool

3. Collect data from respondents

4. Examine psychometric properties and quality

(2011, p. 6)

In articulating the construct and context of teachers' readiness to microblend in the classroom I identified five aspects of a teacher's practice (as explained in 3.6.5.) which could illustrate the espoused beliefs I associate with the phenomenon of microblending:

- *Control*
- *Planning*
- *Variety*
- *Tool selection*
- *Interaction*

The rationale and theoretical justification for these was covered in detail in my theoretical framework (Section 3.7).

As a new scale like this is 'less desirable' (Furr, 2011, p. 8) than a previously validated scale such as TAC, or a modified scale such as CLES, I endeavoured to recycle as many items as possible that had been previously validated in other studies. I attempted to make more concrete technology based application of the more abstract notions in the CLES and Murphy's Constructivist Checklist (1997), as well as considering elements of other tools dealing with applied beliefs including the TPACK, The EU Survey of Schools: ICT in Education (ESSIE) (2013), Yepes-Baraya's series of tools (2002) and items from Petko's survey which could be slightly altered to reflect the areas under investigation.

I constructed the individual items as statements to be scored on a Likert scale taking care to produce response descriptors with an equal psychological distance (Furr & Bacharach, 2014*): I completely agree, I partly agree, I neither agree nor disagree, I partly disagree, I completely disagree.* A midpoint item was necessary to allow rating within the different contexts respondents work although I retained the use of the psychometric scale rather than move outside with a '*N/A'* or *'Don't know'* value which have been shown to detract from the psychometric quality of the measure (Moustaki & O'Muircheartaigh, 2000).

For the purposes of testing reliability I retained some items which might still be used elsewhere in the broader tool for my final survey as my research design would not allow for another opportunity to examine how these indicators perform.

I also repeated some measures in the trial items with slightly different wording and reversed concepts for clarity and triangulation within the instrument, for example comparing:

> *4. There is some ICT which allows teachers more control in the classroom.*

with:

> *5. Classroom management is challenging whenever ICT is in use.*

which was reverse coded so that *I completely agree* was analyzed as a score of 5 rather than 1.

Following exploratory analysis with SPSS, item 23 stood out as being detrimental to the alpha value:

> *23. I have to use the same software all the time when teaching*

This point is covered by other items referring to institutional compulsion and teacher choice of software so I removed it.

Two more items that impacted reliability most significantly were:

> *27. The teacher should aim to facilitate communication more than to guide use of the ICT.*
>
> *25. The language students produce is more important that the ICT input.*

These two questions appear to have confused some respondents and they may in any case state a truism, i.e. that the lesson focus is about language production, not ICT, which transcends the microblending question.

Finally, I removed the first item from TMBR(35):

1. *Computer equipment must be set up before the lesson.*

Here, I had intended to indicate the behaviour of a teacher who dogmatically defines what is to be used pre-lesson (it is a reverse coded item) but as it may simply suggest that the teacher is organized and then selects in the class, this ambiguity makes the value of the item questionable.

Removing these four items gave a revised 31-item TMBR (TMBR31) with α=.75

The SPSS reliability analysis had also suggested removing:

29. ICT should be used for students to work autonomously,

33. A teacher needs to be an expert user of every piece of software in the lesson.

34. I do not mind if the students know more about using a particular piece of software than me.

But as the concepts behind these are directly fundamental to microblending and the value of alpha is now considered sufficiently reliable I chose to retain them.

4.4.3. A series of new measures for Level of Use: EF Quick Competency Scales

As mentioned in 3.5.1. my model will require a more detailed measure of the breadth of ICT used in the classroom rather than use an overall state model such as STAGES or CBAM-LOU seen in previous WST studies (Tables 4.2 & 4.3.). To describe the teacher's state of competency and comfort with ICT tools, I applied a set of self-reporting competency measures for each of the main tools used in the classroom which I had devised prior to this study. This approach is similar to Petko (2012) although I have avoided a danger I see in Petko's measurements of too closely aligning use with skill. My instruments specifically relate to the pedagogic level of classroom practice, moving from the simply additive to more disruptive use of the technology. This is founded on Puentedura's SAMR (Substitution, Adaption, Modification model (2013) which has been used by others (Cavanaugh, Hargis, Kamali, T & Soto, 2013) to evaluate MALL and CALL in use. Applying such a measure ensures that some aspects of microblending are taking place.

I developed and trialled the first of these instruments (shown in Appendix C) with teachers to monitor and reflect on their progress in iPad training in 2013. This tool followed a 'can do' approach as used in the Common European Framework of Reference which teachers in EF ILS regularly use to assess students' competences, an audit approach advocated in TESOL technology adoption by Bannister & Wilden (2013). I worked with a focus group of five teachers recognized as leading adopters of technology in the classroom alongside the content designers of the ICT tools we were using, to create a scale similar to the European Profiling Grid (EPG) (North, Mateva & Rossner, 2013) designed to test teacher competencies. There is a need for such measures as the EPG does not fully focus on Classroom ICT Integration, seeing technology more as an enabling skill while my scale addressed stages in classroom adoption of a specific technological affordance more directly. In 2015 I refined the instrument in use making it simpler to complete and aligning it with two new competency tools devised for both classroom computer labs (iLabs) and PPT based multimedia material used on a projector.

As the requirement of WST is less diagnostic I simplified the suite of assessment tools enabling the teacher to report their classroom competence in applied use of each of the three ICT tools used in the EF syllabus (Appendices Di-Div).

My modifications were made through a modified Delphi process working by email with a group of 12 course designers and senior academics who I asked to comment to me individually on the tools and suggesting revisions. I then sent all compiled suggestions back to the group with three successive rounds of tool revision.

I began revisions by returning to the stages of adoption model that arose from the Apple Classrooms of Tomorrow Project (which reflect an institution's stage of adoption as much as a teacher's) but comparing this with notions from Puentedura's SAMR model which marks a trend towards a more transformative digital pedagogy from simply additive use of ICT in the classroom.

Dwyer's 'ACOT stages' framework of levels of adoption (see section 3.5.1) retain a focus on productivity and managerial efficiency – these emphases on efficiency in gaining output are more performance related objectives of external factors rather than evidence of a willingness to produce creative language construction or output from the students. My colleagues in the consultation felt that the student's voice and learning outcomes should be in here as well as some notion of frequency of use. A focus on pure competency does not demonstrate perceived ability but an assessment of the amount of use that requires a little more reflection on action. In redefining the terms we used we have also considered the community of practice element (Wenger, 2000) where the high level user is becoming an 'expert' who can effect change in their peers, especially if they are transformative in the way suggested by Puentedura (2014).

A statistical limitation of these three measures is that like the CBAM-LOU measure used by Knezek, Christensen, Hancock & Shoho (2000), as single item measures they cannot be statistically tested for internal consistency. Secondly, the simplified version also requires that evidenced competences develop in a linear fashion which may not be entirely true as teachers may adopt techniques more eclectically. Nonetheless I have found in practice that repeated application of an online version of the self-assessment checklist instrument (Appendix C) to the teaching body in a school after introduction of the new iPad app did show that the teacher competence in the technology in question normalized after 6 weeks in most schools (Bish, 2015a). I take this to represent an elementary measure of internal validity of the instrument.

4.5. **Instrument Trialling – Pilot survey**

To reduce exogenous variability in my main survey, I conducted a short pilot study which tested the reliability of my revised CLES and new TMBR scales.

The pilot survey was conducted across a convenience sample of 30 teachers drawn from two schools in different countries from within the population of the final study. As well as qualitative feedback from the teachers, this pilot provided data for inter-item reliability testing calculated through Cronbach's Alpha.

I trialled the resulting 35 item instrument online with 30 teachers in two schools alongside TESOL CLES(19) using Surveymonkey under full anonymity by including an electronic version of the University of Exeter consent form allowing for an opt out (Appendix G).

4.6. **Sample**

Previous validations of the WST model in the mainstream context have been possible based on the large samples available (see Table 4.2.). Exploratory factor analysis and SEM both require a large number of data points. For the model as I have stated it, the minimum sample size for a Structured Equation Model of the whole system is n=463 according to an online sample size calculator from Soper (2015) based on a calculation from Westland (2010).

Such sampling is difficult within the fragmented EFL context so sampling across one of the largest chains of EFL schools offered contextual consistency while still offering me the chance to uncover any variation in acceptance amongst the teachers concerned.

At the time of the study the full population of teachers working at EF ILS was approximately 860 teachers working in the 31 schools. In order to represent the views of these teachers accurately, I needed to gather data from more than 200 teachers (Soper, 2015). This size of sample is also the conventional lower bound sample size recommended for SEM (Hair at al., 2010; Garson, 2015).

My sampling method was simply to include the entire population in the hope that the return rate would not only represent the population but allow the for more sophisticated SEM analysis for a full validation of a modified WST model for TESOL which aligned as closely as possible with that proposed by Knezek, Christensen, Hancock & Shoho in 2000.

4.7. **Data Collection**

4.7.1. **Ethical considerations**

Ethical approval for the instrument trialling pilot and main study were separately sought and granted in advance by the ethics committees at the University of Exeter (see Appendices E & F).

4.7.2. **Anonymity**

Due to the prominence and visibility of EF International Language schools within the EFL industry, I felt it would be a practical impossibility to retain the organization's anonymity in this study. Transparency in identifying the organizational context also allowed for much greater validity of the study and its context for those who might choose to replicate it in future, effectively adding to the study's impact.

I received written permission from the Senior Academic VP of EF ILS to name the organization in this study on the condition that this consent could be removed at any time (see Appendix B).

In order to preserve participant anonymity I have avoided specifically identifying any of the 31 schools who participated in the study, referring to them only by numbers. I have not retained the individual identity of those teachers who participated in the original study, only referring to the number of the school they work at.

4.7.3. **Informed consent**

Participants were informed of the intention of the studies by letter. As anonymous personal responses were gathered online, I adapted the Exeter

Informed consent form so that it would show at the end of the questionnaire informing the participant of the survey's intended use and allowing them to opt out rather than submit (Appendix G). It was also made clear to participants that they could withdraw permission to use their responses at any time.

4.7.4. **Compulsion**

Given my senior position in the organization where participants work, it was necessary to ensure that teachers did not feel pressured to take part nor compelled to answer in any particular way. This was covered in messaging to the stakeholders, initial instructions and in a letter to all participants (instrument trial: Appendix H, main study: Appendix I). There naturally remained some pressure on the Directors of Studies in each school as I sent reminders for their teachers to be given the request to take part and check that everyone who might participate had the opportunity to do so. I mitigated this pressure by being clear with the Directors of Studies that their school's level of participation would not be made known to anyone other than myself.

This is also where there is the danger of a 'Halo effect' to data validity (Cohen, Manion & Morisson, 2011) where survey participants may give what they perceive as a preferred response especially where the surveyor is a respected superior (Presser et al., 2004). As in previous surveys of ILS teachers, it is clear from both quantitative and qualitative responses that participants did not feel compelled to answer in a particular way and were free in expressing their often very critical views as the example below shows.

> *Someone, somewhere, needs to get their act together. These random, anonymous surveys that attempt to limit feedback to a few pointless*

multiple choice answers is a poor excuse for market research, and a complete waste of time. (Extract from participant 277 in the main survey)

While their frustration here is clear, the teacher did make very useful additional points which are included in my results.

4.7.5. **Stress or discomfort**

Teachers in ILS are regularly surveyed for opinions on materials and can be expected to see this survey in the same light. They generally welcome the opportunity to participate and provide feedback. New questions were subjected to approval by an academic panel and piloted in order to ensure that none of the questions used are considered unprofessional, intrusive or offensive to teachers.

A primary concern in my design was to keep the instrument to something that could be completed in under 20 minutes so as not to impact on teachers' preparation time. Hence, for example, my adoption of the combined TACTAT(42) measure.

I tested this timing of my final tool with a small initial subsample of volunteers before sending out the full survey to all participants. The ability of the Surveymonkey tool I used to measure and return completion time was a big advantage here. Nonetheless, in the final survey only 60% of the 310 participants finished in under 20 minutes resulting in some comments in feedback and also no doubt in dissatisfaction with the survey which would have been passed to colleagues who avoided taking part. Those participants who did take the time to comment were amongst the most engaged as shown by their timings. That they felt compelled to comment on the format of the questions used points the need for strong face validity and relevance in any measures used.

4.7.6. Data storage and security

I handled data collection and storage through a professional account on Surveymonkey.com on a secure server using both server authentication and data encryption. This ensured that user data in transit was safe, secure, and available only to myself. Once downloaded from Surveymonkey, the data was kept on an external hard-drive for security.

4.8. Data Analysis

4.8.1. Data preparation and processing

Once data collection was complete, I exported the full survey data from Surveymonkey to Excel before passing it on to the IBM Statistical Package for Social Sciences (SPSS). In the intermediary Excel stage, I encoded some responses for easier processing and I inverted all reverse coded items to ensure consistent directionality of measures before any further analysis (Field, 2005).

In the final study, I also carried out data screening and recoding in Excel, making use of custom filters and sorting features to export only complete cases for analysis. While using Excel in this way appears to be conventional (Gaskin, 2016), and something I personally found easier to do in Excel than SPSS, one drawback of the method is that it could introduce some transfer errors in the multiple exports required. To ensure that no such errors existed in the final dataset I summed the retained values of each variable and checked them against the original survey data. As my case filtering had also relied on multiple sorts I also calculated and checked that the sum of each participant's responses. This also required rechecking the imputation used. The few errors I trapped in these rigorous checks may have been reduced by completing all processing in SPSS but final checks with the original data was still prudent.

The SPSS package was adequate for analysis of the instrument trial, pilot study, and generating the descriptive statistics, as well as conducting the Exploratory Factor Analysis. Confirmatory Factor Analysis and Structural Equation Models were created and analyzed using the AMOS extension to SPSS which allowed me to draw the expected relationship between the observed and latent variables as a graphical model for validation and significance testing.

4.8.2. **Case Screening**

In total, 319 participants responded to the survey, following transformation of reverse coded items I screened for missing data.

I found 8 responses were completely invalid, missing all but very basic data.

Other respondents had not completed all pages of the online survey and so missed providing any data for one or more of the measures in the survey (missing over 32 or more out of 125 questions).

In 4 of these it is clear from the survey data, which includes the submitting computer's IP address, survey start and survey end time, that a participant had started the survey a second time after completing the first few questions so I also fully removed these cases.

This left 38 participants who did not complete the survey. Here it was not clear whether this was an issue with the online survey tool or what Hair et al. (2010) refer to as their ‘morbidity’.

In total I removed the data from 50 respondents reducing my final dataset to 269 responses, an acceptable proportion of the population (Soper, 2015; Hair at al., 2010; Garson, 2015).

Following this screening, the lowest item response was 96.66%. To enable Confirmatory Factor Analysis and Structural Equation Modelling, which cannot be conducted with missing data, I imputed across the measures of each instrument using the mean response to the item as recommended by Hair et al. (2010).

In three of my measures, TPSA, Use, and Facilities, I had allowed ‘N/A’ responses. I coded these as the unique value 999 in Excel and ‘user missing’ in SPSS before dealing with them in an appropriate way for each measure, as detailed in my results section (5.2) below (Pigott 2001; Schumacker & Lomax, 2010).

I was only able to meaningfully screen for invalid responses on the demographic items and those relating to teacher schedules use as covered in more detail in section 5.2 below.

4.8.1. **The effects of incomplete responses**

I tested for Non-response bias after Whitehead, Groothuis & Blomquist (1993) by comparing the initial demographic fields across the 41 incomplete responses I discounted with the 269 I retained as shown in Table 4.6. below. Here I included the percentage of responders in each school to check for regional balance as well as including the teachers experience and personal device ownership HOMECOMM.

I confirmed the impression of the similarity of means and standard deviations using the non-parametric Kolmogorov Smirnov test to establish that both samples were drawn from the same population. Running the Kolmogorov Smirnov test in SPSS proved positive at the 95% confidence level for each case in the table below, statistically verifying that those who did not complete the online questionnaire did not represent an atypical sample of the teachers I was investigating and so that their not completing the survey did not introduce bias to my results.

	Incomplete Responses (*n*=41)		Complete responses (*n*=269)	
	Mean	SD	Mean	SD
V1. School (Distribution)	3.23%	3.36%	3.23%	3.36%
V4T. Age	37.37	11.45	37.42	10.54
V5T. TESOL Years	9.56	11.19	9.33	11.02
V6T. EF Years	4.59	12.19	4.36	10.23
V7. HOMEPC	0.95	0.22	0.95	0.22
V8. HOMETABLET	0.54	0.51	0.54	0.50
V9. HOMEPHONE	0.54	0.51	0.54	0.50
V10. Computer Years	17.54	5.07	19.32	6.66
V11. Teaching Computer Years	5.44	5.51	5.49	4.58
V3. Gender	64% Female		68% Female	

Table 4.6. Demographic comparison across complete and incomplete responders

4.8.2. **Measure reliability**

This is discussed measure by measure in the results chapter. Overall I assessed this using Cronbach's Alpha with initial reference to the following table from Cohen, Manion & Morrison (2011):

> 0.9	Very highly reliable
0.8 - 0.9	Highly reliable
0.7 - 0.79	Reliable
0.6 - 0.69	Marginally reliable
< 0.6	Unacceptable

Table 4.7. Cronbach's Alpha reliability (Cohen, Manion & Morrison, 2011, p. 640)

Although used by tradition, Alpha suffers from many shortcomings as a measure of scale reliability as it is affected by the same inter-item correlations which factor analysis seeks to converge towards. It is also affected by the number of items in a scale (De Vellis 1991). Petko (2012) used 0.7 as the lower bound of reliability with Bryman & Cramer (1990) setting the bar as high as 0.8, while Hair et al. (2010) place it as low as 0.6 in exploratory work.

Morales, Knezek & Christensen (2008) used Alpha cutoffs from De Vellis' 1991 book *Scale Development*. De Vellis seems to offer the most sound and qualified advice in using Alpha for scale construction as shown in Table 4.8. where he splits the higher acceptable bounds and warns against having an over-generalized scale where alpha is over 0.9.

> 0.90	Excellent but consider shortening the scale
0.80 - 0.90	Very good
0.70 - 0.80	Respectable
0.65 - 0.70	Minimally acceptable
0.60 - 0.65	Undesirable
< 0.60	Unacceptable

Table 4.8. Cronbach's Alpha reliability (after De Vellis, R. F., 1991, p. 109)

Factorization is a way of reducing the number of variables in a model by combining measures into factors. This is plausible with an acceptably high alpha value but can also be tested through Exploratory Factor Analysis where the basic measure of suitability is the Kaiser-Meyer-Olkin (KMO) statistic, a value between 0 and 1 that explains the proportion of variance which is common across the measures. A high KMO is good with 0.6 as the lower threshold. Kaiser offers the following interpretation:

0.00 – 0.49	Unacceptable
0.50 - 0.59	Miserable
0.60 - 0.69	Mediocre
0.70 - 0.79	Middling
0.80 - 0.89	Meritorious
0.90 – 1.00	Marvellous

Table 4.9. KMO scale (Kaiser, 1974, p. 35)

4.8.3. **Measure direction**

In combining the measures used in to a single survey there were inevitably differences in the direction of scales used. While changing the direction of responses between items in questionnaire can introduce a questionnaire effect (Perry, 2011), this same variety between scales in an instrument, alongside negatively worded and reverse coded items, may be a way of avoiding response pattern bias such as aquiescence bias or ‘yea saying’ (Podsakoff, Mac Kenzie, Lee & Podsakov, 2003; Cohen, Manion & Morisson, 2011).

With this in mind I retained its original direction of the revised CLES scale which, unusually compared to other measures in my battery of instruments, started with a high frequency value of ‘Almost always’ on the left hand side decreasing to a low value of ‘Almost never’. Moreover, in constructing my new TMBR measure as I was aligning items CLES and other measures from Petko’s (2012) survey (see 4.4.1) that I maintained consistency by retaining this presentation of the highest value first. All measures that appeared before these two in the questionnaire ran from a low frequency or degree of agreement to a higher frequency or degree of agreement.

Despite my rationale this exposed the combined instrument to the danger of participants not thoroughly reading the scale headers and automatically continue checking left hand values as low, irrespective of any extreme response bias. Such response bias is not revealed in reliabilty tests (Presser et al., 2004) so I have demonstrated the consistency of responses in through the simple method of showing the balance of responses to each measure presented in Table 4.10.

Scale	**LH**	**1**	**2**	**3**	**4**	**5**	**RH**	**Weight**	**NA**
Use	**36%**	9%	28%	20%	18%	14%	**32%**	Left	12%
TPSA	**6%**	2%	4%	5%	12%	27%	**38%**	Right	51%
FACS	**17%**	5%	12%	30%	31%	22%	**52%**	Right	1%
Competency	**27%**	8%	18%	28%	28%	18%	**46%**	Right	
TACTAT	**42%**	20%	22%	13%	27%	18%	**45%**	Right	
CLES	**79%**	44%	35%	16%	4%	1%	**5%**	Left	
TMBR	**60%**	27%	33%	20%	14%	6%	**20%**	Left	

Table 4.10. Weight of responses to measures in the final online survey

As Table 4.10. shows, all Likert scale items consistently used a five point scale, with a sixth ‘N/A’ item being used for self-report of frequency of use, TPSA and Facilities measures. To provide an indicator of response weight I have averaged the leftmost two response rates as LH (Left Hand) and the rightmost two responses as (Right Hand) representing the largest of these two as the response weight.

In almost all of the initial 5 measures that use these type of scales with a low value on the left hand side the tendency has been for the weight of responses to fall to the right, higher scoring, values. The only exception being the teacher’s estimation of the amount of time they use a particular type of ICT which should be less susceptible to such bias (see section 6.2.2.). Another reading of this point could be that as the N/A values always appeared on the right, even here 48% of the responses are to the right.

The analysis shows that in the last two measures where the scale direction was reversed, the weight of responses also reversed. I take this as a crude proof that the participant were not automatically biased to any one side of the page when responding as Cohen, Manion and Morrison (2003) suggest they may be. Furthermore that participants continued to take careful note of the response categories and responded accordingly when the last two scales were presented in a new order. Such diligent responses have been shown as a trait of well-educated older survey participants (Meisenberg & Williams, 2008).

4.8.4. **Model Fit**

Using SPSS, it is possible to produce several model fit statistics, although their acceptance varies among different authors. The Goodness of Fit Index (GFI), developed by Jöreskog in the original SEM software LISREL, is no longer used as it is dependent on sample size. As a general case I have worked with the following which are widely reported in other papers:

	Threshold
χ^2 / df (CMIN/DF)	< 3 good; < 5 sometimes permissible
***p*-value for the model**	> 0.05

RMSEA	< 0.05 good; < 0.10 moderate; > 0.10 bad

Table 4.11. Thresholds of model fit (after Hu and Bentler, 1999)

Hair et al. (2010) give further refinement based on sample size and the number of exogenous variables – this is particularly important as χ^2 is affected at large sample sizes. This led to my using the Comparative Fit Index (CFI) alongside the popular Root Mean Square Error of Approximation (RMSEA) metric. Table 4.12. gives these thresholds according to Hair et al. (2010) appropriate to the size of my sample.

	m ≤ 12	**12 < m < 30**	**m ≥ 30**
χ^2	Insignificant *p*-values	Significant *p*-values	Significant *p*-values
CFI	≥ 0.95* (see RMSEA)	> 0.92	> 0.90
RMSEA	< 0.07 with CFI ≥ 0.97	< 0.07 with CFI ≥ 0.92	< 0.07 with CFI ≥ 0.90

m=number of observed variables

Table 4.12. Thresholds of model fit where N>250 (Hair et al., 2010, p. 654)

4.9. **Summary**

In this chapter I have shown the overall structure of the WST model and explained the adaptations necessary in the instruments and measures used in previous iterations of the model to replicate its use in the EFL context.

I have explained both how the sample is composed and the data gathered, as well as how it is to be cleaned prior to the exploratory analysis stage.

Data from the different measures I have explained will allow me to explore several variants of the WST model through SEM to show whether or not including the notion of microblending creates a ‘sharper’ model which can explain the largest amount of variation in classroom ICT use.

I have explained and justified my choice of test statistics and thresholds applied to the data analysis, the results of which are shown in the following chapter.

5. Results

5.1. Introduction

When using Structural Equation Modelling (SEM), it is first necessary to establish a measurement model. This step which, forms the first part of my results, can be seen as a measurement of the validity of each tool used in my questionnaire instrument as it identifies whether the factors I was looking to quantify can be described by the measure used.

Once this has been shown in Part 1, I will move on to showing the results of composing the factors in multilinear regression which several preceding studies have done and, if there is sufficient data through a series of comparative SEM models which explore the ability of a WST model, to explain classroom integration of ICT in EFL.

As other comparable studies did not use SEM to construct a final model due to their sample size, I followed Petko's method in using multiple linear regression to verify the WST model in TESOL. As I was justified in using an SEM model for my final results I have not reported the correlation model in any detail.

As it is likely the reader is new to SEM I have also explained some procedures followed the first time they are encountered. The glossary in Appendix A includes a quick guide to key SEM terms and techniques used in this chapter and the remainder of the study.

Throughout this section I have used the prefix V (Variable) before any item number from my full survey V1-V125, these items are shown in full in Appendix K.

5.2. **PART 1. The Measurement Model**

In the initial stage of my analysis I was focussed on recognizing the latent factors explained by the measured variables.

In the following section I report the initial analysis of data gathered in each of the measures in my survey in turn. To offer clarity for readers familiar with the WST and SEM who may be seeking information about a specific generation of an instrument, I have followed the convention of showing the number of items in the measure after its acronym.

As most variables measured did not exhibit near-normality (Hair 2010; Field 2013) (a full analysis of the distribution of the sample variables is provided in Appendix L), I used the technique of bias corrected bootstrapping (see Appendix X GloassarY) in the measurement model phase to allow for robust parametric methods to be carried out on the data. Nonetheless, throughout this section I report the distribution of each item and discuss where the data is particularly non-normal such as in the case of age (section x.x).

5.2.1. **TPSA(12)**

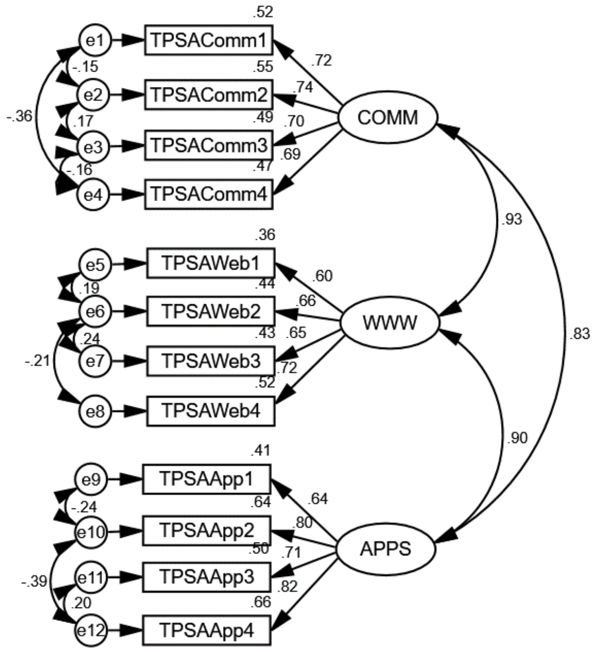
I had included an N/A option which was selected in no more than 6.7% of any item ("*V15, Create a Home page"*) and never across all items in the scale. I recoded these responses in the context of this scale as 'I can't do this'; the lower bound on my 5 point scale. Missing item responses were very low across the scale at under 1%; rather than statistically impute these I also set them to 'I can't do this'.

Cronbach’s Alpha reliability analysis of the responses to the 12 items in SPSS showed high inter-item reliability (α=.899) which would not have been improved by removing any items.

TPSA Communication	α=0.739
TPSA Web	α=0.741
TPSA Apps	α=0.811

Table 5.1. TPSA Measure Reliability

I moved directly to Confirmatory Factor Analysis (CFA) and where an error term to account for measurement error and inter-item correlation could be included along with bootstrapping to compensate for non-normailty in the data...



CMIN/DF	2.769 (Good)
CFI	0.951 (Good)
RMSEA	0.081 (Moderate)

Figure 5.2. TPSA Confirmatory Factor Analysis

To potentially simplify further analysis I then imputed the measured variables V12-V23 into three composite variables created from these factors in my screened dataset.

5.2.2. **TACTAT**

There was between 0.4% to 1.9% missing data across 19 of the 30 items, low enough for mean imputation which I carried out with SPSS.

Inter-item reliability across the scale was reliable (α=.701) although low compared to other measures.

The overall measure was improved (α=.739) by removing the second measure in the perception subscale. This was a semantic differential item in the questionnaire which respondents had to score on the relative appropriacy of one of a pair of opposing adjectives:

V60. (TTPerception1) I think computers are… 'Dull'/ 'Exciting'

Using SPSS, I determined that the potential Alpha values with the entire perception sub scale removed (V60.-V65.) would have been much higher. Additionally SPSS suggested removal of the last remaining measure of interest (V45) which is also prudent as single item measures are by their nature unreliable (Gilem & Gilem, 2003) and cannot be assigned exclusively to a factor in SEM. Removing the perception and interest scales would have radically increased apparent reliability (α=.857); however, not only does this suggest disregarding part of a highly validated scale in search of an unnecessarily high Alpha, individually considering each of the remaining subscales of the shortened TAC and the TAT semantic differentials are checked for reliability, the latter measures can be seen to be very strong:

TAC/Interest	Single item
TAC/Comfort	(α=.872)
TAC/Concern	(α=.838)
TAC/Utility	(α=.893)
TAT/Perception	(α=.932)
TAT/Communication	(α=.910)
TAT/Multimedia	(α=.954)
TAT/Teacher productivity	(α=.946)
TAT/Student productivity	(α=.948)

Table 5.3. TACTAT Measure Reliability

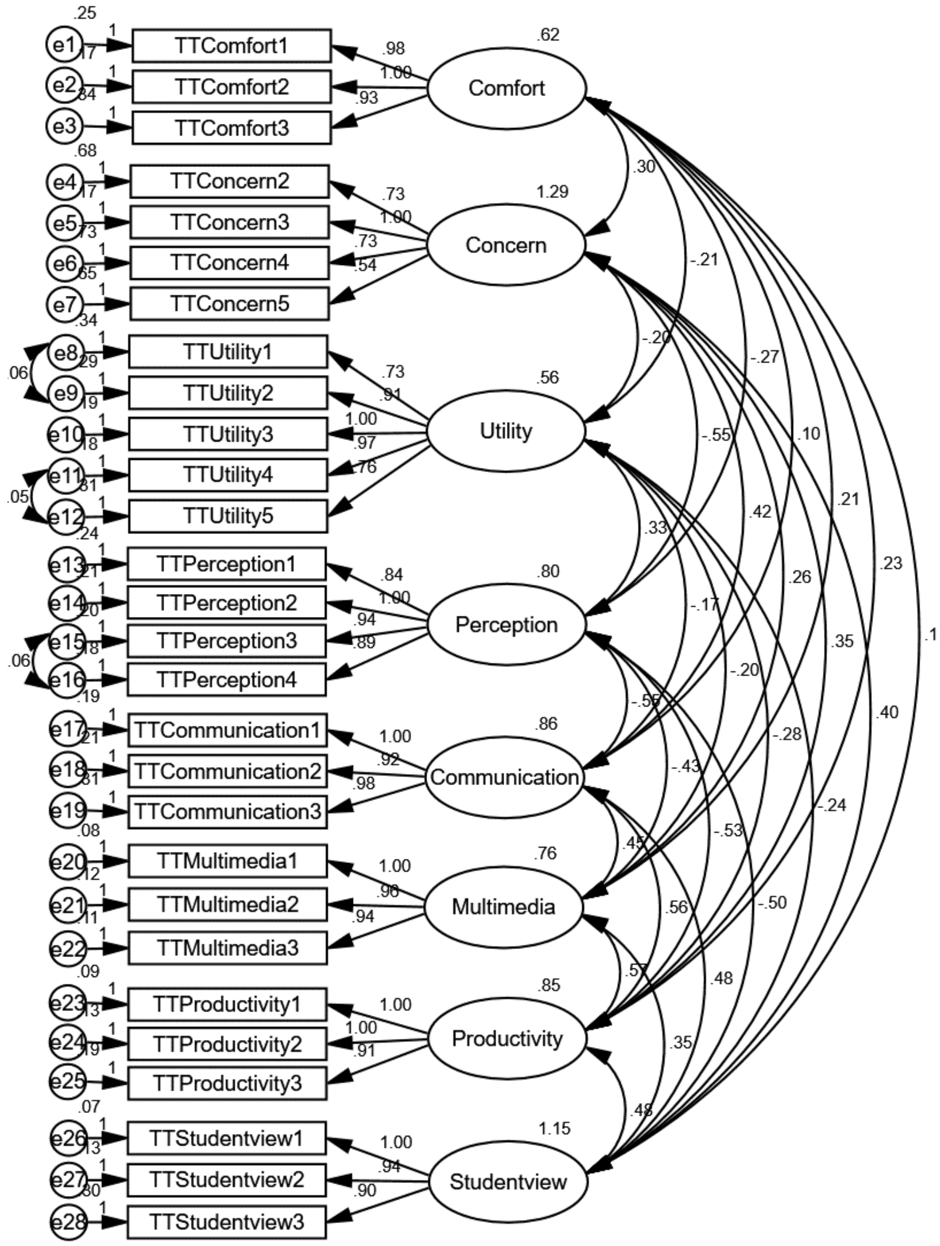
Instead, I continued and corroborated the results through EFA where some items (for example Interest) may have aided reliability when refactorization was complete.

I carried out an EFA constrained to 8 factors using SPSS. This showed the communality of the interest measure V45., already highlighted as unreliable above, to be unacceptable low at .221 (Hair et al., 2010). In addition item V49 was significantly cross-loaded between two factors:

> *V49. (TT Concern1) Computers dehumanize society by treating everyone as a number*

Removing these two items gave eight clean factors matching the remaining subscale items, explaining 81.762% of the overall variance, with a KMO of 0.899, and acceptable reliability (α=.711).

I then transferred the model to AMOS to complete the CFA with bootstrapping as shown below in Figure 5.4:



CMIN/DF	1.758 (Good)
CFI	0.963 (Good)
RMSEA	0.053 (Good)

Figure 5.4. TACTAT Confirmatory Factor Analysis

5.2.3. **CLES(18)**

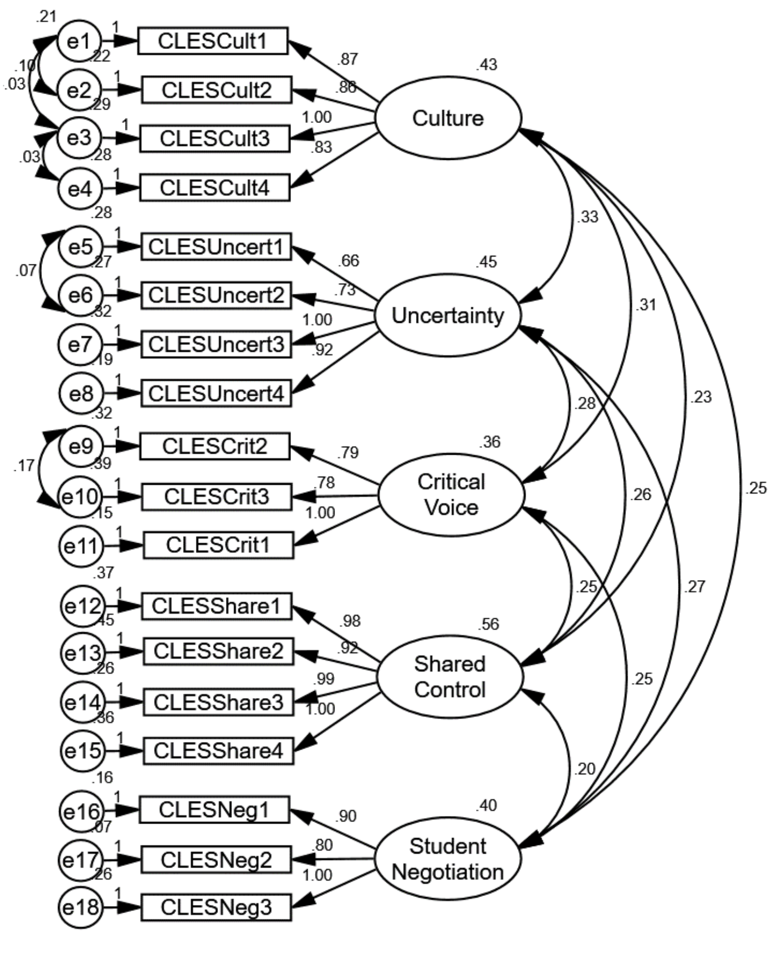
There was missing data in 15 of the 18 items in this section ranging from 0.4% to 4.5% so I imputed the missing data with the mean of each measure.

This scale showed very high reliability (α=.915) although De Vellis (1991) recommends considering shortening the scale at this value.

CLES Culture	α=.859
CLES Uncertainty	α=.827
CLES Critical Voice	α=.806
CLES Shared Control	α=.854
CLES Student Negotiation	α=.853

Table 5.5. CLES Measure Reliability

With CFA, the best model available required adding terms to the equation to allow for covariances between the items (or between their so-called 'error terms' in SEM parlance) resulting in the model shown in Figure 5.6. with a very high goodness of fit.



CMIN/DF	1.908 (good)
CFI	0.959 (strong)
RMSEA	0.058 (good)

Figure 5.6. CLES Confirmatory Factor Analysis

5.2.4. **TMBR(32)**

There were no more than .4% to 3.3% of answers missing across the 32 items in the measure so I replaced the missing values with the item mean.

This measure showed acceptable reliability (α=.735). I was able to improve this inter-item reliability up to (α=.810) by successive removal of 10 items from the overall scale but given that the overall Alpha was already in the reliable range I was wary of changing the nature of the scale through such a deletion before conducting any factor analysis. EFA also confirmed that these 10 items were not beneficial to a parsimonious scale as shown by their low communalities and factor loadings.

Examining the initial reliability of individual measures within TMBR had showed poor inter-item reliability as shown in table 5.6, with the TMBR Planning scale showing exceptionally poor reliability at α=.162. This suggested that the either the initial dimensions of the item (as described in 3.6.5) factors were not sufficiently well defined or that the items had not been sufficiently carefully constructed to represent the dimension they were intended for.

Subscale	Items	Reliability
TMBR Control	6	α=.328
TMBR Planning	4	α=.162
TMBR Variety	7	α=.587
TMBR Tool	6	α=.469
TMBR Interaction	6	α=.234
TMBR Skill	3	α=.298

Table 5.7. Initial TMBR Measure Reliability

Assuming that each of these six factors were robust and simply trying to improve the reliability of each by iterative removal of items within them through EFA could not reach a meaningful retention of the original scales within TMBR scale

Instead, having successively removed the ten items SPSS indicated to most strongly affect Alpha, I then conducted EFA with no expectation that the items in existing categories in the tool would load together into factors.

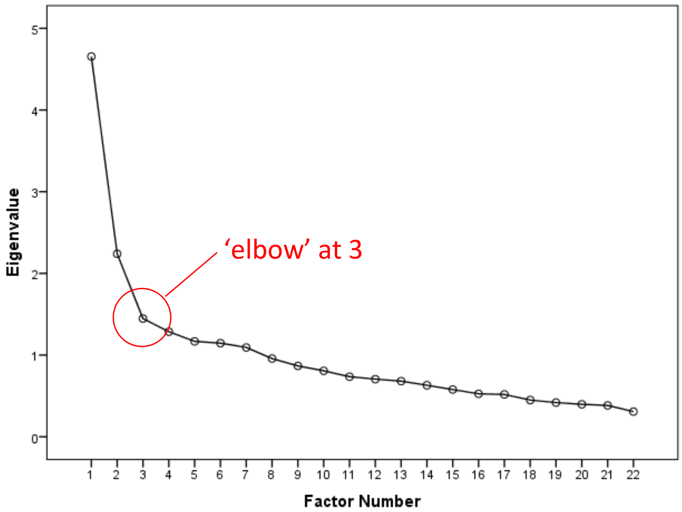


Figure 5.8. TMBR Exploratory Factor Analysis Scree Plot

As the break of slope on the initial Cattel scree plot in Figure 5.8. indicates, three factors most effectively explain the overall variance before further explanatory power trails off.

Running the analysis constrained to three factors suggests that the following measures are most relevant once cross loadings and low loadings have been removed.

	Factor		
	1	2	3
Reliability	α=.704	α=.634	α=.623
TMBRVariety5	.803		
TMBRVariety4	.690		
TMBRTool6	.608		
TMBRInteract3	.378		
TMBRControl5		.698	
TMBRTool4		.527	
TMBRVariety3		.510	
TMBRVariety7		.424	
TMBRInteract4		.380	
TMBRVariety1			.786
TMBRVariety2			.642
TMBRPlan3			.387

* loadings of ≥0.25 are hidden to highlight pattern

Table 5.9. TMBR EFA Pattern Matrix constrained to 3 factors

Using just these factors explains 36.61% of the overall variance while giving a good KMO of .729. This retains 12 of the TMBR measures in a three-factor structure to bring into the SEM model.

As these were new factors which expose underlying themes (or latent constructs) within new groupings of items, I used the procedure suggested by Hair et al. (2010) to name the factors by an emergent theme in the questions primarily using wording in the highest loaded items.

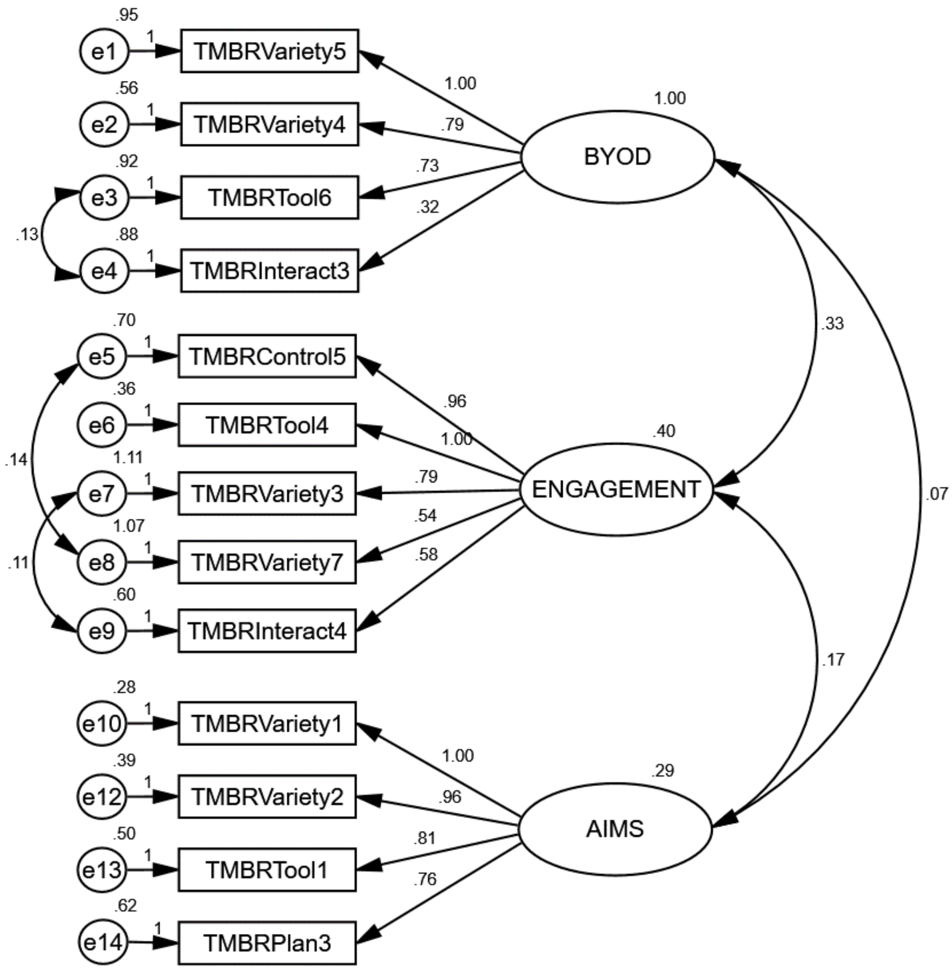
The four items in the first factor related to use of student devices and autonomous work in the classroom, as such they represented a teacher’s positivity towards a Bring Your Own Device (BYOD) policy in the classroom.

Most items in the second factor related to students being creatively engaged or either, individually or together by ICT material. The exception was a reverse coded item:

V109. The fewer software tools a teacher uses in the class the better.

This may have been interpreted as the teacher leaving the students to engage with the technology (rather than indicating a rejection of variety as originally intended). Therefore I have named this factor Engagement.

All of the items captured in the final factor identified related to the aims of the lesson requiring a variety of tasks which vary in their need for ICT. These are all connected variety but I take the central notion at the judicious selection of ICT tools on account of the task aims so I named that factor Aims.



CMIN/DF	2.051 (good)
CFI	0.902 (weak)
RMSEA	0.063 (good)

Figure 5.10. TMBR Confirmatory Factor Analysis

Thus, with the data from my main survey it appears valid to create a measure which captures factors composing teachers' microblending readiness, the factors are different from those I envisaged in 3.6.5 and the structural model is needed to demonstrate whether such a measure is meaningful in describing Use.

The low inter-item correlations in my TMBR measure indicate that the underlying factors need better definition and more robust questions are required to identify with these. In other words, while the measure is reliable and explains a degree of variance it appears inadequate at fully identifying the effect of microblending through triangulation of measures within each subscale I have defined. Given the successive refinements in Knezek & Christensen's initial 248-item TAC in 1995, compared to the 42 questions they use today, it is reasonable that TMBR should have humble beginnings.

5.2.5. **CHOURS**

As a teacher's assigned classroom hours with ICT (CHOURS) are spread over rooms with varied facilities, I attempted to measure this in a more sophisticated way than the typical WST model (e.g. Knezek, Christensen, & Fluke, 2003). Petko achieved such a measurement by splitting the count into the number of computers available in the main classroom and elsewhere. Teachers in EF, the institution under study, are given scheduled access to different types of ICT so I first evaluated this before creating a corresponding measure for use.

> *V24. How many 80 minute blocks per week do you usually teach per week in total?*

V25. How many 80 minute blocks per week do you usually work in a room with a projector & PC?

V27. How many 80 minute blocks per week do you usually work in an iLab?

V31. How many 80 minute blocks do you usually get a set of iPads in a week?

There was little missing data across these scales (1 to 4 items, up to 1.49%) so I used mean imputation.

In screening these responses, I checked whether the scheduled blocks for Projector & PC plus Computer lab (iLab) plus classroom sets of iPads was less than the teacher's weekly schedule. This was not the case for 16 of the participants (5.95%) although closer examination of their teaching week showed that they had included time when iPads were scheduled within their time in a class with a projector. Here I capped the upper limit of the ration of CHOURS to scheduled hours at100% but kept the total CHOURS and breakdown figures unamended for further analysis.

In 19 out of 269 cases teachers said they had no scheduled access to technology. I found this a little alarming until I checked it against their reported usual schedule (V24) where all but three of these teachers said they do not usually have any scheduled teaching hours. This is an interesting aspect of teachers' perception which can be explained either by very new teachers (83 of the 269 teachers were in their first year of teaching at EF and will have been on probationary or unfixed hours), those with highly variable schedules or those unwilling to answer the question.

The data on how many hours teachers had access to different technology, demonstrated that many cases different types of technology were available together. This made it hard to calculate the amount of time teachers had access to technology as a proportion of their teaching week as the total reported horse of technology access exceeded the total number of teaching hours in 16 cases (5.95%)

In terms of pure arithmetic, 20% of the total schedule reports appeared inaccurate. I manually checked this data, uncovering that in 50% of these, the teacher had given the same number of classes as taught in a room with a projector, indicating that this is the main scheduled room for many teachers. Looking at the data overall, 44.9% of the classes in 'usual weeks' reported were scheduled to take place in a room with a PC and projector. Those teachers who had given an inaccurate total had not discounted the time when they move room to work in a computer lab from time spent in a room with a projector, but still recorded that time under V27, in effect doubly accounting for the time. Another issue is that scheduled iPad use was not exclusive to any other room type as classroom sets of iPads are brought into rooms of any type. Given that the questions V24, V25, V27 and V31 all ask about a 'usual' week it is also understandable that the participants gave an approximate measure. The average number of classes given fits well with the typical schedule at EF.

This is fine if the data is considered in this light but it renders the calculation of any proportional number of hours subject to a measurement error.

Following this close examination I did not impute or clean any of the reported V24 data but I did replace five clearly accidental outliers in V27 and V31 where teachers had reported either iPads scheduled for every lesson or every room scheduled in an iLab. While this could happen on rare occasions it would not be the usual case for any teacher so I replaced these with the median for their school at their schedule size.

Although Petko used a scale representing the number of computers in a room this had no significant effect on uptake. In light of this and the correlations between the indices shown in Table 5.11 I felt that the use of a CHOURS measure would only introduce additional error while such a measure is already represented to a large extent by the scheduled access to a room with a PC and projector (V25) as this is a common room configuration in the schools:

	V24.THOURS
V24Tb. CHOURS	.606**
V25.Projector_BPW	.507**
V27.iLab_BPW	.380**
V31.iPad_BPW	.431**

	V25. SchedProj	V27. SchediLab	V31. SchediPad
V25. SchedProj			
V27. SchediLab	.125*		
V31. SchediPad	.229**	.313**	
Total (CHOURS)	.950**	.375**	.453**

Results based on 2000 bootstrap samples.
** Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 5.11. Correlations of measurements of scheduled ICT access

5.2.6. **HOMECOMM**

I also expanded the often used question about whether teachers have a computer at home, asking whether teachers owned a PC/laptop, a tablet or a smartphone. Past surveys such as Knezek's in 2003 concentrated on home access to ICT but with extensive Internet coverage in locations where these schools are based and teachers' tablets and smartphones using wifi I feel this has become a moot point (an EF survey in 2013 showed that 62% of the teachers had smartphones with 52% owning tablets).

V7.Own a PC/laptop

V8.Own a tablet

V9.Own a smartphone

The results bore out that as 87% of the teachers own a smartphone they certainly have home Internet access with 95.2% of the teachers owning a PC or laptop.

A lower proportion of 53.9% of the teachers reported owning a tablet but EF does loan tablets to teachers for preparation so a greater degree of home access is possible.

Just under half of the teachers (46.47%) own all three devices. The spread of personal ICT ownership of the 269 teachers in the survey is shown in the proportional Venn diagram in Figure 5.12.

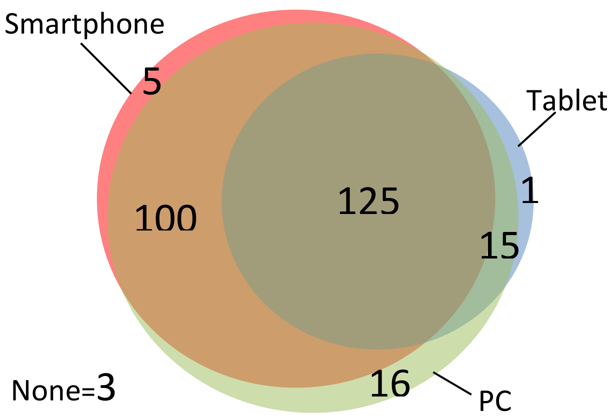


Figure. 5.12. Proportional Venn diagram of teacher ICT ownership

5.2.7. FACILITIES

I measured the teachers' opinion of the ICT facilities available in their school on a six-point scale:

1=Very poor, 2=Poor, 3=Ok, 4=Good, 4=Very good, 6= N/A

From the final sample only a negligible 1 to 3 teachers did not answer different items in this scale, while one more gave N/A for each item. Aside from this, selection of N/A was rare, being chosen for no more than 2.23% of any item (i.e. 6 teachers were unable to comment on Technical Support).

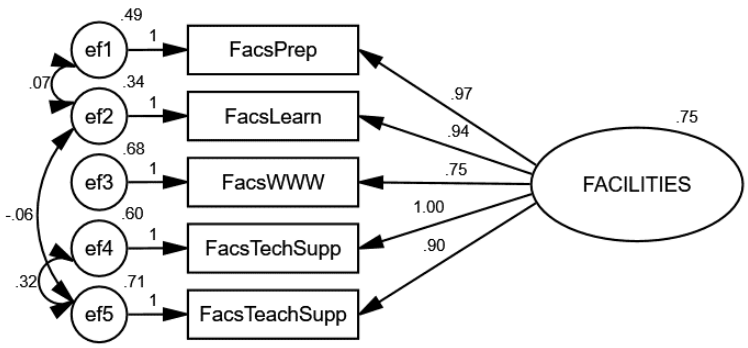
It seemed a logical assumption that this measure the adequacy of school facilities would follow a school specific pattern. To check this, I ran a correlation between school and each of these items, before replacing any missing values, using both a bootstrapped Pearson correlation and a Spearman correlation. Neither test showed any significant correlation between school and any of teachers' the facilities ratings. This indicates a high degree of subjectivity in a teachers' individual rating of facilities and support. It also meant that there was no need to take school into account when imputing the missing values.

Given the small amount of missing data I then imputed both the missing and N/A responses with the item mean.

The data in this measure appear normally distributed when I plot them on a histogram but fall outside the rule of thumb for normality (where standardised skew and kurtosis both fall under 2) I have used in other measures, nonetheless as a scale there is high inter-item reliability (α=.858).

Using EFA with bootstrapping, all items load into a single factor explaining 55.01% of the overall variance which is acceptable

Moving to CFA adding error and covariance terms gave an R^2 of 0.75 – explaining 75% of the overall variance in the Facilities construct, the measures of fit were all good as shown in Figure 5.13.



CMIN/DF	1.874 (Good)
CFI	0.997 (Good)
RMSEA	0.057 (Good)

Figure 5.13. Facilities Scale Confirmatory Factor Analysis

5.2.8. **Amount of Use**

Rather than expect teachers to count the number of hours per week they use with the provided technology, which could simply have resulted in them reporting the number of hours they are allocated, I aimed to offer them a slightly more qualitative indicator of their use of the three provided ICT tools as described in 4.4.3 (classroom PCs with projector, computer labs and classroom sets of iPads) on a six-point frequency scale:

1=Never, 2=Sometimes, 3=Usually, 4=Almost always, 5=Always, 6=N/A

An N/A option was provided to allow teachers to answer the question even though their schedule, course taught or stage in their training may not have them using the technology in question. While the proportion of N/A responses in itself is discussed below, these amount to no use so I replaced these with 1 (=*Never* [used]) for analysis.

Out of the six respondents who responded 'N/A' to all six questions, 5 were Directors of Studies. This raises the question whether these respondents should be excluded from the entire survey if they cannot record use (i.e. the survey was truly non-applicable to them) however this is only 22.72% of the 22 Directors of Studies who took part.

There were between 1 (0.37%) and 4 (1.49%) missing values across the indices in this group so I was able to impute these.

Combining just the ordinally scored items (V26, V28, V29, V30, V32 V33) as a scale retaining the N/A valued at '6' had 'respectable' inter-item reliability of α=.760 (α=.756 without imputation of missing values) nonetheless this is a misrepresentation of N/A as the highest order value on an ordinal scale – I demonstrated this by recoding the 6 as 0 – making it the lowest item (also affecting the mean – used for imputation) and found Alpha to be just α=.571 or even lower α=.564 without imputation of missing).

Another alternative was to rate the N/A values as missing data which omits 4% to 14.5% of the values and results in an alpha of just .444, while replacing the missing values with the mean would undoubtedly increase reliability that means imputing too much data (11.9%) (Hair, 2010) which would hide rather than reveal the true picture

While recoding the N/A as a 1 to show no use and shortening the scale to 5 points had the effect of dropping the reliability to α=.571 (α=564 without imputation of missing values), a value unacceptable in a scale this does represent these measures as provided by teachers.

The frequency of use is a complex picture as illustrated in the chart of cumulative amounts of ICT use reported by teachers on Figure 5.14. below. This shows how typically teachers reported using different types of ICT ‘Sometimes’ (mean distribution 27.39%, SD .089). While they take the opportunity to use the iPads ‘almost always’ or ‘always’ when they are provided. In software terms, teachers most typically report ‘never’ using the provided iPad App.

This contrasts with the use of the computer lab facilitites (iLab) which are not used as much when they are provided. Here again the software usage pattern trails off but more sharply shows that there is only infrequent use of the LMS for self study or independent use although teacher directed use of the LMS is used by teachers consistently at all frequency levels.

The classroom projectors are rarely never used when provided, with an otherwise balanced use pattern while the most balanced reported usage at all frequencies is directed use of the LMS.

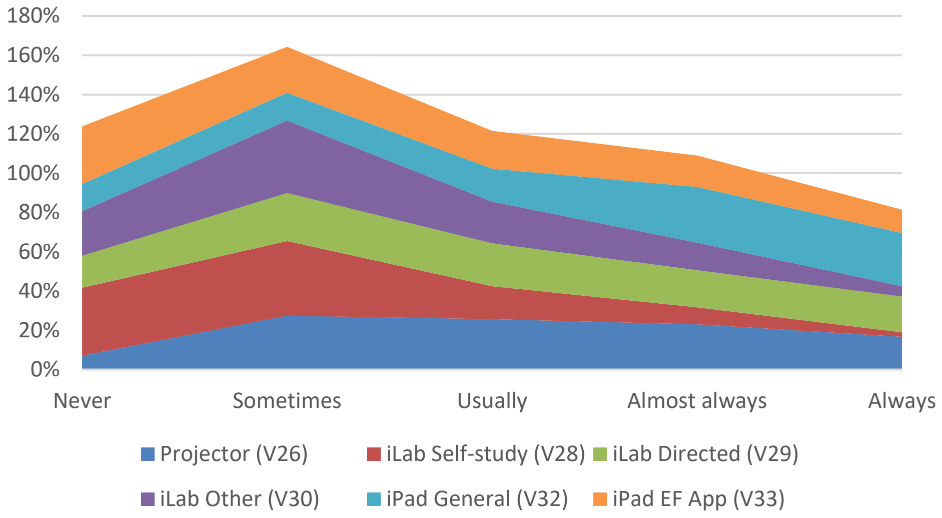


Fig. 5.14. Amount of use of ICT Types in Class

To relate the use of extra ICT (V34.) which was recorded as an open ended scale of hours to these ordinally scored items denoting use, I attempted to recode it as a five point scale. Petko (2012) had taken a similar approach with the number of computers in a room. I began by replacing any non-entry in the additional hours of ICT use scale with 0 as that clearly represented no additional use (as indicated by the very high non-response rate of 26.76%), then I recoded by retaining the scores of 0–3 hours as the first four categories reducing any amounts of 4 or more hours to 4. This approach, truncated the tail of the distribution encompassing the highest 9.29% of the scores into the fifth category. It also suggested equating a frequency of 2 hours of extra ICT use with the notion of ‘usually’ using the provided ICT which may be over 5 hours of use (half of the typical scheduled time with projectors per week).

Adding this recoded item of additional use to create a seven-item scale was slightly detrimental to the scale's already unacceptable inter-item reliability (α=.546). Given such low inter-item reliability it was no surprise that I could not reduce such a scale effectively through EFA work.

Due to the incompatibility of the scale of this measure (V34), I reduced it to the first part of the original question:

V34. Is there any additional time where you use IT?

Converting the teachers' replies to a binary nominal scale of whether they used additional ICT or not (Yes=1, No=0).

Combining just the six scalar measures as a single factor, setting aside additional use to later be considered as a separate subfactor, gives a 'miserable' KMO in EFA of 0.549.

Given the unacceptable KMO and inter-item reliability, I kept all of the use items separate at this point rather than create a single scale. The variation in types of ICT use will allow for deeper analysis of the relationships between other factors later on.

This can be potentially explained by considering that any 'internal reliability' within these numbers as defined by alpha would be based on similarities in independent measures which I would not be expecting to see if the teachers were truly considering these as unique types of ICT use.

Regardless of the suitability of the measures as a scale, it is important to compare these items directly to the amount of time scheduled for these to identify any direct effects. This step shown in Table 5.15 is a partial replication of the regression analyses carried out in other studies that did not use SEM due to lower sample sizes or lack of a consistent model (fuller details of the correlations of measures retained in the final model can seen in Figure 5.30).

		Tool measures				
		V24.Total_BPW	V24Tb. CHOURS	V25.Projector_BPW	V27.iLab_BPW	V31.iPad_BPW
Use measures	V26.Projector_frequency_of_use	.189**	-0.007	-0.036	0.061	0.067
	V28.Self-study_iLab_frequency	0.119	0.094	0.004	.230**	.231**
	V29.Directed-study_iLab_Frequency	.306**	.249**	.200**	.199**	.170**
	V30.Non-courseware_iLab_Frequency	.275**	.196**	0.093	.291**	.292**
	V32.iPad_use_Frequency	.327**	.193**	0.116	.186**	.276**
	V33.EF_app_use_frequency	0.106	0.073	0.012	.158**	.161**
	V34.Extra_ICT_BPW	.142*	.189**	0.118	.201**	.234**
	V34T	.171**	.171**	.127*	0.105	.200**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table. 5.15. Correlation of Tool and Use Measures

As Table 5.15. above shows, although more iPad use corresponds with more iLab use it is because both are correlated to the number of classroom hours of ICT - however both are even more highly correlated to the overall amount of teaching time (V.24).

As mentioned above, teachers use projectors to a varying degree when they are provided so there is no correlation between the projector schedule (V 25) and projector use (V.26). However as projectors are the most regularly available IT type (mean 6.65 BPW = 8.87 hours, SD 5.98 BPW = 7.97 hours), forming the largest portion of a teachers' schedule there is a correlation between the schedule of projectors and use of iLabs. Thus it does not appear to be the amount of availability of ICT per week that most correlates with the use of a particular type of IT here but the size of a teachers working load - teachers with more hours are more likely to use ICT.

The scheduled availability of all tool measures (excepting iLabs) correlates to additional ICT use without these scheduled ICT tools (here teachers refer to use of their own laptops and student's devices as well as requesting additional access to the provided resources).

5.2.9. **Levels of Use/Competency CM**

Here I used the four competency measures as described in 4.4.3, each of which was scored on same the scale:

1=Non user,

2=Newbie user,

3= Developing user,

4= Independent user,

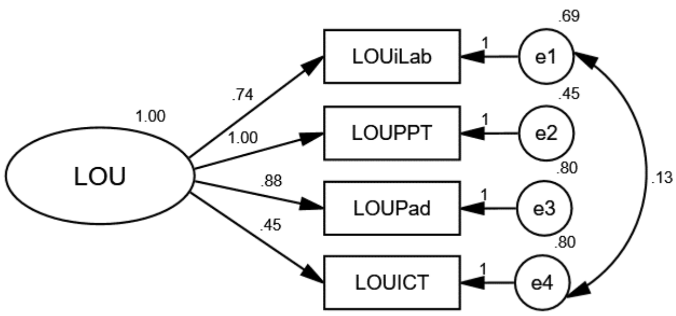
5= Champion user

There were up to 8 responses missing across these items in the final sample, high compared to some questions (possibly as I had not offered an N/A response although there was still the *'Non-user'* option) but still no more than 2.97% so I used mean imputation for the missing answers.

Although these were created as four independent measures built around common principles, considering them as a combined scale shows strong inter-item reliability (α=.768). As parsimony is desirable in SEM (Schumacker & Lomax, 2010), I will attempt to load these indicators into a single Classroom

ICT Competency measure in order to reduce the number of variables in my final models.

As only looking to load onto a single factor, I moved straight to Confirmatory Factor Analysis where my initial model was acceptable in terms of the fit of standardized regression weights, all of which lie above 0.5 with LOUiLab, LOUPPT & LOUICT all above 0.7. All indicators of goodness of fit are good as shown in Figure 5.20 below:



CMIN/DF	0.050 (Very good)
CFI	1.00 (Very good)
RMSEA	0.000 (Very good)

Figure 5.16. Levels of Use Scale Confirmatory Factor Analysis

5.2.10. **Demographic measures**

In *Will* I should include the following as used by Petko:

V1. School

V3. Gender: {M/F}

V4. What year were you born?

V5. What year did you start English language teaching?

V6. What year did you start teaching at EF?

To ensure accuracy, I offered a dropdowns for School, Gender amd number of years for these items in the online survey and used Excel to transform this data to number of years before analysis. I began screening by checking that:

Age ≥ Years in TESOL ≥ Years at EF

All participants who gave their age satisfied these conditions.

Of the participants who completed the survey, 4 declined to give their age with one of these and one other not providing their gender. At just 1.49% of the data missing was acceptable to impute these with the scale mean of 37.155.

I was more concerned that a further 39 participants had marked their age at the highest range on the scale, indicating that they were born in 1960 or before. This would make them (12% of those who completed the survey) 55 years of age or older which seemed unusually high as seen in Figure 5.17. I was initially suspicious of these responses but when I compared the sample distribution to full population data from employee records I was surprised to find that 10% of the teachers at the time of the survey had indeed been over 55. To test that the responses where representative of the population, I simulated my final response of *'1960 or before'* by truncating the population data to 55 before comparing the sample and population with a Kolmogorov-Smirnov test and found that the distributions, although non-normal, matched with .95% confidence.

The age of teachers considered in this study was also comparable to data from the Organisation for Economic Co-operation and Development (OECD, 2017) which places 13.6% of teachers for students in this age range at over 60 in the state sector.

In Figure 5.17. I have added a normal curve to visually show that most data fits a positively skewed normal distribution while these cases of age 55 appear to be outliers.

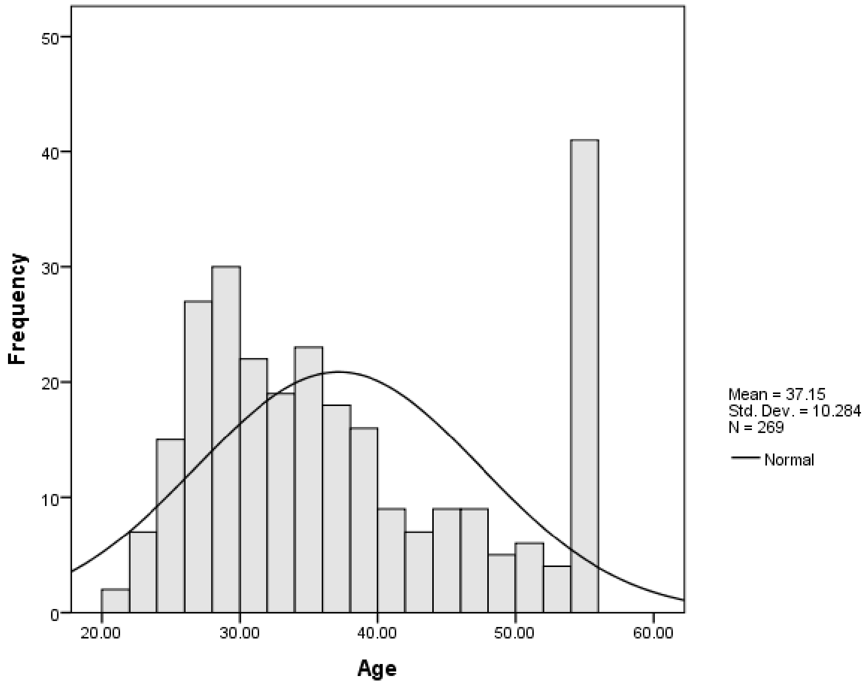


Figure 5.17. Distribution of participant age

Although these extreme values are what Hair (2010) describes as 'Exceptional observations' they are not statistically outliers but rather a high occurrence of a single value, which is in fact the mode. This made transformation to a normal distribution through Winsorizing (Field, 2013) impossible. It was possible to use the novel two-step transformation described by Templeton (2011), which retains a similar sample mean (37.095) and standard deviation (9.878) to the original distribution while resulting in a distribution of the transformed age shown in Fig 5.18. which approximates to normal (Standardised Skew -1.22, Standardised Kurtosis -1.82).

Although this would have allowed me to continue with parametric analysis, it is still important to recognise that this data has been transformed, for example where teacher ages of under 19 have now appeared. The minimum age for the role is 20 as shown in the sample data.

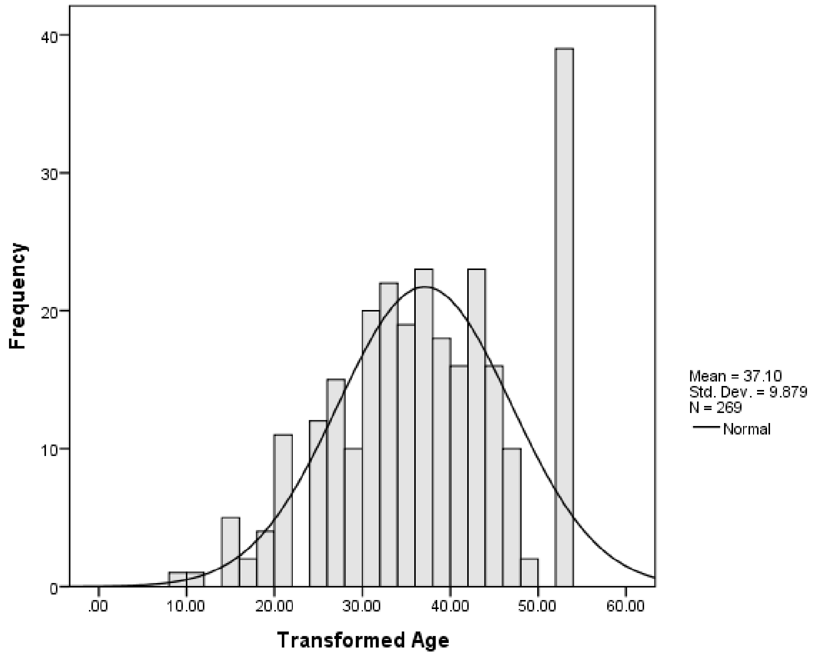


Figure 5.18. Distribution of Age transformed after Templeton (2011)

Using bootstrapping:

As with other non-normal data, found in survey, the most appropriate method of data preparation is to use the bootstrapping technique (Schumacker & Lomax; 2010, Field; 2013) which uses a large number of resamples from the sample distribution to produce a normal distribution. I can automate this resampling in SPSS to provide a robust method of working with the age data within the parametric methods of SEM.

Years in TESOL

Here just 7 responses (2.6%) were missing, comfortably allowing for mean imputation (mean 8.115, SD 8.046).

As an additional verification I checked that teacher ages at starting in TESOL were over 18. In 5 cases (1.85%) teachers' answers indicated that they had started teaching TESOL before the age of 18, I adjusted these to make a start date of 18. This is low but led to minimal alteration of the data as entered.

The data was non-normal, so I applied the same transformation procedure as with teacher ages, resulting in an approximately normal distribution (mean 8.226, Standard Deviation 7.808) showing a Standardised Skew 1.495, and standardised Kurtosis -1.445

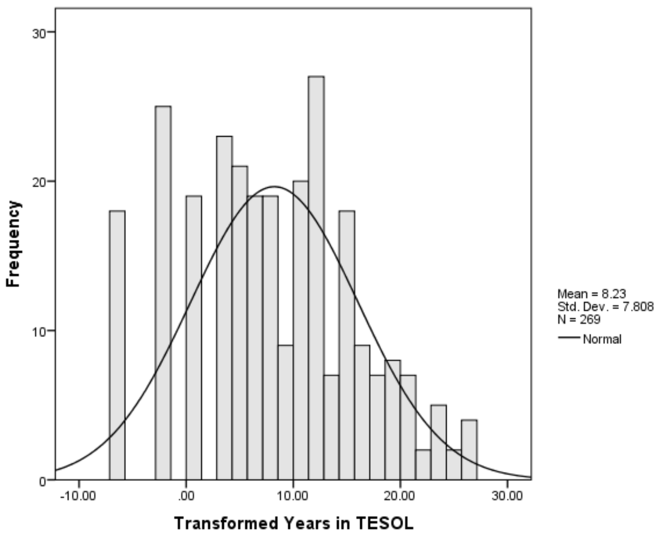


Figure 5.19. Distribution of Years in TESOL transformed through bootstrapping

Years at EF

10 participants did not respond to this question, so I imputed the scale mean (2.59). The reminder of the data appeared valid being less than or equal to the total number of year in TESOL and showed the teacher as having started Mean 2.5907, SD 3.45149 after 18 in every case.

It was not possible to normalise the distribution of years at EF data in this way due to the small number of data points and strong mode (Templeton, 2011).

Checking nonparametric correlations with the untransformed data on each of these scales of experience shows significant but low correlations between all variable pairings, especially Age and Years in TESOL

	Age	TESOLYears	EFYears
Age			
TESOLYears	.460**		
EFYears	.206**	.438**	

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.20. Spearman rho (non-parametric) correlations of Experience

To run a parametric correlation on the same data I used bootstrapping in SPSS which corroborated the correlations as follows:

	Age	TESOLYears	EFYears
Age			
TESOLYears	.475**		
EFYears	.284**	.441**	

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.21. Pearson correlations of Experience (with bootstrapping)

I did consider the three age-related variables together as a latent concept of Experience. If seen as a single scale, inter-item reliability was low (α= 0.599) and attempting an EFA gave an unsatisfactory KMO of 0.621, therefore I omitted these in the final analysis.

Under Skill I intend to include:

> *V10.How many years have you been using a computer altogether?*
>
> (Mean 19.674, SD 6.102)

V11.How many years have you been using a computer in your teaching?

(Mean 5.608, SD 4.551)

After replacing missing answers with the scale mean (4 or 1.86% of answers were missing for each of these) I validated the data by checking that

$$V11 \geq V10 > \text{age (V4T)}$$

…which was always true.

Neither of these two variables is normally distributed so before they can either be examined by robust non-parametric methods or transformed.

These are significantly correlated (Pearson Correlation Co-efficient on transformed data 0.250 significant at 0.01, Pearson Correlation on original data with bootstrap 0.271 significant at 0.01, Non-parametric Spearman's rho Correlation Co-efficient on original data .223 significant at 0.01)

As there are two items they cannot be stably combined to a latent factor in SEM so will be included in the model as individual exogenous variables.

For ease of comparison I have tabulated the correlations of the five scalar demographic measures discussed above in Table 5.22. This illustrates both the significance of correlations across these measures and the similarity in results across the different approaches to deal with the non-normal nature of these data.

	Age	TESOL Years	EF Years	Computer Years	Teaching Computer Years
TESOL Years	*ρ* .461**				
	N .449**				
	B .475**				
EF Years	*ρ* .204**	*ρ* .438**			
	-	-			
	B .284**	*B* .441**			
Computer Years	*ρ*. 427**	*ρ* .184**	*ρ* .176**		
	N .427**	*N* .144*	-		
	B .399**	*B* .176**	*B* .162**		
Teaching Computer Years	*ρ* .345**	*ρ* .632**	*ρ* .339**	*ρ* .233**	
	N .363**	*N* .614**	-	*N* .250**	
	B .361**	*B* .553**	*B* .387**	*B* .265**	

ρ Spearman's rho correlation
N Pearson Correlation of normalized data
B Pearson correlation of bootstrapped data
** Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

Table 5.22. Correlations of scalar demographic measures

School

This initial question in the survey was compulsory in the online survey tool so it always reported. Before testing in the structural model, I checked for any correlations of the school category (V.1) against other individual measures (see 5.2.7. for unsuccessful correlation with Facilities).

It correlated most strongly with V.42 PPT Competency (Spearman Rho -.194 significant at the .01 level) at which may suggest better training or drive for PPT based material use in some schools but that is not bourne out in corresponding scheduled access to projectors or use.

There were some other weak but significant correlations within CLES and TMBR measures but none that suggested a particular localised school phenomenon.

5.3. **PART 2: The Structural Model**

I imputed the factors established in the measurement models into variables according to the factor weights established for their components in part 1 using SPSS AMOS. These new measures could then be considered as exogenous variables enabling me to create a valid initial composite model for SEM analysis.

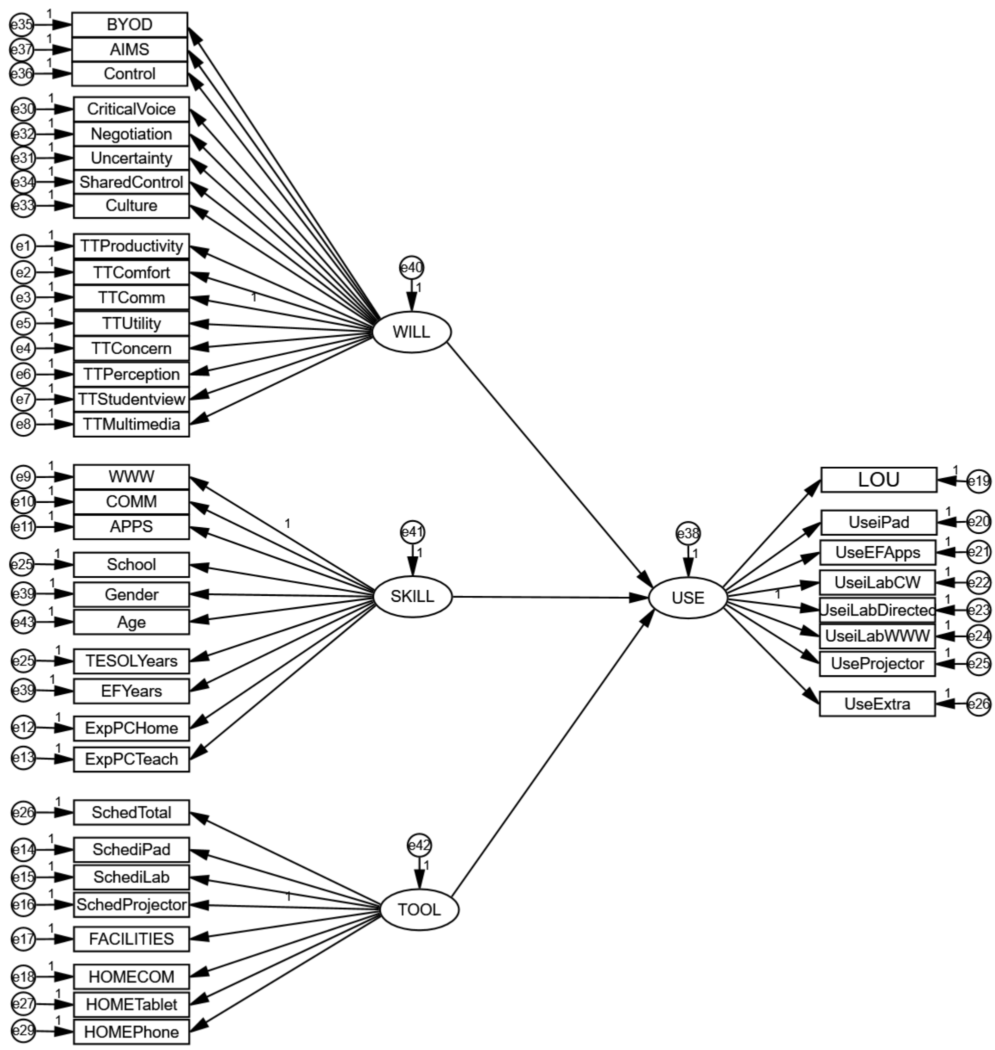


Figure 5.23. Initial Composite Will Skill Tool SEM Model

Although the model can be constructed in 'kitchen sink' fashion as shown in Figure 5.23, retaining all the measure composites and remaining demographic indices and then subjecting it to confirmatory trial and error using AMOS, it seemed more prudent to first run these data through EFA to check the number of factors.

I loaded the 30 observed variables excluding the 3 TMBR and 5 CLES variables shown in the model above (Figure 5.23) into EFA analysis which showed generally high communalities (in the range 0.081 to 0.843, mean 0.462, SD 0.222). There was one issue in this however, that the imputed WWW, APPS, COMM measures from TPSA appear to be so closely covaried that they load too well if all three are included. This prevents SPSS from completing its analysis, as the communality goes above one. As a temporary workaround I computed a scale mean for the TPSA, which seemed appropriate given the strong internal consistency of TPSA and correlation between the three subscales.

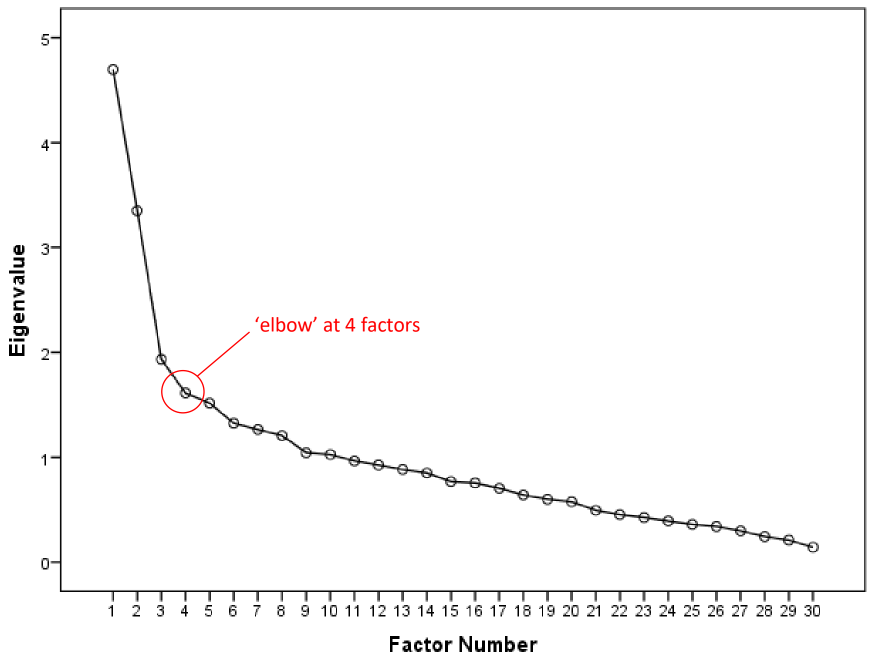


Figure 5.24. WST Factor Verification Scree Plot

As the break of slope on the Cattel scree plot in Figure 5.24. indicates, four factors most effectively explain the overall variance before further explanatory power trails off. The analysis should then reveal these four factors as groupings corresponding to 'Will', 'Skill', 'Tool' and 'Use/Integration'.

The initial pattern matrix also showed these factors emerging clearly even though with an unconstrained factor analysis there were several low cross loadings.

Through re-running the analysis, a four-factor loading is created when low communalities and cross-loaded factors are removed; this displays KMO 0.724 adequacy and explains 53.057% of the overall variance in the model (this is on-par with other publish models in use, as discussed later).

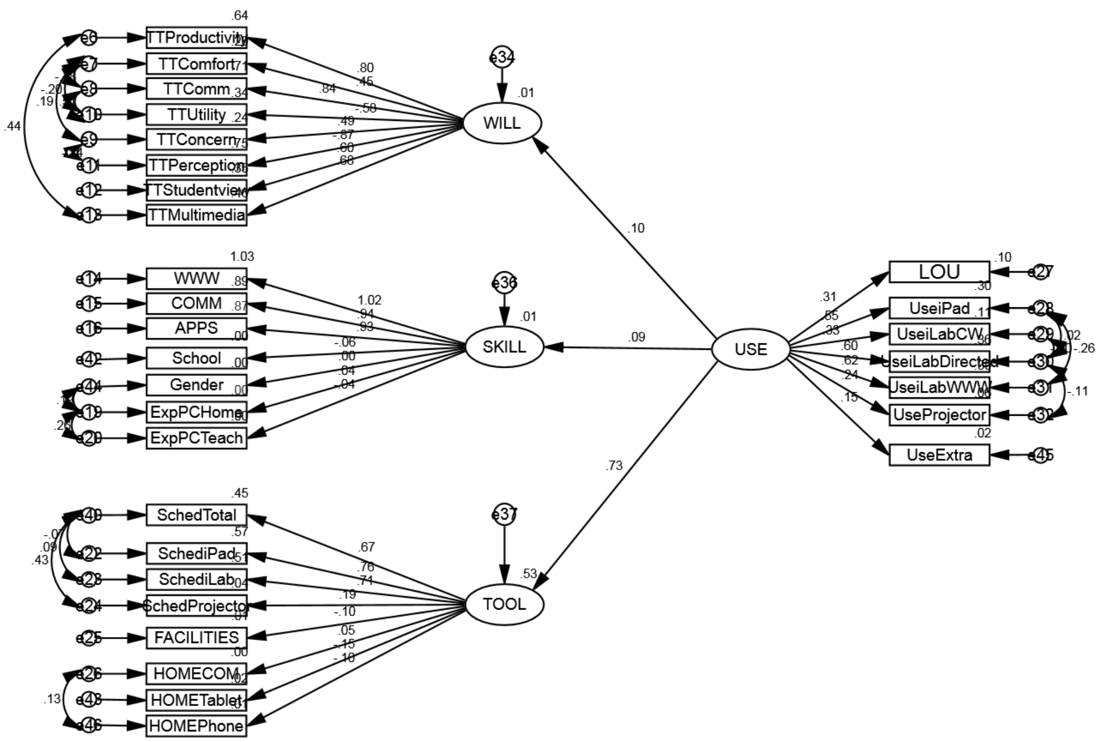
	Factor			
	1 (WILL)	2 (SKILL)	3 (USE)	4 (TOOL)
TTProductivity	.822			
TTComfort	.445			
TTComm	.776			
TTUtility	-.522			
TTConcern	.553			
TTPerception	-.903			
TTStudentview	.606			
TTMultimedia	.705			
WWW		.990		
APPS		.960		
SchedTotal				.835
SchedProjector				.635
LOU			.254	
UseiPad			.673	
UseEFApps			.775	

* loadings of ≥0.25 are hidden to highlight pattern

Table 5.25. EFA Factor Loadings for initial TESOL Will, Skill, Tool model verification

As Table 5.25 shows, once the lightly loading and cross-loading variables have been removed, a clear pattern of the four factor groupings emerges. Although the LOU loading appears low at .254 (Hair, 2010 sets the threshold at .35 for n=269) and would be the next to remove to improve internal validity, this illustrates the point at which sensible factorisation, as shown by my column names, was reached with a view to my instrument. This four factor loading and good model fit confirms that WST model can be applied to the ESOL context with the measures I have in place and I can now move on to develop my model further in the parameters of the more sophisticated SEM model which will allow the components to be related more fully to address answer my research question.

The initial valid composite model can look like this:



CMIN/DF	1.663 (Good)
CFI	0.922 (Good)
RMSEA	0.49 (Good)

Figure 5.26. Initial Composite Will, Skill, Tool SEM

This shows a good initial fit, with a model that explains 11% of the variation in Will (i.e. R^2 = 0.11), .9% of Skill and 52.9% of Tool.

5.3.1. **Comparing models**

To answer my third research question, I then tested what Hair et al. (2010) call ‘Competitive Fit’ by running variations on the composite model above to test each combination of the TMBR, CLES and TACTAT measures to find the model in which Will, Skill and Tool demonstrated best fit and explained the greatest amount of variance in Use. I have tabulated the key results below in table 5.27.

	Will including TACTCAT				Will without TACTCAT		
	TACTAT	**TACTAT & TMBR**	**TACTAT & CLES**	**TACTAT, TMBR & CLES**	**TMBR**	**CLES**	**TMBR & CLES**
Total Variables	59	65	69	75	49	53	59
Covariance Will/Skill	.32	.32	-.3	-.31	.23	-.3	-.3
Covariance Will/Tool	-.28	-.27	.04	.05	-.24	.04	.04
Covariance Skill/Tool	-.04	-.04	-.02	-.02	-.07	-.02	-.02
Will R^2	12%	14%	33%	2%	42%	33%	20%
Skill R^2	90%	90%	90%	90%	98%	90%	90%
Tool R^2	52%	52%	61%	61%	57%	61%	61%
Use explained	**89%**	**89%**	**86%**	**86%**	**87%**	**89%**	**86%**
Observed Variables	27	30	32	35	22	24	27
CMIN/DF	1.831†	1.876†	3.368	3.215	2.081†	2.884†	2.702†
CFI	.927†	.914†	.774	.767	.918†	.868	.862
RMSEA	.056†	.057†	.094	.091	.064†	.084	.080

†Indicates good fit

Table 5.27. Comparison of models retaining all error terms and covariances

Only three of my models in Table 5.27 fully satisfy the balanced goodness of fit criteria suggested by Hair et al. (2010); where TACTAT alone is used to model Willl, explaining 89% of the total variance in Use; where TMBR is combined with TACTAT, also explaining 89% of use and where TMBR alone is used to explain Skill, explaining 87% of overall Use of ICT.

I consider the combination of TMBR and TACTAT on Skill to be the most robust model of these three as it one of the two strongest at explaining variance in Use (R^2=89%) while most successfully explaining the Will construct (R^2=14%), and showing a positive loading between Will and Use (β=.26).

With regard to the CLES measure, the results in Table 5.27. show that it has a detrimental effect to the overall variance explained. Correspondingly the absolute value of the factor loading coefficient of SKILL explained with inclusion of CLES is always lower (β=.16 across all combinations) than without it.

This answers my third research question: that the measure of microblending readiness, even in this early stage of its development, better explains variance in Use than the measure of constructivist beliefs.

The statistical power of this SEM including TMBR and TACTAT model with *n*=269 and three variables Will, Skill and Tool predicting Use is 1.0 (formula derived from Cohen, 1988).

I take this evidence of the contribution of TMBR in explaining Use as confirmation of the provisional answer to my second research question: that the phenomenon of microblending can be measured. The TMBR scale, although a crude measure at this point, has proven to be practical.

5.3.2. **The final model**

I have presented my final structural model and its measures of fit in Figure 5.28., with the standardized regression co-efficients below in Table 5.29. and the full correlation matrix of all variables in the model in Table 5.30.

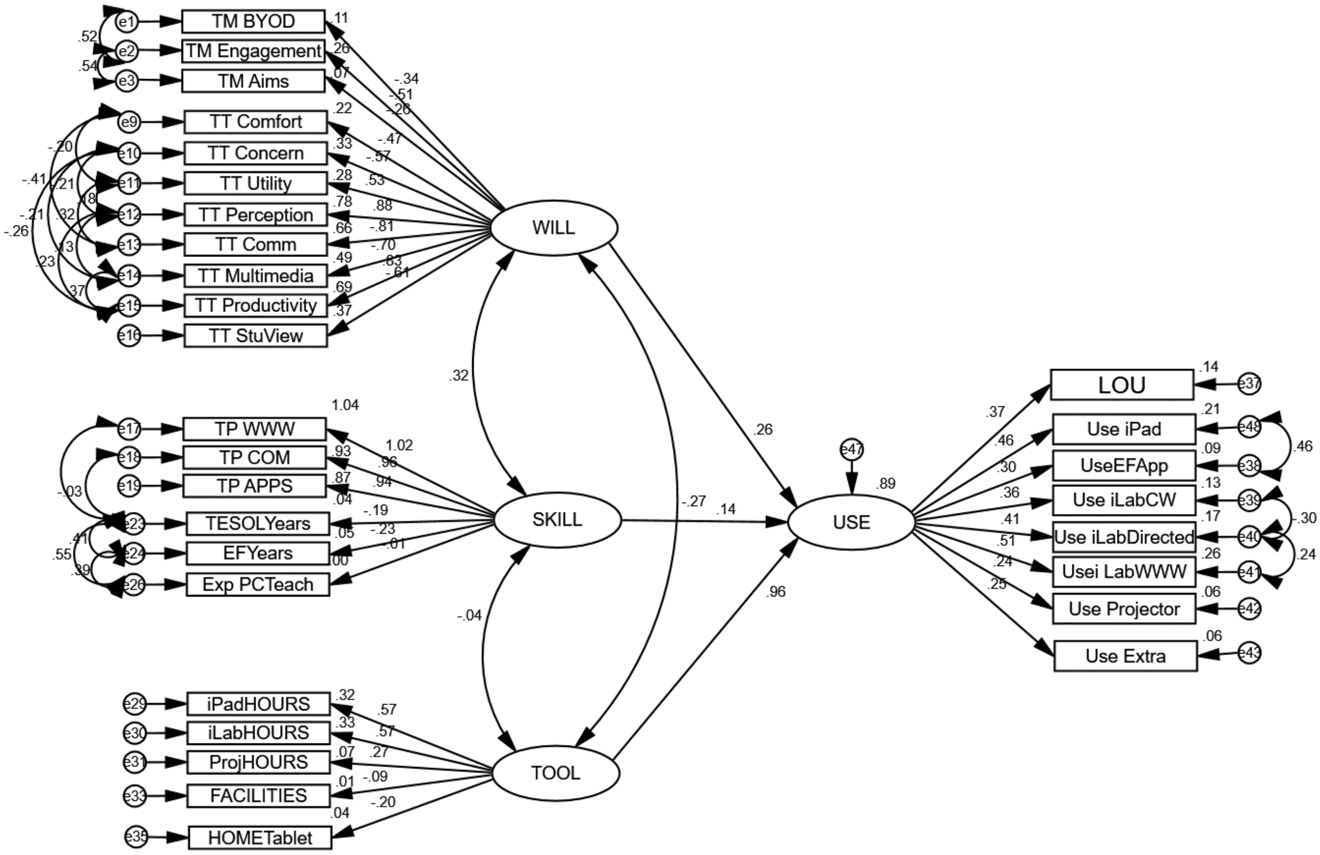
This model shows that 89% of the variation in classroom Use of ICT reported across the 269 teachers can be explained in terms of the concepts of Will, Skill and Tool as defined in the model (Figure 5.28.). The model fits the data well with good values on all measures of model fit, particularly the RMSEA

Tool availability is shown to be highly influential on the amount of Use (β =.96) with Will being the next strongest contributor in terms of direct influence on Use (β =.96). This indicates that the availability a variety of classroom ICT tools in this particular context is the primary driver of teacher's selective use of these tools while the teacher's belief in the usefulness of this technology is the second most important factor. As shown section 5.3.1. above, the teachers' readiness to Microblend is a significant antecedent of Will showing low but significant values of R^2 values for the subfactors of TMBR (BYOD R^2=.11, Readiness R^2=.26 and Aims R^2=.07) which contribute to the Will construct by β =.-.34, Readiness β =. -.51 and Aims β =.-.26 , I take this to indicate that while the factors of the TMBR measure contribute to the latent factor of Will they describe a limitation on use by indicating the degree to which a teacher judicious in their selection of the technology. This contributes to a model with good explanatory power in that overall explanation of 89% of variation in the Use of ICT.

There is also a significant negative covariance between the factors of Will and Skill (-.27) which suggests that the values of Tool and Will are making opposing contributions to the value of Use.

The contribution of the Skill factor is both low (β =.14) and statistically insignificant in terms of its *P* value (0.11). This may appear to suggest that Skill is irrelevant in the model but its strong covariance with the Will factor (.32) is important. This covariance suggests that the teachers' perception of their self-efficacy as measured under Skill is co-dependent on their belief in the usefulness of ICT in the classroom as measured under Will although as shown in my results on the measurement model these are independent factors. Thus even without a significant direct contribution to Use, Skill contributes to the overall goodness of fit of the model.

It is also worth noting that at the antecedents of the Tool construct are truly independent variables with no covariance 'measurement error' appearing across the measures. In comparison the Use construct displays covariance across the iLab and iPad use types. There is even greater covariance within the teachers attitude towards computers (TT) measures from the TACTAT instrument as within the TMBR but the final model still shows these to be independent and thus measuring different aspects of a teacher's attitude towards technology as I had hoped to show in this thesis.



CMIN/DF	1.876 (good)
CFI	0.914 (good)
RMSEA	0.057 (very good)

Figure 5.28. Final ESOL Will, Skill, Tool structural model

Path			Coefficient (β)	*P*
USE	<---	WILL	.26	*
USE	<---	SKILL	.14	.11
USE	<---	TOOL	.96	***
TT Comfort	<---	WILL	-.47	***
TT Concern	<---	WILL	-.57	***
TT Utility	<---	WILL	.53	c
TT Perception	<---	WILL	.89	***
TT Comm	<---	WILL	-.81	***
TT Multimedia	<---	WILL	-.70	***
TT Productivity	<---	WILL	-.83	***
TT StuView	<---	WILL	-.61	***
Exp PCTeach	<---	SKILL	-.01	.80
FACILITIES	<---	TOOL	-.09	.21
LOU	<---	USE	.37	c
Use EFApp	<---	USE	.30	**
Use iLabCW	<---	USE	.36	***
Use iLabDirected	<---	USE	.41	***
Usei LabWWW	<---	USE	.51	***
Use Projector	<---	USE	.24	*
iPadHOURS	<---	TOOL	.57	c
iLabHOURS	<---	TOOL	.57	***
ProjHOURS	<---	TOOL	.27	***
TP WWW	<---	SKILL	1.02†	c
TP COMM	<---	SKILL	.96	***
TP APPS	<---	SKILL	.94	***
HOMETablet	<---	TOOL	-.20	*
Use Extra	<---	USE	.25	**
TESOLYears	<---	SKILL	-.19	**
EFYears	<---	SKILL	-.23	***

Use iPad	<---	USE	.46	***
TM Aims	<---	WILL	-.26	***
TM BYOD	<---	WILL	-.34	***
TM Engagement	<---	WILL	-.51	***

*** Correlation is significant at the 0.001 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
† This should not be more than 1 – points to the issue with high correlation across TPSA
C Indicates a value that was manually constrained in constructing the model

Table 5.29. Final ESOL Will, Skill, Tool structural coefficients with significance

	TM BYOD	TM Engagement	TM Aims	EFYears	TESOLYears	Exp PCTeach	TP APPS	TP COM	TP WWW	iPadHOURS	iLabHOURS	ProjHOURS	FACILITIES	HOMETablet	LOU	Use Projector	Usei LabWWW	Use iLabDirected	Use iLabCW	Use iPad	UseEFApp	Use Extra	TT StuView	TT Productivity	TT Multimedia	TT Comm	TT Perception	TT Utility	TT Concern	TT Comfort
TM Engagement	.595																													
TM Aims	.086	.580																												
EFYears	.024	.037	.018																											
TESOLYears	.021	.031	.016	.435																										
Exp PCTeach	.002	.002	.001	.385	.546																									
TP APPS	-.100	-.152	-.076	-.211	-.179	-.013																								
TP COM	-.103	-.157	-.078	-.217	-.192	-.014	.900																							
TP WWW	-.109	-.166	-.082	-.229	-.191	-.015	.952	.979																						
iPadHOURS	.052	.079	.039	.005	.004	.000	-.022	-.023	-.024																					
iLabHOURS	.052	.080	.040	.005	.005	.000	-.022	-.023	-.024	.327																				
ProjHOURS	.024	.037	.018	.002	.002	.000	-.010	-.011	-.011	.152	.153																			
FACILITIES	-.008	-.013	-.006	-.001	-.001	.000	.004	.004	.004	-.053	-.053	-.025																		
HOMETablet	-.018	-.027	-.014	-.002	-.002	.000	.008	.008	.008	-.112	-.113	-.053	.018																	
LOU	-.006	-.008	-.004	-.015	-.013	-.001	.063	.064	.068	.189	.190	.088	-.031	-.065																
Use Projector	-.004	-.005	-.003	-.010	-.008	-.001	.040	.041	.043	.120	.121	.056	-.020	-.042	.089															
Usei LabWWW	-.007	-.011	-.006	-.020	-.017	-.001	.085	.088	.093	.257	.259	.120	-.042	-.089	.189	.121														
Use iLabDirected	-.006	-.009	-.005	-.017	-.014	-.001	.069	.071	.075	.207	.208	.097	-.034	-.072	.153	.097	.400													
Use iLabCW	-.005	-.008	-.004	-.014	-.012	-.001	.060	.062	.065	.181	.182	.085	-.029	-.062	.133	.085	.181	-.113												
Use iPad	-.007	-.010	-.005	-.019	-.016	-.001	.077	.079	.084	.233	.234	.109	-.038	-.080	.171	.109	.233	.188	.164											
UseEFApp	-.004	-.007	-.003	-.012	-.010	-.001	.051	.052	.055	.152	.153	.071	-.025	-.053	.112	.072	.153	.123	.108	.527										
Use Extra	-.004	-.006	-.003	-.010	-.009	-.001	.042	.043	.045	.125	.126	.059	-.020	-.043	.093	.059	.126	.102	.089	.114	.075									
TT StuView	.204	.311	.155	.043	.037	.003	-.180	-.185	-.196	.093	.094	.044	-.015	-.032	-.010	-.006	-.013	-.011	-.009	-.012	-.008	-.007								
TT Productivity	.280	.426	.212	.059	.051	.004	-.247	-.254	-.269	.128	.129	.060	-.021	-.044	-.014	-.009	-.018	-.015	-.013	-.017	-.011	-.009	.504							
TT Multimedia	.237	.361	.179	.050	.043	.003	-.209	-.215	-.227	.108	.109	.051	-.018	-.037	-.011	-.007	-.016	-.013	-.011	-.014	-.009	-.008	.426	.733						
TT Comm	.273	.416	.207	.058	.049	.004	-.240	-.247	-.262	.125	.126	.058	-.020	-.043	-.013	-.008	-.018	-.015	-.013	-.016	-.011	-.009	.491	.673	.570					
TT Perception	-.298	-.454	-.226	-.063	-.054	-.004	.263	.270	.286	-.136	-.137	-.064	.022	.047	.014	.009	.020	.016	.014	.018	.012	.010	-.536	-.676	-.580	-.717				
TT Utility	-.179	-.272	-.135	-.038	-.032	-.002	.157	.162	.171	-.082	-.082	-.038	.013	.028	.009	.006	.012	.010	.008	.011	.007	.006	-.321	-.441	-.373	-.269	.541			
TT Concern	.193	.294	.146	.041	.035	.003	-.170	-.175	-.185	.088	.089	.041	-.014	-.030	-.009	-.006	-.013	-.010	-.009	-.012	-.008	-.006	.347	.358	.279	.463	-.587	-.303		
TT Comfort	.157	.239	.119	.033	.028	.002	-.138	-.142	-.150	.072	.072	.033	-.012	-.025	-.008	-.005	-.010	-.008	-.007	-.009	-.006	-.005	.282	.387	.327	.163	-.412	-.397	.266	
R^2	.114	.263	.065	.051	.037	.000	.875	.926	1.036	.325	.330	.071	.009	.039	.139	.056	.257	.167	.128	.212	.091	.062	.367	.691	.494	.656	.783	.281	.327	.216
Mean	2.764	2.064	1.437	2.591	7.940	5.608	4.412	5.901	5.596	1.715	1.365	6.648	3.203	.539	3.034	2.165	1.440	1.989	1.075	2.427	1.588	.796	2.280	1.887	1.815	1.955	3.169	4.029	2.614	1.282
Std. Deviation	.885	.542	.462	3.451	7.291	4.551	.910	.917	.932	1.267	1.403	5.978	.791	.499	.900	1.186	1.129	1.345	1.019	1.362	1.361	1.272	1.057	.905	.855	.891	.867	.708	1.088	.741

Table 5.30. The Sample Correlation Matrix showing measures in final model

5.4. **Features of the TESOL WST model**

This final model is aligned to the Will, Skill, Tool formulation, but has some key differences to previous work outside the TESOL context. The following notions emerge.

5.4.1. **Microblending replacing Constructivist Principles**

The composition of this final model reflects the results of model comparisons in showing that a measure of microblending readiness (TMBR) is slightly more effective than the enhanced measure of teachers' constructivist principles applied to ICT use (CLES). In each model tried, the TMBR is also more effective in terms of directly explaining the Wil construct and in creating a model where the contribution of Will appears as a significant positive loading. TMBR is also slightly more parsimonious than CLES in its current form (three fewer variables) – a desirable trait in SEM modelling.

It is the nature of SEM that multiple models can be created to fit the data, guided by the WST framework I tested created seven different models (Figure 5.31). TMBR proved to be an essential measure in all those models I tried which passed the goodness of fit tests. When the teachers' attitude towards computers survey (TACTAT) it explains the most variance in Use creating the most robust model in my comparisons.

This model explains 89% of the variation in overall use of ICT comparing well to Petko's model of 60%. While the Microblending measure has made a small but effective contribution to this, the bulk of variation is explained by the availability of ICT through the Tool factor with a significant secondary contribution from the Skill factor.

5.4.2. **Resources over skills**

The availability of classroom ICT resources appear to pay a far greater contribution to classroom ICT use in the TESOL context studied (β =.96) than the Skill factor (β=.14). The contribution of Skill is so small that it alone is not statistically significant. This negligible contribution of Skill measured in the current way is also shown by how the sign of the factor changes from model to model in Table 5.27.

Examination of the teachers' self-reported TPSA scores shows a great deal of confidence in personal use of ICT across the board (Mean 4.09, SD 1.24). Teachers scored themselves consistently lower in three areas: the ability to create a homepage (potentially a redundant skill given blogs and social media walls), using a spreadsheet and sharing files. This makes for very high inter-item correlations between the TPSA APPS, COMM and WWW measures (APPS:COMM 90%, APPS:WWW 95.2%, COM:WWW 97.9%).

5.4.3. **An approach that places classroom competency as synonymous with use**

My final model, although one of many possible ways to describe variances within the system, places a measure of teachers' self-reported competency in the classroom under the notion of Use. I had asked teachers to report their level of use within this scale (see Appendices Di-iii) to avoid reliance on the more institutional stages of use in most WST models I followed. This was in part to mitigate bias Petko (2012) suspected such models.

In measuring teaching competency with ILS' standard classroom tools iLab, iPad and PPT teachers reported less skill than in their TPSA for personal ICT use. Here they typically rated themselves at 3/5 or 'Developing Users' on the ILS competency scale for iLab and iPad teaching, defined as:

> ***"iLab Developing User:*** *I am aware of the connections between iLab content and the week's unit. I can direct students to different sections of the courseware and devote some time in iLab lessons to structured use of tools with groups or individuals to teach students how to capitalise on iLab learning.****"***
>
> ***"iPad App Developing User:*** *I adapt model lessons and create my own sequences of activity to use in class with the Classroom App. I am able to adapt these sequences in live lessons depending on how the class develops.****"***

However, the teachers collectively self-rated one point higher at 4/5 or 'Independent Users' on the scale of use for PPTs (designed for use in classrooms with projectors):

> ***"Independent user:*** *I work from the aims of the lesson and adapt the lesson beforehand to suit my group. I supplement or use alternative authentic Internet media to be relevant to the context where I teach.****"***

5.5. **Results from the TESOL WST model**

The correlations table shows that components of the TACTAT and TMBR measures are strongly correlated. I shall leave that aside here as it is a facet of the measurement model, but instead focus on some of the weaker correlations which highlight some of the potential reasons for driving the main causality of the Tool factor's influence on use of ICT in the classroom.

These correlations are low as considering such items in isolation is a very limited way of considering how the overall model of this complex system works, nonetheless they do corroborate some aspects of my thinking in creation of TMBR as well as pointing to the value or weakness of other measures used.

5.5.1. **Teacher driven ICT use vs student autonomy**

As figure 5.30 shows, the teachers' strength of belief in the value of students using their own devices (BYOD) policy is not correlated to the teacher's additional unscheduled use of ICT in the classroom, however those teachers who state they make additional unscheduled use of ICT report making significant use of their own laptops and students' mobile phones which is BYOD pedagogy.

Looking more closely at the detail provided by teachers in the types of ICT they use beyond the scheduled ICT provision in the open question:

V35. What additional ICT would you use in this time?

89 out of the 269 teachers (33.09%) reported using extra ICT although 10/89 (11.24%) could not quantify the extra use in terms of sessions per week leading to a low impact on the model.

Those who did estimate their weekly additional usage put it at an average of 2.65 blocks per week (SD 3.46 blocks) which amounts to 18.12% of the average teaching load of the group.

As further evidence that what limits ICT use for these potential microblenders is the availability of technology I found that 11/89 (12.33%) would use their own laptops in this extra time while 22/89 (24.72%) report having students use their mobiles in class.

Where teachers reported a purpose to the use in this additional time, the most common use of ICT was to show videos, which was synonymous with Youtube, the only specific videos being mentioned were TED Talk lectures (5.26% of the respondents mentioned these). This use is an example of teachers enriching their lessons by bringing so-called 'authentic material' into the language classroom as additional input alongside what exists in published study materials.

5.5.2. **Type of ICT Use**

In measuring the fluctuations in overall classroom use of ICT, the leading contributor is where teachers allow for student research and independent use of computer labs using the Internet (UseiLabWWW), (β=.51). This is followed closely by iPad use (β=.46) while next directed lessons using the computer lab contribute at (β=.36).

5.5.3. **The limited role of experience**

These teachers have been personally using computers on average for 19.67 years and using them in their teaching for approximately a quarter of that time (5.6 years).

While experience in using a PC in shows sufficient communality to contribute to the final model it barely correlates to any single type of ICT use nor teachers attitude towards using computers.

5.5.4. **Provision of resources as the key driver of use**

Teachers in the survey admitted to not using ICT tools whenever they were provided, as can be seen by the relatively low means of reported use (UseProjector, UseiLabCW, UseiPad) ranging from 2.06 to 3.41 on a scale representing ‘Developing’ to ‘Independent’ use. This is consistent with the fact that teachers typically classified themselves as ‘Developing Users’ of ICT overall in the level of use measures.

Nonetheless, the variation in their level of adoption of ICT very closely maps to the scheduled provision of facilities with Tool measures influencing Use by β=.96.

5.5.5. **Tablets and mobiles used in extended ICT teaching**

In this study I separated teacher’s ownership of a home computer, mobile phone and tablet, the only one of these which was significant in the final model was the teachers’ ownership of a tablet.
Similarly when asked:

> *V35. What additional ICT would you use in this time?*

Some 13.48% of teachers making additional use of ICT would make additional use of the school’s iPad sets while only 3.37% of them would use the PC facilities. Combining teachers who used either school iPads or students’ own smartphones shows 35.96% of those using extra ICT doing so with mobile technologies.

5.6. **Teacher comments**

There were 57 comments to the survey (21.19%), which shows considerable teacher involvement and interest.

Of those responses, 54.39% were overtly positive about the role of ICT in EFL while only 8.77% were overtly negative.

The respondents tended to write about their own needs as teachers (33.33% doing so) rather than taking a pedagogical or student-centred perspective (only 15.9% mentioning student needs). These are consistent with the findings of TAM based studies where ease of use superseded pedagogical considerations (Šumak, Heričko, Pušnik, 2011), however it is balanced in this study by separate focus on the teachers' pedagogical beliefs. Most of these comments were calls for increased ICT provision (19.3% of the overall responses) with just 12.28% feeling a need for more training. The lack of a comprehensive desire for training corroborates my earlier finding (Bish, 2012) that the teachers typically rate their ICT skill level highly.

As well as a clear request for more prevalent ICT, in particular projectors in more classrooms, teachers complained about software and hardware issues in 10.53% of these responses.

5.7. **Summary**

I began this chapter by demonstrating how the survey results were used to establish the reliability of each of 10 composite measures through exploratory and confirmatory factor analysis to retain reliable measures from which to construct a suitably robust measurement model.

In the second part I detailed and reported the process of finalizing my structural model by combining these measures using SPSS AMOS to arrive at a suitable model structured after the Will, Skill, Tool convention.

I have shown how the results of successively testing variants on the model, in particular comparing the amount of explained variance in Use and overall model fit with the permutations of the TMBR, CLES and TACTAT measures loaded under the Will factor. This enabled me to address my overall and secondary research questions while consideration of the final well-fitted model allowed me to complete those answers.

Although the model showed a demonstrably good fit to the data, explaining 63.9% of the variation in use of ICT in the classroom, it showed that the Skill factor, although integral to the power of the model, plays a negligible part in explaining the final Use.

I was not fully able to model achievement as I had hoped to due to the finding that there appears to be no discernible consistency in ICT use across the individual schools. Whilst I could have still constructed and included a latent variable for achievement with data I have gathered from student test scores, any link would be unjustifiable.

In closing, I paid close scrutiny to individual correlations between observations which highlighted why the Tool factor is so influential in this context and the Skill factor particularly weak. This included triangulation with the open question data, enabling me to corroborate several details and present results that will fuel my discussions in the following chapter.

6. Discussion

6.1. Introduction

In the following chapter I will contextualize and consider the value of my various findings in light of other work.

My secondary research questions centred on testing the application of the WST model in a new field, so I shall begin by considering how effectively that model has been both replicated and extended in TESOL.

In the second part of my discussion I shall address the critical concern of my research, as to whether teacher ownership of microblending CALL into the classroom can increase the use and impact of ICT in TESOL. Here I shall present where my findings resonate with other voices in the contemporary literature in addressing the issues of classroom technology use and teacher ownership and show how my work can help this conversation move forward.

6.2. Application of the WST model to TESOL

The model can be constructed and verified for ICT integration into the EFL classroom (see section 5.3 for an empirical proof). In the specific case of 31 EF English language schools around the world I was able to use the WST model to explain at least 35% of the variance in use of ICT with a linear regression based model and 89% of the overall variance in the model using a structural equation model.

Including microblending readiness creates a marginally more accurate WST model but opens up much potential to develop this measure and the insight it can offer into classroom practice. Now the overall model has been proven, this area is open to further study through a more emic phenomenological approach in identifying the emergent attributes of microblending practice in those teachers who make more use of ICT as opposed to those who don't. Such an investigation would allow for close examination of the methodological practices in a classroom in seeking concrete examples of application of social constructivist principles through a postmethod approach.

6.2.1. **Replication or extension of the WST?**

Fundamentally I based my work on existing studies of WST models, in particular those shown in Table 4.2. While it was tempting to simply replicate these and longer older studies through combining every existing measure in these models into a single survey instrument, I strove both for contextual relevance and to keep my instrument short enough for teachers to use without dropping out. This shortening through removal of redundant items can be seen in Table 4.3. As Burns (2015) points out, busy practising teachers are not likely to participate in long surveys or respond accurately throughout. Thus wherever possible I reduced redundancy, removing similar questions and attempting to keep only items I felt teachers would recognize as relevant. Despite my efforts in this there was still a trail-off and several comments left about the length of time the questionnaire took to complete. Although the average time taken at 17.09 mins and 60% of the teachers who took the survey finished in under 20 minutes, the revisions suggested in this study could make for a far less arduous and more informative tool.

The analytical technique I used was also different from most previous applications of WTS. Almost all of these previous studies did not complete the analysis with SEM but used multiple linear regression following the production of a measurement model. That can be effected as Petko did, by calculating scale means and examining the significant bivariate correlations before attempting a multiple linear regression with the most significant factors. This method offers a relatively quick confirmatory mechanism and quantifies the most significant factors in the model. Nonetheless while this strategy highlights some important trends, I am concerned that the smoothing effect of applying a simple mean across a scale rather than using a factor loading for each index may hide some variation across that scale. There appears to be evidence for this in my factor analysis where I found high inter-term reliability but still negligible loadings on some scales. This smoothing effect is amplified if evaluating sample means for measures such as the three dimensions of the TPSA model I retained and then taking a mean of these means.

A second aspect of the regression approach, as adopted by necessity in other studies with low sample sizes (e.g. Knezek, Christensen, & Fluke, 2003), is that the complex relationships within the directional path aspect cannot be replicated in a multilinear regression with just one dependent variable. As I have tested several modifications to the instruments within the WST model and represented these as subscales my final analysis was of 42 variables rather than 16 in Petko's case. Constraining these to a single indicator cannot demonstrate any directional causality within the system being modelled.

This can also not be considered a simple replication with a new population as I adapted several measures (TPSA & CLES) but was wary of over-extending their principles and losing validity as I had already introduced two completely new measures (TMBR and Competency scales). I was tempted to go further and include TPACK but that would have changed the perspective and underlying construct of the WST model too much. I am satisfied that at the very least the current study paves the way for others to reselect or extend measures in the TESOL field, now a first step has been taken. It is likely that such studies may illuminate subtleties I have missed or even have contradictory findings which I welcome as part of a new discussion.

6.2.2. **Measurement of Use**

My study intentionally measures the concept of Use in different ways to others. I took the typical route of using self-reports (Chuttur, 2009) unlike Rientieles, Giesbers, Lygo-Baker, Ma & Rees (2016) who tested skills. Nevertheless, I was wary of the pitfalls of this technique (Koziol & Burns, 1986). As discussed in section 3.5.1, the accuracy of self-reporting classroom practice to some extent depends on a teacher's self-awareness and self-efficacy. I am aware of examples of this from my own experience such as when I have observed a teacher in the classroom and then post-lesson asked them what percentage of time they spoke as opposed to the student's speaking – most teachers will underestimate this figure in unguided reflection.

Partly in response to this, my approach to measurement of ICT Use stepped aside from the use of a single linear scale of adoption (SoU: Stages of Use) popular in studies since its development in the Apple Classrooms of Tomorrow project (Dwyer, 1994). Here, taking on board criticisms of this approach advanced by Petko (2012), I created more of a raft of competencies in using different classroom tools offering some degree of triangulation. Three of the four instruments I created for this were adapted to the types of ICT tool configuration in use in the schools under study with a fifth offering an overall use scale. These had the additional benefit of measuring use over a range of different classroom interaction types.

While I focussed on competency and quality of use, Petko applied a self-report measure constructed from a teacher's frequency of use of 20 types of software appropriate for the classroom.

6.2.3. **Use of Logs**

The teacher and student's use of any digital system that requires a unique log-in leaves a so-called digital footprint (Martín, 2015). I have access to extensive data in the form of usage logs. Through the use of Google Analytics and proprietary EF tools, I was able to trace and consolidate this data within the ethics agreement for the project.

However in the context of a student having several teachers over the course of their language programme, I had intended to use this data at a school level, reasoning from earlier work that schools would show some consistency in teacher Will, through a normalisation of practice (Bax, 2003) and level of ICT Use within a school.

The collated log data did give me an indication of the schools using ICT most but as usage was not consistent within a school the data could not be used. This presents an issue with corroboration of a use measure and the construction of an achievement measure

I would have liked to trace specific teachers' student outcomes but given that the effect of one teacher's classroom practice is small on one student in a TESOL context where the student studies a variable length course with several teachers, instead I identified the variation in schools with the highest teacher use and then attempted to corroborate the reported use with logs and the outcomes

6.2.4. **Use of student test results**

I gathered and collated standardised student pre and post-course test scores (using the EFSET described in 2.10.4.). This was to allow for a TESOL-based replication of the fourth level of Knezek, Christensen, and Fluke 's (2003) extended EST model where they demonstrated that an 8–12% increase in reading achievement in first and second graders was attributable to technology use in the school.

While I was expecting a very small effect size even if a link could be shown, I had also assumed that there would be some consistency across ICT use at the school level (see 6.3.3.). Because this was not the case I was unable to incorporate achievement data as students on longer courses or with specialist classes have multiple teachers over their time in a school.

6.2.5. **Reliability of participant responses**

It is important to note that the measures used in my questionnaire are inherently subjective and need to be treated with some 'suspicion' rather than treated as absolutes (Klein & Myers, 1999). Structural Equation Modelling recognizes this as 'measurement error' when gathering data though such instruments in the social sciences (Stevens, 2002). This is seen in the measure of Use where the way teachers' reported their number of classes of a particular type was inconsistent. This points to a limitation of the questionnaire methodology (Cohen, Manion & Morrison, 2011) in lack of opportunity to clarify and corroborate with the participants and to the conclusion that unexplored socio-affective factors are at work driving these responses. Participants appeared to contextualize their answers by page and section grouping when their thoughts were focussed on a theme – in some cases that allowed me to use a focussing question such as the number of lessons taught before asking how many use different ICT facilities. One problem here is that with measures in development such as my TMBR, the latent factor grouping has not yet fully emerged. This means that item grouping is not optimized as a question and may appear out of context to the responder, in which case they would give a different response than they would were the question grouped with items probing a similar theme. A clear example of this happened by accident in the TMBR trialling phase when I asked an almost identical question in two sections and received completely different responses. Responses to the following two items in the same survey were only 51% correlated:

> *V99. Teachers should decide what ICT is to be used in the lesson.*
>
> *V22. A teacher should decide what ICT to use when in the lesson.*

There is a small difference in the two questions but their meaning would be identical in giving the teacher control over what ICT to use in their lesson planning.

6.2.6. **Reverse coding and preferred responses**

I had formulated some questions in my survey with negative or near negative statements such as the following:

V117. There is less correction in a lesson using ICT.

V109. The fewer software tools a teacher uses in. the class, the better.

These, along with other positively stated points, were used to call the participant to respond in a negative way towards ICT integration in the class; responses which I reverse coded before analysis.

These reverse coded items in the survey instrument were less reliable than those asking a question in a positive way, thus the presence of these items in my survey weakened it rather than strengthened it through corroboration as I had hoped. I had been looking for what Richards (2003) terms 'negative evidence' but the unreliability of the negative items may not have simply been due to teachers misunderstanding these points, given the performance constraints of quickly completing an online questionnaire. The worst case is that here I may be seeing 'automatic response patterns' (Perry 2011, p. 136) of left-hand bias (Cohen, Manion & Morrison, 2011) in teacher responses to the instrument where teachers simply expect to offer 'Almost always' or 'Strongly agree' to the TMBR items.

Further to this, in open responses, teachers commented that some questions appeared to be tricking them or getting them to agree to something. Even if they are given the opportunity to disagree with a statement, it appears that some respondents felt unhappy when asked how much they agree with a proposition that does not fit their views.

Teachers seemed to feel there was a preferred response even though in some cases I presented opposing views in different items:

V94. I use ICT when I am told to. (Reverse coding)

V99. Teachers should decide what ICT is to be used in the lesson. (Regular coding)

As well as serving as a warning to myself and others in constructing future questionnaires, this also points a social desirability effect (Preswer et al., 2004), the belief in some teachers who responded that they are expected to conform and adhere to a shared value set. Aside from providing some insight into how questionnaires are perceived, it also confirms other studies which say that teachers conform to what amounts to peer pressure (Koziol & Burns, 1986; Kagan, 1990; Borg 2015).

6.2.7. **N/A option leading to missing data**

It seems to me that I overused the *Not Applicable* (N/A) and *Don't Know* (D/K) response types in my survey tools. This allowed for a quick dismissive response to some questions, for example allowing an *N/A* response when rating facilities and training rather than exposing more illuminating trends

6.2.8. **Skills (TPSA is too easy)**

I used the TPSA tool to judge teachers' basic ICT skills as a predictive measure – asking them for their domain-specific classroom ICT skills was included as part of the Use measure. Although I had modified the TPSA scale to bring it up to date and to consider tasks with a pedagogic underpinning, I found that there were few of these tasks which teachers did not consider themselves expert at. This almost rendered the measure useless in a statistical sense as only two questions – whether a teacher could create a homepage and whether they could use a spreadsheet – showed some variation. In other words, TPSA was simply too easy for the teachers in the sample. A more refined measure is required to differentiate between levels of competency.

Here, a closer look at competency scales being developed under the Technological Knowledge (TK) portion of the TPCK framework may help, for example the 42 point questionnaire developed by Brandhofer (2015), which has been developed under the assumption that a constructivist orientation is to be expected alongside a technical skillset in teaching. More such tools are being steadily developed and becoming available through Mishra & Koehler's TPCK.org, used extensively in mainstream teaching in the USA.

A novel recent alternative is to actually test teachers' skill level by giving them ICT tasks to perform rather to rely on self-reports of competence level (Rienties, Giesbers, Lygo-Baker, Ma, & Rees, 2016). Although Rienties et al. took this as akin to Use in a TAM model, simpler tasks could be devised. This might not only further research but has practical application as part of a job interview or measured as part of a pre-service or in-service training programme.

6.2.9. **Creating the TMBR Scale**

My early production of the TMBR measure would have benefited from EFA work on pilot questions although I did not employ quantitative measures beyond reliability checking. As well as increased attention to the statistical side of scale development my reading would benefit from closer investigation of the psychological aspects of question types. This is an area where future work could refine the scale and is likely to improve both the accuracy of explained use and to identify how more use can be gained.

My later reading and studies conducted since my survey (Koh, Chai & Tay, 2014; Brandhofer 2015; Olofson et al., 2016; Rienties et al., 2016; Šumak & Šorgo, 2016; Tseng, 2016) have uncovered further question types but as none of these are directly relevant to teachers in EFL or TESOL some items would still need careful reconstruction from first principles considering the behavioural principles behind these.

6.2.10. **Including TPACK measures**

While I did not use a pure measure of this as it did not feature largely in the models I set out to replicate (see Table 4.2), its use is gaining momentum, including use in TESOL with a recent study of teachers' adoption of CALL strategies beyond their initial training (Tai, 2013) and a tool developed for assessing EFL teachers' TPACK in the eyes of their students (Tseng, 2016).

I had researched and prepared TPACK questions but these would have made my final instrument far longer leading to higher drop-out in the survey and invalid data. Nevertheless, as TPACK itself may be viewed through a constructivist lens (Olofson, Swallow, & Neumann, 2016), there is an overlap in questions asked under both technological and pedagogic knowledge in TPACK and my own TMBR scale, for example.

Technological Knowledge (TK):

TMBR 31. I am ready to regularly learn to use new pieces of software.

TPACK a5. My teacher keeps up with important new technologies (e.g. e-books, Facebook, and whiteboard). (Tseng, 2016, p. 314)

Technical Pedagogic Knowledge (TPK)

TMBR 26. ICT should be used for students to work collaboratively.

TPACK d3. My teacher uses technologies to interact more with us. (Tseng, 2016, p. 315)

Technical Pedagogical Content Knowledge (TPACK)

TMBR 18: It is important to use different software for different learning purposes.

TPCK g1: My teacher represents content with appropriate strategies via the use of various technologies (Tseng, 2016, p. 315)

As Tseng's statements (rated by students on a Likert scale) show, TPACK is not just about knowledge but praxis evident in the classroom. My results would suggest that if 'Skill' is really relevant as has been found in previous studies, the TPACK tool could be investigated for inclusion in a more generalizable study. Notwithstanding the value of the TMBR measure, using my own unique measure could be considered a weakness booth in reliability and inter-study validity.

6.2.11. Comparison of prediction of integrated ICT use with other studies

Badia et al. (2014) modelling ICT use found that including the facilities of a teacher's school raised their model from explaining 28.6% of the variance in measured use to 45.1%. It would be possible to corroborate that in further analysis from this study.

Petko (2012) was able to predict 60% of the variation in use but suggests that his model has greater internal validity than the earlier WST which relied on measurements through the STAGES tool.

Knezek and Christensen (2015) claim to have improved the predictive power of their WST to over 90% but are remaining cautious until their latest tool has been verified through at least 1,500 uses.

This places my own study in predicting 89% of variance in Use as amongst those with the highest predictive power, these findings should be treated with some caution given that this is the first model of its kind devoted to a TESOL context and substation and refinement through other studies would seem prudent.

6.3. The impact of microblending on classroom use of CALL

6.3.1. Interactions and Control

I have previously suggested (Bish, 2012) that teacher-friendly ICT systems are those designed with an element of teacher control. Although Control related items in the TMBR measure were included in the Engagement factor they did not show sufficient internal realiability as a group to stand as a factor in their own right.

My interviews of teachers on this back in 2012 seemed to suggest that they preferred lessons where they had the chance to use PowerPoint, a highly teacher-fronted tool which affords teachers maximum control. However, this study has shown more clearly that self-reported use of ICT across the teachers in the sample was more influenced by the amount of time they had scheduled access to iPads, which is both a very student-centric tool but also one designed specifically with the teacher in mind where the EF Classroom App is used. This bears out principles of User Centred Design (UCD) employed in development of that tool and indicates that ICT tools designed for the classroom with consideration of the role of teacher and student can increase the teacher's use of that technology. This both vindicates the teacher from being purely anti-technology and points to a far better return on investment than the use of tools that have less of a clear role for the teacher in a classroom context. That is corroborated in Figure 5.29 where the time where the teacher made use of a projector, was the lowest contributor to the amount of Use measure at β=.24 with other measures ranging much higher from β=.3 to β =.51.

6.3.2. **The social turn and teacher praxis**

The evolving stance refutes earlier notions that subject knowledge and best practice techniques can be imbued during initial teacher training but that teacher expertise is in effect a professional socialization.

In my final survey I did not retain the item '*I use IT because my colleagues do.*' although it would have been useful to retain this blatant reference to the subjective norm and Community of Practice in the school. Nonetheless, the lack of a school factor does show that not every teacher responds to such peer pressure.

While Petko had recognized the value of receiving peer support from mentoring and informal training asking whether this had been received, I looked for how proactive teachers were sharing their knowledge with their colleagues. I recognized this in the four self-reported ‘Champion user’ competency states for each of the ICT formats in use in EF:

> *... I am able to advise colleagues on how to get the most out of using the [system] in supporting individual student learning and engaging their students in live lessons.*

6.3.3. **The lack of a school effect**

I found no school effect or homogeneity across classroom ICT use within a school.

This was surprising, as although all participants work in the same institution, it is internationally distributed covering over 31 sites with different management teams. I would have expected a significant proportion of the variation in classroom ICT usage to be attributable to the management culture of the site such as found by Perrotta (2013) in surveying secondary school teachers across the UK. The institutional culture is a driver of a teacher’s perception of a subjective norm considered to be in part down to a measure of social influence found in the more general TAM model (Venkatesh et al., 2003) where the social influence of colleagues affects the user’s perceived usefulness of the system. The social cohesion within classroom colleagues and peer influence have been considered a major driver of technology use for some time (Ertmer, 2005), remaining a key component of the latest TPACK research (Tai, 2013; Koh, Chai & Tay, 2014). Blundell, Lee and Nykvist (2016) corroborated this with an Activity Theory approach identifying an institutional influence alongside other extrinsic forces affecting implementation of digital learning.

The only recent study to show anything different is that by Badia et al. (2014) which found that school-level factors did not influence teachers' beliefs in the benefits of the technology.

Here I can only assume that if there is such an effect it acts across the EF institutional context, rather than at the level of individual schools. This corresponds to a similar phenomenon I encountered when examining EF teacher perceptions of professionalism which transcended international boundaries (Bish, 2013). Although I did not look at the training used in this study, there is an element of open practice across schools in the EF group with online training and best practice sharing – this may have a similar effect to that found by Borthwick & Gallagher-Brett (2014).

6.3.4. **ICT Training**

Petko's study was conceived to investigate poor uptake of ICT given investments in training and equipment in Swiss schools. As such he did a significant amount of probing into teachers' perceptions of the value of training they had received.

In limiting the scope of my study, I did not delve into this dimension any more deeply including it in my measures of self-reported use where the salience of training was included more by allowing teachers to recognize an absence of training as a reason why they may not yet have started using technology (as I might expect in new hires). I gave the following 'non-use' response option to items 41–43 in my main survey:

> *I have had some or no training but am not yet able to use the [system] with students.*

Assuming that training completed will load onto skill this would be a useful addition to the skill element in a future tool.

The question is what type of training is most effective, that which directly builds teachers' ICT skillset or that which is intended to change their pedagogical beliefs. While the latter type of training would fit more with the adjusting of the reasoned intentionality on which Davis' original TAM model depends, beliefs are hard to change. Both Ertmer (2005) and Van Praag & Sanchez (2015) suggest training directed towards teachers' beliefs is the best way to effect increased teacher use of ICT.

While training has been beyond the scope of this thesis, the initial use of the competency scales I developed during the piloting phase of this study was to evaluate the success of training without recourse to a model. This contrasts to others such as Cote & Milliner (2015), who used a TAM model to evaluate and guide training in an LMS for university lecturers on language programmes by considering training as an input to the model rather than seeing training success as an outcome as I have done.

6.3.5. **Student ICT Use**

My TAM model considers the learner and teacher both from the perspective of a teacher. This is a deliberate stance as I am seeking to uncover the factors which lead to a teacher's acceptance and use of classroom technology, including that technology in the student's hands. In this respect it is similar to socially situated models such as those of Cowan and Butler (2013) and Jahnke & Kumar (2014) although there is no direct measurement of activity from the student's perspective. It also seeks to redress the balance of models which consider the student as the user.

Few other models make any consideration of the teacher's interaction with the learners or consider how they mutually influence each other's ICT use.

While much learning takes place outside the classroom (Rienties, 2014), students' belief in the value of ICT tools, their subsequent use, and the strategies students employ, may be best influenced by their teachers. Here the students are taking part ownership of a microblended use of various forms of technology in and beyond the classroom but such use appears to need promotion by the teacher (Bárcena et al., 2015).

6.3.6. **Teacher age does not drive use**

Some teachers as well as some earlier studies relate reluctancy to adopt technology to the teachers' age. In the literature this is seen to stem from computer anxiety (popularly known as technophobia) which strongly correlated to age (Chua, Chen, and Wong, 1999), but there is still much questioning in this area in the TPSA scale, in particular the Semantic differentials.

While this effect may be slightly masked due to a marked aversion to reporting age or the teacher making a misleading response (see Section 5.2.3.), my results corroborated those of recent studies such as Badia et al. (2014), Petko (2012) and Chua, Chen and Wong's 1999 meta-analysis in finding no significant relationship between teacher age and computer classroom use in the TESOL classroom.

6.3.7. **Access to technology is the norm.**

Many earlier studies and conversations with teachers mention that a barrier to classroom use of technology is lack of availability (e.g. Yunus, 2007). My results refute that notion with the study having taken place across an institution with good access to ICT for teachers and students.

Across the survey 44.9% (SD .34) of the total number of classes in respondents' typical weeks were scheduled to take place in a room with a PC and projector (making it an analogue to the CHOURS metric used in other studies). A further 9.54% (SD .12) were in computer labs with one computer per student, with the teacher having access to classroom sets of iPads on average twice per week (Mean 1.71, SD 1.26). This access to some form of ICT for over half of the week for most teachers is not enough to drive classroom integration as shown by the use statistics.

Badia et al. (2015) drew a similar conclusion to my own, that access to technology is no longer a barrier to classroom use; this, after all, was the point of departure for Koehler and Mishra (2006) in their creation of the TPCK competency model.

I believe that this use is not simply predicated on teachers now having access to some arbitrary ICT facilities but that we are beginning to see a prevalence and variety of ICT tools available (i.e. for at least 50% of the teacher's weekly time with different ICT facilities in this study), allowing the teacher to microblend at will, as tool access is no longer a barrier. In effect we are in the stage Dwyer refers to as Invention (see Figure 3.6). So given that access is not a barrier, I, like Petko (2012), am concerned with the variation in use across the study despite the good range of available ICT facilities.

6.3.8. **Personal computer ownership and use**

These teachers have been personally using computers on average for 19.67 years (SD 6.1) and using them in their teaching for approximately a quarter of that time (5.6 years SD 4.55).

Whilst 95.2% of the teachers own a laptop or PC, only 87% own a smartphone (an increase of over 25% since a similar EF survey in 2013). A potential explanation is that most of the non-smartphone users (69%) were born pre-1981 before the so-called ‘millennial’, ‘net’ or ‘digital native’ generation. Tablet ownership remains at 53.9% (similar to the 2013 level) and is spread across the age range, being around half (46.47%) of those who already own both a PC and Smartphone.

The traditional HOMECOMM measure of whether a teacher owns a PC is very historically bound up with the price and availability of home computers and teachers’ disposable income. In the schools where this study is based, a teacher with nine years in the profession will likely have had access to computers at home and elsewhere outside, as shown by the 19.67 years of average PC use. Computers have become such a common part of these teachers’ lives that on the one hand, people change devices regularly and may not wish to own a laptop if they have access to email at work or a feature-rich mobile phone, while on the other hand high ownership of PCs has become a constant. The variability in home technology ownership is now seen more clearly in smartphones and even tablets (HOMETablet having been the most significant measure of home ICT use in my final model) which can be an indicator of a digital divide. In the countries where this study took place adult smartphone ownership is ranges from 68% to 77% (Poushter, 2016) placing the ILS teachers well above that digital divide while for example in Ghana where one previous WST replication was situated (Aygei & Voogt, 2011) still only 28% of adults owned smartphones by 2016.

6.3.9. **Additional use of ICT**

The data also indicates that more teaching hours gives teachers the flexibility to choose when to microblend and increases their likelihood to use classroom ICT at additional times.

This unscheduled use of ICT is perhaps one of the strongest indicators that microblending exists. If a teacher only uses ICT when it is scheduled they cannot be microblending fully. However, if they feel the need to make autonomous use of additional ICT in other times of the teaching week, they are microblending.

6.3.10. **Gender**

The population under study is asymmetric in terms of gender, with 65% of the teachers taking the survey being female. This is not unusual in the teaching profession in general or within EFL as shown in other recent studies (Aydin, 2013 – 65% female EFL teachers; Chuang, Weng, Huang, 2015 – 67% female teachers; Šumak & Šorgo, 2016 – 75.6% female teachers). Although the sociological reasons for this are beyond the scope of this study, I took care to consider that as I had far more data from women than men, any effects observed could correspond to gender.

There is some evidence of increased computer anxiety in women over men as shown in Chua, Chen & Wong's 1999 meta-analysis of computer anxiety. Some of my early analysis appeared to indicate a link between gender and teachers' self-assessment of their competency and accordingly I investigated gender as a mediating factor at different points in the analysis of skill. There is some basis in the literature that women make more conservative estimates of their skills than men (Schofield, 1995; Corston & Coleman, 1996). My closer analysis however revealed that no significant effect is visible in this study, unlike Badia et al. (2014) who did find gender to be one of the strong socio-demographic correlates to perceived effectiveness of technology.

6.3.11. **Predicting ICT Use**

The aim of all TAM modelling is to predict, or in other words explain, the amount of use of ICT in terms of other variables.

In this respect my final model compares very favourably with those that precede it. While I was not expecting to reach the 90% prediction rate of Knezek & Christensen's WST through following Petko's 2012 lead in rejecting the way use is measured, I was hoping to produce a valid model and demonstrate the effect of microblending in improving it.

I was able to express 89% of the overall variation in ICT use in TESOL classrooms through my measures and model which is marginally more than Petko's 60% and comfortably more useful than the 43% of variation in ICT use explained by Agyei & Voogt (2011) in Ghanaian mathematics teachers and 46% by Pynoo et al. (2011).

While these previous authors and I have considered each of the aspects of classroom integration in parallel, a more effective future way of demonstrating their compound effect could be to consider them in series. Placing them as first, second and third order factors in a similar way to the nested effects described by Tondeur, Valcke, & van Braak (2008) in section 3.5.3 would lead to the model of classroom Integration shown here in Figure 6.1.

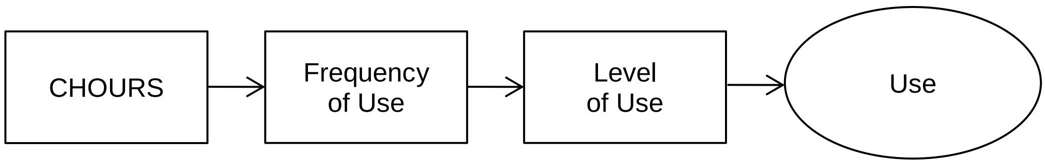


Figure 6.1. A revised conceptualisation of Use

6.3.12. **Pedagogy**

Petko (2012) demonstrated that a measure of constructivism makes a significant contribution to the predictive power of the WST model. His inclusion of the Constructivist Learning Environment Scale correlated at r=0.25 to his measure of classroom ICT use. In the TESOL context where social constructivism lies at the root of methodology, this was an area I set out to develop further. My comparative models from a single survey (Table 5.31.) demonstrated that not only did my enhanced, TESOL-specific measure of constructivism improve the accuracy of a WST model when applied to TESOL, but further that using constructivism as a key factor in devising a measure of a teacher's pedagogical orientation (TMBR) can increase accuracy of the model even further.

This psychometric measure of pedagogic beliefs, TMBR, went into teachers' practice through the classroom strategies techniques they employ. This exploration has gone further than other studies by considering the role of the learner and teacher together. In particular, I considered the teachers' relationship to their students through the autonomy and ownership they afforded students in the classroom, as I had done with my extension of CLES:

> *89. Students can work according to their own learning strategies.*

…extending this further into the specific domain of CALL techniques I term 'microblending' such as:

> *123. I do not mind if the students know more about using a particular piece of software than me*

Since completing my analysis, Knezek and Christensen, authors of the original WST, published a study claiming to offer a model which takes the prediction of integration of technology in the classroom to over 90% by including pedagogical constructs such as student learning style and a more detailed analysis of teaching style which accounts for up to 30% of the variation alone (Knezek & Christensen, 2015). They have updated the TPSA, a measure my study shows to be ineffective in diagnosing teachers' skill at using ICT, and added a scale covering Teaching With Technology (TWT) aligned to some elements of TPCK. Rather than consider TWT a factor of Skill as I have done with TMBR, Knezek and

Christensen use the TWT measures to construct a new latent variable, Pedagogy, as a predictor of integration.

6.4. **Summary**

I have discussed the main outcomes of re-applying the WST to the field of TESOL and how this update and transferral have necessitated redefining some of the measures used, comparing my approach and findings to the work of others applying the WST in education outside TESOL. Within this section I have also critically examined my item creation and data collection, emphasizing where there are lessons to be learned for future studies.

In the second part of the chapter, looking at the impact of microblending, I presented the outcomes of my work on the question of teacher ownership of ICT in the classroom through microblending in the context of other studies in general education and TESOL literature.

7. Conclusion

7.1. Introduction

This study appears to be the first of its kind applying the WST model to TESOL. As such it sets some groundwork for future refinements in the direction of recognizing how a teacher's pedagogy is important when they are being asked to use technology rather than simply equipping their class with new tools.

The model shows how the extent of classroom use of technology is a product of an ESOL teacher's behavioural intent to use a system, that teacher's skill level with computers and availability of the technology.

In demonstrating the need to consider the teacher and how they teach as an essential element in classroom use of ICT for language teaching we can begin to redress a balance in conception and design of CALL systems which have thus far ignored the practitioner.

My intention has been to present pragmatic evidence of 'what works', based on a reflective exploration in a format that is readily accessible to school managers and decision makers.

The need for teachers whose approach to teaching can incorporate technology is fundamental if that technology is to be used. The results of my study indicate that those teachers who make the most use of available classroom technology in their lessons appear to share an identifiable set of underlying beliefs and pedagogic knowledge, which I term microblending readiness. For the readiness, based on social constructivist beliefs also, to have any effect requires a range of appropriate ICT tools to be in place to allow the teacher to selectively microblend in their classrooms.

It is important to note that in microblending the teacher themself is not the sole ‘user’ of the technology but that they are also enabling, facilitating and promoting technology use by their students in language learning inside and beyond the classroom.

I shall begin detailing my conclusions by relating my main findings to the research questions which promoted them before expanding on the most important findings and implications for practice. Before concluding I shall note limitations of this study and recommendations for further study

7.2. **Main Findings**

My study aimed to address the primary research question:

RQ 1. *What factors can best account for the variation of use of ICT in the EFL classroom?*

Utilising the WST model has allowed me to account for 89% of the variance in classroom use of ICT across the classrooms of international EFL institution in this study. The main contributors to Classroom use are the ready availability of a variety of ICT tools and the teacher’s pedagogical orientation towards fostering their use in the classroom. The teacher’s personal ICT skill level was only indirectly relevant in this study. Other factors including teacher, age, gender and the influence of other teachers in the school were not shown to be relevant.

I further

RQ 2. *Can a reliable measure of teacher’s microblending readiness be constructed?*

I have developed a tool which does this, enabling examination of the enacted beliefs of a teacher which contribute to their willingness to microblend ICT in the EFL classroom. Nonetheless the anticipated factors of the measure were not bourne out in measurement analysis suggesting that the dimensions of this measure can be improved.

RQ 3. *Does a WST model for EFL better predict classroom ICT use with:*

a. A measure of teachers' constructivist beliefs?

NO

b. A measure of teachers' microblending readiness?

YES

While I have shown that a measure of a teachers' constructivist beliefs can be used to 'sharpen' the WST model in an EFL context, the most accurate Use prediction comes from the more pedagogically situated measure of microblending readiness demonstrating that this measure of intentionality is borne out in Use.

I should have liked to go beyond predicting classroom ICT use investigating a potential connection between this learning improvement. However as I found the classroom Use of ICT was highly teacher dependent and so much so that it was variable within school sites in my study. While I expected variation at the teacher level I had anticipated a more homogenous degree of microblending to emerge in each school but I did not find evidence for this. I had compiled anonymised test scores but these were only attributable to a school rather than individual teachers so this study could not take the step towards linking classroom adoption of ICT and achievement.

7.3. **Additional findings**

I have proven that in a classroom scenario – even given a high level of technology for language learning –, decisions about use are being made by the teachers (as opposed to students or management) and more importantly that the teachers' underlying beliefs about learning are what guide them in a principled application of ICT in the classroom. My findings reject popular assertions that this use is not simply down to the teachers' age or their experience in use of ICT.

What works appears to be a teacher ready to employ variant forms of ICT at appropriate junctures in the learning. This does not depend on teacher fronted technology use in the role of expert or technician. The teacher who microblends, is not intimidated by the technology, offering students control and choice in what tools to use, including their own devices. Such a teacher also recognizes and sensitises their students to the validity of pluralistic outcomes from lessons with ICT. Potentially these traits may be enhanced through training, but while confidence and competence with ICT is fundamental, the teacher's underlying constructivist orientation is what leads them to be ready to work with students in this way.

This TMBR measure in this study begins to quantify how teachers identify with the role of a Vygotskian 'significant other' who provides the backdrop of knowledge and support to a student's experiential learning. In fulfilling this role through technology use in the classroom, my study shows that the teacher requires a belief in the combination of experiences from different sources. That this enabling belief in the ESOL teacher is constructivist is perhaps a 'no-brainer', as anticipated by others such as Cuban (2001) and

Petko (2012). However, when seeking to apply a measure of constructivist beliefs in the mainstream teaching context Petko was unable to prove that this had an effect on Use. My modified version of the same Constructivist Skills inventory Petko applied shows that, in the EFL case, a teacher with a constructivist orientation applies ICT in the classroom more often; furthermore, that when this measure is replaced by an assessment of ‘microblending’ readiness, we see an even closer fit between the teacher’s beliefs and Use.

7.4. Contributions to knowledge

In undertaking this first application of the WST model to TESOL I have gone beyond the notions of perceived usefulness and intentionality, which form the key factors of TAM models used by many authors, and added consideration of teacher’s pedagogical beliefs, their perceived skill level and the availability of ICT. These all allow for much more situated modelling to take place in the TESOL context.

My inclusion of a measure of pedagogy extends the WST model to allow for consideration of how both teacher and student will use the technology, while previous modelling considered them separately.

A difficulty in studying new modalities of teaching and learning is that to draw comparisons with earlier work, legacy instruments need to be used. As both the TPSA and CLES measures are now out of step with the concepts of available technology, I have updated and validated these tools allowing for their use in subsequent studies.

I have been the first to describe an emergent pedagogy using classroom technology which I have coined microblending. I have identified three major factors underlying teachers' adherence to this pedagogy:

- A need for some aspect of teacher control of technology used
- Selection of ICT tools based on language learning aims of an activity
- A disposition towards flexible BYOD device use

I hope that this work lays the foundation for developing a tighter description of the pedagogy which may then be used to create principles for fellow teachers to adopt in their practice.

I have created a new psychometric instrument (TMBR) which measures a teacher's microblending readiness. This nascent tool is already sufficiently powerful that it can be used within the WST model to predict how much a teacher is likely to use classroom ICT.

I have demonstrated that teachers are not holding back implementation of technology but are rather more eager for appropriate technology which they can apply in their classrooms.

While these findings are contributions to the academic body of knowledge, this thesis also provides valuable new information and tools to software developers and management of TESOL institutions seeking more successful ICT use in the classroom. That is not however by simply increasing the amount of use of each tool but through recognising the thinking behind the appropriate application of classroom ICT in TESOL.

7.5. **Recommendations for practice**

This study is directed less at teachers and more at institutions for whom these professionals play an invaluable role in the use of ICT to assist language learning. In the light of my findings, an institution planning to implement CALL effectively should consider the following:

i] An implementation design which places the teacher in a position which affords them ownership and control of when and how the technology can be best used. This means provision of technology and infrastructure that allows a teacher to make day-to-day decisions as to when to use these tools as opposed to a fixed or rotating allocation. Ideally this is without the expectation that certain work can only be completed on certain technology (for example by intending all grammar instruction to be undertaken on an LMS or vocabulary introduction to be purely with an iWB), ensuring that the software available allows for some pedagogic choice. This flexibility can be best supported through the use of apps and mobile devices in the classroom.

ii] **Tools:** As implied above, a variety of readily available hardware and software are required for work in class and beyond. As a guide, an institution should consider:

- Tools with a short learning curve for students and teachers
- Tools that promote interaction and collaboration
- Tools that allow for students to apply their own learning strategies
- Tools that provide a window to wider world contexts

- Tools that allow students to produce as well as consume media

Tool selection is an ongoing process which should involve and ideally be driven by teachers. Technical support is needed to keep systems up to date and well maintained for this to happen.

iii] **Skills:** I have shown that TESOL teachers have strong general ICT skills but a training programme in the pedagogic application of the main software and hardware available in an institution is fundamental. The instruments I have already developed in Appendix D can be used (as we do at EF) as an initial skills audit in a training programme for specific ICT tools in use and for ongoing monitoring of teacher competency in their application. However, the teacher who is ready to microblend will not require to be trained in every new piece of software they meet as they are characteristically ready to discover and learn alongside the students rather than always assume the role of expert. This exploration should be encouraged and channelled towards reflective sharing through continual professional development in which the teachers take a lead in presenting what has worked for them.

iv] **Will:** Whether the teaching team is aligned with microblending principles, ready to both take ownership but also allow and plan for student choice and discovery.

The TMBR measure can be used to assay whether teachers are aligned with the goals of microblending and likely to use the ICT tools, irrespective of their competence level. The tool may be utilised in its current questionnaire format for such scenarios as teacher interviews or adapted into a lesson observation tool for existing staff.

7.6. **Implications of the study**

The critical implication is that the teacher's role needs to be the primary consideration when applying technology in the classroom. Nonetheless there is more work to be done on clarifying broad guiding principles under which teachers can work with technology. This clarification should come from the classroom and the practitioners themselves, much as principles for task based learning have emerged from the 1980s onwards.

In order to successfully teach with technology in a scenario where TESOL methodology is becoming fluid, teachers need to be empowered with more than a technical understanding of how to use technology and a greater understanding of why its use is appropriate. To some extent this can insulate the teacher from the rapid changes in developing technology I mentioned in section 2.9., as they would have both greater awareness of the rationale for using new tools and more agency in choosing what to adopt and when. This will help teachers move from a more synthetic approach in implementing CALL through a few isolated techniques to a more holistic implementation where technology is applied in the classroom, where the teacher can recognise and capitalise on its contribution to the classroom ecosystem. This contribution is likely to be valuable when use of the tool transforms existing tasks or creates new socialised learning opportunities which promote language acquisition. Nonetheless there is still a place for the self-study drill-like elements found in VLE systems and vocabulary learning apps but the teacher needs to be able to combine these with a richer diet of more motivating and engaging classroom activities both on and off the computers.

Given this, a single software solution, hardware configuration or blended language course is unlikely to provide for the breadth of use teachers and students can make from classroom CALL. An outcome of this is that there would be more rather than less available software, requiring the teacher to retain an open mind towards adopting new tools without being directed to and accepting that they will not become fully expert in software before using it in class.

The most flexible hardware in use during this study were sets of iPads. The teachers' familiarity with and use of iPad sets appeared to encourage their extended use of other ICT tools beyond allocated classroom time including their own PCs and students' mobile phones utilising the available wifi. Teachers were four times more likely to seek out extra opportunities to use iPads than PCs. This suggests that providing access to the latest technology capitalises on the teacher's willingness to innovate and exercise some academic autonomy which has beneficial effects across their teaching.

The most reliable factors in the TMBR measure relate to the use of apps and BYOD technology. This suggests that microblending teachers may have greater affinity with Mobile Assisted Language Learning (MALL) than CALL.

In order to support their navigation of this changing learning space, teachers need training that goes beyond method. Teacher training and professional development should consider bottom up the mechanisms of acquisition as part of a teacher's pedagogic content knowledge in order to allow for a flexible application of this knowledge. Teachers need to be aware of the implication of the constructivist orientation of microblending in its drawing on the successes of social interaction between students, their languaging and dialogic thinking while working on tasks with technology.

7.7. **Limitations**

My rudimentary measure of microblending readiness has only been trialled once and then used and refined in the final study. As my measurement analysis showed the dimensionality of the measure was weak either in terms of description of the factors (see 5.6.5) or in the item writing where potentially items represent the scale but are not clearly enough defined to give a common direction across the scale in terms of the degree of belief in microblending practice. Although its development was influenced by the CLES measure, I analysed my modified CLES and TMBR scales separately contrasting them in my final analysis. It may have been better to conduct EFA with the two together with the aim of creating a stronger new scale

I have not been able to measure any effect of the degree of microblending on student progress due to the absence of a consistent school-wide level of microblending (or ‘school effect’ as I referred to it earlier). From my previous work on teacher control in ICT implementation (Bish, 2012) I had expected to find this, but without it each student will have been taught by several teachers who microblend to differing degrees. This variation across the classroom practice of those who teach each student makes it impossible to quantify the amount of microblended classes received by each student and measure microblending readiness against performance.

This was a weakness of my research design, where in the expectation of a school level connection between the amount of teachers’ technology I only asked my participants to state their school and role, otherwise affording full anonymity in order to secure greater participation. This design flaw limited not only my ability to take the analysis in an unforeseen direction but also made it impossible to respond individually to teachers who participated. This latter point is the most serious from a Critical Pedagogy and Community of

Practice standpoint, where several respondents mentioned a feeling that taking part in such a survey would have little value. I would welcome that becoming the basis for an ongoing dialogue with a greater participatory element both shaping the study and disseminating its findings.

The current lack of evidence increased classroom use of ICT in the form of microblending can brings about an increase in student achievement requires acceptance of my assumption that such a technique is valuable. While this assumption is based on my reading of the SLA literature and appears to align with the views of participants in the study, an objective measure of the value of increased microblending with ICT would be more compelling to those who support different learning approaches.

The exact degree to which training initiatives have helped teachers reach their current state of microblending readiness has not been explored. Some training has been shown to be required in the measures of teacher classroom competency during trialling, but the precise impact of different types of training and support has not been considered. I have found no evidence that any given teacher cannot become a successful ‘microblender’ but the upshot of this is that I am as yet unable to suggest ways to get them to that state.

Teachers in this study are given some degree of autonomy. This allows them to make very selective use of ICT. To some extent making their use of ICT in the classroom voluntary as explored by Davis and Venkatesh (2000) where teachers are more tightly compelled to use certain technology at certain times or for example in schools which have a ‘No mobiles’ rule this model may cease to apply.

As is typical in such studies, measurement was from teacher responses. The subjectivity, and potential inaccuracy of these observations, may have skewed findings. Ideally, triangulation through direct observation or indirect observation by asking students should be used to counter this concern.

My study was based in a private EFL institution whose schools are characterised by technologically rich and generally standardised environments (see Figure 1.2). In other TESOL and EFL settings there is greater variety in ICT provision. In ILS the values in the Tool variable were high with low variation. These subtle variations accounted for much of the variation in use. The findings might apply less in an environment with less available technology where teachers cannot microblend.

The prism of policy in ILS and my own commitment to extending a blended learning implementation into one which affords the teacher greater control in the classroom will have limited my direction in conceiving this study and its potential impliactions for practice.

7.8. **Areas for further research**

While my study has focussed on a single teaching organization, it is essential to replicate the work amongst other groups of EFL, and ESL teachers in the broader ESOL context, and this would provide opportunities for any of the following areas of refinement.

I have shown that with this user group at least, the TPSA tool is no longer an informative indicator of general computer literacy. My results show that TPSA is certainly a reliable and consistent measure but it no longer has sufficiently meaningful external validity nor sufficient internal validity to differentiate between teacher skillsets. I extended the detail of the tasks it mentions as much as possible without changing their function but it appears those ICT functions that challenged users in 1990 have now been trivialized by advancing technology. A measure of competence, knowledge or ICT literacy is still required to complete the WST construct, so replacement tasks need to be found which are sufficiently taxing to differentiate between users. The trap to avoid there will be not simply basing the measures on the competencies of teachers demonstrating successively higher levels of classroom use of ICT, otherwise a circular definition could be created where general (out of class) and pedagogic (in class) use of ICT will be measured in the same way. That would lead to the same situation that exists already where correlations will approach unity and the SEM approach cannot be effectively used.

Refinement of the definition of microblending and the TMBR tool could be effected through classroom observation or interviews with teachers who make extensive use of microblending. My assumption is that, although there is sure to be a postmethod mix of techniques, these can be abstracted to a few commonly held beliefs which may be exposed by factor analysis. This can serve to further illuminate the common traits of microblenders, particularly if done with one or more samples in parallel.

The way is now clear to examine the degree to which teacher training can influence microblending. As the TMBR tool is a psychometric designed to highlight behavioural intent or aptitude, it should be able to identify a teacher ready to microblend at any stage of their career and training. This could possibly be used to evaluate the effectiveness of training.

It may also be possible to use the TMBR as a recruitment tool in pre-service teachers in order to identify an aptitude. Although this is a potential area of application and research, there is an ontological and possibly ethical issue here where a framework conceived as descriptive may be used in a prescriptive way. My feeling at this point is that if there is pragmatic advantage in student learning that should be the most important driver for further research.

A further investigation into learning outcomes may be possible with a more classic experimental design considering microblending as an intervention using a standardised EFL test (such as the EFSET mentioned above) for a pre and post-test. The design for such a study would need to consider the influence on different teachers' pedagogies during the student's time in a particular institution and may also investigate more closely how the microblending behaviour of one teacher is influenced by their peers as a subjective norm.

If any further study is conceived which can retain a direct connection between the teacher and their students' learning outcomes, such a study could also test for any correlation between self-reported teacher use and the digital footprint of the lessons, as this may provide a directly measurable way to provide feedback on learning taking place. From a critical applied linguistics standpoint such a development might be possible but is less desirable as it would potentially constitute a kind of pedagogical tachometer, a spy in the classroom that demonstrates a teacher's lack of power and answerability. As such it is unlikely to be seen in a positive way by teachers and is a step that would be unwise to take.

7.9. **Summary**

This new validation of the WST model in the TESOL context fills a gap in the research, offering a fresh insight as to what leads to increased use of ICT in the language classroom.

Even though this model can still be improved, the teacher themself and their constructivist orientation appears to be at the heart of classroom ICT use in language teaching, as shown by the teacher's application of a microblending pedagogy.

The effects of increased and widespread classroom use of ICT have not yet been shown in this study but now that some parameters are clear this can be explored.

This thesis not only provides for new directions in ESOL research but serves as a call to action to those who have overlooked the value of the teacher in the technology enhanced classroom. In immediate terms, that can be about altering expectations and increasing classroom control and ownership for the practitioner, but more far-reaching is the potential to consider the value of microblended programme design at an institutional level and in the selection and design of appropriate software and hardware.

8. Epilogue: Personal learning journey

In theory there is no difference between theory and practice, in practice there is.

(Jan L. A. van de Snepscheut)

To say that the doctoral journey has been disruptive to my life would be an understatement. It has at times been exciting, inspirational, overwhelming and ultimately satisfying but has taken a portion of time and consistent attention I could not have imagined

The most satisfying early outcome was the opportunity for guided reading and closer investigation of the epistemological and ontological underpinnings of TESOL theory. This caused me to re-appraise my knowledge of methodology in this light and re-visit TESOL authors, reading primary sources rather than being content with methodological handbooks and teacher materials that had been my sources in the past. Here I found myself recognizing the thread of social constructivism in the research and practice which resonate with me most, of which I had been previously unaware

Much of this discovery is down to the fact that my post-graduate work was in mainstream education rather than a masters in TESOL or linguistics so I began visiting theory and research methodology in a way my peers were already conversant with. This led to much early excitement and added vigour to my studies but the need to acquire more skills in research methodology and disciplined reading did slow my progress. I still have a tendency to over-read and include less relevant areas in my studies rather than a dispassionate ability to apply Occam’s razor to my work.

It feels trite to list the study skills I have acquired but these amount at the least to:

- Online article research and discovery
- Critical research reading
- Data sampling and collection
- Instrument design and trailing
- Structural Equation Modelling analysis
- Critical appraisal of results
- Article writing

Of these, the SEM techniques were probably the hardest to grasp and took longest with the most frequent recourse to additional reading and watching. This was particularly tricky as the field is developing and techniques are viewed with some scepticism by some authors. I had identified the need to access specialist SEM software (IBM AMOS) and get training in its use in the University of Exeter's Research Training Needs Analysis in 2015 but could not find an appropriately timed course. On reflection, making time for such training as offered at Brigham Young University in the USA would have been a good investment in time rather than vicarious attendance through working spurious examples alongside recorded webinars.

I am overall most grateful for the people that the Doctorate in Education has introduced me to, both at Exeter and beyond. I have been encouraged to move out of the comfort zone of internal presentations to international conference participation, giving workshops and presentations. I have felt supported in making my small contributions in the GSE conferences at Exeter and Bristol, SIG events in Cyprus and Romania, and EUROCALL and TESOL conferences in Greece, France, the Netherlands and Italy. I hope that in moving forward from my silent position in the back row of the conference hall, I too am becoming more supportive of my peers and a collaborative member of the research community. This is the 'boundary' that Wenger (2009) talks of crossing in entering a community of practice and the 'languaging' that Swain (2000) talks of in creating a shared identity. While the EdD may have created a personal learning journey, its pathway is leading me into a socially created space.

To use my newly acquired vocabulary: I have entered more than just a new discourse community but a community of practice where my peripheral participation has been legitimized and I am becoming a contributory member. Although these five years have seen me join special interest groups, workshops and conferences, I still have to go further in becoming engrossed in an unself-conscious and giving way in study groups and collaborative projects.

I have also returned warily to applied maths: once a lecturer in mechanics, I have had to learn new statistical tools which provide another prism through which to view the classroom. I am apprehensively awaiting any response to my work and looking forward to any replication and re-appraisal of my calculations with new data and contexts. I am eager to see what others make of the ideas I am suggesting and where they may be taken.

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Appendices

Appendix A: Glossary

Bootstrapping	A technique for normalising a sample distribution by resampling from it repeatedly to create a pseudo sample of several thousand items for further parametric analysis. This has come to replace other methods of normalisation (circa 2010) now that the large number of calculations has been automated in software such as SPSS.
CALL	Computer Assisted Language Learning.
CFA	Confirmatory Factor Analysis. An SEM technique which examines how well specific exogenous variables and error terms can account for the variation in endogenous variables.
Common Method Bias	A latent factor that can be the result of gathering multiple measures in a single instrument. This can be checked for in a Harman test and is eliminated by imputing exogenous variables from measures following CFA with AMOS.
Communalities	These are output created by EFA software as it iteratively checks factor loadings. The communality is the sum of a variable's loading across each factor extracted. Communality is thus an approximation of the R^2 for each variable explained by the factors in the model. The overall percentage of explained

	variance in a model can therefore be found by the sum of communalities over the square of the number of factors.
Composite variable	A dummy variable created in SPSS AMOS to represent an endogenous variable by regression of its factors (typically exogenous measures) by their factor weightings.
EFA	Exploratory Factor Analysis, a form of linear regression used to reduce the number of measured variables to underlying factors. In this study EFA was carried out iteratively with SPSS.
Eigen Value	The total explained variance of all variables loaded onto a factor divided by the number of exogenous variable (i.e. the maximum number of factors). According to the Kaiser-Guttman rule, factors with Eigen values of 1 are significant. In software such as SPSS, the values are shown for each iteration of EFA. Plotting the number of factors against total Eigen value gives a Cattell Scree Plot. The break of slope or 'elbow' of this plot is said to indicate the ideal number of factors in EFA.
Endogenous variable	A variable in SEM which is explained by other variables. Endogenous variables may explain other endogenous variables.

Exogenous variable	A variable in SEM which is directly introduced into the model with no explanation from prior models. On SEM models exogenous variables are shown as rectangles.
Explained Variance (R^2)	See Communalities for how this is calculated for exogenous variables in SEM software.
(Goodness of) Fit	A measure of how well an SEM model describes the data it is built on. There are multiple measures available and authors are divided on which are appropriate to use when.
ICT	Information and Communications Technology, usually in the context of a school. Some authors cited may define the term as Information and Computer Technology.
(Model) Identification	Whether the parameters in an SEM model relate to each other sufficiently to provide a variety of solutions. An 'under-identified' model will allow only one solution and is of little use, while an 'over-identified' model (ie. with degrees of freedom greater than 0) allows for more experimentation.
KMO	The Kaiser-Meyer-Olkin measure shows how well a set of variables can be reduced to a smaller number of factors to explain the same overall variance.

Latent variable	A theoretical construct in SEM which is not directly measured. It can only be estimated as a tendency in other variables, similar to a factor. On SEM models latent variables are shown as ellipses.
MALL	Mobile Assisted Language Learning
Microblending	A new term I have coined to describe teacher-managed selective use of a variety of ICT tools alongside other materials in a classroom setting.
Not positive definite	Where an SEM factor matrix cannot be inverted in the intermediary calculations as one of the Eigen values forming the matrix determinant is ≥ 0. This can be resolved by removing variables which are strongly covaried.
SEM	Structural Equation Modelling. A form of multiple linear regression, which includes factor analysis and path analysis, creating a causal model of the relationship between variables.
TAM	Technology Acceptance Modelling. A branch of psychological study concerned with how humans make use of computer systems.
TESOL	Teaching English to Speakers of Other Languages. This may be done in the student's home country, on a stay abroad or entirely online. I treat this as a more generic term than TEFL (Teaching English as a

Foreign Language) which I reserve for the context of teaching a student in their home country.

Winsorizing	Replacing an outlier value with the closest valid value in the data.

Appendix B: Letter of permission to name EF International Language Schools

Education First

International
Language Centers

Benjamin Delahaye
Education First
Bärengasse 25
8001 Zürich
Switzerland

Zürich, January 19th 2017

Dear David,

I have read through your thesis and I am authorizing you to use the name of EF International Language Centers.

Best regards,

Benjamin Delahaye
VP Academic Operations & Development

International Language Centres / EF Education First Ltd. Bärengasse 25, CH-8001 Zürich /
Telephone: +41 (0)43 430 40 00 Fax: +41 (0)43 430 41 00 / **www.ef.com**

CELEBRATING FIFTY YEARS

Appendix C: EF Teacher Self-assessment checklist (iPad App)

International Language Centers

EF Classroom App 2.0
Teacher Self-assessment checklist

Tick the statements that apply to you. If you tick four, tick the level and try the next one up!

1. Newbie user

1. ☐ I can launch, log in and out of the app.
2. ☐ I can find and open the relevant model lesson to my teaching week.
3. ☐ I can access teacher procedure details, interaction and timing for the lesson.
4. ☐ Can start and end a lesson.
5. ☐ Can send playlist items to students.

☐ **I can do 4 of these. I have achieved a Newbie user level.**

2. Developing user

6. ☐ I know each feature of the three main teacher views of the app.
7. ☐ I have had students working in different interactions with iPads shared and individual.
8. ☐ I have used teacher control functions (stop, pause, mute, timer, edit timer).
9. ☐ I understand learning purpose and use all tools that can be added to a lesson.
10. ☐ I have added media content of different types to a lesson.

☐ **I can do 4 of these. I have achieved a Developing user level.**

3. Independent user

11. ☐ I comfortably add in additional tools or content as needed in a live lesson.
12. ☐ I can edit/clone model lessons to create a second weekly iPad lesson for my class.
13. ☐ I use the app lesson-plan format to set aims, consider interaction for lessons.
14. ☐ I have added my own lesson content in from the school teachers' Dropbox.
15. ☐ I use item titles, bundles and student instructions to encourage learner independence.

☐ **I can do 4 of these. I have achieved an Independent user level.**

4. Champion user

16. ☐ I create lessons from scratch which incorporate EF curriculum and a balance of skills.
17. ☐ I include balanced use of syllabus- relevant Efekta courseware in my lessons.
18. ☐ I can demonstrate the full functionality of the app to others in training and live lessons.
19. ☐ I can make lessons which are detailed and engaging enough to be shared with others.
20. ☐ I can observe other iPad lessons and give feedback.

☐ **I can do 4 of these. I have achieved a Champion user level.**

Teacher name:	Date:

Appendix Di: EF Teacher Quick competency measure (iPad App)

International
Language Centers

EF Classroom App 2.0
Quick competency measure

Tick the level of competency (0-5) which most closely describes the way in which you use the EF Classroom App in your classes:

	0. Non user I have had some or no training but am not yet able to use the EF Classroom App in live lessons with students.
	1. Newbie user I can operate the EF Classroom App in live classes, working through most parts of model lessons.
	2. Developing user I use the EF Classroom App in my classes making use of the teacher control functionality and varying student interaction working with different groupings. I am aware of the different tools available within the app and can add my own media and tools to enrich lessons.
	3. Independent user I adapt model lessons and create my own sequences of activity to use in class with the Classroom App. I am able to adapt these sequences in live lessons depending on how the class develops.
	4. Champion user I create my own lessons enabling students to use tools creatively drawing in a variety of media and interactive websites from the Internet. I am able to advise others on how to get the most out of using the app in planning to extend the syllabus and to engage their students in live lessons

Teacher name:	**Date:**

Appendix Dii: EF Teacher Quick competency measure (PowerPoints)

International
Language Centers

EF Fourth Edition Power Point Slides:
Quick competency measure

Tick the statements that apply to how effectively you can use the PPTs at the moment:

	0. Non user I have had some or no training but am not yet able to use the PPTs with students.
	1. Newbie user I can access the PPT lesson content as needed. I take into account the teacher directions and work through the slides in sequence with my classes.
	2. Developing user I can use the PPT contents page menu to move in and out of the appropriate parts of the lesson, supplementing as needed. Students complete the activities in a variety of different groupings often with some students up at the board.
	3. Independent user. I work from the aims of the lesson to adapt the lesson beforehand to suit my group. I supplement or use alternative authentic Internet media to be relevant the context where I teach.
	4. Champion user I naturally move in and out of the PPT lesson alongside the course book and other lesson elements to suit both the syllabus and the stage of the week. I can observe and provide constructive feedback to colleagues to get the most out of PPT use.

Teacher name:	Date:

Appendix Diii: EF Teacher Quick competency measure (LMS)

International
Language Centers

EF Fourth Edition iLab:
Quick competency measure

Tick the statements that apply to how effectively you can use the iLab at the moment:

	0. Non user I have had some or no training but am not yet able to use the iLab with students.
	1. Newbie user I can supervise students working through the iLab content relevant to their General English class, ensuring they are logged in and working on-task independently.
	2. Developing user I am aware of the connections between iLab content and the week's unit. I can direct students to different sections of the courseware and devote some time in iLab lessons to structured use of tools with groups or individuals to teach students how to capitalise on iLab learning.
	3. Independent user. I create a structured lesson based on the week's learning aims where iLab content and tools are used by students working together when appropriate. The lesson includes feedback with me monitoring and adapting the teaching to how the students respond.
	4. Champion user I combine iLab content with additional media and tasks drawn from the Internet to consolidate the week's aims. I am able to advise colleagues on how to get the most out of using the iLab in supporting individual student learning and engaging their students in live lessons.

Teacher name:

Date:

Appendix Div: EF Teacher's Stage of Technology Adoption measure

EF Education First

International
Language Centers

Teacher's Stage of Technology Adoption

Rate your overall stage of technology use in teaching by ticking the statement that most closely relates how you use ICT in the classroom at the moment:

	0. Entry: I am trying to learn the basics of using technology.
	1. Adoption: I can successfully use technology on a basic level in my teaching. I use technology in class from time to time.
	2. Adaption: I am discovering technology's potential to improve what I can offer in class with enhanced learning outcomes and new types of classroom activity for my students. I regularly use technology in the classroom.
	3. Appropriation: I can use technology "effortlessly" as a tool to carry out activities I adapted to the learner's needs which could not have done in a technology free classroom. My students appreciate the value to their language learning and I use the classroom technology almost every opportunity I get.
	4. Invention: I am developing new ways of teaching with the technology with measurable gains for my students. I look for additional opportunities and ways to use the technology and share my ideas with others.}

Teacher name:	**Date:**

Appendix E: Pilot Study Certificate of Ethics Approval

UNIVERSITY OF EXETER

Graduate School of Education

Certificate of ethical research approval

MSc, PhD, EdD & DEdPsych theses

To activate this certificate you need to first sign it yourself, and then have it signed by your supervisor and finally by the Chair of the School's Ethics Committee.

For further information on ethical educational research access the guidelines on the BERA web site: http://www.bera.ac.uk/publications and view the School's Policy online.

READ THIS FORM CAREFULLY AND THEN COMPLETE IT ON YOUR COMPUTER (the form will expand to contain the text you enter). **DO NOT COMPLETE BY HAND**

Your name:	David Bish
Your student no:	610046599
Return address for certificate:	Breitenstrasse, 10 Adliswil 8134 Switzerland
Degree/Programme of Study:	Ed D TESOL
Project Supervisor(s):	Dr Rupert Wegerif, Dr Philip Durrant,
Your email address:	dwb208@exeter.ac.uk
Tel:	+41 (0)43 430 4038 (office)

I hereby certify that I will abide by the details given overleaf and that I undertake in my thesis to respect the dignity and privacy of those participating in this research.

I confirm that if my research should change radically, I will complete a further form.

Signed:...DAVID BISH (BY EMAIL)..date:...02/24/2015.............

Chair of the School's Ethics Committee
updated: March 2013

Certificate of ethical research approval

TITLE OF YOUR PROJECT:

Increasing the impact of ICT in language learning: A model of classroom integration of CALL through a micro-blended approach.

Survey tool pilot study

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1. **Brief description of your research project:**
   A validation of an existing predictive model of teacher uptake of technology re-applied in the TESOL context.

   This is a small scale pilot study to establish the internal validity of two survey instruments (CLES & TMBR) to be used in the main study.

2. **Give details of the participants in this research (giving ages of any children and/or young people involved):**

   Approximately 60 experienced TESOL teachers in two schools will be asked voluntarily participate in this anonymous online study.
   The teachers are from two schools I recognise as 'early adopters' of technology (based on feedback from training uptake), as such they representing the extreme case for the sample. One of the two schools is academically directed by myself, the other by a colleague. While this may compel the academic manager to present the survey to their teachers, the teachers themselves are unlikely to feel unduly compelled to complete the survey or answer in any particular way

Give details (with special reference to any children or those with special needs) regarding the ethical issues of:

3. **<u>informed consent:</u> Where children in schools are involved this includes both headteachers and parents). Copy(ies) of your consent form(s) you will be using must accompany this document.** a blank consent form can be downloaded from the GSE student access on-line documents: **Each consent form MUST be personalised with your contact details.**

   Participants, who are all adults, are to be informed of the purpose of the study and how their data will be treated in the attached letter.

   They will individually need to read and accept the proposed online version of the Exeter consent form attached before submitting their results online.

   No student data is used in this pilot study.

4. **<u>anonymity and confidentiality</u>**

   Teachers taking part in the study will not be required to identify themselves in any way. The contributions of the entire sample are to be reduced to an internal validity measure (such as Cronbach's alpha) per question on each of the two instruments.

5. **Give details of the methods to be used for data collection and analysis and how you would ensure they do not cause any harm, detriment or unreasonable stress:**

   Each of the two instruments being tested should take no more than 5 minutes to complete through entering a secure weblink to an online survey.

Chair of the School's Ethics Committee
updated: March 2013

The data collection and storage is handled through a professional account on Surveymonkey.com using. SSL/TLS connections. Secure Sockets Layer (SSL) and Transport Layer Security (TLS) technology (the successor technology to SSL) protect communications by using both server authentication and data encryption. This ensures that user data in transit is safe, secure, and available only to intended recipients.

Teachers will be provided the link to take the online survey in their workplace (or at home if they prefer) where they have adequate computer access. There will be no compulsion to complete the survey, nor to provide any personal data.

The two instruments being piloted examine the following:

CLES

- Teacher's beliefs about teaching

TMBR

- Teacher's beliefs about teaching
- Teacher attitudes towards technology use

Once collected, the anonymous data will be downloaded to SPSS for analysis and storage on the researcher's laptop.

6. Give details of any other ethical issues which may arise from this project - e.g. secure storage of videos/recorded interviews/photos/completed questionnaires, or

No personal data is gathered by either instrument.

7. Special arrangements made for participants with special needs etc.

No teachers with special needs exist in the population to be sampled.

8. Give details of any exceptional factors, which may raise ethical issues (e.g. potential political or ideological conflicts which may pose danger or harm to participants):

One of the intended aims of the pilot is to ensure that none of the questions used are considered unprofessional, intrusive or offensive to teachers. The tools have already been subjected to approval by an academic panel.

***This form should now be printed out**, signed by you on the first page and sent to your supervisor to sign. Your supervisor will forward this document to the School's **Research Support Office** for the Chair of the School's Ethics Committee to countersign. A unique approval reference will be added and this certificate will be returned to you to be included at the back of your dissertation/thesis.*

***N.B.** You should not start the fieldwork part of the project until you have the signature of your supervisor*

This project has been approved for the period: March 2015 **until:** September 2015

By (above mentioned supervisor's signature): ....**date:**...12/03/2015......

***N.B. To Supervisor:** Please ensure that ethical issues are addressed annually in your report and if any changes in the research occur a further form is completed.*

Chair of the School's Ethics Committee
updated: March 2013

GSE unique approval reference:………D/14/15/29……………………………………….

Signed:……… [signature] **… ……………………..date:……12/13/2015…………………..**
Chair of the School's Ethics Committee

Chair of the School's Ethics Committee
updated: March 2013

Appendix F: Main Study Certificate of Ethics Approval

UNIVERSITY OF EXETER

GRADUATE SCHOOL OF EDUCATION

St Luke's Campus
Heavitree Road
Exeter UK EX1 2LU

http://socialsciences.exeter.ac.uk/education/

CERTIFICATE OF ETHICAL APPROVAL

Title of Project: Increasing the impact of ICT in language learning: Investigating the effect of teachers' ownership of micro-blending CALL in the classroom within the WST model of ICT use.

Researcher(s) name: David Bish

Supervisor(s): Dr Philip Durrant

This project has been approved for the period

From: 01/07/2015
To: 31/08/2016

Ethics Committee approval reference: D/14/15/56

Signature: Date……21/07/2015…
(Professor Jane Seale, Director of Research, Graduate School of Education)

Appendix G: Adapted online informed consent form

[SURVEY PREVIEW MODE] SurveyMonkey Powered Online Survey - Google Chrome

www.surveymonkey.com/s.aspx?PREVIEW_MODE=DO_NOT_USE_THIS_LINK_FOR_COLLECTION&sm=D6i

UNIVERSITY OF EXETER

Cancel

GRADUATE SCHOOL OF EDUCATION

The data you are submitting now is entirely anonymous and untraceable so cannot be changed or withdrawn after pressing 'submit', before submitting this from please read the following

INFORMED CONSENT

I have been fully informed about the aims and purposes of the project. My contribution is entirely voluntary.

All details and opinions I have given will be treated in confidence: my identity will not be disclosed in any way. Any information I have entered will be used for the purposes of this research project, which may include publications.

Information submitted will be transmitted and stored securely online temporarily while data is being collected from other participants. At the end of data gathering all data will be stored securely offline.

If you agree with this statement and still wish to take part please press submit, otherwise press cancel.

If you have any concerns about the project that you would like to discuss, please contact:

David.Bish@EF.com or R.B.Wegerif@Exeter.ac.uk

Data Protection Act: The University of Exeter is a data collector and is registered with the Office of the Data Protection Commissioner as required to do under the Data Protection Act 1998. The information you provide will be used for research purposes and will be processed in accordance with the University's registration and current data protection legislation. Data will be confidential to the researcher(s) and will not be disclosed to any unauthorised third parties without further agreement by the participant. Reports based on the data will be in anonymised form.

Prev Submit

Appendix H: Pilot Study Participant Letter

Education First

UNIVERSITY OF EXETER

Hi all

I am conducting research into teachers' beliefs about teaching and technology.

In order to do this, I have adapted a set of questions which have been repeatedly used in other studies but never before about language teachers (eg. TESOL).

This small study is a pilot of my new instrument in which I would like you to answer the questions honestly and give your opinion on the clarity and answerability of each question.

I will use an online questionnaire to do this. Any completion of the questionnaire is voluntary and your contributions will be entirely anonymous. You will have the chance to review and cancel before submitting if you do not wish to proceed.

As well as taking into account your opinions on the questions I will statistically test the variation between answers to see if any questions give unreliable answers. I may publish the finalised tool developed in this way and a description of this pilot study.

No participant names will be published in the final study although I will mention EF and break down results by the countries involved.

This study will go on to form a small part of my doctoral thesis at Exeter University: *'Increasing the impact of ICT in language learning'* (anyone who is interested is welcome to email me for details).

As this is educational research, you will be shown a University of Exeter ethics compliance statement on screen before you submit your responses. If you do not agree with my use of your answers under the terms of the statement, simply press cancel or close the browser. You are not compelled to take part in any way.

Many thanks in anticipation of your help

Cheers

David Bish
Director of Academic Management, Asia and Pacific Schools
EF Education First | Bärengasse 25 | Zürich, Switzerland, 8001
Tel +41 (0) 43 430 4038 | Skype David.Bish.EF
www.ef.com

Appendix I: Main Study Participant Letter

Education First

UNIVERSITY OF EXETER

Hi all

At EF we are uniquely positioned to contribute to the discussion on Blended Learning in EFL which is why I am undertaking the largest study of its kind in my Doctoral work at Exeter University

In this study ***Increasing the impact of ICT in language learning*** I am looking to find how effective you find technology in helping you deliver lessons. I will be looking at how ready teachers feel to make use of the technology: your expectations and reservations and how much we all actually use the technology in the classroom through ultimately logging in and running connected lessons with the classroom app and iLab work.

All data I collect, like teachers' opinions (positive and negative) and individual expectations of use of any EF tools are entirely anonymous in this research. I am not looking to single anyone out for praise or criticism but to look at how we as a body of teachers and academics at EF can make use of IT tools in the classroom, both what stops us and what makes it work.

At this point all I asking of teachers is your participation in an anonymous voluntary online survey. If we get even 80% participation from all EF teachers this will become a highly significant representation of EFL teacher's views (making it more significant and valuable than recent surveys in Texas, China, UK and Switzerland). Naturally I would like EF to be able to make such a valuable contribution to knowledge about ICT use in language teaching but whether you chose to participate is entirely up to you.

If you are interested to know more feel free to email me directly and I would be happy to send you a copy of Chapter 1 of my thesis. Also if you do not wish to participate, that is absolutely fine, I will not gather any data about you.

No names of teachers, students or schools will be published in the final study although I will mention EF break down results by the countries involved.

I look forward to hearing your views,

Cheers

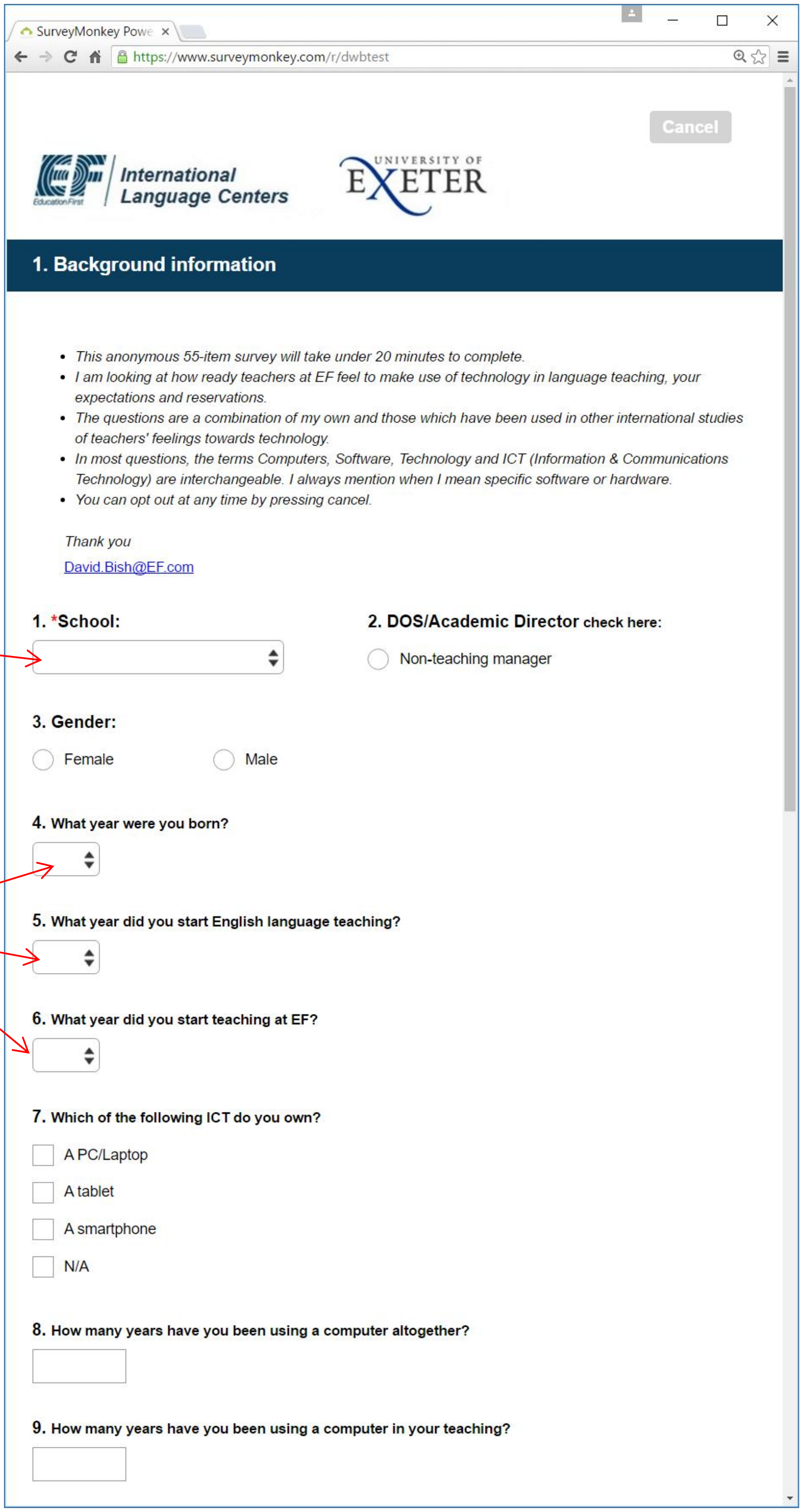
David Bish
Director of Academic Management, Asia and Pacific Schools
EF Education First | Bärengasse 25 | Zürich, Switzerland, 8001
Tel +41 (0) 43 430 4038 | Skype David.Bish.EF
www.ef.com

David Bish is based in the acadmic operations and research team in Zürich. Working directly with schools in the Asia and Pacific region as well as materials development where he plays a key role in shaping EF's digital learning strategy through implementation of iPad learning in our classrooms worldwide. An advocate of Blended Learning, he regularly runs workshops and speaks at conferences, including the USA, UK, the Netherlands, Spain, Turkey, Cyprus and Russia in the last 12 months. He is completing a Doctorate in Education at the Universitv of Exeter. UK.

Appendix J: Online Survey Instrument

A dropdown list of the schools involved

Years 'Earlier than 1965' up to the present



SurveyMonkey Powe ×

https://www.surveymonkey.com/r/dwbtest

Cancel

International Language Centers

UNIVERSITY OF EXETER

1. Background information

- *This anonymous 55-item survey will take under 20 minutes to complete.*
- *I am looking at how ready teachers at EF feel to make use of technology in language teaching, your expectations and reservations.*
- *The questions are a combination of my own and those which have been used in other international studies of teachers' feelings towards technology.*
- *In most questions, the terms Computers, Software, Technology and ICT (Information & Communications Technology) are interchangeable. I always mention when I mean specific software or hardware.*
- *You can opt out at any time by pressing cancel.*

Thank you

David.Bish@EF.com

1. *School:

2. DOS/Academic Director check here:

Non-teaching manager

3. Gender:

Female

Male

4. What year were you born?

5. What year did you start English language teaching?

6. What year did you start teaching at EF?

7. Which of the following ICT do you own?

A PC/Laptop

A tablet

A smartphone

N/A

8. How many years have you been using a computer altogether?

9. How many years have you been using a computer in your teaching?

Questions continue numbered 1-56 in a similar format over four screens ending with the informed consent screen shown in Appendix F.

Appendix K: Full Survey Questions

Listing of all 125 measures/variables by type, showing survey item and possible responses

Key

PV? Petko (2012) variable number

TP? TPSA(12) section and measure

TC? TAC/TAT(42) shown as TAC(51) section and item (Shattuck et al,. 2011)

TT? TAC/TAT(42) shown as TAT(50) section and item (Shattuck et al., 2011)

CM1-4 EF Competency scales (Bish 2015)

CL? CLES(18) question number

TM? TMBR(31) question number

All other questions are newly introduced ‘Ad hoc’ variables

{} = Response type

*Item reverse coded for Analysis

1-23 Demographics:

1. (PV5) School: {List of participating schools}

2. I am a non-teaching DOS/Acdemic Director {Y/N}

3. (PV4) Gender: {Female;Male;N/A}

4. (PV6) What year were you born? {DATE}

5. (PV7) What year did you start English language teaching? {DATE}

6. What year did you start teaching at EF? {DATE}

7. I own a PC/laptop {Y/N}

8. I own a tablet {Y/N}

9. I own a smartphone {Y/N}

10. (PV41) How many years have you been using a computer altogether? {NUMBER}

11. (PV42) How many years, have you been using a computer in your teaching? {NUMBER}

12-23 TPSA (12):

“How well could you do the following with a computer:”

12. (TP COMM 1 & 5) Send an email with an attachment to a colleague. {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

13. (TP COMM 2) Post on social media (eg. Facebook, Instagram, Pinterest) {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

14. (TP COMM 2) Communicate with a friend via instant messaging (eg. Facebook Messenger, Whatsapp, Skype) {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

15. (TP COMM 8) Create a personal home page for people to find out about me or my interests. {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

16. (TP WEB 7 & 10) Locate and use online classroom materials, teaching suggestions or lesson plans. {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

17. (WEB NEW) Book a hotel, flight or other transport with a PC or mobile device. {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

18. (TP WEB 10) Locate and play videos or music from the Internet. {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

19. (WEB NEW) Share a file with others over the cloud (eg. Dropbox, Mailbigfile, Sharepoint) {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

20. (TP APPS 11) Use a spreadsheet to either carry out calculations or present numbers as graphs. {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

21. (APPS NEW) Download and install an app on a smartphone or tablet. {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

22. (TP APPS 12) Create a word processed document combining formatted text and graphics for a poster or handout. {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

23. (TP APPS 14) Create a slideshow presentation (eg. PPT, Keynote, Prezi) {I can’t do this, I can do it with difficulty, I can do it OK, I can do it with ease; I am an expert, N/A}

24-35 Tool:

24. (PV8) How many 80 minute blocks do you usually teach General English/Exam Classes per week in total? {NUMBER}

25. (PV48/PV97) How many 80 minute blocks do you usually work in a room with a projector/pc? {NUMBER}

26. How much of that time do you use the projector/pc? {never; sometimes; usually; almost always; always; N/A}

27. (PV44) How many 80 minute blocks of those do you usually work in an iLab? {NUMBER}

28. How much of that time do you leave the students to select what they do with iLab courseware? {never; sometimes; usually; almost always; always}

29. How much of that time do you direct the students structured use of iLab courseware? {never; sometimes; usually; almost always; always}

30. How often do you have students use other websites; media or software in the iLab? {never; sometimes; usually; almost always; always}

31. (PV45) How many 80 minute blocks do you usually get a set of iPads in a week? {NUMBER}

32. (PV45) How often do students use the iPads in that time? {never; sometimes; usually; almost always; always; N/A}

33. (PV45) How much is that with an EF app? {never; sometimes; usually; almost always; always; N/A}

34. (PV55) Is there any additional time where you use IT? How many 80 minute blocks would that be? {NUMBER}

35. (PV56) What additional IT would you use in this time? {TEXT}

36-40 Facilities:

How would you rate the provision of the following ICT in your school?

> 36. (PV61) Computers for teachers/preparation {Very poor; Poor; OK; Good; Very good; N/A}
>
> 37. (PV62) Computers for learning {Very poor; Poor; OK; Good; Very good; N/A}
>
> 38. (PV64) Internet access {Very poor; Poor; OK; Good; Very good; N/A}
>
> 39. (PV67) Availability of technical support {Very poor; Poor; OK; Good; Very good; N/A}
>
> 40. (PV68) Availability of support for teaching with ICT {Very poor; Poor; OK; Good; Very good; N/A}

41-44 EF Competency/LoU Scales:

41. (CMiLab) Rate your own competency on teaching in the iLab on this 0-4 scale:

> {0. Non user: I have had some or no training but am not yet able to use the iLab with students.
>
> 1. Newbie user: I can supervise students working through the iLab content relevant to their General English class, ensuring they are logged in and working on-task independently.
>
> 2. Developing user: I am aware of the connections between iLab content and the week's unit. I can direct students to different sections of the courseware and devote some time in iLab lessons to structured use of tools with groups or individuals to teach students how to capitalise on iLab learning.

3. Independent user: I create a structured lesson based on the week's learning aims where iLab content and tools are used by students working together when appropriate. The lesson includes feedback with me monitoring and adapting the teaching to how the students respond.

4. Champion user: I combine iLab content with additional media and tasks drawn from the Internet to consolidate the week's aims. I am able to advise colleagues on how to get the most out of using the iLab in supporting individual student learning and engaging their students in live lessons.}

42. (CMPPT) Rate your own competency on teaching in with EF PPTs on this 0-4 scale:

{0. Non user: I have had some or no training but am not yet able to use the PPTs with students.

1. Newbie user: I can access the PPT lesson content as needed. I take into account the teacher directions and work through the slides in sequence with my classes.

2. Developing user: I can use the PPT contents page menu to move in and out of the appropriate parts of the lesson, supplementing where appropriate. Students complete the activities in a variety of different groupings often with some students up at the board.

3. Independent user. I work from the aims of the lesson and adapt the lesson beforehand to suit my group. I supplement or use alternative authentic Internet media to be relevant to the context where I teach.

4. Champion user: I seamlessly move in and out of the PPT lesson alongside the course book and other lesson elements to suit both the syllabus and the place in the week's scheme of work. I can observe and provide constructive feedback to colleagues to get the most out of PPT use.}

43. (CMiPad) Rate your own competency on teaching in with the EF Classroom App on this 0-4 scale:

{0. Non user: I have had some or no training but am not yet able to use the EF Classroom App in live lessons with students.

1. Newbie user: I can operate the EF Classroom App in live classes, working through most parts of model lessons.

2. Developing user: I use the EF Classroom App in my classes making use of the teacher control functionality and varying student interaction working with different groupings. I am aware of the different tools available within the app and can add my own media and tools to enrich lessons.

3. Independent user: I adapt model lessons and create my own sequences of activity to use in class with the Classroom App. I am able to adapt these sequences in live lessons depending on how the class develops.

4. Champion user: I create my own lessons enabling students to use tools creatively drawing in a variety of media and interactive websites from the Internet. I am able to advise others on how to get the most out of using the app in planning to extend the syllabus and to engage their students in live lessons.}

44. (CMICT) Rate your overall stage of technology use in teaching:

{0. Entry: I am trying to learn the basics of using technology.

1. Adoption: I can successfully use technology on a basic level in my teaching. I use technology in class from time to time.

2. Adaption: I am discovering technology's potential to improve what I can offer in class with enhanced learning outcomes and new types of classroom activity for my students. I regularly use technology in the classroom.

3. Appropriation: I can use technology "effortlessly" as a tool to carry out activities I adapted to the learner's needs which could not have done in a technology free classroom. My students appreciate the value to their language learning and I use the classroom technology almost every opportunity I get.

4. Invention: I am developing new ways of teaching with the technology with measurable gains for my students. I look for additional opportunities and ways to use the technology and share my ideas with others.}

45-74 TACTAT(42):

45. (TC8-1) I like to talk to others about computers. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

46. (TC2-1) I get a sinking feeling when I think of trying to use a computer. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

47. (TC2-2) Working with a computer makes me feel tense and uncomfortable. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

48. (TC2-4) Computers intimidate me. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

49. (TC4-3) Computers dehumanize society by treating everyone as a number. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

50. (TC4-4) Our country relies too much on computers. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

51. (TC4-5) Computers isolate people by inhibiting normal social interactions. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

52. (TC4-6) Computers have the potential to control our lives. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

53. (TC4-7) Working with computers makes me feel isolated from other people. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

54. (TC5-2) Computers can help me learn. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

55. (TC5-3) Computers are necessary tools in both educational and work settings. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

56. (NEW) Computers help me be more efficient. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

57. (TC5-4) Computers can be useful instructional aids in almost all subject areas. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

58. (TC5-7) Computers could enhance remedial instruction. {Strongly Disagree; Disagree; Undecided; Agree; Strongly Agree}

59-62 TACTAT Perception: “I think computers are ...”

59. (TT7-2) {Semantic differential: Suffocating/Fresh}

60. (TT7-3) {Semantic differential: Dull/Exciting}

61. (TT7-4) {Semantic differential: Unlikeable/Likeable}

62. (TT7-7) {Semantic differential: Unhappy/Happy}

63-65 TACTAT Email

“To me, communicating with ICT (Email, Messaging, Skype) is ...”

63. (TT 1-4) {Semantic differential: Exciting/Unexciting}

64. (TT 1-5) {Semantic differential: Appealing/Unappealing}

65. (TT 1-7) {Semantic differential: Fascinating/Mundane}

66-68 TACTAT Multimedia: “To me, multimedia (eg. PPTs, Online video, music or images etc.) is …”

66. (TT 3-4) {Semantic differential: Exciting/Unexciting}

67. (TT 3-7) {Semantic differential: Appealing/Unappealing}

68. (TT 3-6) {Semantic differential: Fascinating/Mundane}

69-71 TACTAT Teacher Productivity: “To me, using computers for my professional productivity is ...”

69. (TT 4-4) {Semantic differential: Exciting/Unexciting

70. (TT 4-7) {Semantic differential: Appealing/Unappealing}

71. (TT 4-6) {Semantic differential: Fascinating/Mundane}

62-74 TACTAT Student Productivity: “For my students, using computers in the classroom is …”

72. (TT 5-4) {Semantic differential: Exciting/Unexciting

73. (TT 5-7) {Semantic differential: Appealing/Unappealing}

74. (TT 5-6) {Semantic differential: Fascinating/Mundane}

75-99 TESOL CLES(18):

75. (CL1) In my lessons students exchange knowledge about the world.{Almost always; Often; Sometimes; Seldom; Almost never}

76. (CL2) In my lessons students will share cultural perspectives.{Almost always; Often; Sometimes; Seldom; Almost never}

77. (CL3) In my lessons students learn that language is influenced by people’s cultural values and opinions. {Almost always; Often; Sometimes; Seldom; Almost never}

78. (CL4) In my lessons students learn that language is used in an international context between non-native speakers. {Almost always; Often; Sometimes; Seldom; Almost never}

79. (CL5) In my lessons authentic as well as published material is used. {Almost always; Often; Sometimes; Seldom; Almost never}

80. (CL6) In my lessons students learn there are acceptable varieties within the language (English). {Almost always; Often; Sometimes; Seldom; Almost never}

81. (CL7) In my lessons students are encouraged to offer their own explanations of how language works. {Almost always; Often; Sometimes; Seldom; Almost never}

82. (CL8) In my lessons students use language creatively. {Almost always; Often; Sometimes; Seldom; Almost never}

83. (CL9) In my lessons students use language to raise their own questions and seek answers of others. {Almost always; Often; Sometimes; Seldom; Almost never}

84. (CL10) In my lessons students feel safe questioning what or how they are being taught. {Almost always; Often; Sometimes; Seldom; Almost never}

85. (CL11) In my lessons students learn better when they are allowed to question what or how they are being taught. {Almost always; Often; Sometimes; Seldom; Almost never}

86. (CL12) In my lessons students are involved in planning what they are going to learn. {Almost always; Often; Sometimes; Seldom; Almost never}

87. (CL13) In my lessons students are involved in measuring their own progress. {Almost always; Often; Sometimes; Seldom; Almost never}

88. (CL14) In my lessons students are involved in selecting activities. {Almost always; Often; Sometimes; Seldom; Almost never}

89. (CL15) In my lessons students can work according to their own learning strategies. {Almost always; Often; Sometimes; Seldom; Almost never}

90. (CL16) In my lessons students talk with other students about how to solve problems. {Almost always; Often; Sometimes; Seldom; Almost never}

91. (CL17) In my lessons students explain their ideas to other students. {Almost always; Often; Sometimes; Seldom; Almost never}

92. (CL18) In my lessons students ask other students to explain their ideas. {Almost always; Often; Sometimes; Seldom; Almost never}

93-124 TMBR(31):

(8 items marked * were reverse coded so agreement is always for microblending)

93. (TM1) Students can decide what software to use in the lesson. {I completely agree ; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

94. *(TM2) I use ICT when I am told to. {I completely agree ; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

95. (TM3) There is some ICT which allows teachers more control in the classroom. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

96. *(TM4) Classroom management is challenging whenever ICT is in use. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

97. (TM5) ICT improves the class climate (students more engaged, less disturbing). {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

98. (TM6) Students can use all of the ICT equipment themselves. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

99. (TM7) Teachers should decide what ICT is to be used in the lesson. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

100. *(TM8) I feel I must use computers in every lesson. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

101. (TM9) The aims of an activity are important when choosing what ICT to use. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

102. (TM10) There is some ICT I would like to use in class that I haven't tried yet. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

103. (TM11) The value of ICT varies from lesson to lesson. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

104. (TM12) A lesson is made up of smaller tasks, some done with and some without ICT. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

105. (TM13) Authentic web based or multimedia input is essential to stimulate students in a lesson. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

106. (TM14) Electronic dictionaries are a useful learning tool. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

107. (TM15) Students should use electronic dictionaries on their mobiles whenever they like. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

108. (TM16) Mobile and tablet devices can usefully increase interaction in the class. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

109. *(TM17) The fewer software tools a teacher uses in the class the better. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

110. (TM18) It is important to use different software for different learning purposes. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

111. *(TM19) All ICT gives the same learning outcomes. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

112. (TM20) Software used to teach does not have to be ESOL specific software. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

113. (REMOVED in TMBR(31)) ICT can allow students to be more creative in the classroom. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

114. (TM21) A teacher should decide what ICT to use when in the lesson. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

115. (TM22) Students should be able to use their own devices in the lesson. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

116. (TM23) The process of students working with ICT is more important than the work they produce. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

117. *(TM24) There is less correction in a lesson using ICT. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

118. (TM25) ICT should be used for students to work autonomously. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

119. (TM26) ICT should be used for students to work collaboratively. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

120. *(TM27) ICT work is best completed by students outside classroom time. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

121. (TM28) Students should be encouraged to communicate with others via ICT. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

122. *(TM29) A teacher needs to be an expert user of every piece of software in the lesson. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

123. (TM30) I do not mind if the students know more about using a particular piece of software than me. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

124. (TM31) I am ready to regularly learn to use new pieces of software. {I completely agree; I partly agree; I neither agree nor disagree; I partly disagree; I completely disagree}

125. Additional comments {TEXT}

Appendix L: Distribution of survey responses

	Item Name	N	Range	Mean	SD	Skew	Kurtosis	zSkew	zKurtosis
iv.	Time taken*	310*	43.12*	17.09*	9.29*	0.73*	0.33*	72.303	401.345
V4T.	Age	269	35	37.155	10.284	0.547	-0.944	3.684	-3.189
V5T.	TESOLYears	269	37	7.940	7.291	1.669	3.450	11.236	11.655
V6T.	EFYears	269	24	2.591	3.451	2.448	8.954	16.479	30.254
V10.	ExpPCHome	269	35	19.674	6.102	0.470	0.102	3.166	0.343
V11.	ExpPCTeach	269	30	5.608	4.551	1.615	3.843	10.873	12.985
V12.	TPSAComm1	269	4	4.784	0.551	-3.690	18.290	-24.844	61.796
V13.	TPSAComm2	269	4	4.242	1.128	-1.664	2.047	-11.205	6.916
V14.	TPSAComm3	269	4	4.439	0.962	-2.114	4.363	-14.236	14.742
V15.	TPSAComm4	269	4	3.260	1.409	-0.301	-1.171	-2.027	-3.958
V16.	TPSAWeb1	269	4	4.349	0.853	-1.573	3.015	-10.593	10.186
V17.	TPSAWeb2	269	4	4.498	0.875	-2.165	4.922	-14.577	16.630
V18.	TPSAWeb3	269	4	4.558	0.783	-2.376	6.873	-16.000	23.223
V19.	TPSAWeb4	269	4	3.535	1.364	-0.599	-0.843	-4.031	-2.847
V20.	TPSAApp1	269	4	3.283	1.259	-0.264	-0.912	-1.776	-3.083
V21.	TPSAApp2	269	4	4.152	1.189	-1.452	1.199	-9.779	4.053
V22.	TPSAApp3	269	4	4.078	1.122	-1.273	0.944	-8.569	3.190
V23.	TPSAApp4	269	4	4.067	1.134	-1.245	0.807	-8.383	2.727
V24.	SchedTotal	269	30	14.773	7.226	-0.464	-0.345	-3.124	-1.167
V25.	SchedProjector	269	28	6.648	5.978	0.957	0.048	6.446	0.164
V26.	UseProjector	269	4	2.165	1.186	0.055	-1.006	0.373	-3.399
V27.	SchediLab	269	14	1.365	1.403	4.775	36.399	32.151	122.979
V28.	UseCW	269	4	1.075	1.019	0.848	0.169	5.707	0.571
V29.	UseDrected	269	4	1.989	1.345	0.076	-1.180	0.512	-3.987
V30.	UseWWW	269	4	1.440	1.129	0.543	-0.484	3.654	-1.636
V31.	SchediPad	269	10	1.715	1.267	1.836	8.372	12.359	28.287
V32.	UseiPad	269	4	2.427	1.362	-0.470	-1.008	-3.162	-3.405
V33.	UseEFApps	269	4	1.588	1.361	0.376	-1.087	2.534	-3.672
V34.	UseExtra	269	4	0.796	1.272	1.518	1.120	10.188	3.784
V36.	FacsPrep	269	4	3.451	1.092	-0.211	-0.632	-1.423	-2.135
V37.	FacsLearn	269	4	3.643	1.004	-0.408	-0.173	-2.749	-0.586
V38.	FacsWWW	269	4	3.674	1.049	-0.527	-0.175	-3.551	-0.593
V39.	FacsTeccSupp	269	4	3.406	1.164	-0.271	-0.769	-1.826	-2.600
V40.	FacsTeachSupp	269	4	3.392	1.150	-0.414	-0.522	-2.785	-1.764
V41.	CMiLab	269	4	3.352	1.119	-0.156	-0.746	-1.053	-2.521
V42.	CMPPT	269	4	3.433	1.210	-0.441	-0.720	-2.967	-2.431
V43.	CMiPad	269	4	2.851	1.257	0.071	-1.016	0.479	-3.432
V44.	CMICT	269	4	3.466	1.000	-0.098	-0.701	-0.658	-2.368
V45.	TTInterest1	269	4	3.183	1.110	-0.219	-0.783	-1.476	-2.644
V46.	TTComfort1	269	4	1.714	0.920	1.525	2.296	10.270	7.756

	Item Name	N	Range	Mean	SD	Skew	Kurtosis	zSkew	zKurtosis
V47.	TTComfort2	269	4	1.660	0.890	1.621	2.674	10.913	9.036
V48.	TTComfort3	269	4	1.680	0.931	1.516	1.971	10.205	6.660
V49.	TTConcern1	269	4	1.985	1.026	1.075	0.731	7.238	2.470
V50.	TTConcern2	269	4	2.721	1.172	0.137	-1.057	0.923	-3.572
V51.	TTConcern3	269	4	2.846	1.214	0.046	-1.095	0.309	-3.698
V52.	TTConcern4	269	4	2.959	1.195	-0.066	-1.097	-0.443	-3.706
V53.	TTConcern5	269	4	2.270	1.020	0.672	-0.086	4.523	-0.291
V54.	TTUtility1	269	4	4.325	0.798	-1.851	5.250	-12.465	17.737
V55.	TTUtility2	269	4	4.260	0.868	-1.601	3.310	-10.781	11.182
V56.	TTUtility3	269	4	4.219	0.864	-1.209	1.572	-8.142	5.312
V57.	TTUtility4	269	4	4.175	0.844	-1.204	1.832	-8.109	6.191
V58.	TTUtility5	269	4	4.082	0.797	-0.683	0.630	-4.596	2.127
V59.	TTPerception1	269	4	3.817	0.902	-0.491	0.246	-3.303	0.831
V60.	TTPerception2	269	4	3.892	1.007	-0.643	-0.006	-4.328	-0.020
V61.	TTPerception3	269	4	3.963	0.957	-0.593	-0.167	-3.992	-0.563
V62.	TTPerception4	269	4	3.768	0.909	-0.211	-0.264	-1.423	-0.893
V63.	TTComm1	269	4	2.295	1.025	0.345	-0.412	2.325	-1.390
V64.	TTComm2	269	4	2.086	0.968	0.549	-0.248	3.698	-0.836
V65.	TTComm3	269	4	2.434	1.068	0.302	-0.468	2.033	-1.580
V66.	TTMultimedia1	269	4	1.8401	0.9186	0.9339	0.4247	6.2878	1.4348
V67.	TTMultimedia2	269	4	1.910	0.910	0.838	0.360	5.639	1.215
V68.	TTMultimedia3	269	4	1.794	0.889	1.029	0.654	6.929	2.211
V69.	TTProductivity1	269	4	2.019	0.971	0.725	-0.004	4.881	-0.012
V70.	TTProductivity2	269	4	2.127	0.992	0.642	-0.096	4.324	-0.323
V71.	TTProductivity3	269	4	1.887	0.951	0.857	0.002	5.773	0.007
V72.	TTStudentview 1	269	4	2.330	1.107	0.662	-0.031	4.460	-0.106
V73.	TTStudentview 2	269	4	2.442	1.068	0.467	-0.158	3.144	-0.533
V74.	TTStudentview 3	269	4	2.195	1.109	0.714	-0.126	4.806	-0.426
V75.	CLESCult1	269	3	1.622	0.735	1.020	0.578	6.869	1.952
V76.	CLESCult2	269	3	1.592	0.734	1.046	0.444	7.041	1.499
V77.	CLESCult3	269	4	1.865	0.849	0.818	0.469	5.506	1.585
V78.	CLESCult4	269	4	1.652	0.755	1.153	1.786	7.761	6.033
V79.	CLESUncert1	269	3	1.615	0.693	0.968	0.733	6.520	2.477
V80.	CLESUncert2	269	4	1.568	0.714	1.304	2.097	8.778	7.084
V81.	CLESUncert3	269	4	1.751	0.880	1.143	0.962	7.694	3.250
V82.	CLESUncert4	269	3	1.663	0.751	0.816	-0.216	5.496	-0.728
V83.	CLESCrit1	269	3	1.562	0.716	1.256	1.433	8.458	4.840
V84.	CLESCrit2	269	3	1.623	0.739	0.912	0.006	6.141	0.021
V85.	CLESCrit3	269	3	1.615	0.779	1.089	0.428	7.330	1.445
V86.	CLESShare1	269	4	2.739	0.954	0.025	-0.270	0.168	-0.912

	Item Name	N	Range	Mean	SD	Skew	Kurtosis	zSkew	zKurtosis
V87.	CLESShare2	269	4	2.371	0.966	0.496	-0.011	3.337	-0.036
V88.	CLESShare3	269	4	2.743	0.896	-0.001	-0.111	-0.006	-0.376
V89.	CLESShare4	269	4	2.388	0.961	0.322	-0.405	2.167	-1.370
V90.	CLESNeg1	269	3	1.576	0.701	1.003	0.462	6.753	1.561
V91.	CLESNeg2	269	2	1.394	0.574	1.139	0.314	7.670	1.061
V92.	CLESNeg3	269	3	1.613	0.814	1.237	0.846	8.327	2.857
V93.	TMBRControl1	269	4	3.120	1.062	-0.017	-0.673	-0.116	-2.275
V94.	TMBRControl2	269	4	3.352	1.211	-0.463	-0.702	-3.117	-2.371
V95.	TMBRControl3	269	4	2.177	0.975	0.757	0.461	5.096	1.557
V96.	TMBRControl4	269	4	2.708	1.230	0.101	-1.030	0.678	-3.479
V97.	TMBRControl5	269	4	2.658	1.036	0.220	-0.500	1.480	-1.688
V98.	TMBRControl6	269	4	2.744	1.009	0.115	-0.430	0.778	-1.452
V99.	TMBRPlan1	269	4	1.806	0.824	1.182	1.927	7.959	6.511
V100.	TMBRPlan2	269	4	1.951	1.120	1.043	0.251	7.020	0.846
V101.	TMBRPlan3	269	4	1.604	0.892	1.699	2.771	11.440	9.361
V102.	TMBRPlan4	269	4	2.410	1.225	0.585	-0.580	3.937	-1.960
V103.	TMBRVariety1	269	4	1.612	0.762	1.349	2.079	9.085	7.023
V104.	TMBRVariety2	269	4	1.690	0.813	1.088	0.867	7.323	2.928
V105.	TMBRVariety3	269	4	2.429	1.168	0.696	-0.280	4.687	-0.946
V106.	TMBRVariety4	269	4	2.254	1.101	0.717	-0.182	4.828	-0.616
V107.	TMBRVariety5	269	4	3.396	1.427	-0.365	-1.280	-2.459	-4.326
V108.	TMBRVariety6	269	4	2.635	1.132	0.414	-0.701	2.786	-2.367
V109.	TMBRVariety7	269	4	2.479	1.094	0.268	-0.638	1.807	-2.157
V110.	TMBRTool1	269	4	1.792	0.832	0.958	0.647	6.453	2.184
V111.	TMBRTool2	269	4	2.185	1.133	0.808	-0.080	5.441	-0.270
V112.	TMBRTool3	269	4	2.092	1.047	0.794	-0.063	5.347	-0.214
V113.	TMBRTool4	269	4	1.992	0.877	0.885	0.808	5.960	2.729
V114.	TMBRTool5	269	4	1.906	0.891	1.081	1.282	7.276	4.331
V115.	TMBRTool6	269	4	2.749	1.215	0.306	-0.952	2.060	-3.216
V116.	TMBRInteract1	269	4	3.428	1.238	-0.315	-0.955	-2.122	-3.227
V117.	TMBRInteract2	269	4	2.861	1.143	0.110	-0.959	0.742	-3.240
V118.	TMBRInteract3	269	4	2.687	0.994	0.276	-0.431	1.857	-1.458
V119.	TMBRInteract4	269	4	2.102	0.860	0.581	0.179	3.912	0.605
V120.	TMBRInteract5	269	4	2.748	1.055	0.155	-0.526	1.047	-1.777
V121.	TMBRInteract6	269	4	2.372	0.966	0.517	0.108	3.480	0.366
V122.	TMBRSkill1	269	4	3.000	1.293	-0.136	-1.259	-0.913	-4.253
V123.	TMBRSkill2	269	4	1.758	1.021	1.390	1.183	9.356	3.999
V124.	TMBRSkill3	269	4	1.454	0.760	1.959	4.267	13.189	14.417

*Mins taken values were truncated to 43 mins as times beyond this suggested the computer had been turned off

Shaded Standardised z Skew & z Kurtosis values fall in the benchmark range of ± 2 indicating approximate normality (Albers, 2017)

Appendix M: Original proposal for a Microblending Charter

PROPOSAL FOR A MICROBLENDING 'CHARTER'

These broad principles for a classroom-based micro-blending approach to the curriculum are suggested as guidelines to inform practice for stakeholders in classroom use of ICT in TESOL.

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For teachers

1. The use of in class ICT can enhance language learning.
2. The teacher is responsible for the blend of how ICT is used in the classroom.
3. Knowing the pedagogic role of ICT in the classroom and how to use ICT tools is part of a teacher's job.
4. Students and teachers both have a role in selecting ICT tools to use
   or Selecting ICT tools and strategies in a task can be negotiated with students.
5. ICT does not have to be TESOL specific but should be used with a learning goal in mind.
6. The role and value of ICT tools changes from group to group, lesson to lesson and task to task.
7. In a language classroom the role of interaction between students afforded by any ICT is critical.

For institutions

1. The teacher needs to be able to select what tools are used when in planning classes.
2. ICT should be available on-demand in the lesson
3. Students should be able to use their own devices in the classroom

For materials designers

1. Classroom ICT should be designed with some measure of teacher control in mind.
2. ICT should be designed with student to student classroom interaction in mind.
3. ICT can be designed for a specific task or purpose with the flexibility for classroom re-use.
4. ICT can be designed that supports but does not overwhelm the lesson.

Feedback and adaptations are welcome, please attribute to david.bish@ef.com