ICT IN EDUCATION:
EFL teacher trainees' views of the affordances of ICT use in education and the need for ICT training in teacher education programmes in Finnish universities

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Tiivistelmä – Abstract

Tieto- ja viestintäteknologia (TVT) on tärkeä osa ihmisten jokapäiväistä elämää ja toimintoja. TVT:n yleistyminen yhteiskunnan jokaisella osa-alueella alleviivaa myös uusien digitaalisten kompetenssien tärkeyttä kaikissa ikäluokissa. Aikaisemmassa tutkimuksessa on keskitytty mm. opettajien ja oppilaiden taitoihin ja tapoihin hyödyntää TVT:aa opetuksessa ja oppimisessa, mutta vastaavia kysymyksiä opettajaopiskelijoiden näkökulmasta on esitetty häviävän vähän. On tärkeää huomioida, että kuten kriittisen ajattelun taidot, myös TVT:n laaja-alainen osaaminen on pitkän aikajakson kuluessa kehittyvä taito. Jotta tulevan opettajasukupolven TVT-taitoja voitaisiin tutkia ja selvittää oleellisia taustakysymyksiä tulevien opettajien asenteista ja näkemyksistä TVT:n opetuskäytöstä, on perusteltua kohdistaa tutkimusta myös opettajaopiskelijoihin ja opettajakoulutukseen.

Tämän tutkimuksen tavoitteena oli selvittää suomalaisten englannin kielen opettajaopiskelijoiden näkemyksiä sekä TVT:n opetuskäytön hyödyistä ja haitoista että TVT-koulutuksen tarpeesta ja mahdollisista sisällöistä opettajakoulutuksessa. Taustakirjallisuuteen ja suomalaisessa koulutusjärjestelmässä vallitsevaan sosiaalis-konstruktivistiseen oppimiskäsitykseen pohjautuen luotiin Internet-pohjainen kyselylomake, jolla kerättiin määrällistä ja laadullista aineistoa suljetuilla monivalintakysymyksillä ja avoimilla kysymyksillä. Määrällinen aineisto analysoitiin tilastollisin menetelmin käyttäen Fisherin tarkkaa chi-square testiä, ja laadullinen aineisto taustakirjallisuuteen ja luokitteluun tukeutuvalla, tulkitsevalla sisältöanalyysillä. Tulosten mukaan opettajaopiskelijat suhtautuvat pääosin positiivisesti TVT:n vaikutuksiin oppimiseen ja opettamiseen. Oppilaiden olemassa olevien TVT-taitojen suhteen oltiin kuitenkin varsin kriittisiä, mikä korostaa opettajaopiskelijoiden yleistä näkemystä siitä että oppilaille pitäisi opettaa TVT-taitoja koulussa, erityisesti jotta se mahdollistaisi TVT:n käytön englannin kielen opiskelussa. Tärkeimpinä teknisinä ja pedagogisina hyötyinä pidettiin resurssien, kuten oppimateriaalin, saatavuutta; hyötyjä kognitiivisten taitojen kehittymiselle; sekä TVT:n mahdollistamia motivaatiota parantavia opetustapoja. Teknisinä ja pedagogisina haasteina mainittiin niin ikään kognitiivisia tekijöitä, kuten keskittymisen herpaantuminen ja puutteelliset TVT-taidot; myös teknologian saatavuudessa ja käytössä vaikutti olevan selkeitä teknisiä ongelmakohtia. Opettajaopiskelijoiden näkemysten mukaan TVT-koulutus opettajakoulutuksessa ei ole riittävää siitä huolimatta, että opiskelijat arvioivat omat TVT-taitonsa varsin hyviksi. Suurin osa vastaajista ilmaisi haluavansa sekä teknistä että pedagogista (lisä)koulutusta TVT:n opetuskäytössä.

Tutkimuksen tulokset osoittavat, että TVT:n opetuskäytön koulutusta erityisesti pedagogiikan kannalta olisi hyödyllistä lisätä osaksi opettajaopintoja, jotta tulevat opettajat saisivat itsevarmuutta ja toiminnallisia taitoja TVT:n käyttöön opetuksessa.

Asiasanat – Keywords ICT, EFL, teacher training, language learning and teaching
Säilytyspaikka – Depository Kielten laitos
Muita tietoja – Additional information

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

FIGURES

TABLES

1 INTRODUCTION

The use of information and communications technology (hereafter abbreviated as ICT) in education seems to be regarded as having a wide variety of benefits (Kenning 2007: 132). The benefits of ICT use to learning have been categorised into three relatively broad areas: cognitive gains, motivational gains and interactional gains (Davies 2007: 60–62). Despite recognised gains to the learning process and learning outcomes, teachers have not been very eager to take advantage of ICT, especially in language teaching. Surveys and research (Ilomäki 2008; Ilomäki and Lakkala 2006; Sasseville 2004) have shown that this is likely due to teachers' attitudes towards ICT, feelings in insecurity in using ICT, lack of resources and most often, inadequate training and skills in using ICT in their teaching. For example, Sasseville (2004) argues that teachers are not averse to integrating ICT into teaching, but are more concerned about the practical issues mentioned above. Previously, in-service training programmes have been developed and used in order to remedy the situation. Thus far, these programmes have been ineffective in changing traditional classroom practice or improving teachers' use of ICT in their teaching for the benefit of their pupils. As of yet, other options in improving teachers' ability to integrate ICT use into their teaching have scarcely been considered, much less publicly discussed in Finland. There is a noticeable gap in how teachers should use ICT in the classroom in general, and even more so, in the case of training prospective teachers in the use and integration of ICT in EFL teaching. Furthermore, there is a remarkable shortage of information on the relationship between general educational policy (and in specific, language policy) presented in official documents and the realisation of national goals 'in the field' concerning the use and integration of ICT and expected ICT proficiencies of graduating pupils, or indeed, teacher trainees. Results from national and international surveys remain rather tentative since it is nearly impossible to measure learners' ICT skills consistently across different institutions and curricula. By extension, results of the contribution of different practices and institutional and educational policies to learners' ICT ability are just as likely to be uninformative.

Despite extensive research into ICT in education during the past 30 or 40 years, we know surprisingly little about ICTs' impact on learning and teaching English as a

second or foreign language. This is a result of several issues, but perhaps most notably because ICT has not been taken very seriously inside a subject that is traditionally viewed in terms of literary practice. However, awareness of both the issues and the benefits of educational technology use seems to be increasing, and researching teachers' and pupils' use of ICT in language learning and teaching has in recent years become even somewhat popular. Despite newfound interest in educational uses of ICT, there is a glaring gap in information concerning Finnish EFL teacher trainees, i.e. future teachers of English, and their views and attitudes concerning ICT. We cannot ignore what teacher trainees think about matters relating to ICT in education: teacher training forms the basis on which future teachers will build their beliefs and practices.

This thesis aims to provide a clearer picture of these issues by focusing on teacher trainee students of EFL, specifically on their views on ICT use and integration in EFL teaching. This issue was inspected through three research questions, the first of which addresses the main aim of the present study, i.e. teacher trainees' views on the benefits and disadvantages of ICT use in education. The second question focuses on teacher trainees' views on ICT training during their studies, since the provision or lack of ICT training may have important implications to teacher trainees' views on educational ICT use. Finally, the third question asks whether teacher trainees' views differ according to background variables, and if, what are the variables that may have an influence? It is important to pay attention to, and try to understand and explain, the influence of these variables so that they may be better taken into account, for example, in teacher training. Concerning educational policy, in terms of ICT it would also be essential to examine the current state of national curricula in primary and secondary education, and perhaps to an even greater extent, the situation in teacher training programmes in major universities in Finland. Educational change has been noted to be slow, even somewhat notoriously so, and highly contingent on progress at the 'top', in educational policies, as well as at the 'bottom', among practising teachers, teacher educators and teacher trainees. Further, in the 'middle', municipalities and institutions with their own intricate web of agendas, policies and economic realities have a profound impact as well. It is then worth inspecting how ICT is represented both in policy and practice, since lasting change can only be achieved when it is agreed to and developed in all levels from government to institutions to teachers. Unfortunately, due to limitations of time, it was not possible to include educational policy issues in the current thesis. The present study employed a web-based questionnaire consisting of both closed and open-ended questions for data

collection. While the obtained sample was rather small (N = 47), this thesis is, nevertheless, of interest to teachers, teacher educators, teacher trainees as well as institutions (such as universities) for a number of reasons: it reviews relevant information concerning the affordances and influence of ICT on learning and teaching, offers insight into teacher trainees' views on educational use of ICT (and possible factors influencing those), and reveals important areas for improvement in teacher training with respect to ICT.

The literature is abundant with different terms and concepts concerning ICT. The most central term with regard to this thesis, ICT, is presented here for the sake of convenience and to prevent any confusion arising from its varied uses in the literature. Information and communications technology (ICT), in the modern sense, is broadly defined to mean any and all technology relating to the creation, transmission, consumption and modification of (in general, digitally encoded) information. Some authors (see for example, Kenning (2007)) go even further and include technology or machinery that is currently considered rather obsolete, such as the printing press or the telegraph, in the definition. The definition of ICT in this thesis is much narrower: I have limited the use of ICT primarily to tools and devices that are, from a hardware perspective, modern computers, and devices that extend the capabilities of a computer. These include devices such as 'traditional' computers, laptops, modern mobile phones (also referred to as smartphones), tablet computers, virtual whiteboards (such as SMART Board and Prometheus, see Chapter 3) and presentation interfaces (for example, document cameras). Both physical networks like the Internet and virtual networks (social media, learning environments) and additional computer software are also included in the definition, as they are considered an extension as well as an integral part of computer hardware use. The affordances of modern computers as multimodal, interactive platforms make them vastly more efficient and versatile tools for learning and instruction than previous technologies that were, generally, designed to perform a single, specific task and could not be applied to other uses.

Chapters two and three form the theoretical background for this study. Chapter two, 'ICT and learning', concentrates primarily on primary and secondary level school students (ranging from 7 to 18 years of age in Finland) from a learning perspective: ways in which ICT can be of benefit or a disadvantage to pupils' learning processes and learning outcomes. Essentially, the second chapter highlights the cognitive, affective

and social aspects of ICT in education. The third chapter, 'ICT and teaching', focuses on teachers: benefits and disadvantages of ICT to teachers and to EFL teaching. Rather obviously, the affordances of ICT use are not restricted only to learners, but also affect teachers and teaching. Therefore, it is necessary to provide background information concerning teachers and teaching with respect to ICT in order to evaluate teacher trainees' attitudes and perceptions of ICT in education. Chapter three will thus continue to emphasize the cognitive, affective and social aspects of ICT in education from a practical, classroom-oriented point of view. In addition, as the technical advantages and issues relate strongly to teaching, much of the terminological and technical discussion will be included in Chapter three. Chapter four introduces the set-up of the study: research questions and methods of data collection and analysis. Chapter five presents the analysis and its results, while Chapter six is reserved for discussion of the results. Finally, Chapter seven concludes this thesis by presenting the conclusions, merits and shortcomings, and implications of the study, as well as areas for further research.

2 ICT AND EFL LEARNING

This chapter deals with some central affordances of ICT use in learning English in Finnish primary and secondary level schools. This examination will deliberately focus on the learner and his/her processes of learning in order to highlight aspects of ICT that are potentially beneficial to learning English, in addition to some key concerns about using ICT in teaching. It is necessary to inspect both the benefits and the disadvantages of ICT concerning the learning of the English language: without this information, we cannot hope to design learning experiences that are relevant and contributory to learning. This information is of particular importance to the focus group of the present study, namely teacher trainees of English, who are consciously evaluating and formulating their personal theories of learning and their attitudes towards teaching and learning. As Ilomäki and Lakkala (2006: 192) point out, teachers' understandings of knowledge and learning are directly reflected in their pedagogical practices as well as their application of ICT to their teaching. This principle naturally applies to teacher trainees as well.

The apparent 'failure' of computers and ICT in general in enhancing learning outcomes (a conclusion drawn with increasing frequency from standardized test performance,

such as the PISA tests; see, for example, Biagi and Loi 2013) has, in recent years, given rise to quite the spate of critiques of ICT, schools, schools and educational policy, the technology industry as well as the proponents of ICT in education (see, for example, Selwyn 2011). While there is a need for critical reflection on both past and current practice, the critiques levelled against educational uses of ICT far too often make the implicit assumption that in order to make use of ICT, it needs to somehow surpass traditional practice in producing results in areas that are still evaluated based on performance with those traditional methods and materials. The ways in which we produce, present and consume information have changed substantially, largely because the Internet and devices capable of connecting to it are now globally available. Since computers and the Internet are not inherently 'novice-friendly' (although more and more attention has been given to user-friendly systems in recent years), it seems we need to educate not only the pupils, but the teachers as well, on the productive and meaningful ways of using ICT in conjunction with whatever subject they are learning or teaching.

While teacher training programmes in Finnish universities include general pedagogy as part of the basic pedagogical studies, the inclusion of ICT in the classroom brings about new kinds of challenges for teachers – challenges that general pedagogy or EFL didactics are ill-prepared to meet. Discussions of these challenges tend to gravitate towards questions of the *affordances* of ICT in education. The term 'affordance' was originally coined by James Gibson to describe properties of an object or environment that enable an action (McGrenere and Ho 2000:1–2). Subsequent definitions of the concept of affordance have been developed through other, highly abstract notions, which is perhaps not the best approach considering the rather practical nature of issues presented here. Therefore, the present thesis adopts the definition presented by Conole and Dyke (2004: 115), namely that the concept of affordance is used in a sense that includes both the positive and the negative aspects, that is the benefits and the disadvantages, of ICT use in learning and teaching English.

Before going into the specific affordances of ICT use, it must be clearly noted that ICT in itself does not present a benefit or a hindrance to learning or teaching English: how ICT is used determines whether it has a positive or a negative effect (Davies 2002: 2; Zhao 2003: 2; Kern 2006: 7–8). However, as our understandings of learning, teaching and the issues therein have evolved, so have the designs of computer software,

especially those that are specifically tailored for educational purposes. It is increasingly common to incorporate theories of learning and cognition into the design of not only educational software, but also into that of purely commercial software, such as games. Indeed, even the user interfaces of commonly available operating systems for home computers, tablets, mobile phones and so on, are modelled based on principles derived from modern psychology and cognitive science. Clearly, the design of the software (or hardware, as in the case of interactive whiteboards) should also be considered when evaluating the affordances of ICT use in learning and teaching English.

2.1 Affordances of ICT use to learning English

The impact of ICT use on academic achievement or learning in general is a difficult area for research. We do not yet understand all the factors affecting language learning, and as a comparatively new phenomenon ICT complicates things further. For instance, Biagi and Loi identify no less than 21 distinct factors that affect learners' ICT use (Biagi and Loi 2013: 29). It is no wonder then that no consensus has yet been reached about what kind of an impact ICTs may have on learning. In fact, the results gained so far have been remarkably at odds with each other: some have come to the conclusion that ICT has an averse influence on learning, others praise even the slightest hint of positive effect. Yet, most scholars would agree that we simply do not have enough information to judge one way or the other – in all fairness, the evidence that we currently possess is inconclusive, and at best, only applicable to specific contexts and circumstances. Nevertheless, some interesting, albeit limited, observations of potential benefits of ICT to EFL learning have been made.

Main benefits to using ICT over traditional instruction appear to be in ICTs' opportunities concerning learner interest, motivation and autonomy, and facilitating the development of learners' cognitive abilities. Additionally, ICT has been remarked to have quite unique capabilities for interaction and communication and interactive applications and simulations of real-world phenomena with immediate responses and feedback (Smeets 2005: 344–345, Davies 2007: 65–66; Livingstone 2012: 16, 19–20). Davies (2007) inspects the benefits of ICT in the context of learning English as a second language. In contrast, Järvelä, Häkkinen and Lehtinen (2006) discuss ICTs' benefits to learning in general. Nevertheless, similarities in their respective descriptions

abound. Davies (2007: 60–62) identifies three major benefits of ICT to learning English: cognitive gain, motivational gain and interactional gain. Järvelä et al. (2006: 11) correspondingly link the benefits of ICT mainly to supporting learning in three areas: immediate support for understanding complex concepts, developing cognitive skills and as a stimulating factor. The cognitive and motivational aspects in the accounts of Davies (2007) and Järvelä et al. (2006) are essentially similar. For example, immediate support and feedback (through illustrations and simulations) and support for developing cognitive skills, like problem-solving skills, concern both motivational and cognitive gains; ICT as a stimulating factor involves, at least to some degree, all aspects mentioned by Davies (2007).

In the next section, I will explore the concept of cognition briefly in general, and then more systematically in relation to ICT and the possibilities and limitations of ICT to the development and improvement of cognitive skills and abilities. This thesis adopts a broadly social-constructivist view on learning. This approach emphasises the learners' cognition and motivations as well as social, interactive aspects of the learning process as the major factors involved in learning, or knowledge construction and restructuring. Each subsection will therefore start with a brief introduction to the respective concept concerning learning in general. The general principles will then be linked and applied to the EFL context, where ICTs' benefits to EFL learning will be further elaborated. I will start with a central, yet much debated, concept: cognition. Following sections will deal with the issues of motivation and interaction, or social aspects of learning.

2.2 Cognition

The term cognition is used in psychology to describe "the acquisition, storage, transformation and use of knowledge" (Matlin 2002: 2). Quite a few mental processes are a part of cognition: "perception, memory, imagery, language, problem solving, reasoning and decision making" (ibid.). Current understandings of learning, mainly, social constructive theories of learning, are largely based on cognitive science and emphasize the active role of learners as constructors or builders of new, shared knowledge. New knowledge is constructed by learners through a process of conceptual change, where the existing information structures, or schemas, are transformed and modified according to new, more accurate information and insights gained by

interacting with the environment (Merenluoto 2006: 19; Iiskala and Hurme 2006: 50). It is thought that the conceptual change process is triggered primarily by a conflict between two competing conceptions: the contradiction between two (or more) different understandings leads to a rejection of old knowledge and adoption of the new schema, or rejection of the new knowledge and retention of the old one (Merenluoto 2006: 20–21, 24–25). However, influencing conceptual change can be very difficult: learners' misconceptions may be very resilient, the learner may not possess the required background knowledge to advance further (that is, insufficient knowledge of the core concepts related to a new problem or phenomenon), it may be a result of a lack of motivation towards the subject, and so on (Merenluoto 2006: 19–22, 26–30). Additionally, the conceptual change may not be persistent or complete: the learner may return to the previous model of thinking after a period of time or the new schemata may not replace the old ones, instead becoming alternative conceptualizations to be used in a different context (Merenluoto 2006: 24–25). In this way, conceptual change involves active mental processes, usually categorised under the term *metacognition*, which enable the learner to think about his/her own thinking. However, conceptual change and learning in general involve other parts of cognition as well, in particular, memory and attention. In the next sections, I will explore these concepts in more detail, starting with metacognition.

2.2.1 Metacognition

In psychology, the term *metacognition* refers to being aware of one's own mental (thought) processes (Oxford Dictionaries Online 2013), of being able to understand and evaluate them. Simply put, it is 'thinking about thinking', and controlling one's thought processes independently (Iiskala and Hurme 2006: 40). It is a subtype of cognition: cognitive skills, such as reading and writing, and cognitive processes, such as memory related processes, belong to the *object-level*, whereas the *meta-level* metacognitive skills and processes evaluate and control object-level operations. Metacognition can be further divided into *metacognitive skills* and *metacognitive knowledge* (see Fig. 1 below).

Metacognitively advanced students, that is learners with good metacognitive skills and knowledge, have been noted to be more efficient and to perform better than those learners whose metacognitive abilities are less advanced (Iiskala and Hurme 2006: 40). High achievers are typically more conscious of their thinking processes, which enables

them to monitor and control their thinking, and thus, learning, to a greater extent than low achievers (Iiskala and Hurme: 41).

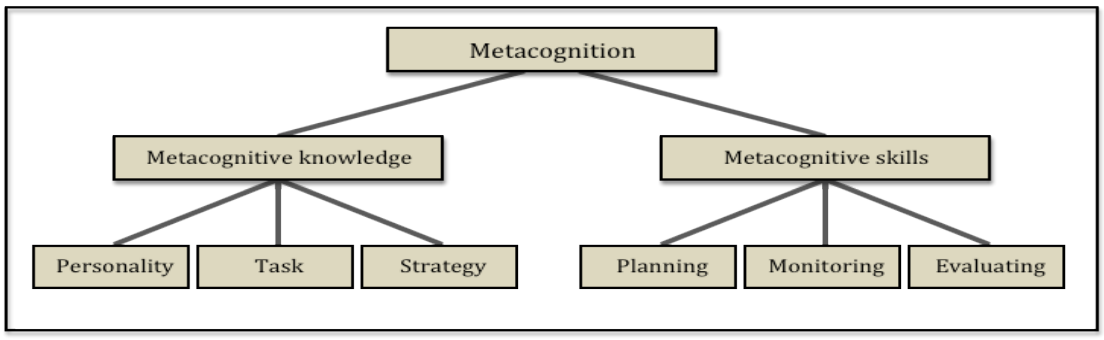


Figure 2.1. Elements of metacognition. Adapted from Iiskala and Hurme (2006: 41).

Metacognitive knowledge consists of three elements: Personality, Task and Strategy (Iiskala and Hurme 2006: 41–42). Flavell, Miller and Miller (2002: 164, 175–176, 262–263) distinguish between sub-categories of metacognitive knowledge in a similar manner, albeit with slightly different terms and definitions: they use the terms *persons*, *tasks* and *strategies*. Table 2.1 below gives a brief overview of how the respective definitions differ from each other.

Iiskala and Hurme and Flavell et al. define the subcategory *Personality/Persons* in largely similar terms: it refers to a person's knowledge of their cognitive qualities and processes. There is, however, a notable difference in that Flavell et al. (2002: 164–165, 175–176) consider it as relating not only to one's own cognitive processes, but also to other persons' cognitive facilities. Definitions concerning the area of *Task* or *Tasks* and *Strategy/Strategies* run in parallel with no discernible differences. *Task/Tasks* relate to two further subtypes of metacognitive knowledge: knowledge of the nature of information required by the task and knowledge of the nature of the task and its cognitive demands. Knowledge of the nature of information the task requires concerns issues such as whether the information is easy or difficult to obtain, how complex and reliable the information is, how long will it take to comprehend and memorize the information, and so on (Flavell et al. 2002: 165). Knowledge of the nature of task demands includes conceptions of how taxing the task is cognitively: how much conscious attention and effort is required to complete the task – if the task is easy or difficult (Flavell et al. 2002: 165, 175). The last category, *Strategy/Strategies,* concerns

knowledge of how to proceed with a given task: what kinds of 'methods' or strategies will be needed during the task.

Table 2.1. Definitions of areas of metacognitive knowledge.

Authors	Term	Definition
Iiskala and Hurme (2006: 42)	Personality	Knowledge of one's own thoughts, strength, weaknesses, attitudes, motivation, mood
Flavell et al. (2002: 164–165)	Persons	Knowledge and beliefs of general qualities of human cognition; similarities and differences between individuals' cognitive facilities and skills
Iiskala and Hurme (2006: 41)	Task	Knowledge and conceptions of the task and the nature of the information relating to the task.
Flavell et al. (2002: 165)	Tasks	Knowledge of the nature of the information relating to the task; knowledge of the nature of task goals, requirements and difficulty
Iiskala and Hurme (2006)	Strategy	Knowledge of how to proceed with the task at hand.
Flavell et al. (2002: 165)	Strategies	Knowledge of the strategies needed, and their potential usefulness, to accomplish cognitive objectives

Metacognitive skills have been defined or described in a number of ways. The definition given by Iiskala and Hurme (2006: 41, 44–47) is a three-fold categorisation: metacognitive skills comprise of the processes of *Planning*, *Monitoring* and *Evaluating* (see Fig. 1 above). Flavell et al. (2002: 170–171) consider metacognitive skills in rather broader terms: metacognitive skills are triggered by metacognitive knowledge and consist of processes known as *metacognitive monitoring, self-regulation* and *executive functions*. Executive functions are further divided into several sub-processes: *planning*, *information retention, response regulation* and *schematic malleability* (Flavell et al. 2002: 170). Table 2.2 below exemplifies how these definitions relate.

Table 2.2. Comparison of metacognitive skills.

Iiskala and Hurme 2006	Flavell et al. 2002
Planning	Executive functions: planning
Monitoring	Metacognitive monitoring
Evaluating	Self-regulation

Iiskala and Hurme (2006: 45–46) define the metacognitive skills mentioned above in a way that emphasises their role in performing tasks. They consider *planning* a skill that involves consideration of the task in general, as well as its specific aspects, such as requirements of the task and strategies needed to fulfil those; evaluating task outcomes and effectiveness of strategies; or planning a timeline and/or courses of action for the

task. They go on to explain *monitoring* as a process of continuous assessment of actions, strategy use and task progress, involving corrections and modifications to operations and strategies when current actions and/or strategies are perceived to be ineffective. Finally, they view *evaluating* as an assessment of specific actions regarding the goals of the task and task completion: whether a proposed action is suitable and successful to advance a step further in performing the task, and whether it corresponds to perceived task goals.

Despite the categorisations mentioned above, metacognitive knowledge and metacognitive skills are not completely separate systems; they are partly overlapping, interlacing and interacting processes that work in parallel (Iiskala and Hurme 2006: 41). Effective intentional and attentive learning, or deep learning, is dependent on fluent interactions between the different components of cognition, especially those of metacognition and memory. The next section focuses on the basic structure of memory and how it works.

2.2.2 Memory

Memory consists of two types of 'storage': long-term memory, which is thought to be limitless in capacity, and working memory, which is very limited (Ortega 2009: 87–91). Working memory can only retain information consisting of three or four 'chunks' for short lengths of time measuring up to half a minute, or 30 seconds (Benyon, Turner and Turner 2005: 104). In order to keep the information in working memory, the information, or memory content, needs to be continually refreshed using different strategies for each of the two modalities that the working memory supports: for verbal information, through the articulatory loop (repeating words, numbers, letters mentally or out loud) and for visual information, through mental and physical actions, such as revisualization, verbal augmentations or looking at the original picture again (Benyon et al. 2005: 104–105). In addition to the verbal and visual storage functions, and the rehearsal (or refreshing) routines, working memory 'houses' several processes: the central executive, automatic and controlled processing facilities, as well as routines for the retrieval and encoding of information (Ortega 2009: 83–84, 90; Benyon et al. 2005: 354–358). Ortega (2009: 83–84) describes automatic processing as almost effortless procedures that require very little in the way of cognitive resources. Therefore several automatic processes can work, as she puts it, in parallel. She contrasts automatic

processing with controlled processing, which takes over when input is unfamiliar, or when automatic processing is disrupted: controlled processing requires attention and conscious effort, and consequently, only one such request can be processed at a time.

In contrast to working memory, long-term memory is limitless (Ortega 2009: 87). It does not contain or 'house' memory-related or cognitive processes *per se*: instead, long-term memory acts as a more or less passive storage. Knowledge or information is passed to long-term memory through rehearsal and conscious processing in working memory (Gazzaniga, Ivry and Mangun 2002: 309–312). Long-term memory is thought to comprise of several types of memory: the most notable types being *explicit-declarative* and *implicit-procedural* memory (Ortega 2009: 87). Declarative memory consists of knowledge of facts and events that the subject has conscious access to, and can recount verbally, whereas procedural memory comprises knowledge that is not accessible consciously, such as habits and skills (Ortega 2009: 84, 87). Additionally, memory systems known as *semantic memory* and *episodic memory,* respectively corresponding to factual knowledge and personal experiential knowledge of past and possible future events, have been proposed (Ortega 2009: 87–88). Semantic and episodic memory, however, are of less concern to the current thesis than the more established declarative-procedural distinction, and will not be considered further in the scope of this writing.

Another concept of special interest in language learning, in terms of memory, is the process of *automatization* or *proceduralization*. Ortega (2009: 84–85) describes this process as a gradual transformation of declarative knowledge into procedural knowledge through repeated practice. Segalowitz (2003: 395) further elaborates that in the proceduralization process, initial production rules, that is mental directives that govern how cognitive processes interact with the declarative knowledge 'at hand', slowly become atomic relationships through repeated processing. Further exposure to situations that require the use of automatized knowledge or skills no longer require conscious or controlled processing since there is a 'direct link' to the required knowledge. Consequently, cognitive load is reduced for those procedures where performance has become automatized. Conceivably, the process of proceduralization would require quite the amount of attention from an individual. This leads me to continue with the topic of *attention*.

2.2.3 Attention

Attention is fundamentally connected with memory, especially that of working memory. According to Ortega (2009: 93), attention is the part of cognition that enables input to be retained in working memory for longer periods of time in order for it to be processed and committed to long-term memory. Additionally, attention is limited, selective and voluntary, and it grants access to consciousness (Ortega 2009: 93–94). The limited and selective qualities of attention are rather simple concepts: attention is selective because attention is limited (ibid.). Because of the limits of attention we need to choose, or *select*, the foci of our attention. The third characteristic of attention, voluntariness, means that attention "can be subject to cognitive, top-down control that is driven by goals and intentions of the individual" (Ortega 2009: 94). This means that we are able to control the amount of attention we dedicate to a task, even to the point where that task consumes all of our attention and inhibits other cognitive processes, such as in an example, used by Flavell et al. (2002: 196), of a girl child who recounted being able to immerse herself in an activity so completely that she was not able to hear any sounds except those related to the activity. The fourth characteristic mentioned by Ortega (2009: 94), access to consciousness, is described by her as our ability to vocalize our thoughts or describe our mental process while we are performing a task. Naturally, interest and motivation toward a subject affects the amount of attention we dedicate to it, and moreover, how easily our attention on the subject is distracted. This probably has at least some degree of impact on actual learning outcomes: Ortega (2009: 94–95) remarks that while incidental L2 learning (learning as a by-product of doing something else; learning without intention of learning) is possible, purposefully attentive effort to learn results in better outcomes in less time. Consequently, we should also be aware of how interest and motivation may help us understand learners' variable levels of attention to learning goals. While motivation and the related concept of interest could be viewed as inseparable components of cognition, I will treat them rather as "factors and forces that activate or intensify human cognitive processing" (Flavell et al. 2002: 66), as something that 'fuels' cognitive processes. Therefore, interest and motivation will be dealt with in their own subsection. For now, I will continue with the affordances of ICT use in terms of what we now know about cognition and related concepts.

2.2.4 Affordances of ICT use to cognitive abilities

It has been noted that ICT can be used to facilitate and improve the conceptual change process, especially in topics and areas that are complex and cognitively demanding (Merenluoto 2006: 30). In addition to altering the ways in which we form and structure new knowledge in our minds, the use of ICT in teaching may have value in facilitating learners' metacognitive abilities in general (Järvelä et al. 2006: 16–17), which, when properly implemented, may lead to better learning strategies for pupils. One of the most long-standing arguments in the debate about ICTs' effects on learning concerns a phenomenon frequently dubbed 'information overload' or 'cognitive overload'. The central idea is that the amount of information that ICT exposes users to can lead to a worsening of their learning or mental processing. Next, I will inspect this argument through the theories of *information processing* and *cognitive load*.

2.2.4.1 Information processing and cognitive load

Current theories of language learning are largely rooted in theories of information processing. As the name suggests, these theories attempt to explain how the human brain processes information in the form of visual and auditory input. Additionally, cognitive psychology and neuroscience have been, and still are, essential fields of research that have informed both language learning and information processing theories for several decades now. Despite the large amount of information the aforementioned fields have produced about cognition and how the human brain functions, we are still far from reaching a definite model for language learning. Among others, one of the factors hindering the progress in this area is the difficulty inherent in observing cognitive phenomena. As we cannot directly observe the mental processes involved, investigations tend to focus on analysing task performance (Ortega 2009: 82–83). According to Ortega (2009: 83, 93–94), processing input data, whether visual or auditory, always involves some cognitive resources, mainly memory and attention – both of which are limited in capacity.

This limited capacity model resembles another theory known as *cognitive load,* however, these two models should not be confused. The limited capacity model is primarily concerned with the type of processing (automatic or controlled) as dependent on input characteristics and available attention. Cognitive load theory, however, states

that the prime constraint to processing (and thus, learning) is the limited capacity of working memory (Plass, Chun, Mayer and Leutner 2003: 225). As Plass et al. (2003:225) explain, the limitations of working memory are especially pertinent to the use of multimodal materials, where a process called *integration* frequently comes into play. Integration in this context refers to developing coherent mental representations of verbal and visual information and then forming links between those representations (Plass et al. 2003: 223, 225). This process involves retaining the required verbal and visual information in working memory long enough for integration to take place (ibid). Due to the limited capacity of working memory, processing the information and forming mental links between verbal and visual representations becomes increasingly difficult and time consuming the more information the recipient is presented with or required to internalize at a given time. Moreover, visual representations or annotations consume significantly more cognitive resources than verbal representations (Plass et al. 2003: 236–238). This 'processing overhead' is most probably a result of two main factors: first, ambiguity of reference associated with visual representations that requires the intervention of a selection process, and second, additional processing resulting from the conversion of the visual representation to a verbal representation (ibid.). Accordingly, Plass et al. (2003: 237) found in their study of 152 English-speaking college students attending a second-year German course that overall text comprehension was worse when only visual annotations were used than when either no annotations, verbal annotations or combined verbal and visual annotations were used. They found no significant interactions between the learners' verbal or spatial abilities and the type of annotations used (Plass et al. 2003: 235) in the text comprehension test. In terms of vocabulary learning, Plass et al. (2003: 236) found that learners' vocabulary acquisition was better when visual and verbal annotations were combined, as opposed to using only a single type of annotation or no annotations. According to their results (Plass et al. 2003: 231–234), low-verbal ability students performed worse than high-verbal ability students when visual and combined verbal-visual annotations were available, but at the same level when only verbal annotations were used. Furthermore, low-spatial ability students performed better than high-spatial ability students when either no annotations or combined verbal-visual annotations were present, but worse when either only verbal or only visual annotations were used. In contrast to the findings of Plass et al. (2003) concerning vocabulary learning, a more recent study by Hirschel and Fritz (2013: 647–650) found that students learned vocabulary better with the help of a CALL (Computer-

Assisted Language Learning) programme than with traditional vocabulary notebooks. The software they used utilised only text, which would represent verbal annotations in comparison to the study by Plass et al. Additionally, they found in delayed post-tests that the long-term effects, i.e. vocabulary retention, were also better when the computer software had been used, as opposed to vocabulary notebooks or no explicit vocabulary practice. However, it should be noted that the focus in the study by Plass et al. was not explicitly on vocabulary, but text comprehension. Therefore, these results may not be fully comparable. Plass et al. (2003: 240) conclude that using multiple representations does not always help learning and may, in fact, impede learning for low-ability students when they are subjected to a high cognitive load from the processing of visually presented information.

Despite these results, it should be remembered that learning with ICT, whether or not it relates to text comprehension or vocabulary in a foreign language, is not simply dependent on the multimodal aspects of the materials or teaching: for instance, learning strategies play an important role in successful learning as well.

2.2.4.2 Learning strategies

In a recent study, Ponce, Mayer and Lopez (2013) investigated the effectiveness of using visual-spatial organizing software to improve cognitive skills for reading and writing. The software and, by extension, teaching relied on using specific strategies by utilizing graphic organizers that were designed to activate learners' cognitive processes (Ponce et al. 2013: 820–822). The results of the post-test clearly indicated that students performed better in standardized reading-writing tests when they had utilized the computer software in lessons than those students who only received traditional instruction (Ponce et al. 2013: 833, 835). Nevertheless, Ponce at al. (2013: 835) think that this result was mainly due to the difference in teaching learning strategies to students rather than the tool used (computer vs. textbook). This conclusion does seem plausible, since the teaching of the relevant learning strategies were, to a large extent, embedded in the computer software – the use of learning strategies could be said to have been enforced by the instructional tool in the computer-based instruction group. Furthermore, it has been noted that ICT enables teachers to design tasks that facilitate the use of learning strategies: in the words of Salovaara (2006: 110, translated by the current author from the original):

> Using technology to support learning is predicated on the opportunities it provides to implement learning tasks, materials, environments and pedagogical models in which the learners are "forced" to process information and to use learning strategies.

In contrast, in traditional instruction the teacher's ability to 'control' pupils' use of certain strategies may be much more limited.

2.3 Motivation

In addition to the increasingly important and salient role of technology (especially ICTs) in society, the most often quoted reasons for using ICT in education are perhaps that it stimulates and motivates learners (Järvelä, Häkkinen and Lehtinen 2006: 61). It has been shown through empirical studies that there are positive effects to the learning process and learning outcomes from motivation energized by interest (Krapp 2002: 384): it is quite a natural conclusion that we find tasks and topics more appealing or pleasing to work with if we are interested in the activity or subject (Veermans and Tapola 2006: 69). These conclusions have been taken to have serious implications for teaching, materials and learning environments: in order to motivate pupils, teachers and designers of materials and learning environments need to take into account learners' personal goals, motives, values, attitudes and expectations (Krapp 2002: 388–391; Järvelä et al. 2006: 70), as well as the authenticity of materials and tasks, learner autonomy, interaction and cooperation and learners' individual needs and abilities (Smeets 2005: 344).

Before we justify using ICT with its capability to motivate learners, we need to clarify a few things. First, what is motivation? And second, how does motivation in general relate to using ICT in education? The first question is both very easy and very difficult to answer. It is easy to state, as Dörnyei (2001: 1) does, that motivation is "an abstract, hypothetical concept that we use to explain why people think and behave as they do". However, it is very difficult indeed to find out and explain what the constituents of motivation, and the factors affecting it, are. It is no wonder then that over half a century's worth of intense research on motivation has not yielded a theory universally recognised and accepted in its entirety. However, with regard to ICT in education, perhaps the most influential model for motivation is that of self-determination theory. I will inspect this motivational theory next.

2.3.1 Self-determination theory

The current understanding of motivation in education has been influenced to a major degree by the theory of motivation by Ryan and Deci. Their self-determination theory (SDT) categorizes motivation into two distinct types: intrinsic motivation and extrinsic motivation (Ryan and Deci: 2000a, 2000b). According to Ryan and Deci (2000a: 60; 2000b: 69), extrinsic motivation rises from external sources, such as peer pressure, rewards and expectations; intrinsic motivation is, however, generated by the individual's own interests and aspirations. The distinction between extrinsic and intrinsic motivation is very important as it is in direct relation to learning outcomes: high levels of intrinsic motivation result in more intensive and sustained motivation, interest and attention towards the task and topic, and thus better learning (Ryan and Deci 2000b: 69). However, promoting intrinsic motivation as suggested by self-determination theory requires three needs to be fulfilled in the process: autonomy, competence and relatedness (Ryan and Deci 2000b: 70–71, Brophy 2010: 7). These needs are explained in short as follows: autonomy in controlling what to do and how; competence in evolving and using skills to control one's surroundings; relatedness as the ability and possibility to engage in social events and relationships (Brophy 2010: 7).

As with any theory concerning such a complex issue as motivation, self-determination theory has some complications and limitations. Brophy (2010: 12, 202, 208–209) argues that intrinsic motivation does not necessarily promote actual learning as well as is generally imagined. He sees intrinsic motivation as a dominantly affect-driven experience that emphasises feelings of enjoyment and pleasure in the activity, but not the underlying goal or purpose of the activity. Another issue is that there are no reliable and definite means of verifying an activity's impact, or lack thereof, to pupils' intrinsic motivation. Furthermore, no exact methods exist to evaluate and distinguish between extrinsic and intrinsic motivation in on-going classroom situations: in-depth interviews do not suit regular classroom practice, and even when such data is available, it is difficult to make clear distinctions and conclusions about learners' motivation one way or the other. The implications for teachers are then that tasks aimed at facilitating learner autonomy and their intrinsic motivation should be designed carefully and well in advance. Ad hoc implementation could do more harm than good, similarly to haphazard employment of behavioural strategies (Landrum and Kauffman 2006: 47, 49–50).

Regardless of the practical issues in self-determination theory, it remains a well-founded and rich source for further investigation. Brophy's (2010) own theory, *motivation to learn*, draws rather heavily on the ideas presented by Ryan and Deci, despite the slightly different focus. Next, I will briefly examine Brophy's theory.

2.3.2 Motivation to learn

Brophy defines *motivation to learn* as "tendencies to find learning activities meaningful and worthwhile and to try to get the intended benefits from them" (Brophy 2010: 11). He further specifies two states of motivation to learn: general disposition and situation-specific. As a general disposition, motivation to learn is seen as a lasting tendency to be motivated in learning situations: individuals with high motivation to learn easily understand the goals and benefits (instrumental and/or cognitive values) of the learning experience regardless of their feelings of interest or enjoyment (or the lack thereof) toward the activity or its topic. The situation-specific state, however, is triggered when the individual experiences interest in that particular activity or understands the value of it (Brophy 2010: 11–12).

Brophy emphasises that motivation to learn is principally a cognitive experience (Brophy 2010: 208). Thus, it differs from both extrinsic and intrinsic motivation: motivation to learn activates learners to think about what, why and how they are learning and to value both the experience and the benefits. Essentially, *motivation to learn* takes students' metacognitive abilities into account. In contrast, intrinsic motivation emphasises personal pleasure in the activity or information, and extrinsic motivation emphasises avoidance of punishment, gaining rewards and performance values. All of these are related to learners' affective factors that they may not be completely aware of, and thus may not be able to express. According to Brophy (2010: 10–11), the factors related to, or resulting from, employing extrinsic and intrinsic motivational practices prevent students from focusing on developing their knowledge or skills in a way that would benefit them in the long-term. Motivation to learn incorporates some aspects of both extrinsic and intrinsic motivation, but the aim of raising students' motivation to learn is to enable students to see the education they are attending as an opportunity and as a long-term investment. How do we achieve that? As mentioned previously, it is quite natural to be motivated to inspect a topic or task that is personally interesting and relevant to us – it seems that *interest* is an essential

component in what energizes or triggers motivation. The next section focuses on the construct of interest, and how it relates to the integration of ICT into EFL teaching.

2.3.3 Interest

Flavell et al. (2002: 66) remark that cognitive functioning is fuelled primarily, or at least to a great degree, by intrinsic motivations rather than extrinsic motivations. As discussed previously, intrinsic motivations arise from the individual's personal goals, interests and affects. It is therefore reasonable to inspect what kind of impact ICT may have to learners' interest. It may at first seem a logical conclusion that, as an external instrument, ICT would rather be an extrinsic source of interest (and thus, motivation). However, closer inspection might actually point to the learner's inherent motivational quality. Veermans and Tapola (2006: 67, 79) point out that ICTs greatly extend the range of instructional tasks and individual support means that can be used in teaching. Additionally, they remark that the use of ICTs in teaching may be effective at raising motivation and interest in the short term (Veermans and Tapola 2006: 79–80), but not when aiming to permanently change their motivational or cognitive qualities.

2.3.4 Autonomy

Benson (2011: 2, 58) defines autonomy as 'the capacity to take control over one's own learning' and argues that autonomy enables the learner to be more successful at learning. Concerning the use of ICT in classrooms, it is often the situation that the teacher's time and attention is divided between pupils and not all of them can be instructed or mentored individually. It is therefore necessary to pay heed to what the promotion of learner autonomy can bring to the table: if learners can be motivated to take control and responsibility of their learning, it will both enable the teacher to focus on those pupils who require more individualized mentoring and improve learners' performance in the long term. Benson (2011: 59–61) elaborates on autonomy in language learning as a concept that involves three interconnected dimensions of control: control over one's cognitive processes, learning behaviours and the content of learning. The first of these, control of one's cognitive processes, refers largely to metacognitive abilities, particularly on those metacognitive skills that allow the learner to direct his or her attention to the relevant features of the task at hand, enables them to monitor and

evaluate what and how they learn (reflection), and metacognitive knowledge of the task (Benson 2011: 100). Control over one's learning behaviours can be summarised generally as the control over one's use, and knowledge of, learning strategies. Finally, control over the learning content, as the name suggests, refers to the "'what' and 'why' of language learning, rather than the 'when', 'where' and 'how'" (Benson 2011: 112). Quite naturally, learners will feel they have more control of their own learning, and they find it more appealing, if they are allowed some measure of control over the content that they are to learn. This can be problematic when these interests collide with the content that is defined in curricula: to a certain extent, there are areas in every subject that pupils need to learn in order to progress further, regardless if they like it or not.

2.3.5 Affordances of ICT use to motivation

One of the most commonly cited reasons or justifications for ICT use in the classroom is that it seems to motivate learners (Järvelä et al. 2006: 61, Veermans and Tapola 2006: 71). At the same time, one of the most powerful arguments against ICT use in terms of learning is that while ICT seems to motivate pupils, this ICT-inspired motivation is not targeted towards learning the actual subject, for example, English, but instead, students only become motivated to dabble with computers, tablets, and so on, because these ICT equipment are a handy distraction from the dullness of obligatory classroom lessons. Since ICT and the use of it in classrooms have not become normalised (Bax 2003), they are, in effect, an intervention in the 'normal' classroom practice. Therefore, learners will likely regard the use of ICT as something new and exciting, and this can seem to be, at the surface, a source of inspiration or motivation for them. Motivational effects that may have been a result of the particular activity, learning strategy or material that the use of ICT has enabled, have been overtly simplified and attributed, perhaps falsely, to a novelty effect. ICT may be a relatively new phenomenon in some classrooms, but it is certainly not anything new to students in the 21st century. Instead of the perpetual recourse to a popular claim of a simple, yet still unproven, novelty effect of ICT in the classroom, a much more fruitful avenue of enquiry would be to inspect the effects that practices, made possible by the use of ICT, have on students' motivation.

The diversity of working methods and ways to present information that ICT makes possible can have an unprecedented impact on students' motivation, especially concerning intrinsic motivation, if ICT is used to enhance and support learners' interest

and autonomy. For example, van Loon, Ros and Martens (2012: 1026–1027, 1029) found that a digital learning task could be used to support learners' feelings of autonomy and competence. In their study, increased autonomy and competence also had a positive effect on pupils' intrinsic motivation, and led to better learning outcomes. Furthermore, the psychological needs of relatedness and autonomy (see section 2.3.1) can be satisfied by taking learners' interests into account in teaching and by allowing the ICT medium to become a (more) neutral space for interaction and negotiation between the pupil and the teacher. This can create better rapport between learners and the teacher (Davies 2007: 61), and may also help the teacher in observing learners' progress.

2.4 Interaction

I have previously noted, rather briefly, that current theories of learning place a great deal of emphasis on interaction in learning and teaching. However, as Beauchamp (2012: 19–20) remarks, interactive teaching is still a rather hazy concept: there is no consensus on the exact definition for interactive teaching as of yet. Therefore, a rather broad conceptualisation of interaction is adopted here, namely that interaction refers to any communication, collaboration or activity performed jointly or between participants. This approach is also meaningful in terms of the theory of learning, i.e. the social-constructivist learning theory, employed throughout the present thesis: Ortega (2009: 217–219) notes that the social-constructivist theory of learning considers learning a process of knowledge construction by the learners in interaction with their environment. This frequently entails learners restructuring their conceptions of different issues within the frame of shared knowledge through interacting with their peers, their teachers and adults. However, in the context of ICT, interaction does not always denote communication and collaboration between human subjects: it can also manifest itself between a human and a computer.

2.4.1 Affordances of ICT use to interaction

The ability to receive consistent and instantaneous feedback when performing tasks with ICT can be a major improvement to traditional classroom practice where teachers have a limited ability to react to learners' performance. Cognitive tools, such as

feedback offered by the educational software, can be used to implement *scaffolding* in the classroom and to help students to perform in their zone of proximal development (Iiskala and Hurme 2006: 48–49). In education, the term scaffolding is used to refer to the individualised support given to a pupil during (usually) brief spans of performing a task and reaching their goals (Sawyer 2006: 11). Scaffolding is therefore comprehensively tied to the cognitive, motivational and interactive or social dimensions of learning – as Sawyer (ibid.) further explains, good scaffolding enables deep learning and knowledge construction by providing the right amount of help in demanding cognitive tasks that the learner would not otherwise be able to complete.

Conole and Dyke (2004: 117) remark that ICT offers new opportunities for communication between much more diverse and large communities than was previously possible, via online communication; it enables learners to come into contact with the experiences of others, which may enhance their learning. However, communication via network technologies is often more challenging than 'traditional' face-to-face communication (Arvaja and Mäkitalo-Siegl 2006: 142), largely due to the lack of gestures and facial expressions that are essential components of face-to-face communication. Nevertheless, as Arvaja and Mäkitalo-Siegl (ibid.) point out, with digital communication environments students may be able to externalise their thoughts better, and furthermore, messages can be stored for later reflection and processing. In contrast to the more global views of interaction by Conole and Dyke (2004: 117–118), Davies (2007: 61) sees the opportunities of ICT for interaction mainly in terms of its capability to provide a neutral space for negotiation between the learner(s) and the teacher.

In addition to human-human interactions via technology, we can also consider interaction as something that happens between a human and a computer. A most limited example of this is the aforementioned capability of software to provide feedback to the user. Beauchamp (2012: 6–8) tackles the issue of human-computer interaction with the concepts of *provisionality* and *interactivity*. Provisionality, in Beauchamp's terms, concerns the features of ICT that enable teachers and learners to "pose and investigate challenges, and explore concepts in a way that conventional resources (such as books) cannot" (Beauchamp 2012: 6). In practice, this would involve using ICT to create, modify and inspect simulations, visualisations and other applications that can help students to understand and learn concepts and topics on a deeper level than merely

presenting the information in a static manner would allow. However, as Beauchamp (2012: 7) mentions, using computer software to model (or formulate) and solve problems may run the risk of teaching learners to solve the task with a 'trial and error' tactic (for example, extrapolating the right answer based on feedback from wrong answers) that does not promote actual learning and critical reflection. Moreover, Conole and Dyke (2004: 117) have previously noted that, while ICT presents opportunities to enhance reflection and critical thought, the speed at which information changes and propagates may actually hinder critical reflection, since there is an expectation, or a sense, of haste to respond to presented information as quickly as possible. Beauchamp's (2012: 7–8, 19–20) definition of interactivity seems a much larger concept than that of provisionality: in contrast to provisionality, which, on the part of ICT, mainly concerns the technical possibilities, interactivity (or rather, interactive teaching) more comprehensively takes both technical and pedagogical aspects into account.

2.5 Access and diversity

In their taxonomy of ICTs' affordances, Conole and Dyke (2004) identify several distinct areas that can have beneficial or detrimental effects on learning and teaching. Some of these affordances have quite direct relevance to teachers, such as *communication and collaboration* and *reflection* discussed previously in connection with interaction, while some are only of peripheral interest in the scope of the present thesis. In addition to interactional aspects, two related affordances, namely *accessibility* and *diversity*, seem rather central to learning and teaching with ICT, including activities that are performed outside the classroom, such as homework and planning lessons. However, it should be noted beforehand that this thesis makes a considerable modification to the definition of *diversity* (introduced in section 2.5.2). Furthermore, the term *accessibility* used by Conole and Dyke (2004: 116) underwent some changes.

2.5.1 Access

Conole and Dyke (2004: 116) use the term *accessibility* to describe ICTs' potential in gaining access to a large quantity of information, for example, via the Internet. While they consider easy access to information a benefit, they also mention some of the issues involved, mainly those of information overload (see also section 2.2.4) and quality of

the information obtained. Despite the importance of the issues above, this definition accounts for only a minor subset of practical benefits and issues of access. In order to reflect the current author's conception of it as a more comprehensive affordance than the original, the term was changed to *access*, and, concurrently, the categories of *speed of change; risk, fragility and uncertainty;* and *immediacy* (Conole and Dyke 2004: 116–120) were incorporated into that of *accessibility*. Conole and Dyke (2004: 116–117) discuss *speed of change* largely in terms of its connection to two other affordances of theirs, namely *immediacy* and *reflection* (Conole and Dyke 2004: 119–120): they seem to consider the speed of access to information more in relation to the potential problems, rather than benefits, it may create, since faster exchange of information, in their opinion, has led to an expectation of immediate response to requests. According to Conole and Dyke (2004: 116) this increased speed and ease of access may also result in poor quality of information, and a lack of source criticism. They further connect these qualities to a worsening of critical thought, or lack of reflection (ibid.), since faster access to information, and the speedier change of said information, may encourage superficial, surface level processing of information, instead of critical evaluation and reflection. Curiously, while Conole and Dyke (2004: 119) point out the risks of technology, referring mainly to unintended consequences of its use, and the vulnerability and operational uncertainty of devices, they fail to address issues related to actual resources: lack of time, appropriate software (and in some cases, equipment) and materials; questions which are ultimately much more pertinent to actual practice than the somewhat inflated claims of technology 'not working'.

2.5.2 Diversity

Diversity as described by Conole and Dyke (2004: 117) refers mainly to the different experiences learners are able to gain by communicating and interacting with other people by using ICT, particularly via the Internet. As this decidedly interactive aspect is readily included in the larger category of interaction (discussed previously in section 2.4), the term itself was appropriated for a more suitable use, namely, as an umbrella term to contain the sub-categories depicting the features of materials. As such, this new definition also covers the affordance which Conole and Dyke (2004: 118–119) have labelled *multimodal and non-linear*: qualities that refer to representations of information and tasks that utilise text, sound and moving or still images; and that are not linear (such

as web pages), and, in the words of Conole and Dyke, "enables the learner to move beyond linear pathways of learning" and to "adopt more individualized strategies and pathways" (Conole and Dyke 2004: 119). Other qualities related to the affordance of diversity include, for example, that it enables access to authentic language (Bradin 2002). Figura and Jarvis (2007: 449) further note that computer-based materials "can provide learners with a range of authentic and pedagogic materials". In relation to interaction, communication via ICT also provides opportunities for creative "identity work" (Lankshear and Knobel 2007: 114–115) where learners are able to construct, reflect on, and display their identity or specific aspects of it. It also enables the emergence of more diverse cultural and social viewpoints, since "technology-based communication affords L2 learners rich opportunities for identity negotiation and reconstruction and social and cultural learning, as well as unprecedented support for literacy development" (Ortega 2009: 253).

3 ICT AND EFL TEACHING

The previous chapter focused on ICTs' impact on learners and their processes of learning. The information presented above is important to teachers and educational institutions in order to make informed decisions about how to employ and take advantage of ICT in education. Nonetheless, it is not enough to consider ICT in education from only one point of view. Just as the classroom typically consists of the teacher(s) and the learners, so should we consider not only what ICT can do for students and learning but also what ICT can do for teachers and teaching? The present chapter will look at ICT and education from the latter perspective, namely EFL teachers and teaching. However, before confronting that challenge, it should be noted that while I have separated learning and teaching into two distinct chapters, they should not be taken as completely disparate elements of education. Traditional teacher-led teaching practices are largely based on the implicit assumption that learning results from teaching, however, this is not always the case. The rationale is really quite simple: an individual *learns* by constructing meaning and knowledge via their cognitive facilities, in interaction with their environment. The teacher, in the sense of a traditional view as the presenter of learning content, has only a peripheral role in this social-constructive process – rather than 'teaching', teachers act as facilitators and guides to enabling the

learners to use their cognitive, motivational and social processes in order to learn. This does not mean that there are no benefits to be gained from traditional instruction – as Ortega (2009: 139) remarks, language instruction enables students to acquire or learn the target language faster and also improves their accuracy compared to learners who receive no instruction. What the 'best' form of instruction is remains a perpetual matter of debate, although current understandings seem to favour supportive, social-constructive practices. As discussed in the previous section, ICTs (or, rather, their use) can have rather important effects on learners' cognitive, motivational and social processes, and consequently, teachers must know how to utilise ICT in a manner conducive to the processes involved in constructing knowledge. As in-service training in Finland concerning ICT has been unable to significantly improve teachers' ICT skills or ICT use in teaching, I will focus on the available evidence regarding teacher trainees' ICT skills and attitudes concerning ICT integration into their teaching.

3.1 The role of ICT in education

A great deal of research on ICT in EFL contexts consists of isolated case studies or specific, rather popular, methods of ELT/EFL/ESL teaching, such as Computer Assisted Language Learning (CALL) and Computer Supported Collaborative Learning (CSCL). The above, while perhaps well-suited for specific contexts, may not give a very comprehensive picture of what roles ICT can assume in education: the potential for very diverse uses of ICT may be greater than what these methods and case studies have afforded it. Recent works on teaching ICT generally identify three distinct roles for ICT in education: as an instrument or tool for teaching and learning; as integrated practice; and as a target of learning (Hadjerrouit 2009: 155). The first of these, ICT as an instrument, pertains to the practice of using a specific tool or software to accomplish a specific task, such as writing a report using a word-processor. This is perhaps the most common occurrence of ICT in education, where computers (as well as other technologies) are regularly used to produce material, be it course material or task outcome. The second option refers to a practice commonly termed *integration*. Integration is a teaching practice where two or more separate school subjects are combined into one learning situation, for example, teaching music using only a foreign language, such as English in a Finnish school, as the language of instruction and classroom interaction. This is considered an integrated lesson of music and English.

Concerning ICT, integrated lessons could involve, for instance, a digital learning environment with content derived from another subject, or course content from ICT integrated into another subject. Integration is not very strictly defined in the same sense that some teaching methods are; integration is rather a practice where it is essential to emphasise the school subjects at hand to similar extents in order to achieve the educational goals concerning both. Nevertheless, there is variation in the balance between subjects: one of the perhaps most widely spread implementation or practice is CLIL (Content and Language Integrated Learning (see, for example, Mehisto, Marsh and Frigols 2008)), which has gained much popularity in recent years, especially in primary education (Nikula and Marsh 1997: 7). While the stated goals of CLIL practice are to develop learners' abilities in both the language of instruction and the learning content equally (Mehisto et al. 2008: 9, 11), some, mostly systemic, pitfalls should be kept in mind, such the lack of qualified teachers and resources in terms of funding, time and materials (Mehisto et al. 2008: 21–22).

The last item on the list, ICT as a subject, is currently perhaps the least practiced in Finnish primary education, due to the fact that ICT has only been afforded the role of an optional subject in primary education in Finland. The Finnish National Core Curriculum for basic education does not define ICT as a subject; ICT can, however, be taught as an optional subject. As such, the organizer of education, which in most cases is the municipality (or, more specifically the school authority or the educational board of the municipality), is rather free to decide to what extent, if at all, ICT is taught in primary schools (Finnish National Core Curriculum for Basic Education 2004, Ekonoja 2011: 27). Further, the National Core Curriculum includes the use of ICT as official, non-optional content and goals in several subjects, including languages, mathematics, geography, physics, chemistry, biology, music, visual arts, crafts and student counselling (Finnish National Core Curriculum for Basic Education 2004). The next major overhaul of the Finnish National Core Curriculum for Basic Education, which will come into effect in 2016, is set to consolidate the role of ICT in education as an overarching area of general knowledge (drafts of the core curriculum for basic education 2016, chapters 13–15).

3.2 Affordances of ICT use to teaching

There are quite a few rather obvious advantages to teaching that using ICT affords. Perhaps the most apparent benefits from the teacher's point of view relate to administrative tasks, such as managing a database of pupil performance (grades and other points of interest), making official requests or enquiries, or booking rooms for lessons. In addition, an increasing amount of the communication between school staff, teachers and parents, and teachers and their pupils is carried out via ICT: email, web-based management software, or even social media. ICTs' relative independence of spatial and temporal constraints, while potentially blurring the line between work and home, allows for more efficient, almost immediate responses to a variety of issues. Administrative tasks are however, only a small part of what constitutes the beneficial aspects of ICT in education. Concerning classroom practice, it is as commonplace to develop learning materials with a computer as it is with pen and paper. Nevertheless, teachers still prefer traditional study methods, favouring the course books and writing answers and essays by hand. However, doing things by hand should not be considered inferior to doing things with the computer. A traditional approach may be, in fact, more beneficial in some circumstances: for example, learners with a preference for tactile learning styles could learn better by writing things down by hand, drawing mind-maps, or other cognitive strategies. Yet, we should also be careful not to neglect the capabilities of ICTs to support different learning styles and to promote learning in a more comprehensive manner, since current technologies can offer a much wider array of technical and cognitive tools for both learners and teachers than traditional approaches usually can manage. Nonetheless, using ICT for teaching and learning in a comprehensive fashion also has rather expansive requirements from institutions and teachers: financial investment is one of the major obstacles, although at a more fundamental level in terms of teaching, advances in the designs of curricula and teaching practices are needed as well. Large-scale implementations of ICT in the classroom have not yet penetrated into standard practices. This does not mean that EFL teachers should be expected to develop all material by themselves, using ICT as both the tool of creation and medium of presentation. It merely suggests that ICT can be used as an alternative to traditional classroom activities and as a supplement to those. It is as obvious as some of the benefits, that ICT does not provide a ready-made solution or the most suitable form of instructed practice to every situation.

Not all aspects of EFL can necessarily be taught simply by using ICT: for example, it may be very difficult, even impractical, to use ICT in practicing communicative competencies (speaking and listening skills) in English, because in foreign language learning situations it is often necessary for the teacher to account for individual learner variables during the communicative activity. ICT cannot be expected to perform such actions or make informed decisions involving learners' emotional, motivational and cognitive factors: applications of ICT are always designed to perform a certain task, and these tasks are always limited in scope, regardless of the number of discrete forms they take in a software. Further, educational software is generally not designed and programmed by language learning specialists or EFL teachers, but by employees of software companies that may or may not recognise special circumstances and features inherent in language teaching. This may lead to a scenario where software and technology purported to aid learning and teaching does not correspond with the actual needs of learners and teachers. While the (mostly textual) content of such language learning applications must by necessity be crafted by qualified language specialists and/or teachers, it is unclear whether or not they are able to influence the representation of the material or to ensure that the material is used in the intended manner. Doubtless the resulting material and software are tested and evaluated to some degree, yet these practices or their results are not public information. In the wake of a growing emphasis on new information society practices, major players in the educational publishing sphere are moving to take advantage of digital markets as well. Unfortunately, in the interests of corporate profit, practising teachers seem to have less and less options in deciding how to use the materials provided by the private sector.

3.3 Students' and teachers' ICT skills

There seems to be a fundamental lack of research, both internationally, and in Finland specifically, on teachers' and students' ICT skills. Virtually all research conducted thus far have used self-report measures, which may introduce self-presentation bias into the results, and thus, can render the self-report data misleading (Kopcha and Sullivan 2007: 634). Moreover, it is doubtful that surveys using self-report questions measure teachers' or learners' actual skills: rather, these types of surveys measure what participants *think or believe* their level of skills to be – essentially, they study teachers' and students' level of confidence with ICT. Even with questions that bluntly ask the respondent to specify

their skill or knowledge concerning particular aspects of ICT, there is always a certain measure of unreliability in the answers if we do not have an objective, definite system. However, as Kopcha and Sullivan (2007: 643) note, self-report surveys are a convenient method to gather information on teachers' (as well as learners') practices and beliefs. Despite the fact that they can give a good general picture of what teachers and students think about their capabilities to make use of ICT, self-report surveys do not necessarily produce reliable information on the actual skills and knowledge of teachers and pupils concerning ICT. Therefore, it is highly questionable to generalize such survey findings on teachers' or students' ICT skills to practice. Furthermore, the rather recent notion of young learners being *digital natives* or belonging to the *Net Generation* can be very misleading. Oblinger and Oblinger (2005: 16) remark that young learners are able to "intuitively use a variety of IT devices and navigate the Internet", simply because they have been constantly exposed to technology all their lives. However, this does not mean that all young people are skilful users of different technologies, or even that every individual knows how to use ICT. The majority of the so-called digital natives arguably do know how to operate devices, but only an extremely small minority of them are what could objectively be called 'expert users': for example, Valtonen et al. (2011) found no convincing evidence for the Net Generation argument in their study of 74 Finnish teacher trainees. Teachers, teacher educators, teacher trainees and, indeed, researchers as well, would do well to remember that the 'digital nativeness' that has been mentioned in recent educational and ICT discourse frequently and all too casually, cannot be generalized to the wider audience of young learners (Valtonen 2011: 22). As Oblinger and Oblinger (2005: 16) note, "although they are comfortable using technology without an instruction manual, their understanding of the technology or source quality may be shallow". Moreover, Thompson (2013: 14) points out that age may not be a factor concerning the adoption of new technologies: older people can become confident users of new technologies, and, contrary to popular claims of universal ICT literacy, the supposed digital natives' use of ICT may actually be constricted to a very limited set of technologies. In fact, Thompson's (2013: 20) study suggests that the so-called digital natives do not use different technologies nearly as extensively as popularly claimed. She further notes that digital natives are prone to superficial learning strategies that emphasise speed and efficiency above critical, reflective and deeper learning habits when browsing the Internet for information. Nevertheless, Thompson (2013: 21) remarks that, in contrast to some previous concerns, students did not demonstrate a

significant ‘need’ for entertaining activities in learning situations in order to concentrate on or learn the topic.

Despite frequent exposure to and use of varied forms of ICT, pupils’ ICT use on their spare time focuses mainly on social networking (social media, such as Facebook, Myspace and Twitter) and entertainment, such as games, the Internet, music and movies (Cicero Learning 2008: 5; Eurydice 2011: 24–26, 107–108; PISA 2009: 157–167). Outside of educational environments, pupils have far less experience on using ICT for academic or other productive uses common in workplaces, such as writing well-formed reports and documents, performing tasks with computer software according to various requirements, efficient information retrieval, familiarity with databases and data analysis using computer software, collaborative work, media literacy and etiquette and good practices, as well as information and data dissemination. According to a recent survey by Hurme, Nummenmaa and Lehtinen (2013: 8–10) high school students (grades 10–13) mainly use entertainment and social media (via the Internet) at home; office software (such as word-processing) were used for studying to a roughly equal extent at school and at home, as were Internet searches. However, Hurme et al. (ibid.) report that VLEs and digital materials were used at school and at home by, approximately, only a third of the students.

While Finnish teachers’ ICT skills have generally been rather good in terms of basic use, such as word-processing, email and the Internet, their use of ICT has mostly been limited to administrative tasks or to preparing lessons with ICT (Ilomäki and Lakkala 2006: 187). Using ICT in teaching and learning, especially in the EFL classroom, has ultimately been a rare phenomenon. Previously, failures to incorporate ICT into other subjects in a meaningful and productive way has largely been attributed to teachers’ poor technical skills; inadequate in-service training (especially pedagogic training in terms of ICT); non-existent guidelines, shared practices or models of operation for ICT use and integration; outdated and/or poorly maintained hardware; and a general lack of resources and support (Ministry of Education and Culture (MEC) 2010: 8–10; Rautiainen and Metsämuuronen 2005: 47–49). Efforts to remedy the situation have in recent years concentrated on systemic change: the main targets of development have been found to lie, on the one hand, in teacher training programs and, on the other hand, in the practices and models of operation on the institution level (MEC 2010: 9). Teachers’ attitudes towards ICT and computer use in general in education have been

found to be one of the defining factors concerning the educational use of ICT in schools (Cicero Learning 2008: 6, 8; Rautiainen and Metsämuuronen 2005: 49), and efforts to train servicing teachers on the use of ICT in teaching have resulted in limited, often short-lived, success (E-Learning Nordic 2006: 15). In order to ensure effective use in learning and teaching, teachers must have a fully developed understanding of the features of ICT before they decide how and when to apply them or when to allow pupils to use them (Beauchamp 2012: 3). However, this seems to be an issue of pedagogical knowledge of ICT, i.e. how to use ICT in a pedagogically sound manner, as well as a lack of confidence (European SchoolNet 2012: 12–13, 28), rather than inadequate basic skills. Nevertheless, teacher trainees' confidence and skills for ICT use in teaching and learning remain a complex and somewhat ambiguous issue (Meisalo, Lavonen, Sormunen and Vesisenaho 2010: 56–57). Meisalo et al. (2010: 52) note that teacher trainees' opinions concerning ICT use in education were largely inconsistent or conflicting: they suggest that, in addition to individual differences, this may be due to different orientations between teacher educators and mentor teachers. Moreover, Meisalo et al. (2010: 55) point out that teacher educators' and mentor teachers' (inadequate) ICT competences and use of ICT form a barrier for the use of ICT in teacher education. Conceivably, if ICT is not employed in teacher education teacher trainees will not gain the technical and pedagogical ICT competences needed to utilise ICT in teaching and learning. In addition to technical problems and issues of resources and funding, a major problem in integrating ICT into teacher training has thus far been the lack of a clear theoretical framework. Such frameworks have, however, begun to surface in recent years, the most notable of which appears to be Koehler and Mishra's TPACK (Koehler and Mishra 2009). Next, I will briefly introduce the TPACK framework and its implications for teacher trainees and future teacher education.

3.4 TPACK: Technological, Pedagogical and Content Knowledge

Technological Pedagogical Content Knowledge, TPACK for short, is essentially an extension of Lee Shulman's construct of pedagogical content knowledge (Koehler and Mishra 2009: 62). It attempts to reconcile the needs and requirements of pedagogy, content and technology in order to build a comprehensive understanding of how these three dimensions interact (Koehler and Mishra 2009: 62), and to enable teachers to

"transform the content as accessible as possible for students with technologies most suitable for the purpose" (Valtonen 2011: 18).

Previous constructs of pedagogical content knowledge (PCK) relied primarily on teachers' content knowledge, that is, knowledge of the subject they teach (Koehler and Mishra 2009: 63), and pedagogical knowledge, i.e. "teachers' deep knowledge about the processes and practices or methods of teaching and learning" (Koehler and Mishra 2009: 64). Koehler and Mishra (2009) add technological knowledge into the mix, and derive two additional concepts from the interactions of technological knowledge with content and pedagogical knowledge: technological content knowledge and technological pedagogical knowledge (see Figure 3.1 below).

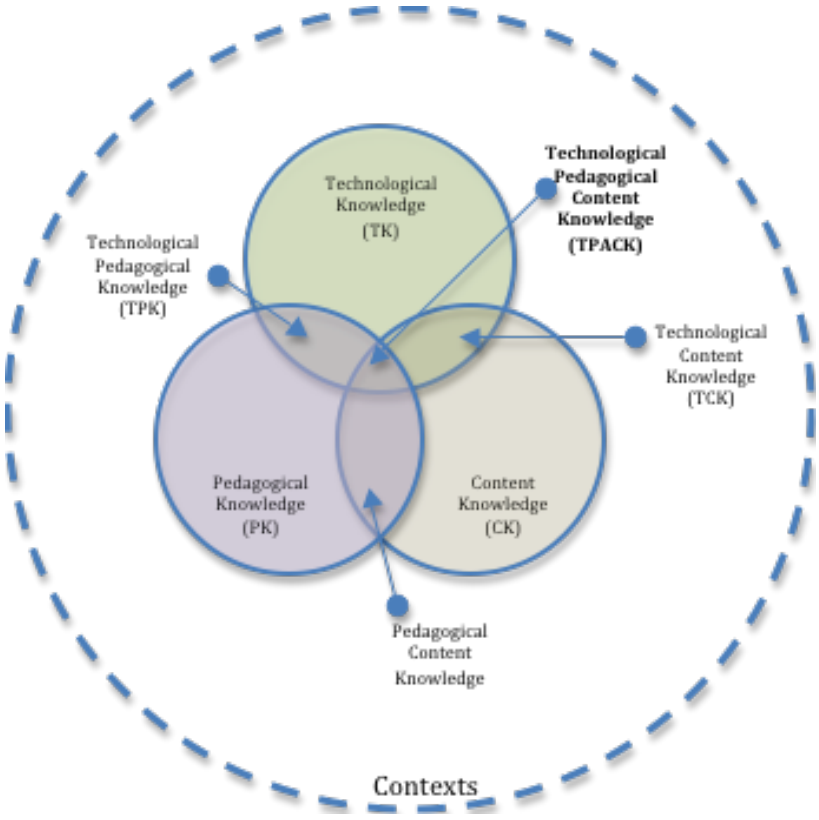


Figure 3.1. Components of TPACK. Adapted from Koehler and Mishra (2009: 63).

According to Koehler and Mishra (2009: 65), technological content knowledge is, essentially, a deep comprehension of, on the one hand, the restrictions that content and technology impose on one another, and on the other hand, the possibilities they afford to either content or technology. In short, teachers need to be aware of what technologies

can be utilised meaningfully to teach specific subject matter, and similarly, "certain content decisions can limit the types of technologies that can be used" (Koehler and Mishra 2009: 65). Technological pedagogical knowledge is, at its core, the teachers' sense or understanding of how certain uses of specific technologies influence and change the way in which learning occurs and how teaching is conducted (ibid.). The teacher's understanding of pedagogy in relation to technologies is then especially relevant when using devices or software that have not been originally designed for educational use (Koehler and Mishra 2009: 66; Valtonen 2011: 18). In essence, teachers must be able to combine their knowledge of pedagogy and technology to evaluate and make informed decisions of whether or not a specific technological approach has pedagogical value. Technological pedagogical content knowledge then exists in the intersection of knowledge of content, pedagogy and technology *and* the understandings of pedagogy–content, content–technology and technology–pedagogy that are formed in the interactions of the former. Moreover, as Koehler and Mishra (2009: 66) explain, it is always located in unique situational contexts where 'solutions lie in the ability of a teacher to flexibly navigate the spaces defined by the three elements of content, pedagogy, and technology'.

The implications of TPACK to teachers, teacher trainees and teacher education in general are then quite clear. The conceptual framework of TPACK provides a model, and a description of teachers' knowledge needs, on which to base future teacher education and in-service training. Specifically, it highlights aspects that have long been absent in both in-service and pre-service training, namely those of technological knowledge and technological pedagogical knowledge that are unavoidable needs in the modern classroom.

4 THE PRESENT STUDY

In this chapter, I will introduce the research design of the present thesis. I will begin by presenting the aims and research questions of the present study, followed by descriptions of the participants, data collection procedures and methods of analysis.

4.1 Overall purpose and research questions

Recent surveys into ICT skills and uses in educational settings in Finland (for example, E-Learning Nordic 2006, Cicero Learning 2008) have yielded remarkably similar results that have generally highlighted the specific systemic and pedagogic shortcomings of ICT integration in schools (E-Learning Nordic 2006: 13–18; Cicero Learning 2008: 5–8; Hurme et al. 2013: 13–15) as well as the rather unremarkable effects of previous in-service training in ICT to actual ICT use in schools (E-Learning Nordic 2006: 12, 16; Cicero Learning 2008: 6, 8). Numerous investigations have been dedicated to inspecting teachers' and pupils' utilisation of ICT and views on educational ICT use, however, teacher trainees' perspectives have been almost completely ignored. The main aim of this study was, then, to shed some light on the views of Finnish EFL teacher trainees concerning the affordances of ICT use in education. As teachers' (as well as teacher trainees') attitudes and orientations largely define whether or not they use ICT in their teaching, and how they use it, it is necessary to examine both what benefits and what disadvantages teacher trainees perceive in the use of ICT in teaching. Furthermore, teacher trainees' opinions concerning the status and the need for ICT training in teacher education were considered essential, as this relates trainees' perceptions of ICT to teacher training as well and may thus provide valuable information for future developments in teacher training programmes. Accordingly, the research questions in the present study were as follows:

1. What are the views among EFL teacher trainees of ICT use in education?
    a. What benefits do teacher trainees see in educational uses of ICT?
    b. What disadvantages do teacher trainees see in educational uses of ICT?
2. What are the views among EFL teacher trainees of ICT training they receive (if any) during their teacher training?
3. Are there significant differences in teacher trainees' views on ICT use in education and ICT training that could be attributed to background factors (gender, age, previous knowledge/experience)?

4.2 Data collection

For the purposes of the present study, I collected multiple data for analysis. The primary focus was on survey data pertaining to the first research question: these data were collected with a questionnaire comprising both closed, Likert-scale questions/statements as well as open-ended questions. This format was chosen for several reasons. Constraints of time and resources were major issues, so I decided that the most efficient method for data collection was to use an online questionnaire comprised of closed questions or statements with scaled responses in a four-point scale. This allows the questionnaire to be sent (or in this case, a hyperlink to the web page containing the questionnaire) to a large audience with minimal expenditure of time or resources, as well as minimizing the pressure put on the respondent. This procedure also ensures that the analysis of the answers should be rather straightforward (Gillham 2007: 5–8). Furthermore, I decided that the neutral response (corresponding to a three in a five-point scale) should be omitted from available responses: this approach forces respondents to choose a meaningful answer, even if at the (debatable) expense of response validity (Gillham 2007: 31–32, Dörnyei 2009: 28). Additionally, this strategy should lessen the impact of a specific aspect of *acquiescence bias*, that is reluctance on the respondent's part to provide a negative response to a question (Dörnyei 2009: 9). Teachers no longer have the luxury of being ignorant or not having an opinion or view concerning the educational use of ICT, since it is an essential part of the lives of students and most probably, even a defining aspect of their future lives and careers. Nevertheless, I judged it necessary to include open-ended questions in the questionnaire that provide the respondents with the opportunity to clarify or expand on their answers. Moreover, the open-ended questions were formulated as follow-up questions to the closed set in order to elicit more detailed information on the respondents' choices. Since the target group was that of Finnish teacher trainees, the questionnaire was conducted in Finnish. The English translation of the questionnaire is provided in Appendix 1.

The questionnaire was divided into five sections according to the theoretical background and the research questions. Closed questions in the first part reflected the three areas of the social-constructive theory of learning presented in Chapter two – cognition, motivation and social interaction, as pertaining to the learners and their learning, in general and from the perspective of EFL. The next two sections addressed teacher trainees' attitudes concerning the role of ICT in EFL teaching and the ICT skills

of students. The fourth section comprised open-ended questions that focused on teacher trainees' views concerning the technical and pedagogical benefits and disadvantages of ICT use from the perspectives of the student and the teacher. Finally, the last section contained both closed and open questions that centred on teacher trainees' opinions of ICT in teacher training and their own ICT skills. Participants were also asked to fill in background information concerning their age, gender, place of study, minor subjects, familiarity with and skills in ICT after answering the actual questionnaire items. This background information was relevant to the study, since personal variables may have an effect on participants' answers to the questions and, in general, their attitudes towards employing ICT in teaching English. For example, having IT as a minor subject will probably result in more positive attitudes and awareness of ICT concerning EFL teaching. Familiarity with ICT is exceptionally difficult to measure because there are almost infinitely many aspects to it. However, it was thought necessary to conduct even a superficial mapping of this aspect to make at least an educated estimate as to whether previous familiarity is an important factor to consider in this study. For this purpose, participants were asked to check and list various ICT applications and skills that they are familiar with or possess. A comparative analysis of the background factors and answers to the questionnaire should provide indications as to which background factors have a significant effect on teacher trainees' views and attitudes towards the use of ICT in the EFL classroom.

The questionnaire was conducted via the Internet in the web survey environment Webropol (http://www.webropol.fi). Webropol allows for easy dissemination of questionnaires and collection and storing of completed questionnaires. Invitations to the questionnaire (along with a link to it) were sent to EFL teacher trainees in six Finnish universities: the universities of Helsinki, Jyväskylä, Tampere, Turku, Oulu and Eastern Finland. Teacher training programmes in Finnish universities all follow the same national qualification requirements for subject teacher graduates, namely that subject teachers, regardless of subject, must complete the teacher's pedagogical studies as part of their Master's Degree. Usually, language teacher students in Finland graduate with one language as their major subject, and a second language and pedagogical studies as their two minor subjects. Language teachers in Finland are qualified to teach at every level of basic education and upper secondary education, as well as vocational education and polytechnic institutions. Additionally, language teachers may seek employment in the field of liberal adult education, such as adult education centres and folk high

schools. Universities typically have their own specific requirements beyond those of teacher training.

The universities included in the present study have teacher-training programmes with admittance quotas numbering between 14 and 65 (in 2013), which should result in a potential respondent pool in excess of 800 students. This figure was approximated following two principles. First, MA students tend to graduate in roughly seven years, calculated as an average of annual median for the length of studies for a Master of Arts (Statistics Finland 2013). Second, subject teacher students generally start their teacher studies or teacher training in their second or third year. Thus, multiplying the total annual admittance quota for English subject teacher training in the universities in question with the average length of study minus years of study before starting teacher studies should give us a fairly accurate estimate of the total number of teacher trainees that the questionnaire was targeting: in this specific case, the calculation described above yields 199 * (7 - 2.5) = 895.5. However, due to technical issues and human factors, the questionnaire email was not disseminated properly to target group students studying in the university of Eastern Finland. This leads me to adjust the estimate by excluding the admittance quota of UEF; the estimate then decreases to 760 (169 * (7 - 2.5)).

Table 4.1. Admittance quotas for English teacher training in Finnish universities*

HY	JY	TaY	TY	OY	ISY	Total
50 (40+10)	65 (40+25)	14	25	15	30	199

The present thesis follows the ethical guidelines of conducting research and collecting data outlined by Dörnyei (2009: 78–82). The main concern, namely that no harm should come to respondents (Dörnyei 2009: 79), was addressed by conducting the questionnaire anonymously. This practice simultaneously fulfils the requirements of another ethical principle, that is, participant privacy and anonymity (ibid.). To ensure participant privacy and anonymity, respondents are referred to with the alphanumeric codes R1–R47 (formed by combining the letter R for 'respondent' and a number based on the order in which responses were received). Furthermore, background information

* Universities abbreviated as: HY – University of Helsinki; JY – University of Jyväskylä; TaY - University of Tampere; TY – University of Turku; OY – University of Oulu; ISY – University of Eastern Finland.

(age, gender, and so forth) concerning individual respondents is not revealed in the analyses to avoid possible identification of participants through these data. Some participants had included information concerning their place of study in their answers to the open-ended questions; while using these answers as examples in the present thesis could be a potential violation of anonymity, I judged that the risk was close to none since no other identifying information was revealed. Finally, to make sure of participants' informed consent (Dörnyei 2009: 79), information concerning the study and the questionnaire was given in the invitation email as well as at the beginning of the questionnaire form. Participants were notified of the confidentiality and anonymity of data collection, and of the collection of background information and the purposes for which those data were to be used. Furthermore, possibly unfamiliar terms used in the questionnaire were explained on a separate webpage (constructed by the current author); a link to this webpage was given in the questionnaire introduction and participants were encouraged to consult it when necessary.

Perhaps the most problematic piece of information that the respondents were asked about was that of gender, since participants were allowed to choose of only two options: male or female. In this regard, the present study follows the example of previous research (outlined in Chapters 2 and 3) by considering the construct of gender a strict biological fact rather than a social and psychological construct of identity. Thus the results of the present study can be easily compared to those of previous research; this would not be possible, had gender been measured in differently in this study. While this is a rather obvious oversight in relation to alternate genders, such as those of transgender individuals, the questionnaire did not impose any preconceptions about gender on the respondents. Instead, this particular item was simply labelled 'Gender' with no additional text. This enabled participants to choose the option they themselves preferred or most identified with. Nevertheless, the existence of only two options could be taken to signify an assumption that alternate genders do not exist in the target population. However, the current author does not hold this view, nor was this part of the questionnaire intended to convey such a meaning.

4.3 Methods of analysis

Since the present study employs a mixed-methods approach, the analysis of the data necessarily involves several stages. Quantitative data was processed first. Since one of the reasons for using closed, Likert-scale questions was to determine whether background factors had an effect on student teachers' views of ICT, and what those differences might be, the *chi-square test* was thought appropriate. As the background information gathered from respondents enables convenient grouping of participants into different categories, the chi-square test can reveal what significant differences lie between groups, or categories (Gillham 2007: 71). However, the chi-square test is generally only suitable for large sample sizes; as the number of obtained responses in this study was rather low (47), a modification of the chi-square test called *Fisher's exact test* (Field 2013: 723) was used. Quantitative data (questionnaire items A1–A28 and B1–B14; see Appendix I) were coded and input into the statistical analysis software SPSS 20. At this point, it became clear that some variables, mainly those of participants' minor subjects and 'ICT activities' (referring mainly to leisure activities) could not be coded in a meaningful way (see section 5.1), due to how the data were gathered concerning these particular variables. Therefore, these variables were not included in the statistical tests.

Analysis of the qualitative data in this study relies on content analysis based on the theory presented in Chapters 2 and 3. It therefore entails interpreting respondents' answers and grouping them into categories formed on the basis of available theoretical knowledge in order to compare and contrast respondents' answers (Dörnyei 2009: 98–99). More detailed descriptions of the process and the categories used are provided alongside the analysis in Chapter 5.

5 FINDINGS

In this chapter, I will present the analysis of the questionnaire data and the main findings of this study. I will start by describing the sample group and participants' background variables. I will then continue with the analysis of the responses to questionnaire items. This analysis follows the logical structure of the questionnaire: individual quantitative questionnaire items form larger categories, such as 'views on the

effect of ICT use to learning', which are complemented (with the exception of items from A18 to A28) by qualitative questions. Questionnaire data is then analysed largely in terms of these larger categories, each category more or less in isolation, in the same order as the items appeared in the questionnaire. In order to compute statistical values for quantitative questions, possible answers were coded as numerical values from 1 (fully disagree) to 4 (fully agree): for example, in terms of the statistical mean of the answers to a question, as a very simplified interpretation, mean values below 2.5 would indicate a generally negative orientation toward the statement. Likewise, mean values above 2.5 would indicate a generally positive opinion. Whether the mean values actually denote a particular (self-reported) attitude is largely a problem requiring significance tests on the part of individual questions and categories. Results of these significance tests are reported in the form

$$\chi^2_{\text{Fisher}}(N = 47) = 18.569,\ p = .021,\ \text{Cramér's } V = .363,\ \text{where:}$$

- N denotes the number of responses (or the sample size) to the particular item
- χ^2_{Fisher} is the test statistic, i.e. Fisher's chi-square (see Field 2013: 723–724)
- p denotes the probability, for which it is typical in social sciences to choose a threshold value, or significance level, of 0.05[1]
- Cramér's V measures the strength of association between the variables, and ranges from 0 (no association) to 1 (perfect association).

Acock and Stavig (1979: 1381) explain Cramér's V as a measure that can be interpreted proportionally[2]. They (1979: 1383) further elaborate that the values for V can be interpreted as the percentage of the maximum departure from independence, although they do not give any rules of thumb as to what values can be considered a small or large effect. Crewson (2006) suggests that 'low association' is indicated by values ranging from .1 to .3; 'medium association' by values from .3 to .5; and 'high association' by values above .5. It should be noted that these interpretations are arbitrary, and based mostly on the author's experience, since the values obtained are dependent on the

[1] Results for which $p < 0.05$ are considered significant. The most common interpretation is that, "only when there is a 5% chance (or .05 probability) of getting the data we have if no effect exists are we confident enough to accept that the effect is genuine" (Field 2013: 61)

[2] Acock and Stavig (1979: 1381) present it as the ratio of obtained departure from independence to the maximum departure from independence. This is equivalent to the formula $V = \sqrt{\frac{\chi^2}{\chi^2_{\max}}}$, where $\chi^2_{\max}$ = N[MIN(r-1, c-1], i.e. the product of the sample and the number of rows or columns, minus one, in the contingency table, whichever is smaller.

research context. Unfortunately, the statistical analysis programme SPSS does not include a method to calculate Cramér's *V* with chi-square values obtained via Fisher's exact test, but instead the method used in SPSS will always calculate Cramér's *V* with values from the standard (Pearson) chi-square test. Therefore, the results for Cramér's *V* from SPSS are not valid concerning the present sample, since the (Pearson) chi-square values themselves are inaccurate. I solved this problem by constructing a rather simple programme with the Java programming language. This enabled for the quick and accurate computing of Cramér's *V* using both Fisher's and Pearson's chi-square values. Accuracy of results was confirmed by comparing Cramér's *V* computed from Pearson's chi-square to those produced by SPSS. After rounding to a precision of three digits, my own programme produced identical values to those of SPSS: as the formula for Cramér's *V* remains unchanged for Fisher's chi-square values, I am extremely confident of the computational accuracy of the presented results.

In terms of qualitative analysis, oversights in the phrasing of question items A29 to A36 produced a situation in which there was an ambiguity of reference in the questions. Specific effects are discussed in conjunction with the analysis of separate question items.

5.1 Sample group

The final sample group consisted of a total of 47 participants, distributed between universities as listed in Table 5.1 below. Using the estimate of the potential respondent pool (760 students) calculated in section 4.2, the response rate was 6.2 per cent. Taking the relatively lengthy form of the questionnaire into account, the low response rate was not entirely surprising, yet rather disappointing: the invitation email was disseminated a total of three times during a period of 10 weeks. Furthermore, the questionnaire platform used (Webropol; http://www.webropol.fi) reported that the questionnaire had been opened a total of 293 times without completing it. Together with those who had completed the questionnaire, 340 individuals (roughly 45 per cent of the estimated respondent pool) had been interested in the topic enough to open the questionnaire. It seems that, ultimately, the preferred method for disseminating the questionnaire invitation cannot be considered the main reason for the low response rate. Since I felt most comfortable contacting potential participants using the most official channels

available, I decided to send the questionnaire invitation via the mailing lists of the (English language) student associations, as well as the mailing lists of the English language departments where possible. Student representatives of the student associations were contacted by email (and even through Facebook in one instance) and asked to disseminate the invitation in cases where posting the invitation directly to the mailing list was not possible. Despite significant efforts to ensure as large a sample as possible, the response rate remained very modest, and therefore the current sample cannot be said to be representative of the population as a whole. Even so, some rather unexpected agreement among respondents was found in certain areas. These are discussed in their respective sections. There was a large bias towards the University of Jyväskylä in the respondent pool (see Table 5.1 below): just shy of 49 per cent of respondents indicated JY as their place of study. This is explained to some degree by the fact that the present author studied at JY at the time of conducting the study, and therefore had direct access to post invitation emails to both the official English section's mailing list and the mailing list of the English student association. Furthermore, the admittance quota for English teacher training was largest in University of Jyväskylä (see Table 4.1). The effect of the size of the admittance quota on the number of eventual participants remains, however, unclear: the University of Helsinki had the second largest admittance quota (50 students, see Table 4.1), yet only five answers came from students studying at HY. In contrast, the second largest sub-sample (8 responses, see Table 5.1 below) came from the University of Turku that had an admittance quota half the size of HY (i.e. 25 students, see Table 4.1).

Table 5.1. Distribution of respondents according to gender and university*.

	HY	**JY**	**TaY**	**TY**	**OY**	**ISY**	**Total**	**% of sample**
Female	4	16	5	6	3	1	**35**	**74.5 %**
Male	1	7	0	2	2	0	12	25.5 %
Total	5	**23**	5	8	5	**1**	47	100.0 %
% of sample	10.64 %	**48.94 %**	10.64 %	17.02 %	10.64 %	**2.12 %**	100 %	-

The lack of responses in the case of ISY seems mainly attributable to the absence of reliable channels of communication. Student representatives were contacted via email

* Universities abbreviated as: HY – University of Helsinki; JY – University of Jyväskylä; TaY - University of Tampere; TY – University of Turku; OY – University of Oulu; ISY – University of Eastern Finland.

and Facebook, but the messages did not reach the appropriate persons in time to collect more responses from teacher trainees studying at the University of Eastern Finland.

Participants averaged 25.85 years of age (SD = 3.445, Mdn = 25), and had studied for an average of 5.5 years at the time of writing (March 2014; mean starting year 2008 [2008.17; SD = 2.51], the academic year starts in September). More than half of the respondents had completed their teacher training (see Table 5.2 below).

Table 5.2. Participants' level of teacher studies.

	Basic studies, incomplete	Basic studies, complete	Subject studies, incomplete	Subject studies, complete
Female	2	2	8	23
% female	5.7 %	5.7 %	22.9 %	65.7 %
Male	1	0	2	9
% male	8.3 %	0 %	16.7 %	75 %
Total	3	2	10	32
% total	6.4 %	4.3 %	21.3 %	68 %

Participants' minor subjects were largely centred on additional language studies, most notably Swedish. Language studies, including philology and linguistics of specific languages but not general linguistics, phonology or phonetics, formed almost 50 per cent of total choices for minor subjects, although it must be noted that this figure does not take into account the fact that a single participant may choose several subjects, and thus, several languages as their minor subjects. Participants' had between one and two minor subjects on average (mean = 1.55, SD = 0.77). However, due to the heterogeneity of the sample concerning the participants' minor subjects and the limited size of the overall sample, obtaining any meaningful results regarding the effect of participants' minor subjects to their views on ICT in education is extremely unlikely. Therefore, statistical analysis concerning this aspect was discarded.

Respondents' experience with ICT was measured with three variables: (compulsory) ICT studies that are part of their major or minor subjects, ICT studies that the participant has completed of their own volition, and their 'ICT activities'. A few cautionary points are worth noting concerning these variables. First, these variables were measured with open-ended questions that were not enforced – participants were able to leave these fields blank for any number of reasons. Second, some of the respondents may not have been aware of the (ICT) courses that were available. Third, coding ICT activities into a computable variable is difficult in terms of useful

categories. For example, should information retrieval from the Internet be labelled as an active or passive activity? How about Facebook? Can a person's affinity with technology, or, for example, ability to do programming, be considered indicative of a positive attitude to technology or a greater than average ability to apply technology to teaching in a meaningful way? Lacking a reliable measure for 'ICT activities' and, indeed, a principled method for categorising this particular data, it was judged that, regardless of the obvious decrease in information content, it was necessary to exclude this variable from the analysis. However, data about respondents' ICT studies was obtained and coded as the variable 'level of ICT studies': frequencies and distribution from this data is presented in Table 5.3 below.

Table 5.3. Participants' ICT studies.

	No ICT studies	Compulsory ICT studies	Voluntary ICT studies
Female	19	13	3
% female	54.3 %	37.1 %	8.6 %
Male	5	5	2
% male	41.7 %	41.7 %	16.6 %
Total	24	18	5
% total	51.1 %	38.3 %	10.6 %

Approximately 50 per cent of respondents had not participated in any ICT courses; 40 per cent indicated that they had completed one or more compulsory courses; and ten per cent had taken ICT courses out of their own volition. It should be noted that ICT courses that the participant had completed as part of their studies outside the Faculty of Humanities[*] were considered voluntary studies. Although it seems that ICT studies were favoured slightly more by male respondents, the sample size was too small to perform a covariate analysis based on gender and ICT studies.

5.2 Teacher trainees' views on the effects of ICT use to learning

Questions A1 to A11 measured participants' views on the effects of ICT use to learning in general (A1–A7), and concerning EFL (A8–A11). Specifically, items A1–A7 focused on participants' views concerning the cognitive, motivational and social-constructive effects of educational ICT use through positively worded statements; items A8–A11 utilised both positively and negatively worded statements that concentrated on practice-

[*] School of Language, Translation and Literary Studies for student at the University of Tampere; Faculty of Philosophy for students at the University of Eastern Finland

oriented aspects of ICT use in the context of EFL teaching and learning, such as authentic materials and learner engagement. Translations of these statements are included in Appendix 1. Descriptive statistics for items A1–A11 are listed in Table 5.4 below. Participants' opinions concerning the influence of ICT use to learners' learning and development of cognitive (and social) skills were mostly positive, concerning both general statements (items A1–A7) and those pertaining to EFL (items A8–A11). Only item A3 (effect on pupils' social skills) had a mean score below the threshold value of 2.5.

Answers to items A1 to A7 did not differ significantly in terms of background variables, except for items A1 (ICT use improves learners' motivation to study) and A6 (ICT use improves learners' critical thinking skills). However, results also indicate a slight to moderate association (the value of Cramér's V ranging from .134 to .314) for item–variable pairs for which Fisher's exact test produced a non-significant p-value ($p > .05$). One interpretation for these results is that the measured background variables may have some influence on how respondents answered the statements, but these interactions were not statistically significant at least in the target population. A larger sample size could produce different results. A1 was found to differ significantly by level of teacher studies ($\chi^2_{\text{Fisher}}(N = 47) = 18.569$, $p = .021$, Cramér's $V = .363$). Approximately 67 per cent of participants who had started, but not yet completed their basic studies in teacher training agreed slightly or fully that ICT use in teaching improves learners' motivation.

Table 5.4 Descriptive statistics for items A1–A11 (N = 47)

Item	'I fully disagree'	'I slightly disagree'	'I slightly agree'	'I fully agree'	Mean	Variance	Standard deviation
A1	1	1	33	12	3.191	0.332	0.576
A2	4	11	31	1	2.617	0.459	0.677
A3	6	18	22	1	2.383	0.546	0.739
A4	2	6	26	13	3.064	0.583	0.763
A5	2	4	28	13	3.106	0.532	0.729
A6	3	19	19	6	2.596	0.637	0.798
A7	2	9	27	9	2.915	0.558	0.747
A8	1	1	11	34	3.660	0.403	0.635
A9	2	4	28	13	3.106	0.532	0.729
A10	0	8	23	16	3.170	0.492	0.702
A11	6	16	20	5	2.511	0.734	0.856

Corresponding figures for other participants were 90 per cent (subject studies incomplete) and 100 per cent (basic studies or subject studies complete). It should be noted that participants were distributed extremely unevenly into the groups (see Table 5.2). A6 differed significantly according to participants' gender ($\chi^2_{\text{Fisher}}(N = 47) =$

8.548, p = .026, Cramér's V = .426). Surprisingly, male respondents seemed highly doubtful of ICTs' capability to improve students' critical thinking skills (M = 2.08, SD = .51): only two (out of twelve; approx. 17 per cent) male participants thought that the educational use of ICT could improve learners' critical thinking, and not one of them fully agreed with the statement. In contrast, almost 66 per cent of female respondents (M = 2.77, SD = .81) agreed fully or slightly with item A6.

A graphical representation illustrates the trend in questions A1–A7 rather more clearly. Respondents' agreement with statements A1–A7 is presented graphically in Figures 5.1–5.4: Figure 5.1 presents a composite of the items, while similarly trending items are displayed in Figures 5.2–5.4 for a clearer view. Respondents' orientations towards the attitude represented by statements A1 through A7 are quite positive in general: this is further reinforced by the strikingly similar pattern of answers to all items except those of A3 and A6. As illustrated in Figures 5.1–5.4, only a relatively small number of respondents disagreed with the statements: full disagreement remained below 10 per cent (or five responses) for all items except A3; slight disagreement was, in general, below the 20 per cent level (except for items A2, A3 and A6). Slight agreement, however, was consistently above 40 per cent in all items.

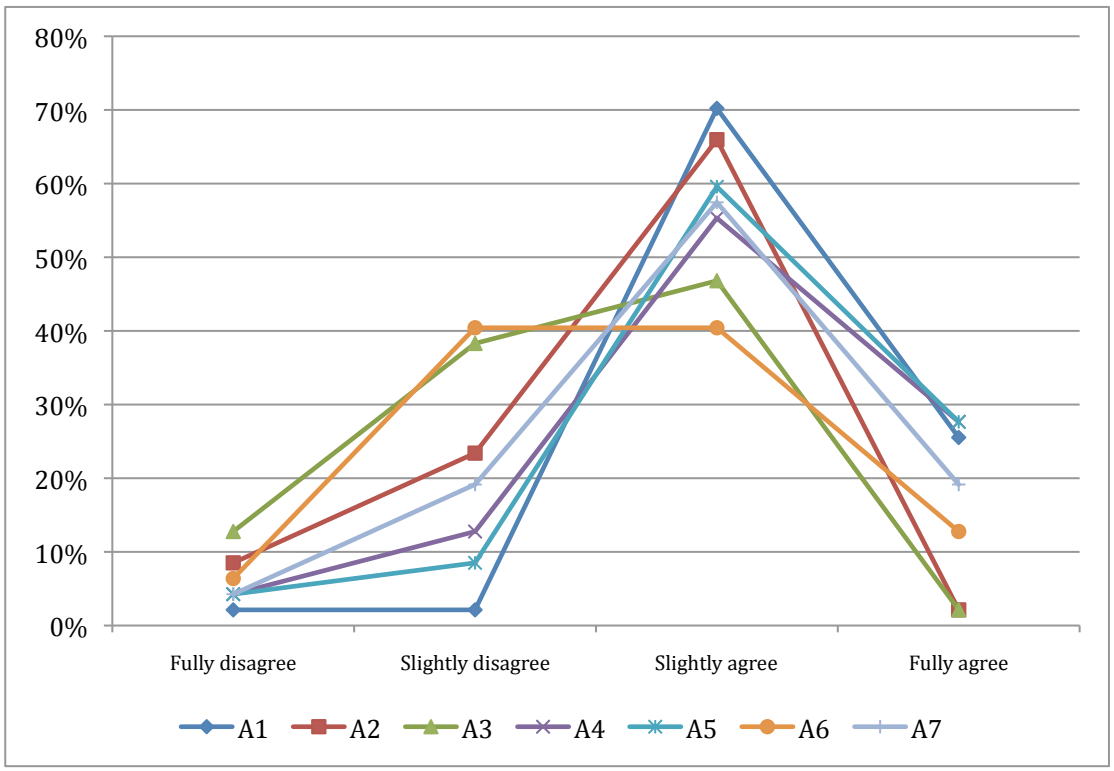


Figure 5.1. Respondents' level of agreement with statements A1–A7.

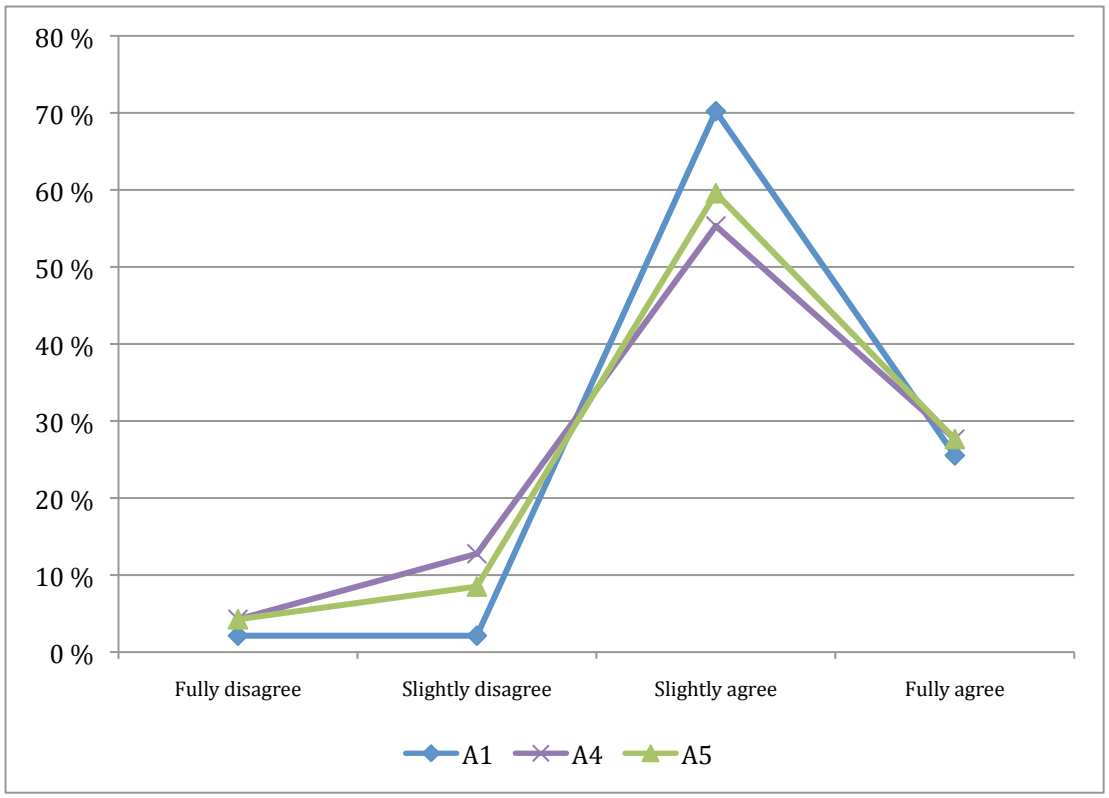


Figure 5.2. Respondents' level of agreement with statements A1, A4 and A5.

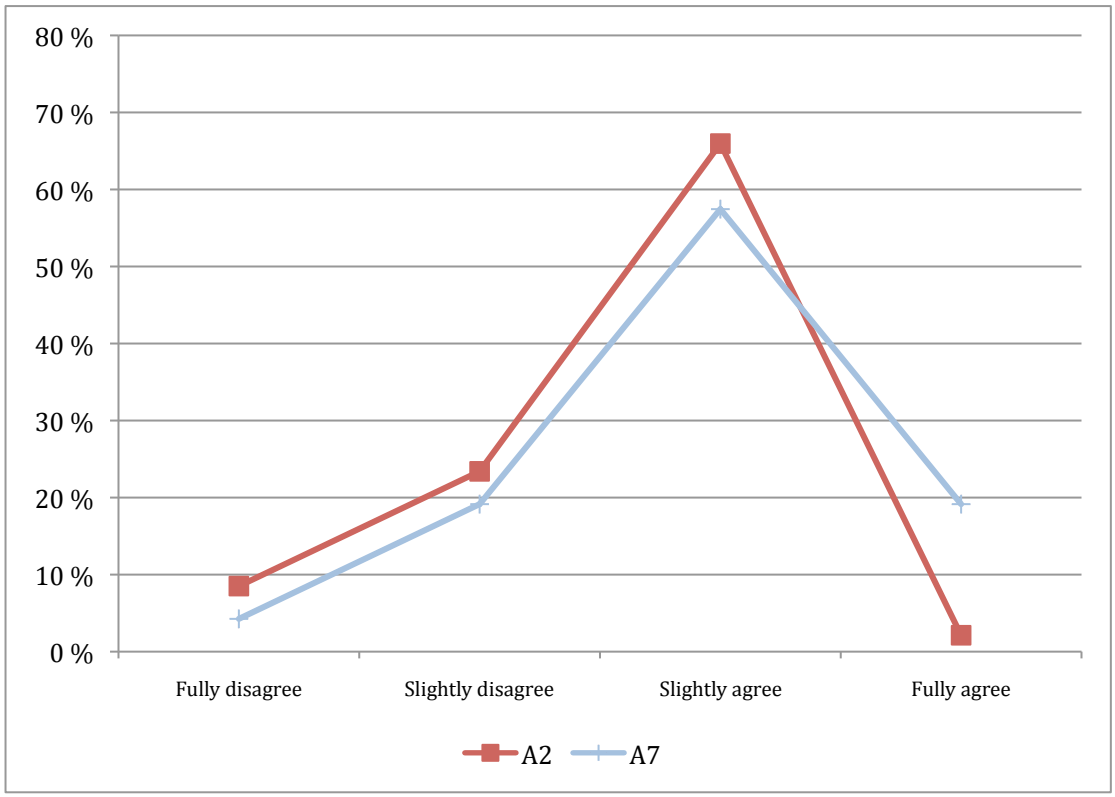


Figure 5.3. Respondents' level of agreement with statements A2 and A7.

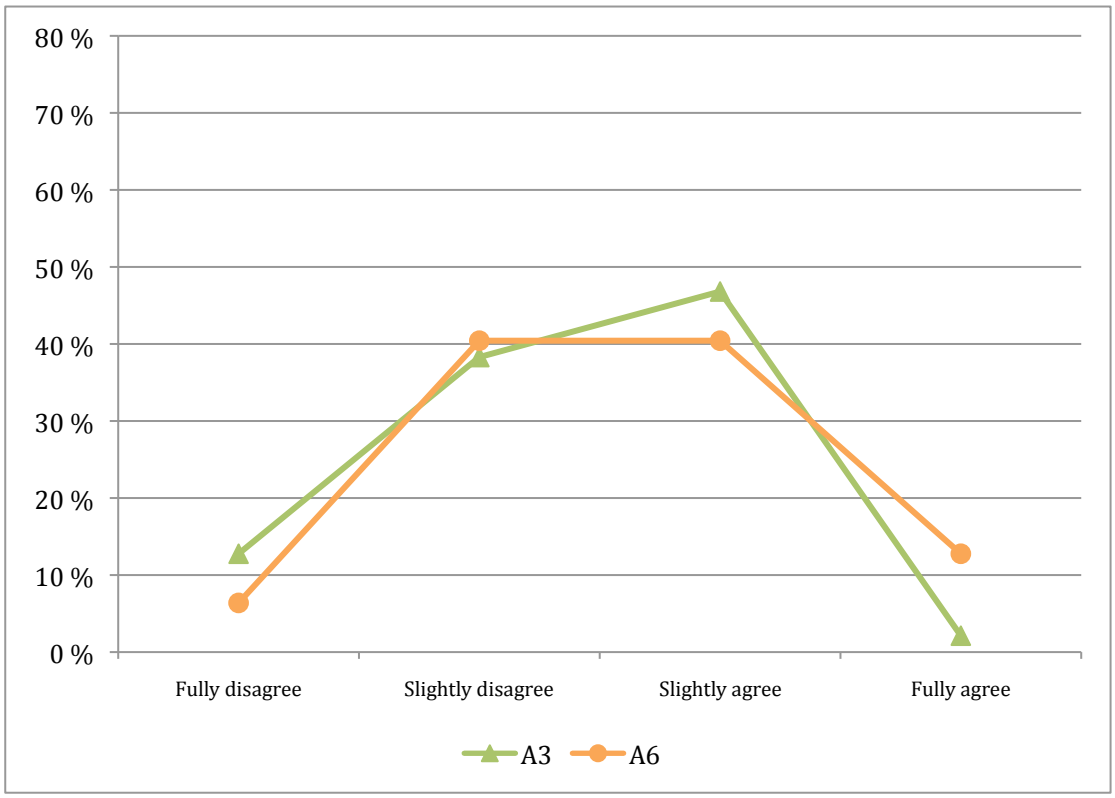


Figure 5.4. Respondents' level of agreement with statements A3 and A6.

Concerning respondents' opinion on the effects of ICT use to EFL learning, results were roughly similar to those of A1–A7 in that answers to items A8 to A11 were largely in agreement with the statements (see Figure 5.5). However, it should be noted that item A11 denoted a potentially harmful aspect of ICT use, namely that ICT use may distract learners' attention from the topic of the lesson. Respondents were quite divided on this particular issue (M = 2.51, SD = .86). Participants were most clearly in favour of item A8, namely that the use of ICT expands the possibilities to learn English through authentic materials (M = 3.66, SD = .64). A8 was found to differ significantly by gender ($\chi^2_{\text{Fisher}}(N = 47) = 9.407$, p = .01, Cramér's V = .447). Female participants, on average, were more positive (M = 3.8, SD = .47) in their opinions than were males (M = 3.25, SD = .87), as well as being significantly more absolute in their support for statement A8: nearly 83 per cent of female respondents fully agreed with the statement, while only less than 42 per cent of males expressed full support.

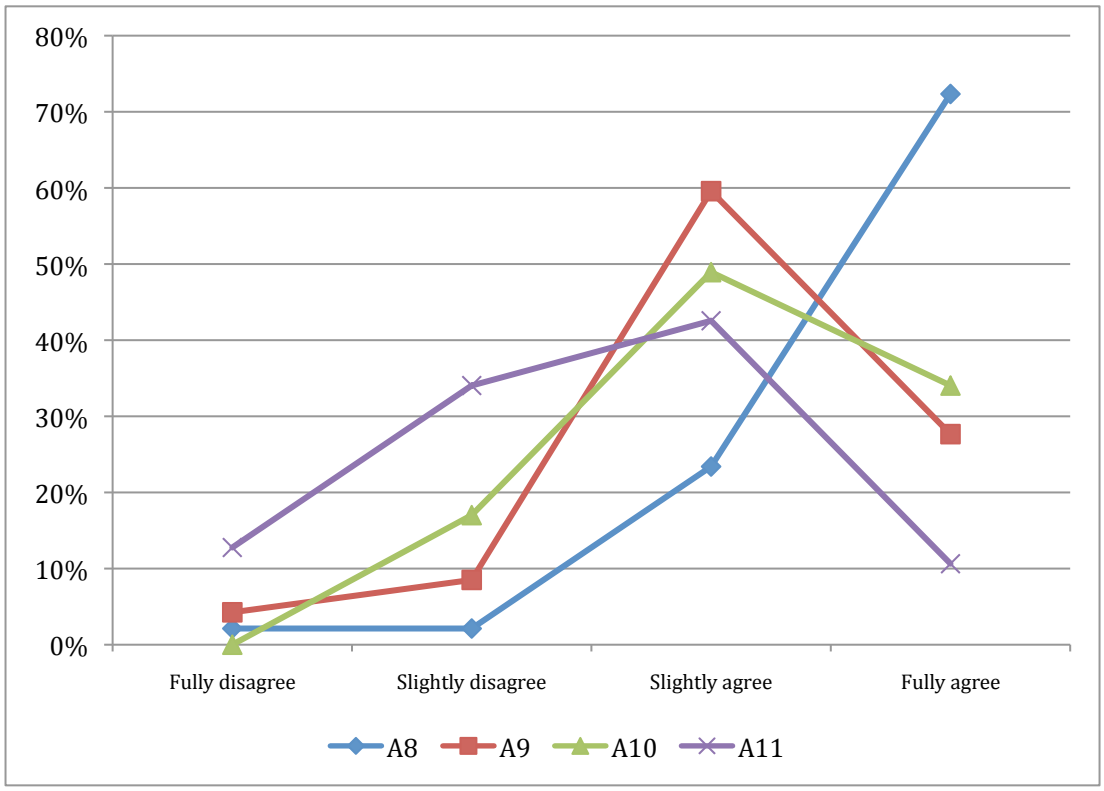


Figure 5.5. Respondents' level of agreement with statements A8–A11.

Differences in the answers to items A9–A11 were not found to be statistically significant in relation to measured background variables. Nevertheless, some measure of association between these items and respondents' background variables was found: values for Cramér's *V* for the items generally varied between .163 and .298, indicating low to moderate levels of association, similarly to those found for items A1–A7. For item–variable pairs A10**x**Gender and A11**x**Age_group the values of Cramér's *V* were, respectively, .055 and .097, indicating that there were neither significant differences (or similarities) between participants' answers ($p > .05$) or appreciable interactions between items and background variables.

5.3 Teacher trainees' views on the effect of educational ICT use to teaching

Statements A12–A17 measured participants' opinions on the effects that ICT use may have on teaching. Statements A12, A13 and A15 were worded in a negative sense, while the wording for items A14, A16 and A17 was positive or near neutral. Results indicate that, in general, ICT use was not considered to take up too much time from

teaching the content of the English language (A12: *M* = 1.87, *SD* = .65); that preparing ICT use for lessons did not consume too much time (A13: *M* = 2.34, *SD* = .87); and that ICT use is not primarily the responsibility of the ICT teacher (A15: *M* = 1.53, *SD* = .62). Additionally, answers to items A14, A16 and A17 show that respondents' attitudes are mainly positive concerning the use of students' own devices in EFL teaching, the presence of ICT in EFL lessons and the need to teach ICT to students.

Table 5.5. Descriptive statistics for items A12–A17 (N = 47)

Item	'I fully disagree'	'I slightly disagree'	'I slightly agree'	'I fully agree'	Mean	Variance	Standard deviation
A12	12	30	4	1	1.872	0.418	0.647
A13	7	22	13	5	2.34	0.751	0.867
A14	1	7	22	17	3.17	0.579	0.761
A15	25	19	3	0	1.531	0.385	0.620
A16	0	4	23	20	3.34	0.396	0.629
A17	0	5	20	22	3.362	0.447	0.668

Figure 5.6 below shows how respondents' answers to items A12–A17 generally follow a common trend, namely that the teacher trainees' opinions of the effects of ICT to teaching were mostly positive. The statements in items A12, A13 and A15 were worded negatively, or in a way that expresses a negative sense; scores for these items were rotated (denoted by the capital letter N, as in A12N) when generating the figure, so as to more clearly show the similarity of answers in relation to the other items.

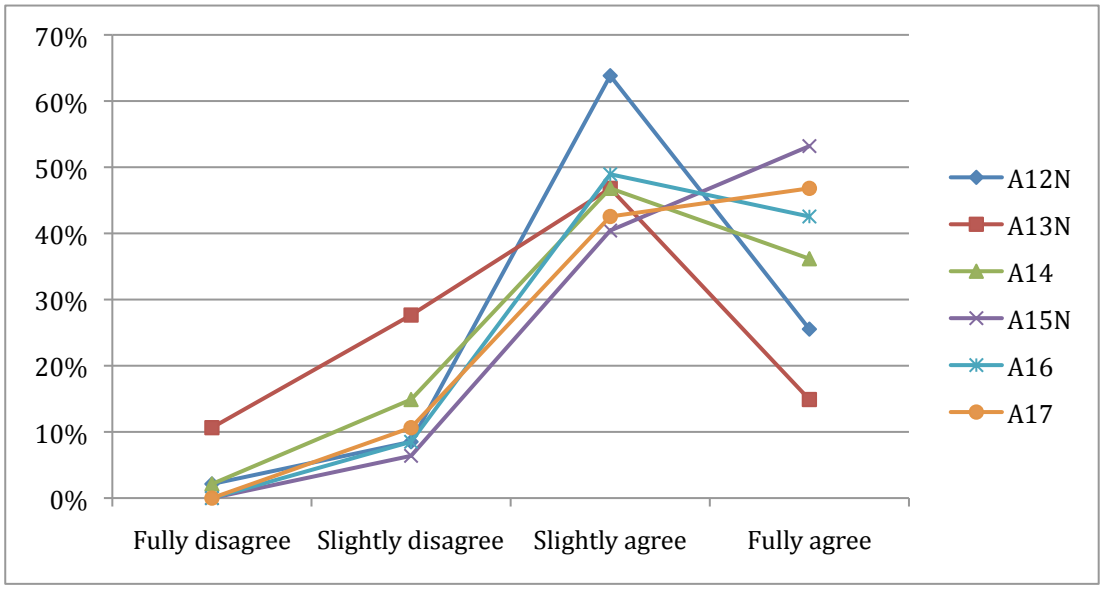


Figure 5.6. Respondents' agreement with statements A12–A17.

Answers to items A12 through A16 did not differ significantly according to background variables, however, the differences in participants' opinions on item A17, the need to

teach ICT to students (in order to make use of it in learning English), were found to be statistically significant in relation to their level of ICT studies ($\chi^2_{Fisher}(N = 47) = 8.932$, $p = .044$, Cramér's $V = .308$). Interestingly, respondents' opinions of the need to teach ICT skills to students decreased in an almost linear fashion the more respondents had studied ICT (see Figure 5.7). Those teacher trainees who had not taken any ICT courses were most in favour of item A17 ($M = 3.54$, $SD = .72$), followed by participants who had taken compulsory courses in ICT ($M = 3.22$, $SD = .65$). Teacher trainees who had completed voluntary ICT courses (for instance, as a minor subject) had the lowest mean score ($M = 3.0$, $SD = .00$). This result seems rather counter-intuitive, and therefore raises some interesting questions. This issue will be elaborated later in Chapter 6.

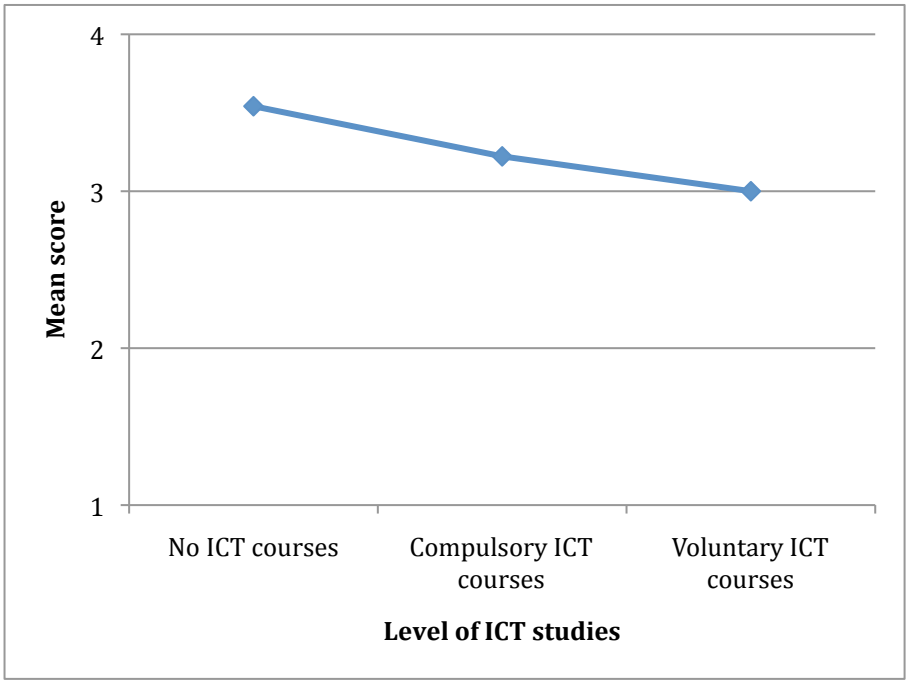


Figure 5.7. Mean score in item A17 according to level of ICT studies

Similarly to previous categories (see sections 5.2 and 5.3), there were some indications of association between background variables and answers to questionnaire items despite non-significant *p*-values for the item-variable pairs: in general, Cramér's *V* ranged between .120 (low association) and .339 (low–moderate association). Remarkably, item-variable pair A17**x**Age_group had a *p*-value of 1.000 and a very small Cramér's *V* of .055. This indicates that, at least in the present sample, there was no relationship or association between participants' age and their perception of the need to teach ICT to pupils.

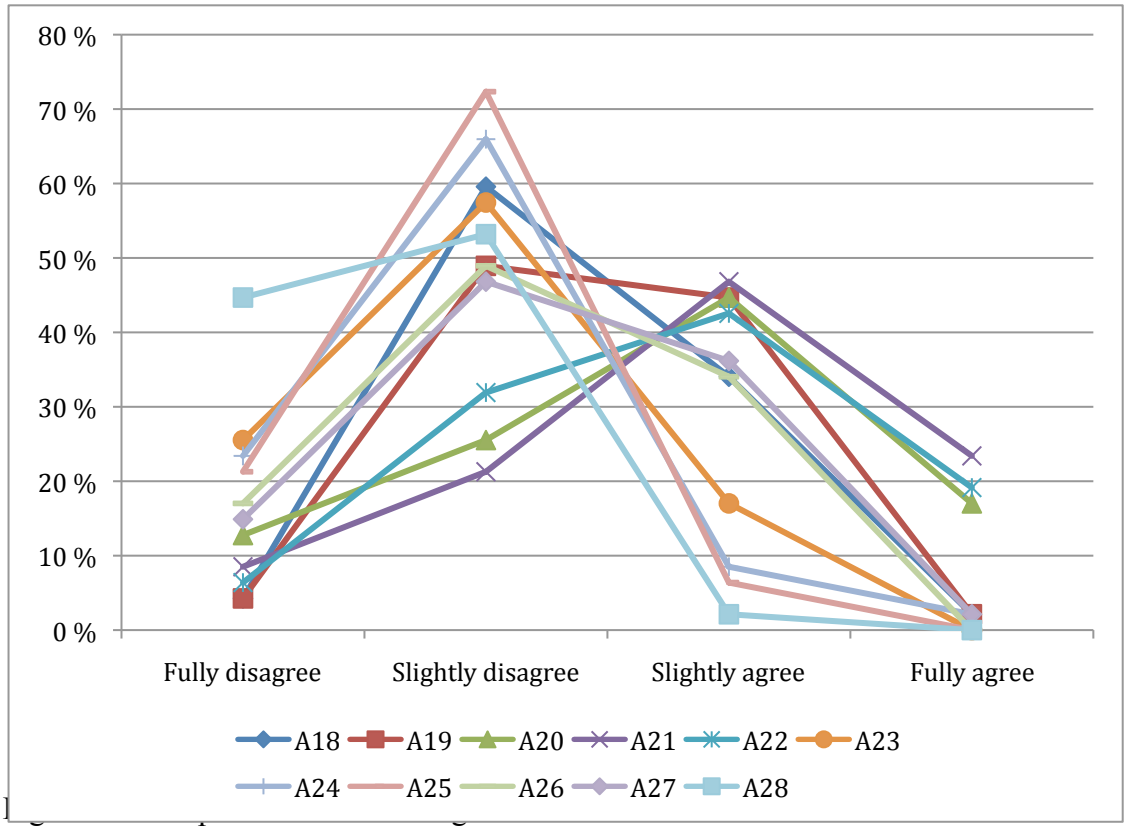
5.4 Teacher trainees' views on students' ICT skills

Statements A18 to A28 were designed to gauge respondents' opinion on learners' ICT skills. Results show that participants are rather critical of the level of ICT skills that pupils possess: all items except A20–A22 had a mean score below the threshold value (2.5; values less than 2.5 indicate a negative opinion, values above 2.5 indicate a positive opinion). Interestingly, answers to item A22, which explicitly measured participants' opinion on students' general ICT competence, were somewhat positive (*M* = 2.75, *SD* = .85), in contrast to the overall trend in this category.

Table 5.6. Descriptive statistics for items A18–28 (N = 47)

Item	'I fully disagree'	'I slightly disagree'	'I slightly agree'	'I fully agree'	Mean	Variance	Standard deviation
A18	2	28	16	1	2.34	0.36	0.6
A19	2	23	21	1	2.447	0.383	0.619
A20	6	12	21	8	2.66	0.838	0.915
A21	4	10	22	11	2.851	0.782	0.884
A22	3	15	20	9	2.745	0.716	0.846
A23	12	27	8	0	1.915	0.427	0.654
A24	11	31	4	1	1.894	0.401	0.634
A25	10	34	3	0	1.851	0.26	0.51
A26	8	23	16	0	2.170	0.492	0.702
A27	7	22	17	1	2.255	0.542	0.736
A28	21	25	1	0	1.574	0.293	0.542

Furthermore, respondents were somewhat in agreement with items A20 (*M* = 2.66, *SD* = .92) and A21 (*M* = 2.85, *SD* = .88) which stated that playing computer games enhances students' abilities to utilise ICT in studying, respectively, in general, and concerning the English language. The slight difference, or its direction, between items A20 and A21 was not unexpected: in the vast majority of games on different platforms (computers, gaming consoles), the language used is English. Therefore, students receive large amounts of exposure to English, especially in games that are story-driven. Figures 5.8–5.11 below illustrate the trends in items A18–A28: Figure 5.8 displays results for all items, while Figures 5.9–5.11 present three distinct groups of items with similar tendencies (in the same fashion as items A1–A7, see section 5.2).



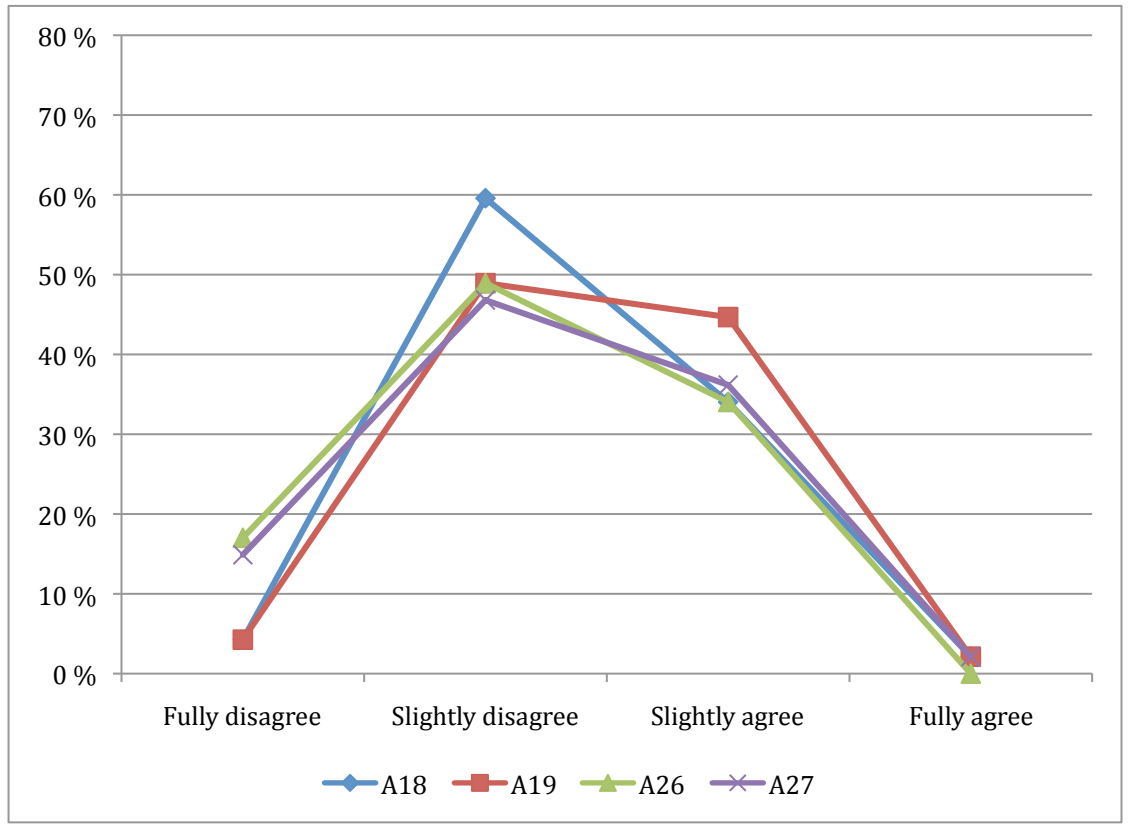


Figure 5.9. Respondents' level of agreement with statements A18–A19 and A26–A27

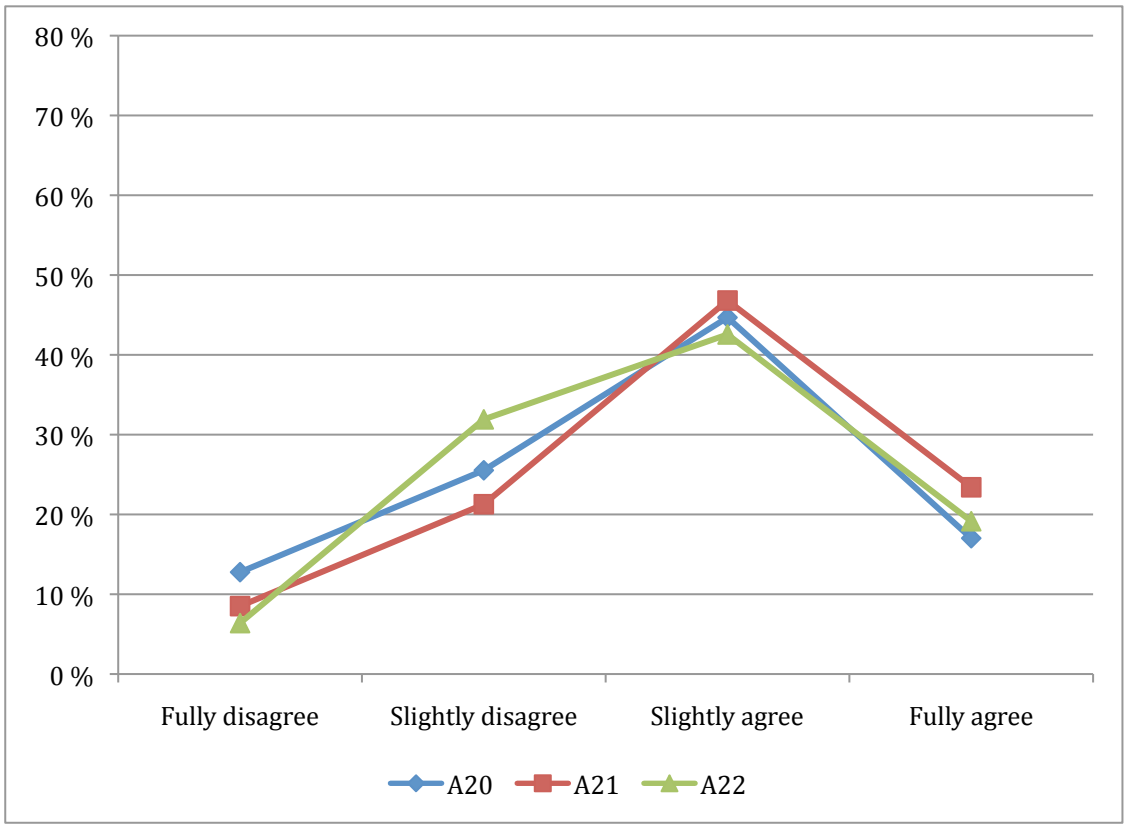


Figure 5.10. Respondents' level of agreement with statements A20–A22

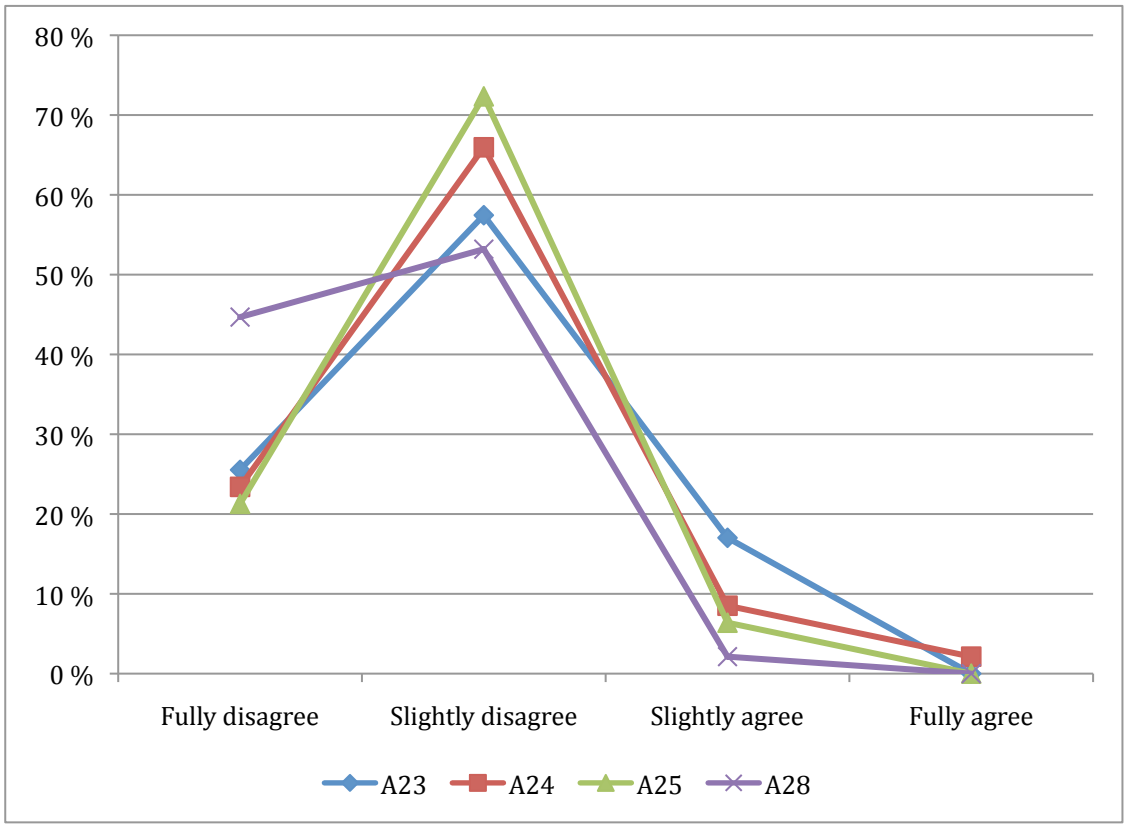


Figure 5.11. Respondents' level of agreement with statements A23–A25 and A28

Answers to item A20 (playing computer games enhances students' ICT skills in general) were found to differ significantly according to respondents' level of teacher studies ($\chi^2_{Fisher}(N = 47) = 13.298$, $p = .048$, Cramér's $V = .307$): teacher trainees who had not yet completed their basic studies in teacher training were the most negative concerning the statement ($M = 2.0$, $SD = .00$), while participants who had completed basic studies (but not yet started subject studies) were divided evenly on the issue ($M = 2.5$, $SD = .71$). Respondents who were in the middle of subject studies or had completed teacher training had generally positive views: 60 per cent of those with incomplete teacher studies agreed ($M = 2.8$, $SD = 1.23$) with statement A20, while nearly 69 per cent of teacher trainees who had completed their teacher studies were in agreement with the statement in item A20 ($M = 2.69$, $SD = .86$). Differences between responses to items A18, A19 and A21–A28 did not reach statistical significance in terms of the measured background variables. As with previous items, low to low–moderate association (Cramér's V varied between .101 and .362) was present in item–variable pairs. The lowest association was found in the pair A26**x**Age_group for which p=1.000 and Cramér's V=.062, i.e. the participants' age was not related to their opinions concerning pupils' ability to use the Internet responsibly.

5.5 Teacher trainees' views on technical and pedagogical affordances of ICT use

Questions A29 to A36 were open-ended questions that were designed to elicit detailed information on respondents' views and attitudes concerning the technical and pedagogical affordances of ICT use. Questions A29 to A32 focused on the beneficial aspects, while questions A33 to A36 concentrated on the challenging aspects, or disadvantages, of ICT use, first in terms of technical benefits/disadvantages from the learner's perspective, and then from the teacher's perspective. All of these questions were obligatory: given that respondents were supplied with, and encouraged to use, a summary of the terms and concepts used in the questionnaire, it was assumed that participants were knowledgeable enough to produce some insights into the areas of enquiry regardless of their current stage of teacher studies or their familiarity with specific applications (such as the SMART Board, an interactive whiteboard with the capability for touch-sensitive input) of ICT to teaching. Indeed, the data gained from the

open-ended questions was at first glance rather expansive. Questions A29 to A36 are analysed in subsections 5.5.1 through 5.5.8.

Preliminary analysis of the data revealed a large number of categories of benefits and challenges. Of these initial categories, many were overlapping in meaning, which implies that there exists a categorisation that more adequately describes the range of qualities that the overlapping categories represent. Therefore, the initial categories were analysed and grouped according to the background theory of ICTs' affordances (presented in Chapter 2). As can be seen in Table 5.7, the final categories are rather broad: some categories represent a wide range of qualities. Furthermore, the categories do not present a superficial and dichotomous benefit/challenge distinction, but a category may embody beneficial, challenging or, indeed, both aspects.

Table 5.7. Grouping of initial categories into the final categories.

Access	**Diversity**	**Cognition**	**Motivation**	**Interaction**
Access	Diversity	Support	Motivation	Interaction
Speed	Quality	Distraction	Interest	Participation
Resources	Authenticity	Attention	Relevance	Collaboration
Equality		Control	Ownership	Communication
Uncertainty		Reflection	Autonomy	
Flexibility		Familiarity	Attitude	
		Skills	Self-regulation	
			Responsibility	

Table 5.8. Number of references to specific categories in items A29–A36.

Item	**Access**	**Diversity**	**Cognition**	**Motivation**	**Interaction**	**Other/N.A.***
A29	**17**	7	**24**	8	6	5
A30	7	13	**30**	**32**	7	1
A31	**36**	**14**	12	6	2	1
A32	10	**28**	**20**	**17**	11	3
A33	**28**	6	**30**	7	0	1
A34	3	5	**37**	**19**	1	2
A35	**28**	13	**30**	3	0	1
A36	**15**	7	**43**	**19**	1	1

Access refers to the mainly technical qualities of ICT that enable both students and teachers to access information and resources. Availability of equipment in the classroom is a priority in this regard, and moreover, the existence of a certain level of ICT infrastructure, such as wireless networks that enable access to the Internet. Furthermore, the speed and ease of access are quite essential to both teachers and students, as they imply not only efficiency, but also reflect the state of the equipment: it

* The 'category' *Other/N.A.* denotes missing answers.

is of little use to have, for instance, digital materials if the equipment are not in working order. Availability of (digital) materials is also a large concern, and one that teachers have only limited power to influence.

Diversity refers to both materials and teaching methods, in that technology allows for much more variety than traditional practice. ICT enables teachers to use multimodal materials that cater to a wider range of learning strategies through the various input channels (visual, auditory and tactile) than traditional textbooks that rely mostly on presenting information with text. Authentic materials are also easier to find using ICT, although it is important to note that the quality of material found, for example, in the Internet, may be an issue. It is rather clear then, than diversity has important links to all the other main categories. Diverse materials and methods require access to resources; they may be more motivating for the students; they enable new forms of interaction and collaboration; and they have important implications for the students' cognitive development.

Cognitive development and support is arguably the most important category in the present analysis. It is also perhaps the most ubiquitous, since the consideration of any given category or sub-category will, eventually, lead to cognition: after all, cognition encompasses, in broad terms, our mind and consciousness. Philosophical questions aside, the current analysis restricts the category of *Cognition* to those aspects of ICT use that concern the following areas: cognitive development (learning for short), cognitive support(s) and scaffolding, attention, reflection (including critical thinking and metacognitive abilities) and familiarity (of tools, practices and contexts). It should be noted that learning to use new tools, such as computers, is considered a development of cognition – acquiring skills, whether cognitive (related to internal processing of information) or manual skills, always denotes a development of cognition. The component of familiarity may seem a bit out of place; yet, if we think of it in terms of its potential to lessen the impact on students' cognitive resources, it should be clear that it too shares a decidedly cognitive dimension. By this definition, familiarity should be considered a form of cognitive support. However, familiarity was explicitly mentioned in some of the answers, and so I decided it should remain a subcategory of its own in order to make the analysis more transparent.

The category of *Motivation* consists of qualities that can be seen to link to motivation, either directly, such as interest, attitudes and enjoyment, or indirectly, such as autonomy, self-regulation and responsibility. The qualities that are considered to have a direct connection to motivation have an effect on students' motivation. The indirect, or derived, qualities, on the other hand, are a result of the students' existing motivated (or de-motivated) state combined with the potentially motivating (or de-motivating) teaching practice: these can have a 'feedback' effect on motivation, for example, a student's heightened sense of autonomy may lead to improved interest and motivation toward the subject. Relevance of a topic to the student's personal 'world' may have a deciding effect on their motivation, although one should keep in mind that the personal preferences of a single student are likely to be shared only by a small minority of the whole group.

Interaction is a rather expansive concept. It is used here to denote mainly two aspects: participation and communication. Participation includes virtually any activity in the classroom that involves or engages the students. It can be used to denote singular activities, or individual work, during lessons when the target or subject of the activity is common to all students, or collaborative activities and group work. Communication is a slightly more precise concept, involving discourse or dialogue between two or more participants.

It should be noted that, regardless of the division of benefits and challenges of ICT use into either technical or pedagogical aspects, the technical and the pedagogical are nearly inseparable in the educational context. One cannot simply divorce a technical aspect from its pedagogical implications, or a pedagogical purpose from the technical requirements that it may impose. Rather, the technical and pedagogical aspects of ICT use should be considered complementary to each other.

5.5.1 Technical benefits to learners

Respondents' answers to question A29 were rather diverse in terms of the specific benefits mentioned, however, few participants explicitly linked the technical benefits they mentioned to the teacher's pedagogical practice or even to an improvement of the pupil's learning. In addition to participants' background variables, this may have been caused by inadequacies in the design of the questions: the strict division into technical

and pedagogical categories suggests a strong, perhaps even misleading dichotomy between these aspects that does not accurately reflect the reality in educational situations. Furthermore, the questions did not unambiguously state the target of the benefit or disadvantage, nor did they ask participants to connect technical aspects to pedagogy or language learning and teaching as a whole. As respondent R47 points out, "The phrasing of the question is unclear whether the technical benefits refer to the fluency of studying or to learning to use technology." Additionally, several of the participants answered question A29 with incomplete sentences composed of only a few words. These responses are challenging to analyse, since the respondent's exact intended meaning is ambiguous. Nevertheless, most of the cases could be assigned to specific categories (or, indeed, several categories) despite the scarcity of information contained in these answers.

Two of the participants, R12 and R31 did not attribute any technical benefits to the educational use of ICT. Subject R31's answer was a plain *I cannot say*, which could indicate either a lack of knowledge, or a lack of motivation to answer the question. In contrast, R12's response was pointedly argumentative:

> (1) En keksi yhtään. Jokainen oppilas osaa kyllä käyttää tietokonetta, eikä jonkin tietyn ohjelmiston oppiminen paranna yleisiä TVT-valmiuksia yhtään. (R12)
>
> I cannot come up with any. Each of the students knows how to use a computer, learning a specific piece of software does not improve general ICT competencies in the slightest.

R12 makes two statements: first, that each of the pupils is a competent user of ICT, and second, learning to use specific software does not improve general ICT competences. Both of these are, essentially, fallacies. The first statements would only be true were the respondent to know with certainty that *all learners are competent users of ICT*. The second statement, on the other hand, is synonymous with the imagined claim 'reading a book does not improve literacy'. Beyond the learner's ability to handle the technical equipment manually (the keyboard, for example), ICT competence develops specifically *by learning particular pieces of software*. General ICT competence, then, is a collection of small areas of competence relating to specific areas and applications of ICT. Interestingly, none of R12's answers to the other qualitative questions reveal a similar, somewhat negative, attitude.

In these examples, it is rather unclear whether respondents were actually connecting the mentioned qualities to an improvement of the pupils' learning, or if they were merely

considered convenient measures of retaining control in the classroom and minimizing undesirable behaviour. The qualities of *visuality*, *amusement, interactivity* and *familiarity* mentioned in examples 2, 4 and 5 could certainly be taken as beneficial aspects of ICT use when implemented in a manner conducive to learning: they can motivate learners and act as facilitators of cognitive processes. The potential contributions of *rapid action* or *swiftness* and *easiness*, however, seem to have more to do with aiding the teacher's everyday practice, than improving learning. In concordance with information processing theory and cognitive load theory (see section 2.2.4.1), the speed at which learners are exposed to information should not exceed the rate at which they are able to process said information. Moreover, social-constructivist pedagogy (which is rather prevalent in contemporary Finnish teacher training) states that learning, in general, occurs when the pupil is functioning in his or her zone of proximal development (ZPD), in other words, when the learner is challenged sufficiently by the learning task. Tasks that are (too) easy do not result in meaningful learning because the learner already possesses the knowledge needed to perform such a task and is not 'forced' to learn anything new.

5.5.1.1 Technical benefits – access and cognition

Interpretation of the answers indicated *access* as a major beneficial aspect of ICT use: seventeen of the answers reflect qualities that represent this category. Speed and ease of access and independence of time and place were defining characteristics, succinctly exemplified by respondent R8's answer:

(2) Helppous ja joustavuus (tietokoneella työskentely ei välttämättä ole riippuvaista ajasta tai paikasta). (R8)

Ease and flexibility (working with the computer is not necessarily dependent on time or place)

The possibilities of returning to the material after the class and using learning materials at home via Internet seemed to be of importance to respondents R22 and R24 (examples 3 and 4, respectively):

(3) Oppilaan on mahdollisuus palata esitettyyn materiaaliin, hän voi itse etsiä autenttista materiaalia. (R22)

The student is able to return to the presented material, they can search for authentic material independently.

(4) Useimmilla tietokone myös kotona, jolloin oppimateriaaleja ja nettiaineistoja helppoa selata myös kotona. (R24)

Most of the students have a computer at home, so they are able to easily make use of [digital] learning materials and online content at home.

The ability to revise on materials previously encountered, for instance, in the classroom may have implications for pupils' performance in the subject overall. Without overt limitations on the time available, learners are able to better reflect the issues presented, and develop a deeper understanding of the topics. Respondent R13 comments, among other things, on the availability of materials on the Internet:

(5) Tvt materiaalit ovat visuaalisempia. Netissä jaettuun materiaaliin on helppo päästä käsiksi missä vaan. TVT mahdollistaa kommunikaation paikasta riippumatta eli tarjoaa mahdollisuksia aitoon englanninkieliseen vuorovaikutukseen vaikkapa natiivien englannin puhujien kanssa. Internetin kautta oppilailla on paljon erilaista englanninkielistä materiaalia käytettävissään. (R13)

ICT-based materials are more visual. It is easy to get access to materials on the Internet from anywhere. ICT enables communication regardless of location, so there are opportunities for genuine interaction in English, for example, with native English speakers. Students are able access to a wide range of material in English by using the Internet.

Comparing presented information to other sources, readily available on the Internet as R13 (example 5) points out, can further enhance learners' conceptions of subject areas encountered during lessons, and perhaps even motivate them to search for information independently. The popularity of digital services that offer open access to information, such as Wikipedia, has already shown the potential inherent in using the Internet for meaningful educational practice.

Overall, considerations of diversity as a technical benefit of ICT use were significantly less frequent than those of access or cognition: seven answers in total exhibited a sense of diversity, either as an explicit expression or an implicit meaning. Roughly half of these related diversity to the materials used in teaching, such as the answer of respondent R3:

(6) Ne tuovat vaihtelua usein kaavamaiseen oppikirjamateriaaliin ja motivoivat siten eri tavalla. Oppilaat voivat itse myös helpommin osallistua ja ottaa kantaa kurssin sisältöön. Ujommatkin oppilaat saattavat rohkaistua ilmaisemaan itseään enemmän. (R3)

They bring variety to the often rigid and formal textbook materials, and thus motivate [students] in a different manner. It is also easier for the students to participate in and express their opinions on the course content. Even shy students may be encouraged to express themselves more.

Others felt that diversity is connected to working methods (one answer), or to teaching in a more holistic manner. The latter view is exemplified in the answer by respondent R30:

(7) Tuo vaihtelua perinteiseen taulu-oppikirja-opetukseen. Saa mielenkiinnon pysymään yllä, koska teknologia kuuluu heidän päivittäiseen elämään. Lisäksi voi etsiä itseä kiinnostavia aineistoja paljon enemmän, esim. ”Tee vastine jonkun itseäsi kiinnostavan artikkelin pohjalta.” (R30)

Diversifies the traditional blackboard-textbook teaching. Sustains [the students'] interest, since technology is a part their daily lives. One can also search for personally interesting materials much more, for example, “Write a reply to an article that interests you.”

Only one of the seven answers in this category, namely that of R3 (example 6) considered the effects of diversity to learning or to other aspects explicitly. As the question did not ask teacher trainees to connect the perceived technical benefits to pedagogical benefits, it can be assumed that such connections were deemed too obvious to mention by most of the respondents: several of the answers suggested motivational or cognitive benefits but not in a causal relationship with diversity of materials or teaching methods. Another possibility is that respondents considered diversity a value in itself, but this seems unlikely given the rather analytical nature of the answers regarding other categories.

Technical benefits related to cognitive gains (referring to the category labelled *cognition*) were rather widely recognised among participants: analysis of the answers revealed 24 cases where cognitive qualities were indicated. As expected, these were largely concerned with the learning of, or development of, skills in using ICT equipment and software, often in connection to either educational use in the classroom, or future needs in terms of work or further studies. Following examples by respondents R4, R26 and R46 illustrate these perspectives:

(8) Pysyvät nykyajassa kiinni jos on teknisiä taitoja. Laitteiden ja sovellusten käyttö on nykyaikaa ja yleissivistystä. (R4)

Possessing technical skills will help them to keep in touch with the present. The use of [computer] equipment and software is part of the present as well as general knowledge.

(9) Se antaa oppilaille paremmat valmiudet käyttää erilaista teknologiaa tulevessa [sic] työssä ja opiskelussa. (R26)

It equips students with better abilities to use different technologies in their future work and studies.

(10) Oppilaat oppivat tietoteknisten välineiden ja ohjelmien käyttöä sekä tiedonhakua; taitoja joita tarvitaan nykyisessä ja tulevaisuuden työelämässä. (R46)

> Students learn how to use ICT tools and software, and how to search for information. These are skills that are needed in present and future working life.

These answers are interesting because they emphasise different contexts of use, even while each of them focus on learning essential skills concerning the use of ICTs. R4 (example 8) feels that ICT skills are a vital part of general knowledge, whereas R26 (example 9) and R46 (example 10), in contrast, display a more specific scenario where ICT skills relate mainly to performing tasks. In the case of R26, future work and studies are relevant, but R46 only refers to work. The difference between R26 and R46 is, however, not of immediate interest here: the discrepancy between the views of R4 and those of R26 and R46 reflects a more fundamental difference between the respondents' attitudes to ICT, namely concerning the *instrumental value* of technology (see also section 3.1.). Where R4 sees the development of ICT skills and knowledge as valuable in itself, R26 and R46 mainly consider those skills as tools. This latter view, i.e. ICT as a tool, promotes an attitude that can, conceivably, hinder the introduction of technically and pedagogically feasible features of ICT into education. Furthermore, such a view contradicts, to a certain degree, the views expressed in the national core curricula for both basic education (Perusopetuksen opetussuunnitelman perusteet 2004) and upper secondary education (Lukion opetussuunnitelman perusteet 2003):

> The theme Humans and technology aims to help pupils to understand the relationship between humans and technology and to perceive the meaning of technology to our daily lives. Basic education must provide basic information on technology, its development and influence, and offer guidance to making rational decisions. Basic education must also guide pupils to reflect on questions of ethics, morality and equality related to technology. Comprehension of the operational principles of tools, equipment and machines must be developed through teaching in addition to teaching their use. (Perusopetuksen opetussuunnitelman perusteet 2004: 42; translated from the original by the current author)

> The theme ["Technology and society"] must guide the student to reflect on the development of technology in relation to societal change from historical, current and future perspectives. The student is guided to **understand, use and manage** technology. (Lukion opetussuunnitelman perusteet 2003: 28; emphasis added, translated from the original by the current author)

It is quite the paradox, especially in an educational system that strives for all-round education, that teachers should reduce the role of ICT into a simple tool and thus, limit the ICT related knowledge and skills that learners are able to obtain through education – particularly in the current (and future!) society which ICTs are a pervasive aspect of. Such thinking seems rather prevalent in subject teaching, perhaps because of concerns over the distracting effects of ICT use and constraints of time and resources. These, of course, remain valid considerations, yet teachers and teacher trainees should, in my

opinion, also reflect on an alternative view: that the requirement of the integration of ICTs into subjects dictated by official policy is not fulfilled by simple, one-way 'integration'.

In addition, several answers mentioned that learning to use ICT through its educational use could enable pupils to take advantage of it outside of school: while a sense of 'meaningful use, something to do with work or studying' could be inferred, such a stance was rarely explicitly expressed. Answers containing explicit reference to benefits to learning (of the subject matter) were surprisingly scarce. Respondent R23 remarks on an important aspect concerning the cognitive effects of ICTs:

(11) He oppivat käyttämään erilaisia laitteita ja sovelluksia. Kun näiden käyttö on hallinnassa, on niitä helpompi hyödyntää, jolloin positiiviset vaikutukset oppimiseen ovat todennäköisempiä. (R23)

They learn to use different [ICT] tools and applications. When they are in control of these, the tools become easier to exploit, which makes their positive influence on learning more likely.

As R23 explains in their answer (example 11), positive effects on learning are more likely to occur if pupils already possess knowledge and skills to use ICTs. This does not mean that pupils must know every detail of ICT or its use in order to gain benefits to their learning from it. Rather, learners are able to concentrate better on the actual content, and thus gain more benefit from ICT, when their cognitive resources are not exhausted by the simultaneous processing of content and unfamiliar features of the technology used. Additionally, participant R28 mentions an equally important effect that relates to learners' metacognitive abilities:

(12) TVT mahdollistaa uusia työskentelytapoja, jotka eivät muuten olisi mahdollista ja antaa oppilaille mm. paremman mahdollisuuden seurata omaa oppimistaan ja kehitystään. (R28)

ICT enables new kinds of working methods that would not be possible otherwise. It also gives students better opportunities, for example, to keep track of their own learning and progress.

R28 (example 12) refers, quite clearly, to learners' metacognitive skills of *monitoring* and *evaluation* (see section 2.2.1), the development of which the informed use of ICT in teaching can facilitate. These metacognitive skills are essential to fostering pupils' autonomous and self-regulatory behaviours and practices, in the short and the long term.

In total, eight answers were assigned to the category of *motivation*. All of these answers included other aspects as well, that is, technical benefits related to motivation were

never mentioned in isolation. These motivational technical benefits are connected to three distinct areas: diversity of materials and methods; relevance, or personal sense of meaning, of materials, tools (ICT) and methods; and enjoyment of using technology. As respondent R3 (see example 6, earlier in this chapter) remarks in their answer, diversity and variety in teaching can be a motivating factor. Learners' sense of personal meaningfulness, relevance in short, is an important motivating factor. Despite the fundamental role that it has especially in terms of pupils' intrinsic motivations, the relevance of teaching and lesson content to pupils seems to receive very little attention from teachers, perhaps because it is nearly impossible to take into account the orientations of every pupil in the class, at least through traditional methods of teaching. Respondents R30 (example 7) and R35 (example 13) observe that using ICT in teaching may enable the teacher to connect their teaching to the learners' world in a way that is relevant to the learners, as is evident in the answer by R35:

(13) Aika-paikkariippuvuuden katkeaminen (esimerkiksi joitakin tehtäviä voi tehdä kotoa tai myöhemmin). Kommunikaation helpottuminen (opettajan ja kanssaoppilaiden kanssa). Tietotuksen [sic] helpottuminen (läksyt netissä ja tiedotteet voi tarkistaa jne.). Opetuksen yhdistyminen oppilaan ”omaan maailmaan”. Opettaja kykenee esittämään asiat usein havainnollisemmin tai tietoa voi etsiä itse. (R35)

Independence of time and place (for example, some tasks can be done from home or later). Ease of communication (between the teacher and students, and between peers). Ease of informing (homework and notices available on the Internet). Relating or integrating teaching to the students' 'world'. The teacher is able to present things in a more illustrative manner, or the students can search information independently.

Pupils' interest and enjoyment in using ICT in education is often described as a *novelty effect* of technology where, after some time has passed since the introduction of a new form of technology, learners' interest in it, and the activities performed with it, quickly dissipates. Respondent R7's answer (example 14), which implies that using ICT is *fun* for pupils, could indeed be interpreted to be a typical example of this:

(14) Visuaalisuus, hauskuus, nopeus (R7)

Visuality, amusement, swiftness

However, R30 (example 10) presents quite a different view: learners' interest and motivation are sustained by virtue of the technology being of relevance to their lives. While the latter view probably does not represent the actual situation in an exhaustive manner, it seems that a possible novelty effect explains the reality to an even lesser extent. As most people can surely agree, adolescents are very familiar, and in general, comfortable, with current technology; yet, contrary to what the novelty effect

hypothesis states, no reliable evidence has surfaced regarding the diminishing of learner interest or motivation when using ICT in teaching for extended periods of time.

In a similar trend to motivation, the category of *interaction* comprised, for the most part, cases that were related to several categories. Only one case contained exclusive reference to interaction, expressed with the single word *interactivity*. Other cases in this category described the interactive qualities of ICT use in terms of two aspects: participation and communication. Participation was generally expressed as an enhancement of pupils' ability to take part in activities and content of the lesson or classroom, whereas communication had a more specific role as an activity involving inter-personal communication, for example, between the teacher and the pupils, and communication in the target language (English) between the learners and a third party, such as a native speaker, by utilising the Internet.

5.5.1.2 Summary

In summary, respondents felt that technical benefits to learners comprise mainly of access and cognitive gains. While some support for the categories of diversity, motivation and interaction were found, these qualities were represented to a significantly lesser extent than those of access and cognition. In terms of access, speed and ease of access to information and materials, and freedom of time and place were the most prevalent technical benefits considered by the respondents. Cognitive benefits were mainly seen to connect to learning ICT skills for future use (such as work or studying), but less on how ICT, combined with (sufficient) ICT skills, may facilitate learning in general.

5.5.2 Pedagogical benefits to learners

Question A30 was designed to elicit information on teacher students' views on the pedagogical benefits of ICT use from the learners' point of view. Since the larger context is that of educational technology, the intrusion of some technical aspects into the pedagogical considerations is inevitable. As with the previous question (A29, technical benefits), the phrasing of the question could have been more precise: instead of asking about the pedagogical benefits of ICT use, a more accurate expression would have been, for example, to ask respondents to describe the potential benefits of

pedagogically informed uses of ICT to learners. As an example of the ambiguity resulting from the present phrasing of the question, respondent R47 provides a critical viewpoint:

(15) TVT ei ole pedagogiikka, joten sillä ei ole pedagogisia hyötyjä tai haittoja. Kaikki riippuu siitä, millaista pedagogiikkaa ja miten sovelletaan TVT:tä käytettäessä tai sitä käyttämättä. Yleisesti ottaen TVT:n hyödyt ovat laihat, koska materiaali tyytyy toistamaan oppikirjarakennetta eikä tuo juurikaan lisäarvoa opiskeluun. Työskentelyn nopeutuminenkaan ei erityisesti edistä oppimista, sillä ihmisen omaksumiskyvyn rajat säilyvät samoina oppimisympäristöstä toiseen. (R47)

ICT is not a pedagogy, therefore it does not possess benefits or disadvantages. Everything depends on what kind of pedagogy is applied, and how, when using, or not using, ICT. In general, the benefits of ICT are quite slim, because the material only imitates the structure of the textbook, and brings no additional value to studying. The increased speed of working [in the classroom] does not significantly improve learning, since the human limits of absorbing information remain the same from one learning environment to the next.

While R47 is correct in most parts of their assessment, at least in terms of what we currently know about the effects of ICT use to learning, they fail to address the question, or rather, the intended meaning of the question. R47's answer was also the only case that did not assign any pedagogical benefits to the use of ICT. Nevertheless, it seems respondents were able to articulate their views more clearly in terms of the pedagogical benefits than technical ones. Notably, while pedagogical benefits were clearly linked to cognitive and motivational aspects, those of access, diversity and interaction, in comparison, received little attention from participants, as seen in Table 5.6 (see section 5.5).

5.5.2.1 Pedagogical benefits – cognition and motivation

Cognitive benefits were related, among other things, to the capacities of ICT use to develop learners' critical thinking and evaluation skills, as shown by respondent R21's answer in example 16:

(16) TVT:n käyttäminen opetuksessa edistää autonomista oppimista ja oikein opastettuna myös kriittisen ajattelun kehittymistä. Vaikka TVT itsessään ei välttämättä kasvata oppilaiden motivaatiota, tuo se opetukseen vaihtelua, mikä taas näkyy motivaation kasvuna. (R21)

Using ICT in teaching promotes autonomous learning and, when conducted correctly, the development of students' critical thinking. Even if ICT does not necessarily raise students' motivation, it brings diversity to teaching, which manifests as an increase in motivation.

Additionally, possibilities and support for different learning styles and strategies were seen as major cognitive benefits. The opportunities to receive (immediate) feedback, and to be appropriately challenged by tasks and activities, were also mentioned by

several of the participants. These qualities are exemplified by the answers of respondents R1 and R6:

(17) Oppilas voi edetä opiskelussaan itsenäisesti, itselleen sopivan haastavalla tavalla. (R1)

The student can proceed in their studies in an autonomous manner that is appropriately challenging for them.

(18) visuaalinen, auditiivinen ja taktiilinen tuki, voi auttaa monien eri opppimistyylien [sic] omaavia oppilaita (R6)

Visual, auditory and tactile support, it [ICT] can assist students by catering to many different learning styles.

Motivational aspects were characterised mainly by three interrelated qualities: interest, autonomy and relevance. In particular, motivation was often connected to the learner's individual preferences, denoting the importance of autonomy and the personal relevance of the content (and working methods) to the learners. This can quite readily be seen in R4's answer:

(19) Tukee itsenäistä ja omatoimista, ja myös yhteisöllistä(!), oppimista. Mahdollisuus päästä paremmin irti opettajajohtoisuudesta ja tiedon pakkosyöttämisestä, kun tieto ja taito ei tunnu olevan yksin opettajan hallussa. Oppilaat voivat hyödyntää omia taitojaan kielenopiskelussa, ja vaikuttaa materiaaleihin, metodeihin ja sisältöihin yksilöllisemmin, jolloin oppimisesta voi tulla enemmänkin "oma mielekäs projekti" kuin ulkoinen pakko, jolloin siihen ehkä myös sitoutuu paremmin. (R4)

Supports independent and self-directed, as well as collaborative, learning. Opportunities to break loose from teacher-centred practice and the force-feeding of information, when knowledge and skill are not seen as exclusive to the teacher. Students can use their own skills in studying the language, and can influence the materials, methods and content in a more individual manner, which may transform learning from an external imperative to a private, meaningful project. This may also improve students' commitment to and involvement in learning.

Relevance of teaching to the pupil's life experiences and skills is a pervasive aspect of motivation to learn. It could be argued that, since ICT seems an inseparable part of pupils' lives, teachers should pay close attention to what learners see as relevant or essential when conducting ICT activities. Respondent R9 seems to recognise the importance of ICT to learners:

(20) TVT:n käyttö tuo opetuksen lähemmäksi oppilaan omaa kokemusmaailmaa, sillä TVT on merkittävä osa heidän arkeaan. Oppilaat voivat myös oppia tarkastelemaan mediaa kriittisesti. (R9)

The use of ICT brings the teaching closer to the students' experiences, because ICT is a significant part of their daily lives. Student can also learn to inspect media with a critical eye.

Personal interest is arguably one of the most important factors, or facilitators, of intrinsic motivations. As such, promoting learners' interest toward the target of learning through the use of ICT can have important implications for learning as well, even if interest is not, strictly speaking, a requirement for learning. Keeping in mind that the activity, namely the content of it, should also appeal to pupils, the methods and tools used to perform the activity may have an impact on interest, and thus, motivation. R28 reflects on this issue to some degree:

(21) TVT monipuolistaa opetusta ja sen tapoja, joka edesauttaa oppilaiden mielenkiinnon säilymistä opetukseen. Lisäksi TVT mahdollistaa eritoten kielten opetuksessa "autenttisen" materiaalin käytön, joka saattaa myös vaikuttaa motivaatioon. Lisäksi, riippuen järjestelmistä ja lähteistä, joita hyödynnetään, TVT antaa oppilaille enemmän mahdollisuuksia vaikuttaa omaan oppimiseensa ja tulla enemmän itseohjautuvaksi oman oppimisensa suhteen. (R28)

ICT diversifies teaching and its methods, which facilitates maintaining the students' interest towards the teaching. In addition, ICT enables the use of "authentic" materials especially in language education, which may have an effect on motivation as well. Furthermore, depending on the systems and sources used, ICT provides more opportunities for the students to influence their learning and to become more self-determined of their learning.

As R28 remarks, maintaining learner interest toward the target of learning is easier with ICT, since it provides a range of tools and methods to conduct (interesting) teaching. Additionally, R3 (example 22) observes that

(22) Ajankohtainen ja autenttinen materiaali innostaa ja motivoi oppilaita. Opettaja voi kartoittaa ja käyttää opetuksessa hyväkseen oppilaiden omia mielenkiinnon kohteita. (R3)

Materials that are current and authentic motivate students. The teacher can chart the interests of the students, and then make use of them in teaching.

5.5.2.2 Summary

In brief, pedagogical benefits to learners were seen to primarily include cognitive and motivational gains. Cognitive benefits were linked to the development and use of cognitive and metacognitive abilities and skills, such as critical thinking skills, evaluation and learning styles. Concepts emerging from social-constructive theories of learning, such as ZPD, were also considered to some extent. Motivational benefits mentioned by participants included interest, relevance and autonomy: components that are essential to facilitating and maintaining motivation. Remarkably, participants' answers correspond well to the background theory of the present thesis: the cognitive and motivational benefits of ICT use mentioned by respondents have also been suggested in the literature (see sections 2.2 and 2.3).

5.5.3 Technical benefits to teachers

Question A31 asked participants to specify what were, in their opinion, the most essential technical benefits of ICT use from the perspective of the teacher. Unfortunately, the phrasing of the question was flawed: the question can be read in two distinct ways – as denoting either what the teacher thinks are the technical benefits to learners, which is, in essence, a repetition of question A29, or what the participants think are the technical benefits to teachers. To be clear, it is the latter meaning that the question was originally intended to convey. Despite the shortcomings of the phrasing, participants had interpreted the meaning of the question as intended, a few rare cases excepting. Cases which show a definite and total departure from the intended meaning of the question will not be analysed in detail; if no part of an answer corresponds to the intended question, there are little grounds for analysis. However, if an answer demonstrates an understanding of the intended question at least partly, it is included in the analysis. In these answers, only the parts corresponding to the technical benefits to the teacher are taken into account.

5.5.3.1 Technical benefits – access and diversity

As displayed in Table 5.6, technical benefits of ICT use to teachers were almost exclusively connected to the category of *access*. This was not entirely unexpected: teaching is very much a practical activity in which, especially when ICT is used, considerations of what materials and tools are available, and in what capacity those tools are used, become essential to the daily operations of the teacher and the pupils. The most commonly cited aspects were speed and ease of access in terms of designing lessons and activities (example 23), producing materials (example 24), and storing and accessing previously crafted materials (examples 25 and 26).

(23) Opettaja voi jatkuvasti kehittää TVT-osaamistaan kielenopetuksen lomassa, ja niin pitääkin tehdä, sillä puutteelliset TVT-taidot pahimmillaan estävät koko tekniikan hyödyntämisen opetuksessa. Opettajan työ helpottuu hyvien TVT-taitojen ansiosta: opetuksen suunnittelu voi nopeutua, opetuksen laatu monipuolistua ja opettajan työtaakka vähentyä. (R5)

The teacher can continuously develop their ICT skills while teaching the language, and s/he certainly should, since inadequate ICT skills can, at worst, prevent the use of ICT in education altogether. The teacher's job becomes easier with good ICT skills: the planning of lessons is faster, the teaching becomes more diverse, and the teacher's workload decreases.

(24) TVT:n käyttö sujuvoittaa oppitunnin etenemistä ja mahdollistaa esim. monistamisen poisjätön. Opetusmateriaaleja on helpompi tuottaa. (R9)

Using ICT in teaching makes the lessons go smoothly, and can eliminate the need to take photocopies (of the material). Materials are easier to produce with ICT.

(25) Opetusmateriaalit säilyvät heposti[sic] netissä, jolloin fyysisten materiaalien raahaaminen loppuu. (R12)

One can easily store the materials on the Internet, so one can quit dragging physical copies around.

(26) Luodut asiat helppo tallentaa ja pitää tallessa. Jos kotilaiteella pääsee käsiksi koulussa luotuihin tiedostoihin, ei papereita tarvitse raijata edestakaisin, eikä papaereiden[sic] unohtelu kotiin tai työpaikalle ole ongelma. (R39)

The things that one creates [with ICT] are easy to store. If one has access to the files created at school from home, one does not have to drag papers around and forgetting them at home or at work is not a problem.

Categories other than access were indicated to a far lesser extent in the answers. While the possibilities to use more diverse materials seemed to be appreciated to some degree, the small number of cases containing reference to cognition and motivation suggests that only a small minority of participants consider ICT use as an opportunity for the teacher to develop his or her professional and technical competencies. In contrast to the learner perspective, diversity of materials was generally not mentioned in the capacity of a facilitator of motivation, but rather as a time-saver – easy access to diverse materials, whether produced by others or by the teacher themselves, was considered to decrease the teacher's workload. However, the decrease in workload or increases in the availability of time were not explicitly linked to an increase in the quality of teaching. Nevertheless, there were two remarkable answers detailing the effects that a better access to a diversity of materials has on the teacher's practice. Respondent R28 notes (example 27) that ICT enables the teacher to more easily take the individual needs of students into account by reducing the effort needed to produce materials aimed at different learners.

(27) Opetusmateriaalin tuottamisen helppous, joka vaikuttaa suoraan oppilaskohtaisen materiaalin ja eriyttämisen helppouteen. Mahdollisuus suunnitella opetusta enemmän oppilaiden mukaan. Lisäksi TVT voi potentiaalisesti vähentää opettajan taakkaa esim. siten, että opettajajohtoinen tehtävien tarkistaminen vähenee ja opettajan on helpompi määritellä jos esim. jokin tietty opetettavan alueen osa-alue tuottaa yksittäiselle oppilaalle ongelmia. Myös kommunikointi laajemmassa yhteisössä kuin vain luokkahuoneessa tulee mahdolliseksi. (R28)

Producing materials is easier with ICT, and this directly affects how easy it is to implement individual materials and differentiation. It also enables the teacher to plan their teaching more according to the students. ICT can, potentially, lighten the load on the teacher by, for example, reducing teacher-led examination of tasks and making it easier for the teacher to

notice when a student has problems with a specific subject area. Communication is no longer confined to the classroom, but can span a much wider community.

Respondent R16 (example 28) displays a quite different, yet important, view. R16 considers the ability to use diverse materials a beneficial aspect that is useful to both learners and teachers. In terms of the benefit to teachers, R16 perceives the effect as a motivating factor that helps the teacher to sustain their creative power in their daily routines of planning and producing the content and means for learning.

(28) Monipuolista ja autenttista opetusmateriaalia pääsee hyödyntämään, mikä myös ylläpitää opettajan luovuutta tuntien ja opetustapojen suunnittelussa. Myös oppilaat voivat siten tuoda omia materiaalejaan tunnille. Opettajalla voi säästyä aikaa tuntien suunnittelussa. (varasuunnitelmia toisaalta tulee myös olla, jos tulee teknisiä ongelmia) (R16)

The teacher has the opportunity to use diverse and authentic materials, which also sustains the teacher's creativity in planning lessons and teaching methods. It also enables students to bring their own material to the class. The teacher can save time on planning the lessons, although they should also have backup plans in case there are technical issues.

5.5.3.2 Summary

Technical benefits to teachers were mainly related to the categories of access and diversity. Similarly to the technical benefits to learners, speed and ease of access to information and materials seemed the most important aspects. The foremost practical considerations in terms of access entailed designing lessons and content and producing and managing materials, for which purposes the technical aspects of ICT were rather unequivocally viewed as beneficial. In short, technical aspects of ICT related to access were largely perceived as something makes the teacher's job easier, or at least lessens their workload in some capacity. Diversity was primarily linked to access in that better access to information enables more diverse teaching materials and practices. Moreover, the opportunities to find and use a wide variety of resources were seen by some respondents as facilitators and maintainers of the teacher's creativity and professional development.

5.5.4 Pedagogical benefits to teachers

Question A32 asked respondents to specify, in their opinion, the most important pedagogical benefits of ICT use from the perspective of the teacher. As with previous questions, there appeared to be some issues regarding the interpretation of the question: most of the participants considered the pedagogical benefits to teachers with regard to

learners, that is, in terms of what kinds of activities or teaching the teacher is able to provide learners with via ICT, instead of reflecting on the qualities that may help the teacher to develop their pedagogical practices. This distinction pertains only to the extent to which participants were seen to consider the issue from the perspective of the teacher, as specified in the phrasing of the question. Unfortunately, few of the answers follow this format: most answers only mention ways and new options of conducting teaching that could be viewed as pedagogically beneficial. These answers give very little information on the participants' views on whether or not ICT use can contribute to the development of teachers' pedagogical skills and practices. Nevertheless, rather than not utilising the information at all, the answers to question A32 were analysed in terms of what categories the respondents seemed to indicate as potential areas of pedagogical development. This approach entailed, to a certain degree, rather creative extrapolations from the message contents of individual answers, for reasons explained above.

5.5.4.1 Pedagogical benefits – diversity, cognition and motivation

As shown in Table 5.6, pedagogical benefits to teachers were mostly supported in the categories of diversity, cognition and motivation: of these, diversity was the most popular. Quite naturally, diversity of materials and methods is closely connected to both cognition and motivation since it enables the teacher to motivate learners more easily than traditional materials and to simultaneously address the different needs of pupils, for example, in terms of different learning styles. Additional benefits concerning cognition and motivation were that ICT can help the teacher in raising and focusing learners' interest and attention toward the target of learning, as demonstrated in the answers of respondents R26 (example 29) and R27 (example 30):

(29) Oppiliaden[sic] huomion saaminen ja keskittäminen. (R26)
Getting the attention of the students, and focusing it.

(30) Joissain tapauksissa saa oppilaiden mielenkiinnon paremmin. (R27)
In some situations, it helps to raise students' interest in the matter.

Opportunities to differentiate teaching to pupils of different skill levels seemed a popular topic among participants as well: several answers expressed this view, exemplified by the answers of R29 (example 31) and R40 (example 32):

(31) Tuntia pystyy eriyttämään realistisesti eri tasoisten oppilaiden hyödyksi. (R29)

The lesson can be differentiated to the varying skill levels of students in a realistic manner.

(32) Materiaalin muokkaaminen oppilaille tasoerojen, heikkouksien ja vahvuuksien mukaan. (R40)

Modifying the materials to better suit students of varying skill levels, weaknesses and strengths.

In terms of motivational aspects, answers implied a rather shallow understanding: motivation, in general, seemed to have only superficial value, and was rarely connected to actual learning. Instead, ICT was simply stated to motivate learners. A few exceptions to this trend were found, for example, in the answer by respondent R28:

(33) TVT on osa oppilaiden arkipäiväistä elämää koulun ulkopuolella ja koulun tärkeä tehtävä on pysyä ajantasalla muun yhteiskunnan kanssa eikä toimia omana kuplassa olevana instituutionaan. Ottamalla mukaan järjestelmät ja käytänteet, joita oppilaat käyttävät myös koulun ulkopuolella, saadaan oppilaiden motivaatio paremmin sidottua kouluun ja oppimiseen. Lisäksi teknisesti TVT helpottaa mm. eriyttämistä ja antaa oppilaille paremman mahdollisuuden opiskella ja työskennellä oman tahtinsa mukaan. (R28)

ICT is a part of the daily lives of the students outside of school. An important mission of the school is to keep up-to-date along other parts of society, instead of functioning as an isolated institution inside its own bubble. By utilising systems and practices that students use outside of school, we can get students to better commit their motivation to school and learning. In addition, on the technical side, ICT can make, for instance, differentiation easier and give students better opportunities to study and work according to their own pace.

As R28 argues, it is essential to take into account the realities in which pupils live, if motivational practices are to be conducted successfully. Concerning more direct demonstrations of the development of the teacher's skills and pedagogical practices through the application of ICT to their teaching, available examples are scarce: only two such cases were found amongst the answers. The two cases show rather different attitudes: respondent R15 displays the first of these, which appears to refer mostly to technical skills:

(34) Hyödynnetään eri opetusmetodeja, opitaan käyttämään TVT:aa opetuskäytössä. (R15)

Different teaching methods are utilised, learning to use ICT in education.

As can be seen in R15's answer, educational use of ICT is seen as a facilitator of new or different teaching methods, which is of particular interest since different learners have different styles and strategies for learning. The latter part of R15's answer also implies a development in the teacher's skills: while a certain level of skill with ICT is necessary to make use of it in teaching, these skills can only be improved by using them. Respondent R5 begins their answer in a similar vein:

(35) Opettaja voi kehittää opetusmetodejaan ja huomioida myös erilaiset oppijat TVT:n avulla. Opettaja voi myös löytää TVT:aa käyttämällä uusia ulottuvuuksia opetukseensa ja innostua itsekin työstään uudella tavalla. (R5)

The teacher can improve his or her teaching methods and take different learners into account by using ICT. The teacher can also discover new horizons in their teaching through the use of ICT and become motivated of their job in a new way.

R5's response indicates an even stronger conviction of the capability of ICT to diversify the teacher's repertoire of teaching methods than that of R15. Additionally, the answer demonstrates deeper levels of reflection concerning the teacher's mindset towards their practices and the profession. R5 sees ICT use as a transforming power that enables the teacher to 'think outside the box', and in doing so, motivate themselves in their work. This aspect is extremely important in the educational environment: adolescents generally spend more time interacting with their teachers in classrooms than they do with their parents at home – it should then be rather self-evident that, just as parents' attitudes influence those of their children, teachers' attitudes and motivations affect the attitudes and motivations of their pupils. In short, a de-motivated teacher cannot be expected to be able (or even willing!) to motivate and inspire their pupils.

5.5.4.2 Summary

Concerning pedagogical benefits of ICT to teachers, participants' views centred mainly on diversity, cognition and motivation. Diversity was seen to enable the differentiation of teaching to the specific, varying needs of learners, and was thus connected on a fundamental level to both cognition and motivation. In addition to non-traditional methods or forms of teaching, the motivational aspects were largely seen to arise from learners' interest towards ICT and the relevance of ICT to learners' daily lives. Cognitive benefits, on the other hand, seemed to be regarded in terms of differing learning styles and strategies, the development and use of which the teacher can facilitate through diverse teaching methods available with ICT.

5.5.5 Technical challenges to learners

Question A33 enquired about respondents' views concerning technical challenges of educational ICT use to learners. Analysis of the answers revealed that participants considered issues related to access and cognition, quite overwhelmingly, the major challenges in ICT use. In comparison, diversity, motivational aspects and interaction

seemed to be of rather little consequence to participants. The exact number of cases corresponding to each category is presented in Table 5.6.

5.5.5.1 Technical challenges – access and cognition

The most frequently expressed concerns related to access were issues of the availability of equipment at school and at home, inequalities between pupils resulting from socio-economic status, and technical problems or malfunctions of the technology. Respondent R4 illustrates these issues in example 36:

(36) Ei välttämättä ole omia laitteita, ja koulukäyttö paljastaisi kavereille, ettei itse osaakaan käyttää jotain. Nuoret on niin herkkiä, että saattaisi olla kova pala. Toinen haaste yleinen muutos: jo uuteen kirjan tehtävätyyppiin tai uuteen tapaan kysellä läksysanoja liittyy tavallisesti paljon vastarintaa ja hämmennystä, joten tvt:n käyttäminen voi olla yllättävän sekavaa. Koululta odotetaan rutiininomaisuutta ja raameja, siis oppilaatkin, vaikka sellainen onkin muka "mälsää". Oppilaat osaavat olla yllättävän konservatiivisia. (R4)

The student does not necessarily own a specific device, and the use of said device in school could reveal the student's inability to operate the device to his or her friends. This could potentially be devastating to the student's ego, since adolescents are very vulnerable to 'losing face'. Another challenge is that ICT can be very confusing – just a new type of task in the course book or a new way of checking vocabulary homework may enough of a source for resistance and confusion. Schools are expected to provide routines and borders; even the students expect these in spite of it being 'boring'. Students can be surprisingly conservative.

Certain answers also demonstrated that at least some participants were well aware of the limitations in resources that result largely from financial decision-making and realities higher up in the hierarchy, as demonstrated by respondents R18 (example 37) and R28 (example 38):

(37) – mistä kaikille välineet, jos koululla ei ole varaa? (eriarvoisuus). – tietotekniikkataidoissa huimia eroja, tvt-taitojen puutteen ei pitäisi olla kielen oppimisen tiellä. (R18)

Where do we get ICT equipment for everyone if the school lacks the funds? There are huge differences in students' ICT skills; lack of ICT skills should not be a barrier to the learning of the target language.

(38) TVT laitteita ei useimmiten riitä kaikille tai ne eivät toimi odotetusti. TVT:n opetuskäyttöön ei ole ainakaan kaikilla kouluasteilla riittävästi sovelluksia ja sisältöä tällä hetkellä. Tekniikka pelottaa/ei kiinnosta osaa oppilaista. (R28)

In most cases, there is not enough ICT equipment to go around, or they fail to operate as expected. There is an insufficient amount of applications and content for educational ICT use, at least for most school levels. Technology is intimidating or uninteresting for some students.

In addition to the potential problems related to access, issues in terms of cognitive abilities were widely recognised. Most frequent concerns in this category include, for

instance, partial or total lack of ICT skills (example 39: respondent R8) and differences in the level of ICT skills between pupils (example 40: respondent R10).

(39) Jos ei ole käyttänyt tietokonetta yhtä paljon kuin muut oppilaat niin tekniikan kanssa voi olla ongelmia. (R8)

If one has not used computers as much as other pupils, one may have difficulties with the technology.

(40) Oppilaiden taitotason vaihtelevuus. Kaikki oppilaat eivät ole lähtökohtaisesti valmiita käyttämään teknologiaa ilman erillistä opastusta. Perusasiat sujunevat, mutta moni mahdollisuus voi jäädä oppilailta hyödyntämättä puutteellisen kokemuksen vuoksi. (R10)

There is variability in the ICT skills of students. Not every student is ready, from the start, to use technology without separate instruction. They may be in control of the basics, but they may not make use of the technology to its fullest potential due to a lack of experience with it.

Furthermore, one of the foremost issues was thought to be the potentially distractive nature of ICT. This concern can be divided into two parts: first, distractions arising from inadequate skills in using the technology (as illustrated by respondent R16 in example 41), and second, distractions arising from the other interesting features of the technology (example 42: respondent R3).

(41) Laitteita tulee osata käyttää ensin, muuten keskittyminen menee laitteiden hallintaan kuin itse opetuksen aiheeseen. (R16)

[Students] must know how to operate the equipment, otherwise their attention is focused on managing the devices rather than the topic or content of the lesson.

(42) Välineet voivat olla puutteellisia ja kiusaus puuhailla muita juttuja voi olla suuri. (R3)

The equipment may be inadequate, and the temptation to fiddle with things other than the intended activity may be great indeed.

5.5.5.2 Summary

The technical challenges of ICT to learners considered by the respondents focused mostly on the categories of access and cognition. These areas were also identified as the major technical benefits – this should not be too surprising, since technical aspects usually have both advantages and disadvantages (as discussed in conjunction with the introduction of the categories, see section 5.5). Concerning access, participants highlighted problems with resources and malfunctions of the technologies. In terms of resources, a frequent concern was equality: is there enough equipment for everyone, do learners have similar opportunities to use technology at home, is using ICT at school discriminating against pupils with no or only modest ICT skills, and so forth. These

issues are also linked to the perceived cognitive challenges that participants remarked on, mainly concerning pupils' varying ICT skills. Furthermore, several participants noted the potential distractions arising from the use of technology, which were, again, linked to the ICT skills that learners do or do not possess.

5.5.6 Pedagogical challenges to learners

Question A34 asked participants about their views on the foremost pedagogical challenges from the perspective of the learners. In striking similarity to question A30 (pedagogical benefits to learners), answers to A34 represented, almost exclusively, the categories of cognition and motivation. Other categories only rarely received attention from participants. On the basis of the answers to question A33, it was expected that, similarly to technical challenges, pedagogical challenges would focus largely on attention and ICT skills. This was indeed the case, however, the rather large number of cases indicating motivation as a potential challenge was somewhat surprising, given its substantial role as a beneficial aspect in question A30.

5.5.6.1 Pedagogical challenges – cognition and motivation

The cognitive challenges of focusing and maintaining attention on the topics of the lessons were generally considered to arise from the distracting features inherent to ICT, competing interests (learners may find other things with ICT that are more interesting than the current topic) and unfamiliarity of specific technology or features of it:

(43) Hyvin usea ihminen ei pysty keskittymään tekemään vaikkapa tietokoneella tai tabletilla jotakin tehtävää. (R2)

Many persons are unable focus on performing tasks with a computer or a tablet.

(44) Keskittyminen saattaa vaikeutua. Ja vaikka nuorille yleisesti ottaen teknologia ja uudet mediat ovat tuttuja ja mieluisia, poikkeuksiakin on. (R3)

Concentrating on tasks may become more difficult. Even if, in general, technology and the new media are familiar and pleasing to adolescents, there are exceptions as well.

(45) Keskittyminen yhteen asiaan kerralla: kun oppilas käyttää teknologista välinettä voi olla hankala seurata ohjeistusta ja itse opetusta. Keskittyminen voi mennä laitteen eri ominaisuuksien testaamiseen sen sijaan, että se menisi siihen tarkoitukseen mihin laitetta on tarkoitus käyttää. (R17)

Concentrating on one thing at a time: when the student uses technology it may be difficult to follow instruction [at the same time]. Attention may be spent on testing the features of the equipment, instead of focusing on the thing or purpose that the equipment is used for.

While complete inability to focus on tasks when using ICT (example 43) is rather doubtful, the distracting and attention-consuming effects of ICT, illustrated by respondents R3 and R17 (examples 44 and 45, respectively) remain valid concerns. Additionally, as respondent R9 (example 46, below) remarks, ICT may become the focus of the lesson instead of the actual target of learning.

(46) TVT:stä voi tulla pääasia oppisisältöjen sijasta. (R9)

ICT may become the main issue, instead of the instructional content.

Additional concerns related to cognition were mainly mentioned in terms of critical thinking skills and reflection. Respondents R7, R19 and R21 (examples 47–49) illustrate challenges of critical reading and evaluation:

(47) Sisällön kriittinen arviointi, huomion harhautuminen muihin asioihin. (R7)

Critical evaluation of content, attention may stray from the actual topic.

(48) Materiaalia tulee eri lähteistä ja lähteiden arviointi (mikä tärkeää, mikä vähemmän, mikä luotettavaa) (R19)

Materials come from many different sources, assessment of the sources (what is important, what is not, what is trustworthy)

(49) Jos TVT:n käyttöä ei pohjusteta huolellisesti, voi esim. mediakriittisyyden puutteet heijastua oppimiseen. Lisäksi TVT ei saisi olla itseisarvo opetuksessa, vaan opetuksen väline: jos TVT:aa käytetään opetuksessa vain sen itsensä vuoksi, mitä oppilaille jää käteen oppitunnista muuta kuin TVT:lla leikkiminen? Mielestäni ei pidä myöskään ottaa automaationa että kaikki oppilaat innostuvat yhtä lailla TVT:n opetuskäytöstä ja motivoituvat. Oppilaiden yksilöllisyys tulisi siis ottaa huomioon. (R21)

If the foundations are not laid properly for the use of ICT, deficiencies in, for instance, media criticism may be reflected on learning. Additionally, ICT should not be a value in itself in teaching, but a tool for teaching: if ICT is used in teaching only for the sake of using ICT, what are students left with, other than neat little tricks with ICT? In my opinion, it should not be taken for granted that every student is motivated to a similar extent by ICT use. The individuality of students should also be taken into account.

Reflecting on the issues presented during class and in materials should be an essential part of using ICT for learning tasks. Respondents R13, R25 and R45 (examples 50–52) express concerns that ICT may promote superficial reflection and processing of information:

(50) Hypertekstiä luetaan eri tavalla kuin perinteisiä lineaarisia tekstejä. Hypertestit[sic] tarjoavat loputtomasti linkkejä erilaisin versioihin totuudesta, ja oppilaiden olisikin hyvä oppia ymmärtämään, että asioita voidaan katso[sic] eri näkökulmista. Toisaalta, oppilailla on kuitenkin tarve saada tunne että ”nyt he tietävät tämän asian (kokonaan).” Oppilaille ei välttämättä muodostu jäsentynyttä kokonaiskuvaa. TVTn käyttö voi johtaa myös pinnalliseen ”copy-paste” oppimiseen. Usein laitteillä[sic] on myös helppo eksyä tekemään jotain aivan muuta kuin mitä opettaja on suunnitellut. (R13)

Hypertext is read differently than traditional linear texts. Hypertexts offer endless links to different version of the truth, and it would be good for the students to understand that there are differing perspectives to issues. On the other hand, the students desire the feeling that "now they know this thing (completely)". Students do not necessarily receive a structured overall picture of the issues. The use of ICT may also lead to superficial "copy-paste" learning. Often it is easy to wander off to do something completely different with the equipment than what the teacher had planned or intended.

(51) TVT:n käyttö esim. esitelmien teossa johtaa usein leikkaa-liitä –lähestymistapaan, eikä johda oikeaan oppimiseen. (R25)

Using ICT, for instance, to produce presentations often leads to a cut-and-paste approach, which does not result in genuine learning.

(52) Keskittyminen, oma ajattelu kopioinnin sijaan (R45)

Concentration, personal reflection as opposed to copying

In terms of motivation, concerns centred largely on issues connected to attention and interest, as demonstrated in the answers by respondents R20 (example 53) and R32 (example 54):

(53) Mielenkiinto kohdistuu muualle kuin opeteltavaan asiaan. (R20)

Students' interest is focused on things other than the target of learning.

(54) Välineen menenimen[sic] sisällön edelle: tvt:n käyttö opetuksessa aiheuttaa joskus sen, että itse väline/tekotapa on kiinnostavampi ja siihen keskitytään enemmän kuin itse tehtävän suorittamiseen. (R32)

The tool can displace the content: using ICT in teaching sometime results in the students finding the tool/operations more interesting, so they concentrate more on that than performing the task.

Finally, respondents R21 (see example 49) and R40 note that all of the students are not necessarily motivated by ICT:

(55) Oppilaiden motivaatio voi vaihdella, osa tykkää perinteisemmistä oppimiskeinoista. (R40)

Students' motivations can vary, some students prefer traditional methods.

5.5.6.2 Summary

Participants' views on the pedagogical issues of ICT use mainly revolved around cognitive and motivational challenges. Cognitive challenges included the distracting effects of ICT, the lack of critical thinking and reflection and superficial processing of information. Motivational issues were, to a certain extent, linked to cognitive challenges in that ICT was regarded to redirect attention and interest away from the actual topic. Some participants also noted that not all learners are interested in or motivated by ICT.

5.5.7 Technical challenges to teachers

Question A35 focused on participants' views on the technical challenges of ICT use to teachers. Results of the analysis seem to generally follow the pattern established regarding question A33, namely that, in the participants' opinion, the major challenges reside in the categories of access and cognition. Some issues relating to the category of diversity were also identified.

5.5.7.1 Technical challenges – access and cognition

The foremost problems in terms of cognition seemed to be inadequate ICT skills of teachers, largely resulting from the lack of proper of training in the use of ICT, and insufficient time and resources to develop ICT skills independently. Respondent R5 criticises teacher training for not providing said training:

(56) OKL ei tällä hetkellä opeta riittävästi (oikeastaan ei lainkaan) TVT-taitoja tuleville opettajille,jolloin opettajanalut ovat jo lähtökohtaisesti "ulkona" viimeisimmästä kehityksestä. En ymmärrä, miksi opettajan opintoihin ei sisälly kunnon TVT-kurssia (siis sellaista kurssia, jolla opettajaopiskelijaa opetettaisiin ensin käyttämään erilaisia opetuskäyttöön tarkoitettuja teknisiä laitteita ja sitten perehdytettäisiin niiden soveltamiseen oman aineen näkökulmasta), vaikka lähes joka koulussa on nykyään kaikenlaisia smart boardeja, iPadeja, tietokoneita ja dokumenttikameroita. Mitä järkeä on siinä, että mukamas ensiluokkaisen ja maailmallakin kehutun opettajakoulutuksen yliopistossa saanut opettajanalku joutuu vielä kaiken koulutuksensa jälkeen itse kouluttautumaan vapaa-ajallaan saavuttaakseen nykykoulussa tarvittavat TVT-taidot ja oppiakseen käyttämään laitteita? (R5)

Currently, the Department of Teacher Education does not adequately (or rather, at all) train prospective teachers in ICT skills, which, from the outset, leaves the teacher trainees ill-equipped to deal with the latest developments [in schools/education]. I do not understand why teacher studies do not incorporate a proper ICT course (meaning, a course in which the teacher trainees would be taught, first, to use different types of educational technology, and finally, how to apply them in the context of their own subject), even when nearly every school has educational technology, such as IWBs*, iPads, computers and document cameras. What is the point, when, after a supposedly first-class, internationally recognised teacher training in a university, the teacher has to train themselves in the ICT skills and competences required in modern schools?

While R5's response is quite charged emotionally, R5 was only one of several respondents to point out the current lack of ICT training. R33 further elaborates the effects of insufficient ICT training (and thus, lack of relevant ICT skills):

(57) Koulutuksen puute TVT:n tehokkaaseen käyttöön ja sitä myötä kynnys ottaa TVT osaksi opetusta. (R33)

Lack of training on how to utilise ICT efficiently, which becomes a barrier to making ICT use a part of education.

Many of the participants remarked on the time and effort needed to learn ICT skills independently, and to keep up-to-date with technology. These issues were considered to affect the teacher's practices rather excessively, although mostly regarding time spent on planning lessons. Respondent R21 (example 58) comments on the extra work that poor ICT skills put on teachers; R10 (example 59) further remarks how this may affect the quality of teaching:

(58) Riittämättömästä koulutuksesta tai tottumisen puutteesta johtuen TVT voi aiheuttaa lisähommia ja vaatia lisäresursseja. Huonot laitteet voivat myös syödä aikaa itse opetuksesta. Tekjänoikeusviidakko voi myös aiheuttaa päänvaivaa. (R21)

Insufficient training and lack of familiarity with technology can result in ICT requiring extra work and additional resources. Poor equipment can also take up time from the actual teaching. Tangling with the intricacies of copyrights can be a real headache as well.

(59) Innovaatioiden tekeminen. Kuka tahansa voi oppia näyttämään kirjan sivun ja kulloisenkin tehtävän smartilta, mutta TVT:n hyödyntäminen opetuskäytössä vaatii tiettyä teknistä osaamista ennen kuin sen mahdollisuuksia voi hyödyntää luontevasti. (R10)

Making innovations. Anyone can learn how to use the SMART Board to show a page in the textbook, or the current task, to the students, but utilising ICT in education requires a certain technical know-how before the opportunities it offers can be fluently realised.

Many, if not most, of the cognitive issues, that is, problems regarding skills and learning, are rather intimately connected to issues of access. Frequently mentioned challenges, in this regard, were concerns about the availability and condition of equipment, as illustrated in the responses by R4 and R42 (examples 60 and 61):

(60) Onko koululla varaa tukea hankintoja, lisenssejä, tekijänoikeusmaksuja, jne. Ja se, että tvt:tä hyödyntävässä ei voi luottaa siihen, että kaikki sujuu suunnitelmien mukaan, kun aina jostain on netti poikki ja sivusto kaatunut ja joku rikki ja väärä päivitys. Mahdollisuuksia on mutta niiden mukana epävarmuutta. (R4)

Whether or not the school can afford to make investments in equipment, licenses, copyright fees, and so forth. One cannot trust that everything goes according to plan when using ICT: there are always problems in connecting to the Internet, or a webpage cannot be reached, or the equipment is broken, or there is a wrong update on the computer. There are opportunities, but they come with uncertainties.

(61) Kaikissa kouluissa ei ole hyviä varusteita, eikä opettaja voi olettaa, että kaikilla oppilailla on käytössään samantasoisia laitteita. Kotona ei lapsilla ole aina edes käytössään kunnon tietokonetta, saati sitten älypuhelinta tai tablettia, jotka voisi tuoda mukaan luokkaan. Lisäksi sähkökatkot, nettikatkot (minullekin on käynyt niin, ettei aamulla opetustunnin alkaessa koulussa toimikaan nettiyhteys) yms. saattavat tehdä opetuksesta haastavaa. (R42)

Every school does not have good equipment, and the teacher cannot assume students to have similar devices at their disposal. The children may not even have a decent computer, let alone a smartphone or a tablet, at home that they could bring to class with them. Moreover, power cuts and problems in connecting to the Internet (personally I have experienced a malfunction in the Internet connection at school in the morning just when I was supposed to start the lesson) can make teaching a challenge.

Some participants also raised the issue diversity: schools may have any number of different equipment and software, which requires additional effort from teachers, particularly those teachers who are not familiar with a specific technology beforehand. R17 demonstrates this point based on personal experience:

(62) Teknologian käyttö vaatii perehtymistä ja valmistelua tunnille. Haasteen asettaa myös tosiasia, että teknologiset välineet eivät aina toimi. Tuntia ei siis voi yksinomaan rakentaa TVT- välineiden käyttöön, vaan pitää olla myös suunnitelma B. Koulutus valmistaa toki laitteiden käyttöön, mutta sijaisena toimineen näkökulmasta esimerkiksi älytaulujen hyödyntämisen haaste on ollut se, ettär[sic] eri kouluissa käytetään eri merkkien tauluja, jotka toimivat kukin hieman eri tavalla, joten jokaisen taulun käyttöön pitäisi saada oma perehdytyksensä. (R17)

Using technology requires the teacher to familiarise themselves with it, and spend time on preparing it for the lesson. The fact that the equipment does not always work is also a challenge. One cannot simply base the lesson on using ICT; one needs to have a plan B as well. Training of course prepares one to handle the equipment, but from the perspective of a person who has worked as a substitute teacher, the challenge in utilising, for example, IWBs, is that different schools have IWBs from different manufacturers that each work in slightly differing ways, so one would need training for each different type of IWB.

One of the most intriguing features of question A35 was that it provoked one respondent to reflect on the moral and health issues of technology, specifically concerning wireless technologies:

(63) Mielestäni tässä on moraalinen ja terveydellinen kysymys. Haluanko esimerkiksi vaatia oppilaitani olemaan jatkuvasti lähikontaktissa langattomien päätelaitteiden kanssa, joiden terveysvaikutuksista jatkuvasti tulee uutta tietoa? Haluanko olla mukana rapauttamassa oppilaiden hienomotorisia taitoja tai keskittymiskykyä? (R2)

In my opinion, this is a question of moral and health issues. There is a perpetual flow of new information on the health effects of wireless technologies, do I want to subject my pupils to continuous contact with wireless devices? Do I want to contribute to the worsening of pupils' fine motor skills or concentration?

As a relatively new development, the widespread use of wireless technologies (such as mobile devices and wireless networks) is an understandable cause for concern. Respondent R2 (example 63) recognises that new information concerning the health effects of wireless technologies is revealed continuously, however, the general phrasing of their answer gives reason to suspect a rather negative attitude toward the issue. Specifically, the last clause of R2's answer, formulated as a question, makes the rather explicit assumption that wireless technology does in fact have an adverse effect on pupils' fine motor skills and cognitive functions. However, no research to date has been able to present evidence in favour of adverse health effects due to exposure to electromagnetic fields (EMF) or radio frequency (RF) transmissions produced or employed by wireless technologies (WHO 2006, 2007a, 2007b, 2011). Likewise,

current research does not support claims of EMF or RF fields producing the non-specific health effects commonly referred to as electromagnetic hypersensitivity (EHS) (WHO 2005, 2011). While scientific evidence confirming the existence of harmful health effects from wireless technologies has yet to surface, it is prudent to remember that research is still lacking in some areas.

5.5.7.2 Summary

Technical challenges to teachers were primarily cognitive in nature; namely, participants were concerned about insufficient ICT skills. Several of the respondents attributed teachers' (perceived) poor ICT skills to a lack of training in those skills. These criticisms were further emphasised by respondents who noted that learning ICT skills independently takes a significant amount of time and effort, and even then, some aspects cannot be self-taught at home (interactive whiteboards being a prime example). These challenges are also an issue of access: in addition to scarce opportunities and lack of time to train oneself to use the equipment, there may also be a shortage of functioning equipment at school. Potential technical malfunctions and practical arrangements are feared to reduce the time and energy the teacher has to plan and conduct their lessons – and therefore also to reduce the quality of teaching and learning in the classroom.

5.5.8 Pedagogical challenges to teachers

Question A36 focused on participants' views on the pedagogical challenges of ICT use from the teacher's perspective. In general, responses to question A36 show a trend very similar to that of question A34: the categories of cognition and motivation received most of participants' attention. However, unlike in A34, issues of access were observed fairly often in the responses as well. Overall, answers to question A36 are very reminiscent of those received to question A32: more often than not, pedagogical challenges were connected to the, in this case undesirable, effects that ICT use may have on students. In addition, respondents seemed to be rather uncertain of their ability to positively influence students, and their learning, by using ICT.

5.5.8.1 Pedagogical challenges – access, cognition and motivation

The perceived challenges were frequently expressed in terms of cognitive aspects: avoiding distractions or ensuring that students pay attention to teaching and the intended target of learning, as illustrated in the responses by R3 and R14 (examples 64 and 65, respectively):

(64) Oppilaiden huomio itse asiasta saattaa helposti herpaantua. Netissä on paljon myös kaikenlaista kyseenalaista materiaalia ja epäluotettavia tiedonlähteitä. Mielestäni tietotekniikka on niin sanotusti hyvä renki, mutta huono isäntä. (R3)

Students' attention is easily distracted from the actual subject. There is a large amount of questionable content and unreliable sources on the Internet. In my opinion ICT is a good servant, but a poor master.

(65) Sen varmistaminen, että oppilaat eivät harhaudu tekemään muuta kuin opittavaa asiaa (R14)

Ensuring that the students do not stray into doing something else than the thing they are supposed to learn.

In addition to issues of attention, participants expressed concerns over how to utilise ICT in a pedagogically sound manner, that is, in a way that genuinely improves learning. Among others, respondents R13, R37 and R40 (examples 66–68) remarked on this aspect:

(66) Jotta TVTstä saisi irti jotain enemmän kuin perinteisistä kalvosulkeisista, niitä täytyisi ymmärtää käyttää erilaisten tehtävien tekemiseen. Mitä hyötyä esimerkiksi erilaisista keskustelualustoista on? Onko keskustelu siellä muka jotenkin parempaa tai syvällisempää kuin kasvokkain? Nykyiset oppimateriaalit, ja osaltaan myös opettajankoulutus, ei vielä tarjoa hirvittävästi apua opettajille. TVT sinänsä ei tee opetuksesta parempaa tai huonompaa – se on vain väline. Oleellista on edelleen opettajan pedagoginen näkemys ja se, että hän osaa käyttää TVTtä opetuksessaan niin, että se palvelee tarkoitustaan. (R13)

In order to make ICT more useful than traditional drills of taking notes from transparencies, it should be understood as a tool to producing or performing different tasks. For instance, what are the benefits of different communicative platforms? Is communication via those platforms supposed to be somehow better or deeper than face-to-face communication? Current materials and, in part, teacher training, do not yet offer very much support to the teacher. ICT, in itself, does not make teaching better or worse – it is only a tool. It is the teacher's pedagogical views that are essential, and that the teacher is able to use ICT in teaching in a manner that serves the purpose (of education).

(67) Osata valikoida oikea materiaali ja käyttää laitteita järkevästi (R37)

To be able to pick out the right materials and to use the equipment in a sensible manner

(68) Kuinka ottaa TVT osaksi opetuksen rutiineja sopivassa suhteessa perinteisiin työtapoihin, niin että se tukee oppilaan oppimista ja motivoi. (R40)

To know how to incorporate ICT into the routines of education in a manner that is appropriate in relation to traditional methods, so that it supports students' learning and motivates them.

Furthermore, respondent R10 makes three important points concerning the use of ICT in teaching: first, that ICT-based materials may not be suitable for every student; second, that it may be difficult to apply ICT to every area of language learning (R10 specifically mentions that of oral skills); and third, that ICT-based teaching may stagnate and centre around only specific types of activities:

(69) Materiaalit eivät välttämättä sovi kaikille. TVT:n kautta on myös vaikea järjestää mahdollisuuksia käyttää kieltä suullisesti, joskin esim. skype-puhelut ovat mahdollisia. Liian TVT- painotteinen opetus voi helposti jäädä jumiin pelkkään tekstinkäsittelyyn ja lukemiseen. (R10)

[ICT-based] materials may not be suitable for everyone. With ICT, it is difficult to arrange opportunities to speak the language, although it is possible to, for instance, have phone conversations through Skype. Teaching that emphasises ICT excessively can easily get stuck on only doing word-processing or reading.

The second largest category, motivation, included answers that mostly reflect participants' uncertainty regarding how to use ICT in a way that motivates students. In addition to rather general statements of motivating students, such as the example from R8 (example 70), some of the participants also recognised the individuality of motivation, illustrated by R21 in example 71.

(70) Ohjeistaa kaikkia oppilaita samaan aikaan, saada kaikki motivoituneiksi. (R8)

How to instruct all of the students at the same time, to motivate all of them.

(71) Ihan ensimmäisenä tulee mieleen oppilaiden innostaminen: ihan minkä tahansa opetusmateriaalin kanssa tulee olla tarkkana, että jokainen oppilas on mukana. Kaikki eivät innostu samoista asioista, ja tuntuu että varsinkin TVT, koska se on jo niin arkipäivää nykynuorille, ei jaksa automaattisesti enää innostaa ainakaan yhtä paljoa kuin mitä me "vanhemmat" sukupolvet kuvitellaan. Lisäksi opettajana pitää olla tarkkana, että käyttää TVT:aa nimenomaan opetuksen välineenä eikä niinkään arvona itsessään. Jos TVT ei tuo jotain lisäarvoa opetukseen, miksi sitä pitäisi ehdoin tahdoin tunkea joka väliin. (R21)

The first thing that comes to mind concerns inspiring students: regardless of the materials, one should be careful to involve all of the students. Every student is not motivated by the same things, and it seems that ICT in particular does not automatically motivate students to the extent that we "older" generations think since it is already such a common thing in their lives. Teachers also need to be careful to use ICT as an instrument of teaching instead of it being a value in itself. If ICT does not bring any additional value to teaching, it should not be forced into every part of teaching on purpose.

How to use ICT in a manner that motivates student via interest toward the content, or target of learning, was of particular concern to R32:

(72) Miten opettaa yhtäaikaisesti tarvittavia tvt-taitoja sekä asiasisältöä? Opetusmetodin ”erilaisuudesta” syntyvän mielekkyyden siirtäminen sisällön mielekkyydeksi (R32)

How to teach the necessary ICT skills and the content at the same time? How translate the enjoyment resulting from the method being "something different" into enjoyment of the content of the activity.

Issues of access seemed to be important to respondents as well, although, except for one case, it never appeared as the only challenge identified in an answer. Several responses indicated access as a potential problem because of the time and effort needed to find or produce appropriate materials, reported, for instance, by R24 and R25 (examples 73 and 74):

(73) Opetuksen ja opetettavan materiaalin etsiminen voi olla toisaalta helpompaa ja monipuolisempaa, mutta toisaalta paljon aikaavievämpää, kun täytyy esim. ottaa huomioon eri tasoiset oppijat ja löytää sopivan tasoiset opetusmetodit ja –materiaalit. TVT-sisältöjen täytyy suurimman osan ajasta kuitenkin loogisesti kytkeytyä opetettavaan asiaan, TVT:n käytön ei pitäisi siis olla itseisarvo ja "sitä pitää käyttää koska sitä pitää käyttää". TVT:n käytön pedagoginen tarkoitus tulisi siis aina miettiä tarkkaan, ja se voi olla haasteellista. Oppilaiden hallitseminen esimerkiksi internetissä eli milloin pysytään asiassa ja milloin ei. (R24)

Finding diverse materials can be easier, but it can also take up a lot more time when one needs to take learners with different levels of skill into account and find suitable teaching methods and materials for them. ICT-based materials need to connect meaningfully to the subject, at least most of the time. Using ICT should not be a value in itself in the sense that "it should be used because it should be used". The pedagogical rationale for the use of ICT should be always considered in detail, and that can be a challenge. [It is difficult] to control what students do, for example, on the Internet, whether the use is relevant or not.

(74) Tarkoituksenmukaisen materiaalin löytäminen/laatiminen vie paljon aikaa ja vaivaa. (R25)

Finding or producing appropriate materials takes a lot of time and effort.

As already reflected in example 73, another major issue regarding access seemed to be that teachers are at a loss as to how to control how students make use of the technology. As R2 (example 75) remarks, the ease of access granted by ICT can be a very serious challenge for teachers:

(75) Jos oppilaat vaikkapa tekevät tehtäviä omilla päätelaitteillaan, kuinka voin kontrolloida heidän tekevän sitä, mitä pyydän? Miten saan oppilaan keskittymään olennaiseen, jos saatavilla on koko maailmankaikkeus internet-yhteyden päässä? (R2)

If students are working on assignments with their devices, how can I control and supervise that they are actually doing the things I asked them to do? How do I get students to concentrate on the essential, if the whole universe is available on the Internet?

Moreover, R47 laments on the poor availability and quality of ICT training for teachers, commenting, among other things, that the continuing training regarding ICT rarely addresses didactic or pedagogical issues:

(76) Täydennyskoulutuksen huono saatavuus ja vielä huonompi taso. Useat täydennyskoulutukset etenevät virtanapista aina office-ohjelmiston käyttöön saakka. Harvoin päästään edes sivuamaan sellaisia asioita joiden voisi katsoa kuuluvat didaktiikan tai pedagogian alueelle. Opettajat ovat yksin –tai kaksin viihdelaitteen kanssa – luokan edessä, keksien kukin omalla tahollaan pyörää uudelleen, koska nykyaikainen, sähköinen oppimisympäristö nyt vaan on muodikkaampi kuin liitu ja leuka. Oppilaan kohtaamiseen käytettävissä oleva aika kapenee, kun sähköiset laitteet sekä niiden väsyttämien lasten levoton käytös vievät ajan, huomion ja jaksamisen. (R47)

Poor availability of continuing training for teachers, and the even worse quality of it. Many of the training courses start with the power button and continue up to the use of [Microsoft's] Office-package. It is rare for these courses to even touch on matters belonging to the realms of didactics or pedagogy. Teachers are alone – or paired with an entertainment system – at the front of the class, reinventing the wheel, just because modern e-learning environments are more fashionable than traditional methods. Time available for encountering students is worn thin, as gadgets and the restless behaviour of children, tired by electronic devices, eat up time, attention and energy.

5.5.8.2 Summary

The foremost pedagogical challenges perceived by respondents consisted of the categories of access, cognition and motivation. Issues of access centred on the problems of resources and control: producing appropriate materials with ICT was seen to take lots of time and effort, while respondents also felt that they had no means of controlling what pupils are actually doing with technology. Challenges regarding cognition were considered to lie, first, in how to ensure pupils' attention to the topic at hand instead of the technology and its distractions; and second, in how to use ICT in education in a manner that actually facilitates learning. Motivational issues focused largely on the same issues, namely, uncertainty of how ICT can be used to motivate pupils without distracting them from the target of learning. Finally, nearly all of the issues concerning access, cognition and motivation could be seen to culminate in the perceived lack, and relatively poor quality, of ICT training available to teachers and teacher trainees.

5.6 Teacher trainees' views on ICT training in teacher training programmes

Items B1 to B8, B13 and B14 measured respondents' attitudes toward the status of ICT training inside teacher training. Results suggest that, while different ICT equipment are explored to some extent in teacher training (item B5: M = 2.7, SD = .86), the educational use of ICT is not covered sufficiently (B1: M = 2.13, SD = .82) nor are technical (B3: M = 2.09, SD = .8) or pedagogical (B4: M = 1.96, SD = .75) training adequate concerning ICT. Only one respondent disagreed with the statement that

educational use of ICT should be a part of teacher training (B2: *M* = 3.68, *SD* = .52). Item B8 was a partly redundant statement since it overlapped, to some extent, with B2. It nevertheless provides additional support for item B2 as it indicates that the majority of participants did not view ICT training (regarding the educational use of ICT) as something that belongs to courses outside the teacher training. Furthermore, participants were nearly unanimously of the opinion that educational use of ICT is an essential part of a teacher's professional competence (B14: *M* = 3.36, *SD* = .68), yet on the whole they were rather ambivalent on whether or not competence in using ICT in education is achieved primarily through working as a teacher (B13: *M* = 2.38, *SD* = .68). Results also suggest that more than half of the respondents were not certain of where they could obtain (further) information on the educational use of ICT (B7: *M* = 2.28, *SD* = .8).

Table 5.9. Descriptive statistics for items B1–B8, B13 and B14 (N = 47).

Item	'I fully disagree'	'I slightly disagree'	'I slightly agree'	'I fully agree'	Mean	Variance	Standard deviation
B1	10	24	10	3	2.128	0.679	0.824
B2	0	1	13	33	3.681	0.265	0.515
B3	11	23	11	2	2.085	0.645	0.803
B4	12	27	6	2	1.957	0.563	0.751
B5	6	8	27	6	2.702	0.735	0.858
B6	6	21	14	6	2.426	0.772	0.878
B7	8	20	17	2	2.277	0.639	0.8
B8	18	22	6	1	1.787	0.562	0.75
B13	4	22	20	1	2.383	0.459	0.677
B14	1	2	23	21	3.362	0.453	0.677

Most of the answers to the items in this category, namely those of B1–B8 and B14, were not significantly dependent on background variables, however, respondents' age seemed to have some effect on the answers to item B13. In terms of item B13, respondents 25 years of age or younger were more positive (*M* = 2.63, *SD* = .57) than those who were older than 25 (*M* = 2.05, *SD* = .69). This result was statistically significant according to Fisher's exact test ($\chi^2_{\text{Fisher}}(N = 47) = 8.678$, $p = .013$, Cramér's $V = .430$).

5.7 Teacher trainees' technical and pedagogical self-efficacy beliefs

Statements B9 to B12 measured participants' self-efficacy beliefs. Items B9 and B10 measured respondents' technical and pedagogical competence beliefs directly, while B11 and B12 measured whether participants wanted (additional) technical and

pedagogical training. Results suggest that teacher trainees were somewhat confident of their technical skills in utilising ICT in EFL teaching (B9: *M* = 2.83, *SD* = .87), but less so in terms of their pedagogical skills (B10: *M* = 2.6, *SD* = .74).

Table 5.10. Descriptive statistics for items B9–B12 (N = 47).

Item	'I fully disagree'	'I slightly disagree'	'I slightly agree'	'I fully agree'	Mean	Variance	Standard deviation
B9	5	7	26	9	2.83	0.753	0.868
B10	3	17	23	4	2.596	0.55	0.742
B11	0	8	18	21	3.277	0.522	0.743
B12	0	5	21	21	3.34	0.447	0.668

Confidence in technical skills differed significantly according to gender (χ^2_{Fisher}(N = 47) = 8.723, p = .018, Cramér's V = .431) and level of ICT studies (χ^2_{Fisher}(N = 47) = 12.303, p = .027, Cramér's V = .362). Approximately 92 per cent of male participants (M = 3.42, SD = .67) believed their technical ICT skills to be sufficiently advanced to use ICT in EFL teaching, whereas the corresponding figure for females was slightly less than 69 per cent (M = 2.63, SD = .84). 75 per cent of those who had not completed any ICT courses believed their technical ICT skills to be adequate (M = 2.83, SD = .82); interestingly, this figure dropped to slightly less than 67 per cent with participants who had completed one or more compulsory ICT courses (M = 2.56, SD = .86). All participants who had taken voluntary courses in ICT believed that they possessed adequate ICT skills (M = 3.8, SD = .45). Statistically significant differences were not found regarding participants' confidence of their pedagogical skills.

Most of the respondents indicated a desire to receive additional technical ICT training (B11: *M* = 3.28, *SD* = .74) and pedagogical training (B12: *M* = 3.34, *SD* = .67). Concerning technical training, 83 per cent of participants indicated agreement with the statement; no statistically significant differences were found between participants. In terms of pedagogical training, 89 per cent agreed with the statement, and responses were found to differ significantly according to age (χ^2_{Fisher}(N = 47) = 6.219, *p* = .042, Cramér's *V* = .364). Participants 25 years of age or younger were more eager to receive additional pedagogical training (*M* = 3.48, *SD* = .7) than older participants (*M* = 3.15, *SD* = .59).

5.8 What kinds of ICT training do teacher trainees desire?

Statements B11 and B12 measured respondents' opinions concerning whether or not they desired additional training in the technical and pedagogical aspects of ICT (see Appendix 1). Questions B15 and B16 were follow-up questions to B11 and B12 that asked participants to specify, in detail, what areas or items concerning ICT they wanted additional training in. Similarly to B11 and B12, questions B15 and B16 corresponded to, respectively, technical and pedagogical aspects. The instrument used to collect the data did not appear capable of forcing participants to answer specific questions based on options chosen in other questions; B15 and B16 were, therefore, optional. Fortunately, participants were quite diligent in answering these questions: 38 out of 39 'eligible' participants answered question B15, while B16 was answered by 39 of the 42 participants who had agreed 'slightly' or 'fully' with question B12. Respondents' answers to questions B11 and B12 were cross-referenced with those to questions B15 and B16: this comparison confirmed that only those respondents who agreed with the statements in items B11 and B12 answered questions B15 and B16.

5.8.1 Technical training needs

A large number of participants indicated a desire to receive (additional) training concerning the hardware, that is the ICT equipment, in its different forms (see Table 5.9 below). Educational technology, namely, technology designed specifically for educational or presentational purposes (such as IWBs, document cameras, and so forth), formed a substantial group under this category, which is not surprising given its emergence in teacher training schools during the last ten years or so. Of all cases considered indicative of educational technology, eleven mentioned IWBs (in specific, the SMART Board), while only four participants specified, either in addition to or instead of IWBs, other technology that is considered educational technology by the rather strict definition used here. References to educational technology other than IWBs included video projectors, (virtual) learning environments and management software; one answer cited *the use of ICT equipment specifically intended for educational use* (respondent R33) and used the SMART Board as an example. Respondents' conceptions of educational technology seem to revolve almost exclusively around

IWBs, perhaps because they are currently the most conspicuous form of educational technology that teacher trainees come into contact with during teacher training.

Table 5.11. Areas of desired training concerning the technical aspects of ICT.

Hardware (equipment)				**Software**		
Educational technology (IWBs, etc.)	Tablets	Smartphones	In general	Educational use	Internet	In general
13	9	4	15	8	7	10
41				**25**		

Interestingly, the largest group in the category *hardware* was that of 'ICT in general', formed by responses that do not refer to specific devices or equipment. Participants mainly used words like *equipment, device* and *technology*: unfortunately, the meanings denoted by these words are too broad to make very meaningful distinctions in terms of designing future training. For instance, in examples 77, 78 and 79, respondents do not give any indication of the specific nature of the devices they refer to, nor do they mention the specific context of use – consequently, we have no information on whether the respondents mean common, universal-use technology, such as computers or tablets, or if they are referring to specific technology mostly confined to the classroom, such as IWBs. We can, of course, make informed guesses: R20 (example 78), for example, mentions actions of *adjusting* a device or the lighting and using the remote, which imply mainly physical actions usually associated with technology of a rather more 'primitive' or basic nature than that of computers. We can go as far as claiming that the participant was referring to an overhead projector, yet we still know nothing of the actual type of the projector. The fact that such a large proportion of references to ICT equipment were of the vague quality illustrated in examples 77–80 invites the rather radical notion that, in general, teacher trainees are not aware of ICT or its use(s), at least where education is concerned.

(77) Laitteiden käyttö yleensä (R7)

Using the equipment in general.

(78) Miten laitteet laitetaan päälle, miten niitä säädetään ja käytetään, kaukosäädinten käyttö, valaistuksen muuttaminen. (R20)

How to turn the devices on, how to adjust and use them, how to use the remotes, how to adjust the lighting.

(79) Yleisesti eri teknologialaitteista ja niiden käytöstä (R24)

Generally about different technological devices and how to operate them.

(80) Laitteiden käyttäminen, laitteiden yhteensopivuusasiat, ohjelmistot ym. tuli käsiteltyä harjoittelussa melko pintapuolisesti. Lisäksi, koska kaikissa kouluissa ei ole samanlainen varustelutaso, olisi mukavaa päästä kokeilemaan erilaisia laitteistoja. Tekijänoikeusasiat! (R21)

The use of [ICT] equipment, compatibility issues between devices, software, and so on, were covered rather superficially in teacher training. It would also be nice to be able to try out different technologies, since different schools have different standards of equipment. Copyrights issues!

Concerning tablets and smartphones, there seemed to be relatively low levels of interest towards training in the mobile technologies these devices represent, as opposed to the somewhat more familiar technologies. Nevertheless, there is an interesting discrepancy between smartphones and tablets: whereas only four participants indicated interest in training to use smartphones as educational tools, this number more than doubled, to a total of nine participants, in the case of tablets. This is despite the fact that tablets are, in general, less abundant, and therefore, probably less familiar, as indicated in the answers by respondent R13:

(81) Lisäkoulutusta tarvitsee varmaan vähän väliä laitteiden kehittyessä – esimerkiksi iPadit olivat vasta tekemässä tuloaan viime vuonna kun tein harjoitteluani. Haluaisin tutustua erilaisiin sovelluksiin, sosiaaliseen mediaan ja tekijänoikeuksiin paremmin. (R13)

Additional training is probably needed frequently as devices develop – for example, iPads were only just becoming available last year when I was doing my practical training. I would like to better familiarise myself with applications, social media and copyrights.

There may be several explanations to this. First, as they are less familiar, they provoke more curiosity. Second, tablets have larger screens than do smartphones: consequently, tablets lend themselves better to both entertainment and productive activities. Third, conceptually tablets lie somewhere between smartphones and computers; it could be argued that they evoke a more distinct sense of 'computerness' and are therefore regarded as more useful in productive tasks. Fourth, tablets are far less common in the hands of students than are smartphones: smartphones, and mobile phones in general, have been stigmatised by teachers as the primary reason for inattentiveness during lessons. Tablets have yet to see a similar judgement, probably due to their current scarcity in classrooms. Finally, despite the relatively modest amount of tablets in active educational use, tablet computers have received at least decent, if not overwhelming, coverage in the media compared to other technologies. It is quite clear that this has had some influence on public awareness of these devices, and thus, it has generated an increasing interest in them as well. What is not clear, however, is whether this increased

interest and general awareness of tablet computers will translate into a deeper understanding of tablets (and other mobile technologies) in the educational context.

In terms of software, three broad groups emerged from the responses: educational use (of software), the Internet and software in general (see Table 5.9). The sizes of the groups were roughly equal in terms of the number of occurrences in each group. Educational use of software includes *de facto* educational software (including virtual learning environments and learning platforms) as well as other software when the respondent indicated educational use as the specific purpose of using said software. Altogether, eight responses were considered to have indicated this group. Half of these specified actual educational software: one respondent mentioned the use of the most common VLEs (virtual learning environments), while three participants wanted more training on the use of the SMART Board software. An important issue regarding the use of IWBs was mentioned by respondent R33: the use of IWBs is unfamiliar to teacher trainees because they do not have the opportunity to use them at home (see example 84). The rest of the answers did not mention specific software, but focused on how software in general can be used in teaching; examples 82 and 83 illustrate this view:

(82) Yleisesti eri laitteiden ja ohjelmistojen käytössä, jotta osaisin hyödyntää niitä opetuksessani. (R30)

Using different devices and software in general, so that I can make use of them in my teaching.

(83) Erilaisten ohjelmien ja alustojen käyttäminen opetuksessa. Mitä ylipäänsä on jo valmiina olemassa, mitä minun tulee/voin luoda itse. Laillisuus/laittomuus: vaikka tätä on paljon käsitelty eri yhteyksissä, tarvitsisin lisäkoulutusta siihen, mitkä ohjelmat/materiaalit/toimintatavat ovat laillisia kouluympäristöissä, mitkä laittomia. (R32)

Using different applications and platforms in teaching. What, on the whole, already exists, what do I need to or can create myself. Legislation: although it has been discussed quite extensively in connection to other things, I need additional training regarding what applications/materials/methods are legal in schools, and what are not.

(84) Erityisesti opetuskäyttöön tarkoitettujen TVT-laitteiden käyttö. Esim. älytaulujen käyttö on täysin vierasta, koska sitä ei voi harjoitella kotona. (R33)

Specifically, the use of ICT equipment meant for educational use. For example, the use of IWBs is a complete mystery, because one cannot practice using them at home.

In total, seven responses clearly indicated a need for further training concerning the Internet. As this number represents nearly a third of the references in the software category, it seems fitting to present it as its own group. More importantly, a preliminary analysis of the responses based on this grouping revealed two distinct orientations

concerning the use of the Internet in education. The first of these could be defined as a view that considers the Internet an educational tool. In this capacity, the Internet comprises and enables the use of, for instance, VLEs (virtual learning environments), social media, educational websites, and so forth. In these contexts, the students become active participants. A majority of responses in this group (five out of seven) represent this view, albeit to a somewhat limited extent, demonstrated in examples 85 and 86:

(85) Smart-board. Tablettitietokoneet. Erilaiset opetuskäyttöön soveltuvat nettisivustot. (R27)
SMART Board. Tablet computers. Different websites that are suitable for educational use.

(86) Smart-board, internetin tehtävä/ohjelmasivustot. (R34)
SMART Board, task/application sites on the Internet.

In contrast, the second orientation reflects a perspective focused on teachers: considering the Internet as a resource for teachers, particularly as a means to gain access to and share materials and ideas. In this view, the teacher is the immediate beneficiary, regardless of whether or not the students ultimately benefit from it. Materials that the teacher picks up from the Internet may never make an appearance in the classroom, although it should be pointed out that searching for and picking out materials from the Internet is not necessarily a wasted effort. Even if the teacher does not use the material they have found, the process of evaluating material others have produced may also lead the teacher to reflect on their own materials and practices. Furthermore, teachers may be able to spend less time on producing materials from scratch, if they have consistent access to materials on the Internet. Respondent R35 points out the need to train future teachers on how to efficiently share and gain access to materials:

(87) Itse osaan jo, mutta jos en olisi itse hakenut tietoa, nämä olisivat yhä täysin hukassa: Opettajien materiaalit ovat netissä hujan-hajan, niitä voisi opetella jakamaan samoissa paikoissa muiden kanssa. Tekijänoikeudet. Ongelmanratkontataidot (netti nurin, mitä teen jne.). Mitä kaikkia vaihtoehtoja maailmasta löytyy? Miten saan ne omaan käyttöön? (R35)
I am already pretty competent [with ICT], but had I not been active and searched for the information by myself, I would still not know which way to turn. The [digital] materials that teachers produce are all over the Internet, teachers should learn to share their materials and ideas in the same place as others. Copyright issues. Management and problem-solving skills (what do you do if the computer cannot connect to the Internet, etc.) What kinds of options or opportunities are there with ICT? How do I obtain them for my own use?

The last group, namely software in general, consists of responses that did not denote a specific purpose or category of software. In terms of the number of cases, this group was the largest by a small margin. This is not surprising considering that several

responses indicated multiple groups. For example, the answer by respondent R43 indicates all three groups:

(88) Haluaisin lisää tietoa esimerkiksi koulujen ohjelmistoista ja niiden kootusta hallinnoinnista, mahdollisten oppilassähköpostien kootusta käytöstä, Wilman tai muiden viestintävälineiden käytöstä käytännössä ja erilaisiin laitteisiin (esim. eri valmistajien tabletteihin) ja ohjelmiin tutustumista. Lisäksi haluaisin tietää miten laitteita ja ohjelmia voi hankkia ja saada käyttöön. Myöskään tekijänoikeuksista ei ole tarpeeksi käytännön tason tietoa. (R43)

I would like to get more information on, for example, the software used in schools and their management; the centralised use of possible student email accounts; the use of Wilma or other communication tools in practice; and familiarising myself with different devices (for instance, tablets from different manufacturers) and applications. Additionally, I would like to know how devices and applications can be obtained and put to use. There is not enough practical information on copyrights either.

Similarly to the corresponding group in the hardware category, it is difficult to make judgements on the basis of such a vague category. This result does indicate, to a certain degree, that teacher trainees want additional training concerning software applications in general. However, at the same time we can be quite certain that most participants were already familiar with and capable of using the most commonly needed software, such as internet browsers, e-mail, word-processing software, and so on. Indeed, had participants not been able to use such software, they would have been unable to respond to the questionnaire. Nevertheless, we should not dismiss the need for 'basic training' regarding these types of software, simply because it seems that participants are able to use them. Respondent R10 (example 89) claims quite emphatically, that training in the basic ICT skills has no added value for teaching and that training should be focused on special features that are of value in teaching. However, R10 does not mention what these special features are in their opinion.

(89) Tarpeeksi haastavia TVT-kursseja. ”Näin käynnistät tietokoneen” ja ”tämä on Word, näin käytät sitä” ei enää tuo mitään uutta pöytään. Tarvittaisiin taitotasoltaan erikoistuneempaa opetusta joka suuntautuu ohjelmistopuolella nimenomaan opetukseen. (R10)

ICT courses that are sufficiently challenging. Courses in the form of “this is how you turn on the computer” and “this is Word, here’s how you use it” bring nothing new to the table. What is needed is training that is more specialised and focuses specifically on teaching.

In addition to the strictly technical categories presented in this chapter, two further discoveries were made during analysis. These could be described broadly as *experience* and *awareness*, and they are, rather obviously, highly interrelated. In this context, experience denotes teacher trainees' experience and familiarity, confidence and amount

of practice with ICT and its use in education. The (rather lengthy) answer by respondent R46 (example 90) captures this issue almost perfectly:

(90) Tay:n Normaalikoululla oli muutama vuosi sitten käytössä pieni määrä ikivanhoja hitaita tietokoneita lähinnä tietokoneluokassa sekä dokumenttikamera, jonka sai ehkä varattua viikon varoajalla. Smartbordeista ym. ei ollut tietoakaan, ja ohjaava opettaja oli sitä mieltä ettei oppilaita kannata viedä tietokoneluokkaan ”kun siitä kuitenkin tulee vain kaaosta”. Vaikea osata välineiden teknistä soveltamista jos ei ole ikinä edes nähnyt saati käyttänyt niitä! Itse kaipaisin eniten tietoa juuri Smartbordista tms. sekä tablettien & älypuhelimien käytöstä ja hyödyntämisestä opetuksessa. (R46)

A few years ago the Normal School of the University of Tampere had only a small number of ancient, slow computers in use, mostly in the computer lab, and a document camera that one could maybe book on a week’s notice. SMART Boards or the like had never been heard of, and in my supervising teacher’s opinion there was no point to arranging lessons in the computer lab “because it will only be chaos anyway”. It is quite difficult to be able to utilise ICT equipment if one has never seen, much less used them before! Personally, I would like information, most of all, on especially the SMART Board or a similar technology, and the use of tablets and smartphones in teaching.

Lack of experience and opportunities for practice is clearly a major factor affecting teacher trainees’ confidence in using ICT in their teaching, extending from the physical equipment to the software employed. In addition to example 90, several previously presented examples, such as 82, 84, 87 and 88, illustrate the importance of providing teacher trainees with the opportunities and means to become confident and competent users of the technology.

The concept herein referred to as awareness includes, in the context of the present thesis, teacher trainees’ knowledge and information regarding ICT, the use of ICT, and particularly, the opportunities and possibilities (as well as limitations and ‘hazards’) that ICT offers to teaching and learning. As such, it is a pervasive quality that is an important part of teachers’ technological, pedagogical and content knowledge (TPACK, see Chapter 3). While awareness could be considered to include, broadly speaking, the whole range of responses to question B15, it is necessary to limit this scope somewhat. It was therefore decided that awareness should, in the present context, mainly include issues that were not readily represented by previous categories. Consequently, it currently represents two aspects: teacher trainees’ awareness of the possibilities of ICT in general, and awareness of practical issues (or solutions to them) that were not included in the categories of hardware or software. Respondents R11 (example 91) and R18 (example 92) demonstrate the first aspect, mentioning a desire to know more about the possibilities of ICT in general:

(91) En mistään asiasta erikseen vaan lisää tietoa ylipäätään erilaisista mahdollisuuksista (R11)
Not about any specific thing, but more information about different possibilities in general.

(92) enemmän tietoa eri mahdollisuuksista, itselle enemmän varmuutta (R18)
More information on the possibilities, more self-confidence

Moreover, respondent R39 (example 93) explicitly mentions that they do not possess the necessary skills to operate ICT devices other than the computer. Essentially, R39 displays a lack of awareness concerning the operation and possibilities of educational technology in general.

(93) Aivan kaikkeen mahdolliseen: miten laitteet toimivat, mitä kaikkea niillä voi tehdä ym. Minulla ei ole minkäänlaisia taitoja muiden laitteiden kuin tietokoneen käyttöön. (R39)
[I would like training on] everything possible: how do the equipment work, what they can be used for, and so on. I have no skills to operate devices other than the computer.

Practical issues relating to the use of ICT in education focused largely on legislative issues, specifically on copyrights. Six participants mentioned copyrights or legislation as an area they would like training or additional information on, mostly in the sense that they did not know or were not sure what materials they are allowed to present to the students. While the number of cases in this group was small compared to the overall sample size, this does not necessarily mean that other respondents are fully aware of the issue: legislation concerning copyrights in particular is a complex matter, even more so when public institutions such as schools are involved.

5.8.2 Pedagogical training needs

Initially, answers to question B16 seemed perhaps the most fragmented of all with respect to the qualitative items in the questionnaire. However, after several iterations of examining the data and refining the classifications, three broad categories emerged: theory, practice and technical competence. The category labelled as theory concerns the affordances of ICT in education: theoretical and research-based information about the possibilities, benefits and disadvantages of ICT in education. Practical issues are, naturally, closely related to those under the heading theory. The category of practice contains things such as ideas, advice and methods on how to implement ICT in teaching in a way that improves learning; information about the ways in which ICT can be used to enhance students' motivation, attention, learning strategies, and so on. In contrast to

the categories of theory and practice, technical competence is not, strictly speaking, a part of pedagogy. Nevertheless, it does possess a rather fundamental relevance to both of the other categories, namely that, without technical competence, pedagogically sound practice with regard to the use of ICT in education remains only an idea without a means to become realised. Although this notion is important, this particular category is not analysed here, since technical training has already been covered in the previous chapter. Additionally, no technical features were found in the answers to question B16 that did not already surface previously in question B15.

Approximately half of the respondents expressed a view that training should provide teacher trainees with information on the theoretical and empirical evidence on ICTs' impact on learning and teaching, illustrated in examples 96 and 97. Additionally, participants desired information on what the actual possibilities to teachers and students are: this is demonstrated in example 94. While example 95 should rather be an example of the practical aspect, it is included here to further illustrate the need for training that highlights the opportunities ICT offers.

(94) Luentoja/esitelmiä siitä, minkälaisia eri mahdollisuuksia (pelit ja sovellukset) on tarjolla ja pienryhmissä harjoituksia: luodaan eri tilanteita ja tehtäviä, joita tehdään: nähdään myös oppilaan näkökulma. (R20)

Lectures and presentations on what different opportunities there are with ICT (games and applications). Exercises in small groups: creating situations and tasks that bring forth the student's perspective as well.

(95) Erilaisista opetustavoista ja –menetelmistä, joita TVT mahdollistaa. (R33)

Different teaching methods that ICT enables.

(96) Sama vastaus kuin yllä. Lisäksi olisi hyvä saada konkreettista tutkimustietoa siitä kuinka oppilaat kokevat TVTn käytön. (R22)

Same as in the previous question [referring to q. B15]. It would be good to get tangible information from research into how students experience the use of ICT.

(97) Olen epävarma sen suhteen miten hyödyllistä tvt:n soveltaminen oikeasti on (siis tutkitusti-oikeasti). Haluaisin lisää tietoa siitä kuinka paljon sen soveltamiseen kannattaa nähdä vaivaa, koska omat hyödyllisyystietoni perustuvat mutu-tuntumaan ja arveluihin, joten voisi ihan hyvin olla, että sitä ei oikeasti edes kannattaisi käyttää. Vähäisellä tvt:n käyttämisellä ei ainakaan saa oppilaita pilalle, joten sillä kannalla on turvallisempi olla siihen asti kunnes saan tvt:stä ja kielenoppimisesta varmaa tietoa. (R4)

I am uncertain of how useful it is to use ICT in teaching (i.e. how useful it really is, based on research). I would like to get more information on how much effort it is worth to put into using ICT, since my own assessment is based on a gut feeling and conjecture. It could well be that ICT is not really worth using. At least I will not ruin my students by using ICT only to a modest extent (as opposed to using it more), so it is a safer bet until I get reliable information on ICT and language learning.

Practice was, by far, the largest category: three out of four responses indicated the need for training that focuses on the (practical) ways and methods in which learning and teaching can be implemented with ICT. Respondent R5 (example 98), for instance, displays a desire to know about ways to raise students' motivation, while R32 (example 99) would like to know how students' critical thinking skills could be improved:

(98) Tämä sisältöosuus olisi yllä kuvaamani kurssin toinen puolisko; millä tavalla TVT voi auttaa erilaisia oppijoita, nostaa motivaatiota, tuoda uusia ulottuvuuksia opetukseen jne. (R5)

This content part would form the second half of the course I previously described [referring to question B15]; the ways in which ICT can help different learners, improve motivation, diversify teaching, and so forth.

(99) Miten opettaa ja ohjata oppilaita lähdekritiikkiin, kriittiseen lukemiseen, turvalliseen ja lailliseen tvt:n käyttöön. (R32)

How to teach and guide students in source criticism, critical reading skills, and the safe and legal use of ICT.

Other cognitive aspects included, for instance, learning strategies, differentiation and attention. For example, respondent R12's answer (example 100) touches on the aspect of learning strategies, specifically on how to combine different learning strategies with the aid of technology; R14 (example 101) is interested in how to design tasks according to individual needs of students; and R36 (example 102) is concerned about focusing students' attention and building a coherent unit of teaching with ICT:

(100) Miten yhdistää monia oppimistyylejä tietotekniikan avulla. Jos TVT:llä pystyisi yhdistämään ripauksen behavioristista, hieman yksilökonstruktivismia, ja sosiaalista tiedon rakentamista englannin rakenteiden ymmärtämisessä, olisi TVT kuin taivaan lahja. (R12)

How to combine different learning styles with the help of ICT. If it were possible to combine a hint of behaviouristic, a little bit of individual, and social construction of knowledge in understanding the structures of the English language, ICT would be like rain in the desert.

(101) Ehkäpä lisää tietoa siitä, miten erilaisille oppijoille voisi räätälöidä sopivia tehtäviä (R14)

Perhaps more information on how the teacher can 'tailor' tasks to suit different learners

(102) Huomion kohdistaminen, kuinka saadaan eheä kokonaisuus (R36)

Focusing [students'] attention, how to build a coherent whole.

As the previous examples show, some participants seemed to be genuinely concerned with how ICT could be used to improve students' learning and cognitive abilities. However, the majority of responses did not display pedagogical thinking on this deeper

level, but instead, reflected mainly didactic practice, such as how to use ICT in teaching grammar and vocabulary. Respondent R24 (example 103) demonstrates this rather well:

(103) Miten niitä voidaan hyödyntää konkreettisesti kielten eri alueiden esim. kieliopin ja sanaston opettamisessa? Milloin TVT voi toimia paremmin kuin ns. vanha ja perinteinen metodi? Lainsäädännölliset seikat liittyen esim. tekijänoikeuksiin. (R24)

How can ICT be utilised in a tangible manner regarding the different areas of languages, for example, in teaching grammar and vocabulary? When does ICT work better than the so-called old and traditional method? Legislative issues concerning, for instance, copyrights.

The majority of answers in the category of practice were similar to that of R24 in that they lack an explicit pedagogical viewpoint and concentrate either on how ICT relates to didactics or the technical operation of devices and software.

6 DISCUSSION

As discussed in chapters two and three, the use of ICT in education presents a wide variety of affordances to learning and teaching. These affordances have previously been suggested to centre on the areas of cognition, motivation and interaction (Davies 2007; see also Chapter 2). More fine-grained distinctions have also been suggested, for example, by Conole and Dyke (2004): in this thesis, I have argued for, defined and used two further categories, labelled *access* and *diversity* (see sections 2.5 and 5.5). These combine the most notable technical and practical considerations into more manageable 'chunks' whose meaningfulness is not obscured by the details, yet allow for distinctions within, and between, the categories. These five categories of ICTs' affordances, recognised in the literature, essentially formed the framework upon which the present thesis was built.

The data collection procedures used in the present thesis utilised a questionnaire composed of both closed and open-ended questions pertaining to teacher trainees' perceptions of ICT use and its affordances concerning, on the one hand, learning, and, on the other hand, teaching. In addition, teacher trainees' opinions about their ICT skills, the status of ICT in teacher training, and the perceived need for ICT training during teacher training, were examined. Quantitative data were analysed using a statistical method called *Fisher's exact test* (see, for example, Field 2013: 723), which is a variation of the commonly used Pearson chi-square test and is suitable for small sample sizes. Effect sizes, or more appropriately, association, was measured using

Cramér's *V* (see Chapter 5). Qualitative data were analysed through an interpretive classification process based on the background theory (see section 5.5). This process enabled the identification of the major areas of interest to the participants concerning ICTs' affordances to learning and teaching. In this chapter, I will discuss the major conclusions, and their implications for various parties, drawn from the results of this study.

Perhaps most remarkably, the category of interaction was characterised by an almost complete absence throughout the research data. This is in stark contrast to the theory presented in chapters two and three, but also to the currently prevalent orientation towards social-constructive theories of learning and teaching in teacher training in Finland. The data gathered for this study does not provide enough information to explain this finding to any degree of certainty, and therefore it must be noted with caution that the few explanations offered here are mostly specific to the present study, in addition to being highly speculative. One factor that probably explains the lack of interactive aspects of ICT use in the responses to the open-ended questions, at least to some degree, is that interaction was not properly addressed in the quantitative questionnaire items. Only one item, A3, can be considered to address interactive qualities of ICT use in education. Furthermore, it can be questioned whether the statement "educational ICT use develops learners' social skills" truly represents the range of interactive affordances of ICT (discussed in section 2.4). This was, admittedly, a major flaw in the design of the questionnaire, but unfortunately, this was not noticed until performing final analysis of the data. It is likely that participants' thinking was primed more toward other aspects of ICT (and its affordances), and therefore, interaction or interactive aspects received less attention than other categories. Nevertheless, the aforementioned alone does not sufficiently explain the situation. An overwhelming majority, 68 per cent, of participants had completed their teacher studies, which makes the absence of interactive qualities in their answers all the more puzzling – especially since one would expect the social and interactive aspects of learning and teaching to be relevant to language teachers. A further consideration relates to the idea of *normalisation* introduced by Bax (2003), although from a slightly different perspective. Bax (ibid.) considers normalisation a meso- and macro-level phenomenon that broadly concerns technology-adoption, or the lack of it, in education. On a micro-level in relation to interaction, it could be said that most ICTs are inherently interactive. Consequently, the interactive aspects of technology could already be normalised to such

an extent that some users may fail to consider the fact that not all practices with these technologies are necessarily interactive. Specifically, respondents may have overgeneralised the interactive qualities of ICTs to such an extent they felt it unnecessary to point it out explicitly in their answers. Furthermore, respondents could have considered it to require too much effort to make use of the interactive affordances of ICT in learning and teaching. This would explain why interaction did not receive significant support as a beneficial aspect, yet it does not explain the fact that interaction in this capacity was not considered a challenge either. While most of the probable explanations offered in the above discussion are feasible to a certain extent, they remain rather speculative without further information from the participants. It seems further investigations into teacher trainees' views on the interactive affordances of ICT are warranted if we are to gain a more comprehensive understanding of these issues.

Another category that received relatively little support from respondents was that of *diversity*. Diversity (see sections 2.4.2 and 5.5) was indicated mainly in the role of a technical and pedagogical benefit to teachers. This is rather surprising, given that diversity has quite clear links to cognition and motivation, especially on the part of learners (as discussed in the theoretical background). Teachers are responsible for selecting and producing appropriate materials for their pupils. This is perhaps the most probable reason why respondents considered diversity almost exclusively an aspect relating to teaching, as opposed to its effect on learning. While some of the participants expressed concern over the effort needed to pick out good material amongst the variety of material available, for example, on the Internet, the majority of respondents found it to rather be a benefit in this regard: instead of spending significant amounts of time and effort on producing material themselves, they are able to pick and choose material they feel is suitable, and perhaps even to gain new perspectives into teaching and learning. Female participants were significantly more positive than males with regard to ICTs' capability to enhance learning EFL through authentic materials. It is currently unclear what this result denotes exactly, particularly since male participants were, overall, rather positive regarding ICT-based authentic materials as well. It could be that the male respondents' orientations to teaching EFL were in favour of more formal or traditional teaching, but the available data does not support this view. However, the results do suggest a lack of explicit consideration of the benefits (and issues) of diversity *to learners*, which prompts the question of whether this aspect should be given more attention in teacher training. After all, diversity is inseparably connected to the

cognitive and motivational aspects of learning and teaching, and therefore should be considered by teachers and teacher trainees with respect to learning in general as well as in the context of educational ICT use.

The aspects of cognition and motivation appear to be major areas of consideration in current literature about ICT in education (see chapters 2 and 3). Additionally, the current emphasis on social-constructive theories of learning in teacher training serves to further bring reflection on cognitive and motivational (and social and interactive aspects, as previously discussed) aspects of learning and teaching to the fore. Accordingly, these categories were expected to feature quite prominently in the participants' responses. However, there was a substantial, and quite surprising, difference concerning how cognition and motivation were viewed: motivational aspects were seen as exclusively pedagogical affordances, while cognition was identified as a category embodying both technical and pedagogical affordances.

Participants' views on the motivational effects of ICT use were largely congruent with the theoretical background (see section 2.3.5), namely that the motivational benefits of technology are dependent more on how it is used, than the technology itself. Concerning learners, motivational benefits were seen to arise from pedagogical practices that promoted learner interest, autonomy and personal relevance (see section 5.5.2.1). The use of ICT was considered to support and enable these practices. These views are also supported in the literature (see van Loon, Ros and Martens 2012; Veermans and Tapola 2006). Pedagogical challenges to learners in terms of motivation centred on interest and attention: the major concern was that ICT could prove more interesting to pupils than the content of the task, and it could therefore divert pupils' attention from the target of learning. In contrast to the rather in-depth reflection concerning motivational effects of ICT to learners, participants' views of motivational affordances, specifically the beneficial aspects, from the teacher perspective seemed somewhat restricted in comparison. The views expressed conveyed, essentially, the meaning that pupils can be motivated by ICT, yet few participants reflected on this aspect. It may be that the pedagogical motivational benefits to learners and teachers were thought to be so intertwined, that participants considered them not in terms of two different perspectives, but essentially as a unitary aspect. Although the respondents were provided with information on the terminology used in the questionnaire, participants appeared to have found it difficult to distinguish between the pedagogical affordances to learners and to

teachers. However, pedagogical challenges to teachers regarding motivation seemed to be easier for participants to identify, although the exact reason for this remains elusive. It is possible that participants focused more on the challenging aspects because of the relative novelty of ICT as part of teaching practices, and therefore the possible issues with ICT are more noticeable or salient to them than the possible benefits. An overarching motivational issue was, ultimately, that of uncertainty in how to motivate pupils and/or raise their interest toward the subject of learning. Given the individual and situational nature of learner motivations, varying degrees of uncertainty is to be expected in this regard. Largely for the same reasons, this issue is very challenging to address in teacher training, both in general and specifically regarding educational ICT use.

The category of cognition was the most widely featured aspect in participants' answers. This could be taken to underline the importance of understanding the comprehensive role of cognitive factors in learning and teaching. However, we do not need to rely on a single result to notice how important it is to consider cognition and its specific components in the present context. Section 2.2 of this thesis presents an overview of cognition in relation to, first, learning and teaching, and second, educational ICT use. It also highlights the fact that cognitive aspects are fundamentally connected to all the other aspects (motivation, interaction, access and diversity) addressed in this thesis. Of all the components of cognition introduced in section 2.2, memory (see section 2.2.2) was the only one to not receive explicit reference from participants. The data does not provide an explanation for this, although it could be speculated that memory in general is something that is taken for granted and therefore, it becomes 'invisible' in the face of larger concerns. Furthermore, participants' thinking was probably not primed or activated towards considering memory in their answers (similarly to the situation concerning the category of interaction) as preceding questions did not address the issue of memory specifically. From a technical viewpoint concerning both learners and teachers, educational ICT use was seen as an opportunity to develop and improve ICT skills. However, varying or inadequate ICT skills were also seen as major challenges that could hinder ICT use in education and even have negative effects on learning and teaching. While respondents' views were likely borne out of personal experiences and impressions, they bear a remarkable similarity to what has previously been suggested in the literature, namely that educators' poor skills with ICT may hinder its use in (teacher) education (Meisalo et al. 2010: 55) and that effective use of ICT in education requires a

well-developed understanding of ICT on the teachers' part (Beauchamp 2012: 3). In addition to (the lack of) ICT skills, participants expressed concern over the cognitive aspect of learner attention. According to some respondents, distractions or inattention could result simply from the technical aspects or details (implying that ICT is inherently distracting), but such a view is not widely recognised in the literature. As other respondents noted, distractions arising from technical features are rather attributable to insufficient ICT skills. Although this latter view seems a more plausible explanation, sufficient evidence to clearly support this assertion was not found in the literature reviewed for the present thesis. ICT use was also perceived to have potentially beneficial effects on learners' metacognitive abilities, particularly the metacognitive skills of monitoring and evaluation (see section 2.2.1). While specific research on the effects of ICT use on learners' metacognitive abilities could not be found for the purposes of the current thesis, potential affordances can be extrapolated on the basis of general theories of metacognition. Furthermore, learning strategies are intimately connected with metacognition, as they require the learner to plan, monitor and evaluate their actions and learning: certain uses of ICT make it possible to enforce the use of learning strategies (Salovaara 2006: 110), and may thus support the development of metacognitive skills.

From a pedagogical perspective, cognitive affordances to learners and teachers focused mainly on critical thinking and reflection, attention, learning styles and metacognitive skills. The main benefit to teachers was that of differentiation: ICT was seen to help with supporting learners with varying skill and/or knowledge levels as well as different learning styles. It is also connected to diversity and particularly to the concept of scaffolding (see section 2.4.1 and Sawyer 2006: 11) in that the multitude of opportunities afforded by ICT can provide individualised support, for example, via feedback (Iiskala and Hurme 2006: 48-49), alternative materials and representations, and so forth. Concerning learners, benefits were perceived to consist of ICTs' capability to support and develop pupils' critical thinking and reflection, (metacognitive) evaluation and learning styles. As previously discussed, the development (and improvement) of metacognitive skills and learning styles through ICT use are supported to some degree in the literature, despite the scarcity of research conducted. Critical thinking and reflection, however, are currently much more a matter of debate. Conole and Dyke (2004: 116) suggest that ICT does not support, but rather hinders critical thinking and reflection due to a variety of reasons. They do not, however, support this

claim with evidence from research; such research does not appear to be currently available. Participants were clearly on this particular issue, as lack of criticism and reflection on information gained through the use of ICT, or toward computer-based tasks, was also considered a challenge to learners. Additionally, issues of attention seemed to be a serious concern for respondents, from the perspective of the learner as well as that of the teacher. On the part of the learner, distractions as a pedagogical issue is quite easily related to the corresponding technical challenge discussed earlier. It may not be feasible to discuss it as a strictly pedagogical or technical problem, as it is an issue that always involves both dimensions, not to mention areas like motivation, interest and autonomy. In contrast, to teachers the pedagogical challenge of attention quickly becomes an issue of control: how to control what pupils use ICT for, what information is available to them via ICT, and so forth. It is therefore also an issue of access, but it additionally reflects a further concern – uncertainty of how to use ICT in a pedagogically feasible manner. These issues have largely been noted in recent surveys as well (see European SchoolNet 2012: 12-13, 28; Meisalo et al. 2010: 56-57), and they remain essential questions, particularly regarding teacher training in Finland.

Some rather unintuitive results were found in the quantitative data concerning cognitive factors, specifically, learners' ICT skills. On the whole, participants felt that learners need to be taught and instructed in the use of ICT in order to make use of it in learning EFL. However, participants' opinions on this question decreased almost linearly in relation to their level of ICT studies: those who had taken voluntary ICT courses had the lowest mean score in item A17, while those who had not taken any ICT courses had the greatest mean score (see Figure 5.7, section 5.3). The data gathered does not offer a straightforward explanation for this, but some reasons can be hypothesised. First, it is likely that the ICT courses taken by respondents consisted mainly of general-purpose courses, or ones focusing on specific *technical* aspects, for example, word-processing, presentation software, information processing and analysis, programming, and so forth. As such, these courses most probably did not involve pedagogical aspects of learning and teaching. This may have influenced the views of the participants in a way that emphasises the technological, as opposed to the pedagogical. Second, an increased familiarity with technology may have lead to an overestimation of learners' skills with ICT: as one is already familiar with certain features of technology, they may easily lose sight of the fact that another person may find the same things difficult to grasp. This in turn relates to the 'Net Generation' debate discussed in section 3.3: currently, the media

casually depicts young people as ‘diginatives’, bluntly implying that learners are already competent with technology despite the majority of them not having studied it neither formally nor, most likely, even informally. While this does not explain the situation concerning the present study where respondents did not seem to regard the current generation of learners as ‘digital natives’, we should keep in mind that the increasingly casual use of these terms and description in mainstream media certainly does affect public perceptions and may therefore also have consequences for learners, teachers and education as a whole. Questionnaire items A18–A28 concerned participants’ views of learners’ ICT skills. As already mentioned, participants did not seem to regard learners as ‘digital natives’ (at least in the popular sense discussed above), judging from the fact that they evaluated pupils’ ICT skills to be rather poor in general. Curiously, item A22 (learners’ abilities to make use of ICT are good) did, however, receive slight support from participants. Remarkably, participants also recognised, to a certain extent, that computer games may have beneficial effects to learning (items A20 and A21, see section 5.4). As speculated previously in section 5.4, computer games may have beneficial learning effects particularly in EFL learning, since most games released to the public still mainly use the English language. Currently, this claim has not been substantiated by evidence from relevant research. Computer games and gaming-related learning and teaching are relatively new, yet growing, areas of enquiry, but as of yet, research into these areas, specifically in terms of EFL, is severely lacking.

The category of access was primarily seen as a technical aspect. References to the pedagogical dimensions of access were almost non-existent, probably because they relate to access via the other categories, mainly cognition and motivation. In general, the perceived benefits and disadvantages of access consisted of the same issues regardless of the perspective – learners or teachers – these issues were viewed from. The most frequent benefits mentioned were the speed and ease of access, and freedom of time and place. These are also perhaps the most immediate and widely recognised benefits associated with technology in the literature (see, for example, Conole and Dyke 2004). Freedom of time and place was, according to respondents, related to learners in terms of the availability of (digital) materials not only in school, but also elsewhere. Speed and ease of access made possible by modern ICTs’ were seen to benefit pupils as well as teachers, although the benefit to teachers was considered perhaps more in connection to teachers’ ability to design lessons and produce teaching materials: in this

respect, ICT was regarded to simplify and reduce teachers' workload. However, participants also considered ease of access a pedagogical challenge, since they felt it difficult to control how pupils use ICT. In their view, uncontrolled access to, for example, inappropriate material on the Internet was a potential threat. The foremost challenge was, nevertheless, that of resources. From the learner perspective, this culminated in the number and availability of equipment to pupils, and therefore also extended to the question of equality – issues that are frequently criticised about educational technology in the literature (see, for example, Selwyn 2011; Conole and Dyke 2004). Ensuring equal opportunities to education is a fundamental problem regarding ICT in schools, and one that does not have simple solutions. Diverse backgrounds of the learners should be taken into account, and ideally, different schools and institutions should possess similar equipment, software and arrangements. Numerous other issues abound as well; therefore it should be clear that the matter transcends the micro-level of individual learners and classrooms, and becomes a societal, economic and political issue. These are all reflected in the participants' views of the teacher perspective as well, since the defining challenges of inadequate time and resources available to teachers are in direct relation to the challenges faced by learners.

In addition to teacher trainees' views on the affordances of ICT in education, a significant component of the present thesis was to inspect teacher trainees' perceptions of teacher training with respect to ICT. Essential questions in this regard were whether ICT (and its implications to teaching and learning) was covered adequately during teacher training, and if not, what are the specific topics regarding ICT that should, in their opinion, be included in teacher training. Furthermore, teacher trainees' self-efficacy beliefs concerning their technical and pedagogical abilities to apply ICT to EFL teaching were measured. Unfortunately, (published) research on ICT in teacher training in Finland is currently almost non-existent. The considerations presented here are largely based on a report by Meisalo et al. (2010), as well as the concept of TPACK presented by Koehler and Mishra (2009; also see section 3.4).

Notably, the quantitative result from items B1–B14 indicate that, in the participants' opinion, technical and pedagogical ICT training within teacher training programmes is inadequate. Meisalo et al. (2010: 55) suggest that this may in part be due to teacher educators' lack of ICT skills. Essentially, teacher trainees are left to discover and learn ICT on their own – yet teacher trainees do not appear to know, or be certain of, how

they could go about developing their ICT competences: answers to item B7 reveal that the majority of respondents were not aware of where they could obtain information regarding educational ICT use. These issues indicate that, while ICTs and educational ICT use are increasingly gaining support in educational policy, teacher training has not yet responded to developments in policies and in the field. It seems that more recent theories and models of teacher competences, such as TPACK (see Koehler and Mishra 2009), are currently ignored in favour of well-established, more traditional practices. While participants' perceptions of their technical ICT skills were generally on the positive side, they seemed rather ambivalent concerning their pedagogical ICT skills. Gender and level of ICT studies were found to have an effect on respondents' evaluations of their technical ICT skills. The available data does not explain why males were more confident than females, although it could be speculated that males were, in general, more familiar with the technical aspects of ICT. However, in the absence of further background information I am reluctant to draw such conclusions. Nevertheless, the recent emergence of entertaining and communicative ICT activities, for example, gaming and social media, as popular and socially acceptable practices is likely to reduce the gap between the genders. Interestingly, compulsory ICT courses appeared to have a slight adverse effect on participants' self-efficacy in terms of technical ICT skills: respondents who had not taken any ICT courses were, in fact, more positive of their skills compared to those who had taken compulsory ICT courses. It is possible that participants who had not taken any courses overestimated their skills, while those who had taken compulsory courses were more critical of their skills. It is conceivable that, among other factors, the specific topics of the compulsory courses, the relative difficulty of the topics, and the competences and attitudes of the person(s) teaching those topics must have had an effect on the participants' perceptions of their skills. However, it is very difficult to estimate the influence of these factors, since they could not be measured reliably within the scope of the present thesis. Furthermore, comparisons to actual ICT skills are not possible: it is perhaps even impossible to objectively measure actual ICT skills of learners, teacher trainees and teachers, due to the vast variety of contexts across which ICT, and therefore ICT skills, are used. According to the statistical analysis, differences between participants' opinions concerning their pedagogical ICT skills were not attributable to the measured background factors. This could be taken to imply a number of things, for instance, that pedagogical ICT skills were not addressed during teacher training (no statistically

significant differences between participants at different stages of teacher training) or separate ICT courses (no statistically significant differences between participants with different levels of ICT studies). However, without a more comprehensive mapping of the relevant background factors these considerations remain merely conjecture.

Willingness to receive (additional) technical and pedagogical ICT training was very high among participants. The fact that participants' perceptions of the technical training needs focused on hardware and software *in general*, seems to indicate at least two important points: first, that teacher trainees general ICT competences, and their general understanding of ICT in education, may not be as good as commonly imagined – this conclusion is also supported by a study of teacher trainees' TPACK conducted by Valtonen et al. (2011: 14); and second, that ICTs' technical implications to education are not discussed or reflected on during teacher training. The first can, at least to some degree, be attributed to the lack of ICT training and experience of ICT in education: learners', specifically, university students' use of ICT has been found to focus on specific, narrow areas, with an emphasis on entertaining and communicative uses (Thompson 2013: 20). Therefore, it is conceivable that teacher trainees lack a more holistic view of how to apply ICT in teaching and learning. The second claim, namely that ICTs' technical implications to teaching and learning are not discussed during teacher training, cannot be verified on the basis of the currently available data, although participants' evaluations of the extent to which ICT was addressed during teacher training (questionnaire items B1, B3 and B4) speak volumes concerning the current situation. Pedagogical training needs were considered in terms of theory and practice: participants felt that the theories of learning and teaching reflected on during teacher training should be connected explicitly to ICT, and therefore, to practice. This implies that currently teacher training does not support such considerations, resulting in a hesitation of pedagogical competence with regard to ICT, as seen in previous discussion concerning teacher trainees' self-efficacy beliefs. Furthermore, practical considerations on how to implement teaching or tasks with ICT seemed to be of primary interest to the majority of participants. These considerations, more often than not, lacked a pedagogical perspective, which could be taken as an indication that activities employing ICT were not seen as implementations of theory to practice. Whether or not this suggests a lack of pedagogical reflection concerning ICT during teacher training is currently unclear. Arguably however, pedagogical reflection (at least valid and

productive reflection) on ICT in education is impossible without also considering the technical implications of it.

Obviously, ICT in education remains a hugely complex issue that encompasses a wide range of benefits and challenges to learners, teacher trainees and educators. This study has aggregated available knowledge of and insights into these affordances of ICT from the perspectives of both the learner and the teacher, and investigated Finnish EFL teacher trainees' perceptions concerning these issues. Additionally, teacher trainees' views on the current role of ICT in teacher training programmes, and perceived training needs concerning educational ICT use, were mapped. Essentially, the present thesis provides a snapshot of the current situation, but also highlights the areas and aspects where more attention is needed. Particularly the comparisons made between existing knowledge of ICTs' effects on learning and teaching and participants' perceptions of those issues provide teacher educators and teacher training departments critical information of where to aim their resources regarding educational ICT training. Furthermore, this study has emphasised the very real need to provide (educational) ICT training to teacher trainee students, regarding both the technical and the pedagogical aspects of it. Finally, the present thesis raises awareness of all the aforementioned issues concerning ICT in education – hopefully in a sense that provokes thought and reflection among educators, teacher trainees, educational policy-makers, and perhaps even learners.

7 CONCLUSION

Information and communications technology in education is an immensely complex area of enquiry. During the past two decades or so, ICTs have become such a pervasive aspect of our daily lives that we hardly think about them with any special meanings attached: we go about performing tasks and activities with computers, tablets, smartphones and the like with an accustomed efficiency that rarely sees major setbacks. Our societies, in general, are so permeated by technology that we seldom stop to reflect on the how and why ICTs operate as they do, our own use of them, or even on what our alternatives are. In contrast, educational settings remain, it seems, as zones of isolation from the ever-increasing dependence on technology – ICT has not managed to penetrate into schools, into the mainstream practices of teachers and students alike.

While ICT in education has received some attention from researchers and educators along the years, both research and training has concentrated on in-service teachers and students. Teacher trainees have largely been neglected in this respect. Considering that student teachers are the educators of the future, the lack of research on teacher trainees and ICT represents a blindingly obvious gap in knowledge. Therefore, the aim of the present thesis was to fill that gap, at least partly, by examining student teachers' views of ICT in education. Additionally, there was an attempt to bring teacher trainees' voices to the fore in inspecting whether or not teacher trainees feel a need to include ICT training in teacher education, and what specific aspects of ICT use they feel should be a part such training. These objectives were met mainly through qualitative analysis: statistical analysis of quantitative data did not produce as consistent results as in previous, large sample studies of in-service teachers, mainly owing to the modest number of responses to the questionnaire in this thesis.

In terms of the effects of ICT to learning and teaching, teacher trainees' views were generally positive. Significantly, access to and use of authentic materials through ICT received more support from teacher trainees than any other closed question in the questionnaire. Furthermore, concerning the need to teach ICT skills to students in order to make use of ICT in learning English (item A17), participants demonstrated an interesting pattern: student teachers' opinions were found to be progressively less positive regarding this issue the more they had studied ICT. Although opinions in this question were positive overall, it is worth asking what aspects of ICT courses, compulsory or voluntary, may have such an effect on student teachers' attitudes. One possible answer is, that the courses in question lacked a pedagogical element: this may have had a negative impact on students' perceptions of ICT in general, and thus lessened their willingness to consider it a useful instrument for learning. In contrast to learning and teaching, teacher trainees' opinions of students' ICT skills were rather critical on the whole.

Concerning the technical and pedagogical benefits of ICT in education, teacher trainees thought that access to materials and other resources; development of cognitive skills; and motivational practices and methods enabled by the use of ICT were of greatest importance. The most pressing technical and pedagogical challenges seemed to arise from certain cognitive aspects, such as problems with attention and inadequate ICT skills; and those of access to technology. Student teachers, for the most part, were of the

mind that technical and pedagogical ICT training is insufficient in teacher education, regardless of the fact that they were somewhat confident of their own technical ICT skills. In contrast, teacher trainees' evaluations of their pedagogical ICT skills were quite ambivalent on the whole. Accordingly, a majority of respondents expressed a need for (additional) technical and pedagogical ICT training. On the technical side, this need was reflected most prominently in becoming familiar with the equipment in general, both on the part of hardware and software applications. Concerning pedagogy, participants indicated that ICT training needs are most needed with regard to theoretical information on ICT pedagogy, and the practical issues and methods in its employment.

The primary merits of the present thesis rise from the coherent overview of ICTs' affordances to learning and teaching that it presents and compares to teacher trainees' views. This allows for the identification of critical areas that should receive (more) attention, especially in the educational sphere. Notably, the information presented in this thesis can be used by all educational actors, be they policy-makers, educators, or students, to improve teaching and learning for everyone involved. Furthermore, the present study has focused on teacher trainees, a group that has previously received almost no attention in Finland or internationally. Remarkably, in the Finnish context, teacher trainees' views on the educational use of ICT and its affordances have not been studied, and the present thesis therefore present new and original information on this particular issue.

The major weaknesses in this study are attributable to problems in the construction and dissemination of the data collection instrument, and to the fact that previous research is lacking in some areas considered in this thesis. As discussed in conjunction with the analysis of the data, some of the qualitative questionnaire items appeared rather ambiguous to respondents: as one of them pointed out in their answer, it was unclear whether technical benefits referred to the benefits of ICT to the learning of the subject/topic, or to learning ICT. It is likely that some missing answers (of the form "I don't know", "-", and so forth) are attributable to the relative ambiguity in these questions. Another problem in the design of the questionnaire relates to the measured background variables. *ICT activities*, the variable used to measure participants' familiarity with ICT and frequency of ICT use, turned out to be too indeterminate to code meaningfully for analysis and had to be discarded. The fact that participants generally neglected to mention the frequency of specific ICT uses further detracted

from the usefulness of this variable. Another variable, participants' minor subjects had to be similarly discarded: individuality of answers resulted in too much variability in terms of the computability of the statistical tests that could not be accounted for by recoding the answers. In the case of participants' place of study, the extremely uneven distribution (see Table 5.1) would not have produced meaningful results in terms of their validity or generalisability. Finally, background information on the specific teacher training programmes, ICT courses and major subject courses was insufficient to make definite conclusions on some aspects of this study, although most of these are speculated about in the discussion (see Chapter 6). Most, if not all, of the abovementioned issues could probably have been avoided by a more careful preparation of the questionnaire items, and regarding the background variables, inspecting the curricula of different teacher training programmes and participants' major subject (i.e. English). Concerning the dissemination of the questionnaire, there was a problem in getting enough responses: after three rounds of circulation, 47 EFL teacher trainees had responded. Considering that the study included six universities, the only reasonable method of dissemination was that of an online questionnaire. However, online questionnaires are easy to ignore, since the author's ability to control the process is extremely limited. One way of circumventing this problem would have been to 'recruit' university staff from the English and teacher training departments to further help disseminate the questionnaire. This would probably have resulted in a more representative sample.

There are still a large number of issues concerning ICT and education, especially concerning EFL. For example, the absence of a framework to enable the evaluation of learners' and teachers' actual ICT skills, as opposed to self-reported perceptions, remains a barrier to understanding the development of ICT skills, and possibly to ICTs' effects on learning in general. Building a more unified understanding of ICTs' affordances in education would probably also help in conducting future research: most current descriptions vary greatly in the breadth of factors considered, their specificity and their definitions. Not having a common frame of reference may limit the comparability of results, since researchers have different interpretations, for instance, of what constitutes a particular affordance. Further research should also aim to fill the gaps in research concerning teacher trainees' and ICT: currently the amount of research on teacher trainees is modest at best. In order to continue improving education with regard to ICT, it is essential to also take teacher trainees into account, not just the distal ends,

that is teachers and learners. As a specific example from the present thesis, the relative absence of interactive aspects in teacher trainees' considerations of ICTs' affordances presents a conundrum to which there is as of yet no explanation. However, the most pressing issue in current research on ICT in education relates to sample sizes: it seems the majority of research in this field consists of case studies and studies with relatively small samples. Therefore, they are suggestive, but rarely generalisable to the wider population. Large-scale studies are needed to establish valid principles for the use of ICT in education.

The implications of the results of the present thesis for teacher education are quite clear: student teachers need more training with ICT, especially on its pedagogical foundations in both theory and practice. Since general purpose ICT courses cannot provide such training, it falls unto teacher training departments to pull their weight in the matter, and help prospective teachers to gain the skills and competences they will need to make use of ICT in education. In the future, curricula at all levels of compulsory education will move even more toward integrating ICT in teaching and learning, and in order to ensure beneficial rather than harmful effects of this transformation, our teachers need to be knowledgeable, capable, and equipped with a solid pedagogical mindset toward accepting and furthering the development of education.

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APPENDICES

APPENDIX 1: TRANSLATED QUESTIONNAIRE

Note: only the questionnaire questions are presented here. The formatting of the original questionnaire has been altered, and explanatory text (mainly questionnaire instructions for the respondents) has been removed in order to present the essential parts of the questionnaire here. The questionnaire items presented here are translations from Finnish to English. Original Finnish wording is presented in Appendix 2.

PART I: Views on the educational use of ICT

Effects of educational ICT use to learning

Statements (four point Likert-scale: "I fully disagree", "I slightly disagree", "I slightly agree", "I fully agree"):

The use of ICT in teaching…

A1. …improves students' motivation to study
A2. …improves students' learning results
A3. …develops students' social skills
A4. …supports students' processes of knowledge construction
A5. …improves students' abilities to adopt new learning strategies
A6. …develops students' skills for critical thinking

Educational ICT use…

A7. …improves students' skills for autonomous studying/learning
A8. …expands the possibilities to learn English through authentic materials
A9. …helps to concretise the learning content of English (for example, grammar, vocabulary)
A10. … in teaching English contributes to students' willingness to utilize English content on their spare time (for example, blogs, wikis, forums, etc.)
A11. The use of ICT in teaching English distracts students' attention from the topic or content of the lessons

Effects of educational ICT use to teaching

Statements (four point Likert scale: "I fully disagree", "I slightly disagree", "I slightly agree", "I fully agree"):

A12. The use of ICT in teaching takes up too much time from teaching the language content of English (grammar, vocabulary…)
A13. Preparing educational ICT use for lessons takes up too much time
A14. It is possible to utilize students' personal devices (tablets, smart phones) in teaching English
A15. Educational use of ICT is primarily the responsibility of the ICT teacher
A16. Educational use of ICT belongs to the teaching of English
A17. Students are in need of ICT instruction in order to utilize ICT in studying the English language

Students' ICT skills

Statements (four point Likert scale: "I fully disagree", "I slightly disagree", "I slightly agree", "I fully agree"):

A18. Students have a good understanding of how to take advantage of ICT in studying English
A19. Students are able to apply ICT to studying English
A20. Playing computer games improves students' abilities to apply ICT to studying in general
A21. Playing computer games improves students' abilities to apply ICT to studying English in specific
A22. In general, students' abilities to utilise ICT are at a very advanced level
A23. Students are conscious of how ICT affects their learning
A24. Students are conscious of the importance of critical assessment when using the Internet as a source of information
A25. Students are able to evaluate the reliability of Internet sources
A26. Students know how to use the Internet and social media (for example, Facebook) in a responsible manner
A27. Students are aware of security issues when using ICT
A28. Students are aware of the legislation pertaining to the use of ICT

Affordances of education ICT use

Open questions, empty answers not allowed.

What are, in your opinion, the most important…

A29. …technical benefits of ICT use from the student's perspective?
A30. …pedagogical benefits of ICT use from the student's perspective?
A31. …technical benefits of ICT use from the teacher's perspective?
A32. …pedagogical benefits of ICT use from the student's perspective?
A33. …technical challenges of ICT use from the student's perspective?
A34. …pedagogical challenges of ICT use from the student's perspective?
A35. …technical challenges of ICT use from the teacher's perspective?
A36. …pedagogical challenges of ICT use from the teacher's perspective?

PART II: Views on ICT in teacher training

ICT training in teacher training programmes

Statements (four point Likert scale: “I fully disagree”, “I slightly disagree”, “I slightly agree”, “I fully agree”):

B1. Educational use of ICT is covered to a sufficient extent in English teacher training programmes
B2. In my opinion, educational use of ICT belongs to the content of teacher training
B3. In my opinion, technical training regarding the educational use of ICT is broad enough in teacher training
B4. In my opinion, pedagogical training regarding the educational use of ICT is broad enough in teacher training
B5. Different ICT equipment are explored in teacher training
B6. Different ICT software are explored in teacher training
B7. I know where I can get more information on the educational use of ICT
B8. In my opinion, training in the educational use of ICT belongs to courses outside the teacher training (for example, courses in the university’s faculty of Information Technology)
B9. My current technical ICT skills are adequate to utilise ICT in teaching English
B10. My current pedagogical ICT skills are adequate to utilise ICT in teaching English
B11. I would like to have (additional) training on the technical aspects of utilising ICT in teaching English
B12. I would like to have (additional) training on the pedagogical aspects of utilising ICT in teaching English
B13. Educational use of ICT is a skill that is primarily learned on the job
B14. Educational use of ICT is an essential part of the teacher’s professional competence

Open questions

B15. What are the specific technical aspects of ICT that you would like (additional) training in (if you answered statement B11 with option “slightly agree” or “fully agree”)?
B16. What are the specific pedagogical aspects of ICT that you would like (additional) training in (if you answered statement B12 with option “slightly agree” or “fully agree”)?

APPENDIX 2: TESTS OF INDEPENDENCE

Table A.2a Tests of independence for questionnaire items A1–A28 and B1–B14. Results below the level of significance ($\alpha = 0.05$) are marked in bold.

Item	Gender						Age group					
	X^2	*df*	*p*	X^2_{Fisher}	p_{Fisher}	*Cramer's V*	X^2	*df*	*p*	X^2_{Fisher}	p_{Fisher}	*Cramer's V*
A1	1.099	3	0.777	1.392	0.838	0.172	2.622	3	0.454	2.472	0.538	0.229
A2	4.307	3	0.230	3.483	0.306	0.272	1.666	3	0.645	1.779	0.755	0.195
A3	4.366	3	0.225	3.816	0.266	0.285	1.630	3	0.653	1.683	0.732	0.189
A4	0.945	3	0.814	0.846	1.000	0.134	3.785	3	0.286	3.347	0.351	0.267
A5	2.034	3	0.565	1.717	0.773	0.191	2.946	3	0.400	2.663	0.498	0.238
A6	9.168	3	**0.027**	8.548	**0.026**	0.426	3.078	3	0.380	3.106	0.380	0.257
A7	3.463	3	0.326	3.396	0.316	0.269	5.184	3	0.159	4.628	0.188	0.314
A8	10.226	3	**0.017**	9.407	**0.010**	0.447	2.155	3	0.541	2.078	0.838	0.210
A9	1.991	3	0.574	1.834	0.690	0.198	1.923	3	0.589	2.087	0.645	0.211
A10	0.007	2	0.996	0.143	1.000	0.055	1.279	2	0.527	1.328	0.580	0.168
A11	3.083	3	0.379	2.757	0.486	0.242	0.212	3	0.976	0.438	1.000	0.097
A12	0.366	3	0.947	0.678	1.000	0.120	2.138	3	0.544	2.236	0.574	0.218
A13	1.397	3	0.706	1.830	0.647	0.197	1.185	3	0.757	1.186	0.870	0.159
A14	2.039	3	0.564	2.210	0.578	0.217	3.050	3	0.384	3.007	0.430	0.253
A15	2.709	2	0.258	2.175	0.353	0.215	3.073	2	0.215	3.098	0.205	0.257
A16	1.717	2	0.424	1.803	0.426	0.196	2.764	2	0.251	2.652	0.305	0.238
A17	5.124	2	0.077	5.409	0.073	0.339	0.015	2	0.993	0.143	1.000	0.055
A18	0.979	3	0.806	1.509	0.793	0.179	4.449	3	0.217	3.943	0.236	0.290
A19	1.134	3	0.769	0.954	1.000	0.142	4.301	3	0.231	4.419	0.114	0.307
A20	1.261	3	0.738	1.627	0.644	0.186	1.685	3	0.640	1.719	0.700	0.191
A21	1.529	3	0.676	1.270	0.818	0.164	0.514	3	0.916	0.729	0.917	0.125
A22	1.330	3	0.722	1.079	0.883	0.152	5.456	3	0.141	5.040	0.172	0.327
A23	0.760	2	0.684	0.959	0.663	0.143	0.392	2	0.822	0.476	0.847	0.101
A24	7.207	3	0.066	6.167	0.081	0.362	2.113	3	0.549	2.001	0.597	0.206
A25	1.149	2	0.563	0.800	0.739	0.130	3.919	2	0.141	3.866	0.149	0.287
A26	3.780	2	0.151	3.647	0.194	0.279	0.101	2	0.951	0.183	1.000	0.062
A27	3.542	3	0.315	3.232	0.414	0.262	2.775	3	0.428	2.642	0.483	0.237
A28	0.476	2	0.788	0.618	0.813	0.115	0.763	2	0.683	0.745	1.000	0.126
B1	4.047	3	0.256	3.796	0.293	0.284	6.365	3	0.095	5.850	0.109	0.353
B2	0.437	2	0.804	0.544	1.000	0.108	2.202	2	0.333	2.085	0.324	0.211
B3	8.001	3	**0.046**	6.421	0.077	0.370	3.764	3	0.288	3.334	0.372	0.266
B4	6.239	3	0.101	4.843	0.148	0.321	5.070	3	0.167	4.630	0.191	0.314
B5	0.443	3	0.931	0.659	1.000	0.118	3.195	3	0.363	3.031	0.393	0.254
B6	2.670	3	0.445	2.812	0.478	0.245	2.878	3	0.411	2.789	0.427	0.244
B7	1.861	3	0.602	1.591	0.783	0.184	2.688	3	0.442	2.820	0.483	0.245
B8	0.674	3	0.879	0.767	1.000	0.128	2.312	3	0.510	2.258	0.564	0.219
B9	10.732	3	**0.013**	8.723	**0.018**	0.431	0.814	3	0.846	1.012	0.910	0.147
B10	6.363	3	0.095	5.929	0.081	0.355	0.446	3	0.930	0.723	0.959	0.124
B11	2.576	2	0.276	2.744	0.325	0.242	5.565	2	0.062	5.532	0.059	0.343
B12	1.117	2	0.572	1.352	0.576	0.170	6.248	2	**0.044**	6.219	**0.042**	0.364
B13	2.175	3	0.537	1.811	0.715	0.196	9.161	3	**0.027**	8.678	**0.013**	0.430
B14	4.358	3	0.225	3.589	0.316	0.276	2.184	3	0.535	2.370	0.637	0.225

Table A.2b Tests of independence for questionnaire items A1–A28 and B1–B14. Results below the level of significance ($\alpha = 0.05$) are marked in bold.

Item	Level of teacher studies						Level of ICT studies					
	X^2	*df*	*p*	X^2_{Fisher}	p_{Fisher}	*Cramer's V*	X^2	*df*	*p*	X^2_{Fisher}	p_{Fisher}	*Cramer's V*
A1	23.135	9	**0.006**	18.569	**0.021**	0.363	4.213	6	0.648	4.908	0.622	0.229
A2	4.465	9	0.878	8.458	0.589	0.245	5.954	6	0.428	5.196	0.532	0.235
A3	5.363	9	0.802	8.315	0.669	0.243	3.274	6	0.774	3.341	0.877	0.189
A4	11.694	9	0.231	10.179	0.281	0.269	6.362	6	0.384	4.998	0.538	0.231
A5	8.472	9	0.487	8.740	0.472	0.249	7.923	6	0.244	6.278	0.334	0.258
A6	8.105	9	0.524	8.244	0.497	0.242	7.160	6	0.306	6.382	0.334	0.261
A7	6.956	9	0.642	8.584	0.461	0.247	4.236	6	0.645	3.520	0.805	0.194
A8	9.300	9	0.410	12.543	0.312	0.298	7.268	6	0.297	6.222	0.398	0.257
A9	9.459	9	0.396	9.997	0.329	0.266	9.396	6	0.153	7.777	0.177	0.288
A10	3.220	6	0.781	2.972	0.913	0.178	2.580	4	0.630	2.500	0.695	0.163
A11	10.652	9	0.300	8.534	0.410	0.246	3.644	6	0.725	3.223	0.833	0.185
A12	9.932	9	0.356	10.634	0.343	0.275	2.709	6	0.844	2.945	0.945	0.177
A13	7.582	9	0.577	8.603	0.396	0.247	7.833	6	0.251	6.615	0.335	0.265
A14	26.252	9	**0.002**	11.257	0.266	0.283	4.556	6	0.602	4.461	0.684	0.218
A15	12.249	6	0.057	9.628	0.086	0.320	2.161	4	0.706	1.967	0.836	0.145
A16	4.455	6	0.615	5.202	0.538	0.235	1.116	4	0.892	1.612	0.862	0.131
A17	6.259	6	0.395	5.921	0.396	0.251	8.833	4	0.065	8.932	**0.044**	0.308
A18	4.211	9	0.897	8.102	0.758	0.240	1.556	6	0.956	2.279	1.000	0.156
A19	2.208	9	0.988	6.331	0.967	0.212	6.949	6	0.326	6.278	0.342	0.258
A20	16.744	9	0.053	13.298	**0.048**	0.307	7.444	6	0.282	7.546	0.241	0.283
A21	5.325	9	0.805	6.220	0.757	0.210	11.939	6	0.063	10.035	0.083	0.327
A22	3.218	9	0.955	4.321	0.982	0.175	5.873	6	0.438	6.052	0.400	0.254
A23	14.313	6	**0.026**	9.485	0.074	0.318	6.276	4	0.179	5.951	0.194	0.252
A24	18.006	9	**0.035**	11.096	0.291	0.281	2.177	6	0.903	3.117	0.934	0.182
A25	2.325	6	0.888	3.298	0.832	0.187	4.543	4	0.338	3.994	0.405	0.206
A26	8.425	6	0.209	6.332	0.325	0.260	2.042	4	0.728	1.962	0.795	0.144
A27	7.090	9	0.628	8.720	0.595	0.249	3.562	6	0.736	3.742	0.803	0.200
A28	1.289	6	0.972	4.389	0.891	0.216	5.679	4	0.224	5.876	0.146	0.250
B1	4.768	9	0.854	5.446	0.859	0.197	5.630	6	0.466	6.056	0.396	0.254
B2	8.057	6	0.234	9.222	0.202	0.313	2.717	4	0.606	2.883	0.694	0.175
B3	7.497	9	0.585	7.605	0.595	0.232	3.719	6	0.715	3.160	0.842	0.183
B4	7.466	9	0.589	7.787	0.562	0.235	3.648	6	0.724	3.217	0.845	0.185
B5	16.145	9	0.064	13.214	0.060	0.306	1.612	6	0.952	2.200	0.957	0.153
B6	16.681	9	0.054	11.845	0.103	0.290	3.898	6	0.690	4.070	0.697	0.208
B7	5.590	9	0.780	7.215	0.680	0.226	7.154	6	0.307	6.952	0.274	0.272
B8	13.010	9	0.162	12.782	0.144	0.301	4.556	6	0.602	5.017	0.579	0.231
B9	15.817	9	0.071	12.175	0.098	0.294	14.831	6	**0.022**	12.303	**0.027**	0.362
B10	10.172	9	0.337	10.270	0.247	0.270	12.251	6	0.057	8.242	0.158	0.296
B11	3.675	6	0.721	3.544	0.840	0.194	4.827	4	0.305	5.029	0.277	0.231
B12	10.894	6	0.092	9.822	0.062	0.323	7.087	4	0.131	6.939	0.117	0.272
B13	6.584	9	0.680	8.680	0.628	0.248	4.988	6	0.545	4.855	0.597	0.227
B14	4.221	9	0.896	8.292	0.730	0.243	4.987	6	0.545	4.445	0.705	0.217