“The role of ICT in the teaching of English as a Foreign Language in Norwegian lower secondary schools – a study of ICT use and patterns of associated factors”

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Chapter 1: Introduction

ICTs have become an essential part of everyday life of most people in the Western world.[1] From the smooth running of societies' vital functions, such as banking and finance, to social networking and recreational activities, new technologies rapidly transform important aspects of our lives. ICTs empower us to perform tasks that were inconceivable only a few decades ago. From our personal computers we buy and sell all kinds of products, keep in touch with friends and find new ones, participate in chat rooms and discussion groups, work and play. The number of tasks we perform via new technologies is continuously rising.

New technologies' massive impact on society has various consequences also for the Norwegian educational system. For one thing, most pupils are high frequency users of new technologies. They are familiar with browsing the Internet, playing games and participating in social networks. More importantly, they have access to a wealth of information regarding all curriculum subjects, and thus might feel less inclined to respect the authority of teachers and traditional textbooks. Furthermore, pupils and teachers are expected to be using ICTs in class on a regular basis as reflected in national plans and official documents. In the latest national curriculum (LK06) "the ability to use digital tools" is defined as a basic skill along with numeracy, the ability to express oneself orally, to read and write (KD (Kunnskapsdepartementet), 2006).

There are mixed experiences with the introduction of ICTs in the Norwegian school system, despite ambitious political plans and strategies, substantial economic investements, and a widespread faith in the educational power of digital technologies. One of the main policy objectives in "Program for digital kompetanse 2004-2008" was to become among the best in the world in the pedagogic application of digital tools in teaching and learning (UFD (Utdannings- og Forskningsdepartementet), 2004). Still, the latest report (ITU Monitor 2009) from the National Network for IT-Research and Competence in Education (ITU) on the state

[1] In what follows, the concepts 'digital technologies', 'ICTs', and 'new technologies' will be used interchangeably to maintain a varied language. When called for, more precise concepts are used to explicate important issues.

of the integration of ICTs in teaching and learning shows a decrease in the use of ICTs in lower secondary schools (ITU (Forsknings- og kompetansenettverk for IT i utdanning), 2009).

The faith in ICTs' positive effects on pupils' learning was expressed by the so-called "kvalitetsutvalget" in the following way: "Det er også viktig å understreke at IKT ikke bare kan bidra til hvordan elever kan lære bedre eller mer, den bidrar også til at elever kan lære eller arbeide med et kvalitativt bedre innhold" (KD (Kunnskapsdepartementet), 2003). Similarly, the reported decrease in the use of ICTs in lower secondary schools, spurred ITU to state that:"Den norske grunnskolen er akterutseilt og klarer ikke å integrere data i undervisningen. Det går utover elevenes ferdigheter i alle fag".[2] Yet, recent international research into the effects of ICTs on learning shows few indications of massive learning gains. On the contrary, John Hattie reports only medium effects of ICTs on learning, and Fuchs & Wössmann's reanalysis of the PISA-data showed significant negative correlations between frequent use of new technologies and Internet at school and learning outcomes (Hattie, 2009) (Fuchs & Wössmann, 2004). Similarly, based on finding in the international TIMMS-study (Trends in International Mathematics and Science Study), the Norwegian project group noted; "det er for oss et stort tankekors at arbeidsmåter som anbefales sterkt for tiden (prosjektarbeid, gruppearbeid og bruk av datamaskin) ser ut til å henge sammen med svake resultater i matematikk" (Lie, Kjærnsli, & Brekke, 1997): 203. Futhermore, a study of the views and experiences of headmasters at lower secondary schools participating in the international SITES study, revealed that there was a strong negative correlation between the number of years the school had used ICTs actively, and the faith in the positive effects of new technologies (Mason, Law, Pelgrum, & Plomp, 2008): 266. So, it would seem that the more experience headmasters' had had with the use of digital technologies, the less faith they had in ICTs' positive impact on pupils' learning. Finally, it is striking that Norway, which is the OECD country with the highest ICT use among pupils and the best school level ICT infrastructure, has the largest relative decline in skills and knowledge from 2003 to 2009 as measured in the PISA study.[3] Unsurprisingly, both teachers, researchers and politicians are interested in identifying the causes for the state of affairs.

[2] http://www.itu.no/Datakompetansen+for+svak+i+norsk+grunnskole.9UFRDGZV.ips, 13.05.2010.
[3] Lars Vavik, conference presentation at "FOU i praksis", Trondheim, 10.05.2010.

In the wake of the release of ITU Monitor 2009 and the reported decrease in ICT use at lower secondary schools, the project manager blamed the teachers for failing to integrate ICT in their teaching; they were the ”bottlenecks” in the efforts of digitalising Norwegian classrooms.[4] In a similar vein, the directorate for education (Utdanningsdirektoratet) has insinuated that teachers who do not use ICT frequently in class are less conscious about their 'theory of practice' than their ICT using colleagues: ”Liten bevissthet om egen praksisteori kan fort bli en bremsekloss for forandringsvilje, og dermed også en bremsekloss for viljen til å ta i bruk ny teknologi i opplæringa”.[5] In a response to the directorate, Lektorlaget pointed out that: " (...) liten forandringsvilje hos lærerne kan på enkelte område springe ut av meget velbegrunnet praksisteori og meget bevisst refleksjon om egen praksis", and provided an alternative way of thinking about the current state of affairs "(...) når sentrale myndigheters kraftige satsning på å innføre IKT i skolen ikke har gitt de resultater man hadde håpet på, kan årsaken ligge i en mangelfull analyse av situasjonen i skolen".[6]

The analysis of the situation in Norwegian schools is founded on certain ideas about ICTs' role and function expressed in educational policies. An evaluation of the value of ICTs in education must be based on some underlying assumptions about what constitutes quality and what is ICTs' ideal role and function in education. Arguably, official policy has for the last two decades been based on two main ideas about ICT in education. The first main idea is that schools must be digitalised in order to keep up with the rest of the world, and thus avoid what ITU refers to as being ”akterutseilt”. From this perspective all integration is good, and it makes sense to use frequency of ICT use as a measure for quality. Consequently, a registered decrease in the use of ICTs is by definition bad. From this perspective it is not particularly important to see ICT use in relation to the characteristics of the individual curriculum subject. This is what Gabriel Salomon refers to as a *technocentric* view of ICT in education (Salomon, 2000).

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[4] ”det er lærernes kompetanse og arbeidsmønster, i tillegg til usystematisk skoleledelse, som er de store flaskehalsene som hindrer it-basert undervisning” http://www.nrk.no/nyheter/1.6736536, 11.11.2009.
[5] http://www.regjeringen.no/upload/kilde/ufd/hdk/2005/0019/ddd/pdfv/233915-strategi-u.dir..pdf, p.14, 6.12.2009. 'Theory of practice' is defined by (Lauvås & Handal, 1990) as “a person's private, interconnected, continuously changing system of knowledge, experiences, and values which influences a person's teaching practice at a given point in time”.
[6] http://www.norsklektorlag.no/getfile.php/Filer/NLL%20mener-%20filmappe/Strategi%20for%20digitale%20l%C3%A6ringsressurser%2025%2002%2005.doc, 14.05.2010.

The second main idea is that schools must adopt a radical progressive pedagogy in order to make full use of ICTs' affordances. From this perspective ICTs are valuable since they seem ideal for promoting so-called pupil centered teaching and learning through the access they provide to sources of information and arenas for interaction. From this perspective it is not particularly important to look closely at the use of ICTs in relation to the characteristics of individual curriculum subjects, since the traditional understanding of curriculum subjects will not be the basis for a pedagogically transformed educational context. "This potential [for innovative pratices] simply cannot be fully realized within the single subject and single session model. We need to develop learning situations where complex problems are approached from a cross-curricular position and across flexible timescales" (Lund, 2004): 276. The new educational context is instead emphasising the development of pupils' so-called '21st century skills', such as their ability to access and process information, and their ability to identify problems and choose strategies for solving them (Vavik et al., 2010):18. The emphasis is on tasks requiring that pupils work across traditional curriculum subject boundaries. From this perspective, teachers sticking to a traditional understanding of curriculum subjects and thus object to an ICT induced pedagogic transformation, might be seen as reactionary and old-fashioned. Their lack of enthusiasm might be seen to stem from a general opposition to change per se, and might thus be accused of lacking consciousness about their own 'theory of practice'.

The view adopted in this study is that the value of ICTs must primarily be assessed according to the degree to which it promotes the attainment of central subject specific objectives. This view is based on international research findings and trends. The trends in the literature show that researchers increasingly turn their attention to characteristics of teachers and curriculum subjects to understand the proper role and function of ICTs in complex educational contexts. One obvious reason is that teachers play a crucial role in relation to the quality of pupils' learning (Hattie, 2009), and are the ones who decide what actually takes place in the individual classroom. Moreover, teachers experience the obstacles to successful integration of ICTs in their teaching on a daily basis. A steadily growing emphasis in the literature on the individual differences between teachers in relation to their beliefs, attitudes, and competence, reflects the understanding of teachers as key players in the educational context (Mueller, Wood, Willoughby, Ross, & Specht, 2008). Simultaneously,

there is a tendency in the literature to draw attention to the unique *subject specific context* new technologies are part of. Previous research suggest that teachers require *positive experiences with ICTs which are specific for the subject they teach* in order to make use of ICTs (Mueller et al., 2008). Also, some researchers have found that successful integration of ICTs are more likely to happen if the teacher's general pedagogical approach corresponds in some way to the characteristics of the technology (Zhao, Pugh, Sheldon, & Byers, 2002). Similarly, a common characteristic of successful projects is when the teacher sees a close connection between the technology and the curriculum, and has an educational rather than technocentric understanding of the role of technology, i.a. uses the technology as a means for reaching a subject specific objective, rather than seeing the integration of technology as an end in itself (Zhao et al., 2002). The findings suggest that research should be directed towards the teacher's role in the integration of new technologies in the individual school subject.

The focus in this thesis is on teachers of English as a Foreign Language (EFL) in Norwegian lower secondary schools. The overarching rationale is to develop and refine the current understanding of the forces which shape teachers' actions in relation to the use of new technologies in their everyday practice. By providing empirically based evidence of associations between various salient elements in the educational context, this thesis will hopefully contribute to a reduction of unfounded, derisive accounts of teachers' motives and agendas.

There is only a meagre body of previous national research upon which to build this study. As Andreas Lund points out, "(…) det [er] forbausende å se hvor lite som er skrevet i Norge om IKT i engelskfaget, iallfall innenfor vitenskapelige rammer som mastergrads- og doktoravhandlingar" (Lund, 2009). There are a couple of exceptions. Elisabeth Ibsen has written the Norwegian contribution to a European comparative study of 10.graders' English competence (Ibsen, 2004). Her quantitative analysis shows among other things the correlation coefficients between various classroom variables and pupils' results on predesigned language tests, thus trying to identify the most salient factors for pupils' learning. She shows that the use of ICT does not seem to be one of them. A more detailed description of Ibsen's study is provided in the chapter on previous research.

For the purposes of this study, only Lund's PhD thesis (Lund, 2004) is directly relevant. Although Lund's study is based mainly on qualitative methods and is placed within a sociocultural theoretical framework, both studies share a systemic rather than an analytic approach (Salomon, 1991) to a common research object; EFL teachers' encounters with ICT. However, where Lund provides a thick description of the practice of a limited number of teachers, the current study seeks to provide a less detailed description of the reported practice of *many* teachers. So, where Lund provides a close-up image of a number of intricate processes, the current study seeks to provide a general overview revealing *common patterns and systems of associations*. Also, Lund directs his attention to teachers participating in a course designed to try out school environments with high ICT density and collaborative pedagogical practices, whereas the current study seeks to capture the *voices of teachers working in their regular environment*. So, where Lund is concerned with capturing innovative practices that can serve as models for other schools to follow, the current study is more concerned with capturing *actual practices* that might help explain the state of ICT integration in the teaching of EFL in Norwegian lower secondary schools.

There are many unchartered areas related to the use of ICTs in the teaching of EFL, and more research is clearly required. The overarching research objective in this study is to determine EFL teachers' actual use of ICTs, and identify the system of associated variables that can help explain what is characteristic about EFL teachers with high ICT-intensity. In order to reach this research objective, the study seeks to provide answers to the following research questions:

1. What characterises the use of ICTs in EFL classrooms, and what attitudes and knowledge do the teachers have regarding new technologies?

2. How is EFL teachers' reported ICT use associated with;
    a. their knowledge about ICT and their thoughts relating to the usefulness of and experiences with technology; and
    b. their background, subject specific priorities and qualifications?

The thesis consists of six chapters. In the next chapter (chapter 2) previous research and the study's theoretical framework are accounted for. Chapter 3 provides insight into the methods used to obtain data and an evaluation of the generalisability and trustworthiness of the findings. The results of the different statistical analyses are presented in chapter 4, while a theoretically oriented discussion, conclusions and implications are provided in the last chapter.

Chapter 2: Previous research and theoretical perspectives

In this chapter, findings from previous research are presented according to the degree to which they are vital for an understanding of this study's general research approach and findings. Next, two theoretical frameworks are accounted for. One suited for the classification and categorisation of new technologies, and one needed for the elaboration on ICT use and the system of associated variables.

Previous research

In a masters thesis about EFL teachers' use of ICT for lower secondary school pupils, many angles from which to approach previous research are open. Ideally, the state of the art both nationally and internationally within each field constituting this composite area of research should have been comprehensively accounted for. Yet, for pragmatic reasons linked to time, resources and level of academic sophistication, this is beyond the scope of the present presentation. Instead, a principled selection of a few exemplary studies has been carried out.

First, by using a spatial principle of selection, I have separated national from international literature. Arguably, there is a need to place this study in context of other relevant studies of the Norwegian situation, and at the same time present findings that communicate important background information. There are few studies to choose from, so no studies are excluded. The studies included based on this principle are (Ibsen, 2004) and (Lund, 2004).

The second principle of selection can be said to be of a methodological nature. So, even though there are numerous studies concerning the integration of technology in education, I have primarily focussed on those with similar methodological underpinnings. Hence, the current study can be placed within the larger picture of quantitative studies dedicated to the identification of variables associated with ICT use. There are a number of international studies sharing these properties, and I have consciously excluded some of them, most notably (Becker, 1994). The second principle led to the inclusion of (Mueller et al., 2008) for a closer inspection.

Thirdly, studies with similar exploratory and empirical outlooks are included. This principle of selection *ex*cludes e.g. theoretically grounded, confirmatory studies occupied with the testing of the robustness of scales and items, and studies with an expressed or implied desire to influence the object of study in a particular predefined direction on the basis of theoretical convictions. There probably are a number of studies sharing these properties, but I have solely focussed on (Zhao et al., 2002), which is presented in more detail in this chapter.

Finally, studies on Computer Assisted Language Learning (hereafter simply referred to as CALL) are included, since this is the field that most comprehensibly covers the composite reality facing EFL teachers trying to integrate ICTs in their classrooms. (Chapelle, 2005) is included in this presentation of previous research on the basis of the fourth principle of selection.

The Norwegian context 1: English proficiency and associated variables

> "De norske elevene framstår som dyktige og dessutan godt motiverte både når det gjelder aktiviteter på skolen og det å lære engelsk" (Ibsen, 2004): 76.

In "Engelsk i Europa – 2002: Norsk rapport fra en europeisk engelskundersøkelse om holdninger til og ferdigheter i engelsk ved utgangen av den obligatoriske grunnskolen" (Ibsen, 2004) Elisabeth Ibsen presents the findings from the Norwegian part of a European study dedicated to the comparison of European 10.grade pupils' English proficiency.[7] The relevance of this report for the current study lies primarily in its presentation of findings related to Norwegian lower secondary school pupils' English proficiency. It is obviously important to know something about the level of proficiency in a study concerning EFL content, activities and methods. Even more important, perhaps, are the identification of variables associated with high levels of proficiency.

[7] The study was coordinated by The European Netweork of Policy Makers for the Evaluation of Education Systems and involved eight countries: Norway, Sweden, Denmark, Finland, France, Spain, Germany, the Netherlands.

The overall results showed that Norwegian 16-year-olds had a comparatively high level of English proficiency.[8] They achieved the highest test score on both listening comprehension and text production, and performed well on reading comprehension and linguistic competence as illustrated by diagram 1 below.

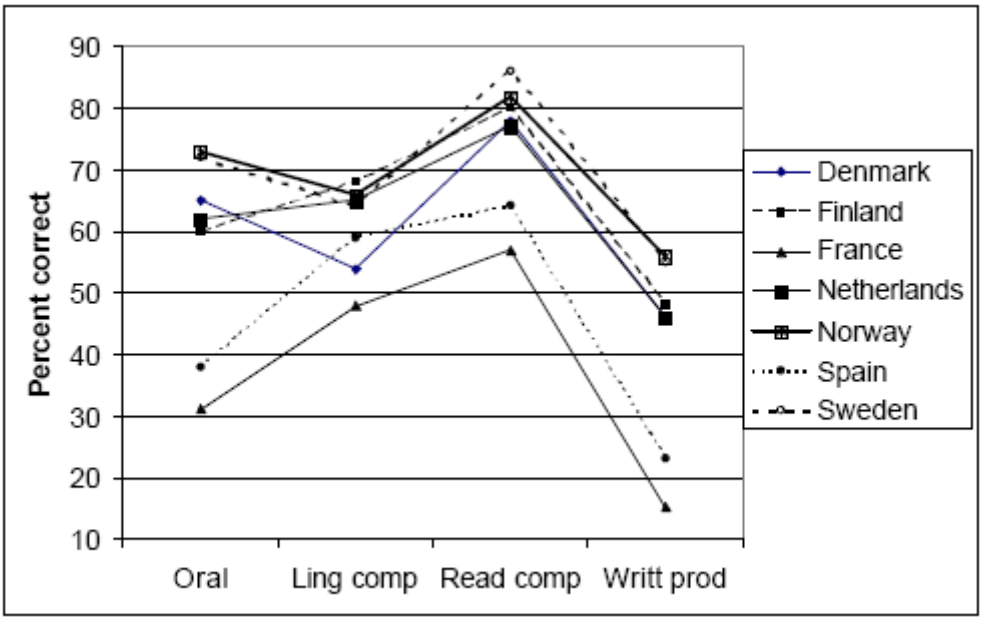

Diagram 1: Norwegian lower secondary school pupils' English proficiency expressed in scores on tests of listening comprehension, linguistic competence, reading comprehension, and written production (Ibsen, 2004)**: 19**

The Norwegian mean score was 65 per cent correct answers, but high standard deviations showed variations in their performance (fluctuating between 4 to 97 per cent correct answers). The pupils were on the whole highly motivated for learning English and saw the relevance of the school subject.

The report also presented findings related to variables associated with high test scores. Diagram 2 shows that "teacher using English as the language of instruction" was the school factor with the strongest positive correlation with test scores, whereas the use of ICTs showed the strongest negative correlation. Internet use at home, on the other hand, correlated positively with test scores.

[8] The test was relatively short (90 minutes) and the format was designed to measure pupils' listening and reading comprehension, linguistic competence, and written production.

Faktor	Korrelasjon med skåre
Tid på hjemmelekser	-0,10
Lærer snakker engelsk	0,11
Bruk av video	-0,09
Bruk av dataprogrammer	-0,17
Bruk av blader etc	-0,11
Engelske besøkende	-0,15

Diagram 2: Significant correlations between school factors and test results (Ibsen, 2004)**: 56.**

The relationship between different school activities on pupils' test scores, self-assessment and grades are presented in diagram 3 below. Again the variable linked most closely with pupils' good results is the teachers' use of English as the language of instruction. Moreover, textbook based activities in a classroom environment emphasising the importance of hard and diligent work seem to pay off in higher test scores, better grades and stronger beliefs in own competence. More open-ended tasks and activities such as project work show significant negative correlations with test score, but less so on pupils' grades and self-assessment.

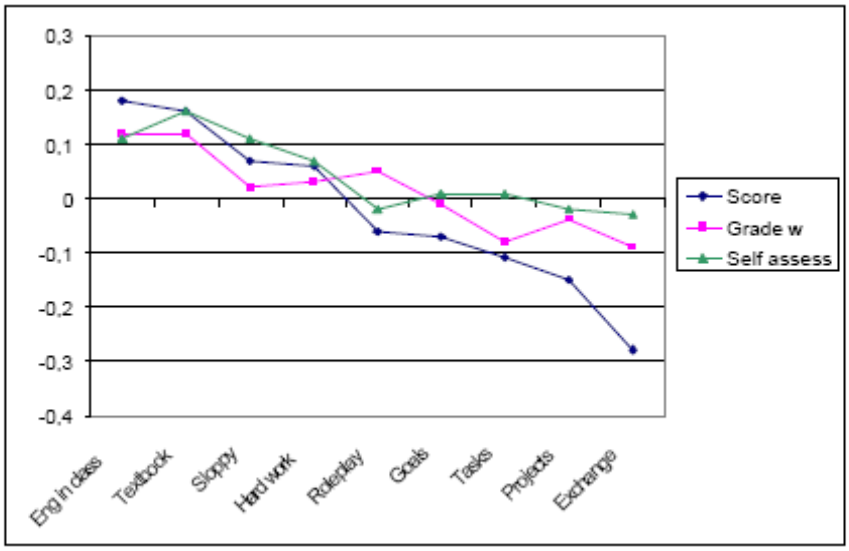

Diagram 3: Correlation between test scores, grades, self-evaluation and classroom activities (Ibsen, 2004)**: 57.**

Based on the findings that pupils' use of Internet and other media *at home* correlates positively with test scores, while their use *at school* correlates negatively, Ibsen concludes that it is important to consider how the few lessons of EFL per week can *supplement* and *structure* the language input pupils' receive at home. Furthermore, schools and teachers must develop their didactic competence in order to make use of media and other resources in accordance with principles for quality EFL teaching and learning. Overall, Ibsen maintains that the findings confirm the appropriateness of three fundamental principles for EFL teaching and learning: communication, authenticity and autonomy. She stresses that not only texts, but also activities and relations, must be seen in light of the concept of authenticity:

> "Internett åpner for en verden av autentiske tekster og autentiske møter og relasjoner, og lærerens oppgave blir å hjelpe elever til å analysere, vurdere og kommunisere tanker og informasjon i ulike sjangre med ulike mottakere" (Ibsen, 2004): 81.

The Norwegian context 2: EFL teachers' appropriation of ICTs

> "(…) life in ICT-infused learning environments is indeed complex, multivoiced and polytextual. If teaching is a complex endeavour, it becomes even more so when artifacts become digitized and – along with their users – increasingly networked and distributed" (Lund, 2004): 265.

"The teacher as interface – teachers of EFL in ICT-rich environments: beliefs, practices and appropriation" is the title of Andreas Lund's Ph.D. dissertation, in which he presents the findings from a focussed exploration of the processes involved in EFL teachers' appropriation of digitized artifacts. He uses a sociocultural theoretical perspective in his mainly qualitative study of EFL teachers practicing in ICT-rich environments.

He defines his research field as EFL teachers' encounters with technology, and poses one overarching research question to guide his study: "In what ways are ICTs appropriated in the EFL classroom?" Incorporated in this overall approach are questions related to the beliefs and attitudes of EFL teachers who encounter ICTs in their profession, the kinds of

educational practices that emerge when ICTs are integrated in EFL classrooms, and the identification of conditions conducive for innovative practices. A main line of conflict presented in the study is how teachers (should) approach the task of fully embracing the inherent (genotypical) properties of ICTs (appropriation) while at the same time looking after traditional aspects of enculturation, i.e. between innovation and tradition.

> "At the interface of the two we see a dialectic relationship of traditional (thesis) and transformational (antithesis) practices and with a third space as the potential synthesis. For those spaces to prosper, however, impediments in the traditional system will have to be conquered. As schools are socially and culturally constructed institutions, the way they arrange conditions for teaching and learning are manifestations of how they think about (or ignore) urgent educational issues" (Lund, 2004): 276.

He finds answers to the overarching research question through an examination of the *transformation* of the underlying activity system of 'teaching' (Lund, 2004): 276. He identifies three dimensions of transformation related to the teaching of EFL that he considers to be closely linked to teachers' appropriation of ICTs:

- *The school subject of EFL itself is undergoing change*. Lund maintains that the new participatory social spaces and associated genres of communicational forms provided by networked ICTs should be regarded as 'acceptable' functional practices. "The result is that ICT-rich environments afford opportunities for authentic, diverse, mature practices to a greater extent than in non-ICT classrooms" (Lund, 2004): 277. Moreover, a consequence of the the rapidly changing standards for 'correct' English should in Lund's view be a realignment of the ontological position of EFL. "Instead of locating the discipline within a linguistic system to be acquired, it is located in practices that are constantly being shaped and reshaped through a constantly increasing number of people who engage in global and online Englishes" (Lund, 2004): 277.
- *The social spaces (both in terms of time and place) for EFL practices are extended*. Lund sees the emergence of new social spaces for EFL practice which extend beyond the classroom (online communities etc.) as opportunities that must be exploited by

teachers through the use of designs for learning that bridge the gap between off and online environments.

- *Teachers must teach in ways they were not taught to do*. Lund maintains to see in ICT-rich environments the outline of communicative practices that should prepare learners for the future. Teachers must continuously keep up with new conventions and practices through ongoing professional development, according to Lund.

Lund's study provides an in-depth analysis of the intricacies involved in the process of integrating ICTs in EFL classrooms, and can be said to be the present study's *qualitative counterpart*. His theoretically informed investigation of the "messy" reality of ICT integration provides "thick" descriptions of individual appropriation-processes based on a deep understanding of the multilayered ecology of influencing factors in EFL teachers' wider social and cultural context. His fine-grained presentation of individual processes needs to be complemented by a study of recurring patterns among larger groups, which is exactly what this study tries to accommodate for.

Lund has taken advantage of the relative strengths of quantitative methods himself in order to capture "several refractions of a phenomenon" (Lund, 2004): 12. While the methodological approach is mainly qualitative, he uses quantitative methods to capture the beliefs of a sample of teachers in order to create a backdrop for the concerns teachers have when integrating ICTs. He claims that "complementary approaches may carry a lot of potential when analyzing dynamic phenomena that appear at individual as well as collective and institutional levels" (Lund, 2004): 12. The present study sticks to a quantitative approach, but the findings should be considered in conjunction with results from Lund's investigation as they complement, inform and relate to each other.

The methodological context: Classroom integration of ICTs and associated predictors

> "Although environmental barriers remain important considerations, it is the individual differences in beliefs, attitudes, and skills among teachers that is the key area of interest for researchers today. Educators are the focus of interest because it is educators that have the primary contact with students and it is educators that experience the barriers

> and supports to integration of technology first-hand. Given the critical role of educators, it is important to understand the contributions that teachers make in supporting or inhibiting the integration of computer technology in the classroom" (Mueller et al., 2008): 1524.

The title of the article – "Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration" – captures the purpose of Julie Mueller et al's recent survey study involving a sample of Canadian primary and secondary school teachers. They deem it critical to understand *teachers' perspectives* regarding computer integration, given the prevalence of computers in education today, and go on to provide a comprehensive summary of teacher characteristics and variables that best discriminate between high and low users of ICTs.

They point out that both "access to ICTs" variables and individual characteristics of teachers have been identified by previous research as potential barriers to ICT integration in classrooms. However, recent years' rapid developments of digital infrastructure and equipment have weakened the saliency of access variables in explaining differences in ICT intensity. They maintain that: "[t}he diminished emphasis on costs lends support for the idea that barriers to computer integration are lessening and research should focus on a teacher's attitudes and perceptions as important influences" (Mueller et al., 2008): 1526. The perceived lack of research into the complexities of the development of a skilled, reflective technology-using teacher, was used as a stepping stone for their quantitative study which included a variety of teacher attributes, both technology and non-technology specific.

The findings most relevant for the current study include:

1. "The high and low integration groups did not differ in terms of gender, years of experience, technical problems they had experienced, or the enjoyment and outward motivation for their work" (Mueller et al., 2008): 1532.
2. "Our results clearly implicate both experience with computer technology and attitudes toward technology in the classroom as important variables that predict differences between teachers who successfully integrated computer technology from those who did not" (Mueller et al., 2008): 1532.

3. “Attitudes towards computer technology also proved to be a critical contributor that distinguished successful and less successful integrators (…). (…). This scale measures the degree to which a teacher sees computer technology as a viable, productive, cognitive tool that is appropriate for use within their teaching context” (Mueller et al., 2008): 1533.
4. “The predictive strength of attitudes toward computer technology as an instructional tool is consistent with recent research (…). (…) a teacher’s attitude toward technology, specifically the value of the innovation, along with expected success, was one of the chief indicators of implementation” (Mueller et al., 2008): 1533.
5. “(…) consistent with previous research, computer experience variables such as comfort with technology and higher frequency of use of computers were significant contributors to the function that separated successful (…) secondary integrating teachers from their non-integrating peers.(…). Our results, however, suggest that “general” exposure and use is less critical than very specific, task-relevant, and classroom-applicable experience. Specifically, the positive outcomes measure contributed the most to the discriminating function for (…) secondary teachers” (Mueller et al., 2008): 1532.

Many of the items included in Mueller et al’s study, were also included in the current exploration of teachers ICT use. Some items were adapted to meet the needs of a subject specific context, others to better capture elements deemed salient in Norwegian lower secondary schools. However, the similarity of research design and underlying rationales made the study a particularly important stepping stone for the current study. One of the conclusions reached in Mueller et al was that further research was needed, especially concerning the use of ICTs in subject specific contexts. They stated:

> “Although the sample size for particular subject areas in the current study was too small to analyse the data as a function of the subject taught, teachers are likely to need experiences specific to their topic of instruction. Personal experience with technology success could be necessary for any change in attitudes and increase in computer efficacy” (Mueller et al., 2008): 1534.

The exploratory context: Acknowledging and adapting to existing structures for successful ICT projects

(Zhao et al., 2002) carried out a particularly relevant study where factors which facilitated or hindered teachers' use of technology in their classrooms were identified. It is necessary to have a closer look at what they found, due to the impact on the current study in terms of their thinking, approach, and results. They constructed a model to illustrate the relationships discovered. As illustrated, they placed each factor identified in one of three interactive domains, the innovator (the teacher), the innovation, and the context.

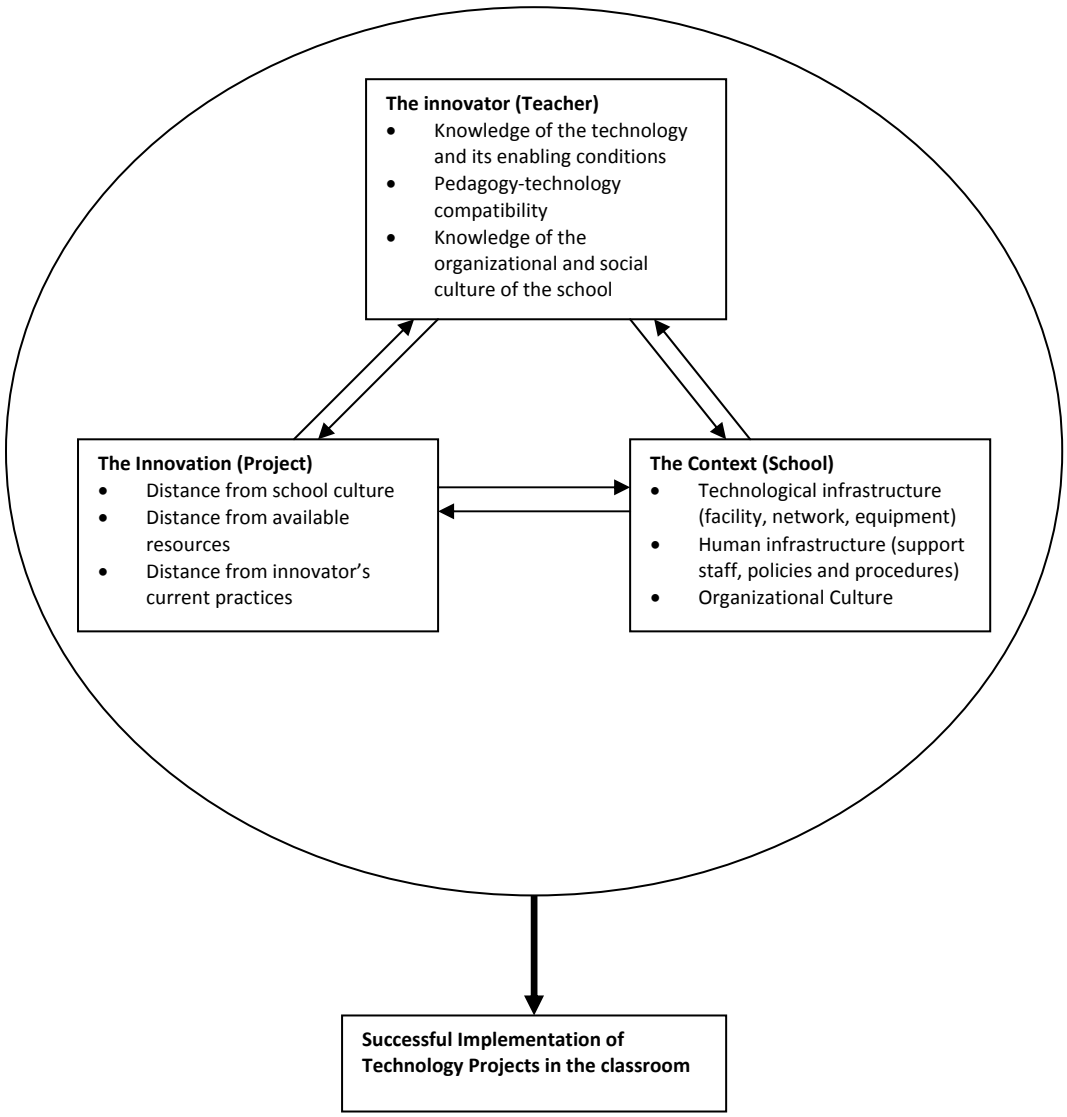

Diagram 4: (Zhao et al., 2002)**'s model of factors which facilitated or hindered teachers' use of technology in classroom contexts**

Three factors associated with *the teacher* were found to contribute significantly to the success of classroom technology innovations: technology proficiency, pedagogical compatibility, and social awareness. With regard to *technology proficiency* they found that teachers' ability to operate a piece of equipment or use a software application was not sufficient. Their observations suggested that an additional dimension of technology proficiency played an equally important part: "knowledge of the enabling conditions for a technology – (…) knowing what else is necessary to use a specific technology in teaching. Modern computers and computer-related technologies are dependent on many contextual factors to function" (Zhao et al., 2002): 489. They saw that knowledge beyond the actual application, a broader understanding of technology, played a critical role for success. Interestingly, they discovered that most teachers reported to be proficient in basic computing applications (especially those that do not involve the understanding of the broader computing system), but that there were "significant differences on measures of more advanced applications that require operations of more than one component" (Zhao et al., 2002): 491.

With regard to *pedagogical compatibility* they found that successful integration of ICTs is 'more likely when teachers are highly reflective about their own teaching practice and goals, in the sense that they consciously use technology in a manner consistent with their pedagogical beliefs.' In contrast, when teachers' pedagogical beliefs were in conflict with the technology they attempted to integrate, they struggled to accomplish their objectives. 'Projects were postponed, severely modified, or simply cancelled.' Furthermore, positive results were more likely to materialise when teachers viewed technology as the means to an end, rather than an end itself, and when they saw 'an intimate connection between technology and the curriculum.' When the value of ICTs was linked to more peripheral functions, the chance of success was severely reduced.

The *social awareness* dimension was identified as a crucial element for successful integration of ICTs. The analyses suggested that socially competent teachers were more likely to succeed in their efforts, since they 'knew the social dynamics of the school, were aware of where to go for what kind of support, and were attentive to their peers.' In other words,

these teachers understood which innovations the social context would constrain and which ones it would afford.

Having presented the *teacher related* findings, the study turned to the nature of the *innovation* itself. They found that '[A] prime determinant of whether a project succeeded or not was the nature of the innovation itself. Put simply, some innovations appeared much more difficult to implement than others.' The study showed that innovations varied along two dimensions, *distance* and *dependence*, and that success was related to these two dimensions. Distance related to the degree to which the innovation deviated from status quo, and was found to be of importance in three areas: distance from the existing school culture, distance from existing practice, and distance from available technological resources. Dependence referred to the extent to which an innovation relies on other people or resources – particularly people and resources beyond the teacher's immediate control.

Distance from school culture was perceived as the degree that an innovation differs from the dominant set of values, pedagogical beliefs, and practices of the teachers and administrators in a school. When the innovation converged with the existing school ecology, distance from the school culture was not a salient issue. In the cases where the innovations were very distant from the school culture, however, the result was often quite negative. 'Distance from the school culture leads to significant, sometimes insurmountable, roadblocks to a project's success.'

Distance from existing practice referred to the degree to which an innovation differs from the prior educational practices of the teacher, i.e. the teacher's particular practical experiences. 'The most successful projects generally involved an innovation that was a variation of a project previously completed by the teacher.' Projects which deviated significantly from previous practices, on the other hand, had to be seriously remodelled or were abandoned.

Distance from available technological resources refers to the amount of new technologies (hardware, software, accessories, connectivity, etc.) needed for successful completion of the innovation. Again, the most successful projects were not very distant – they either required

no new technology or minimal purchases or installations. Innovations requiring a lot of new technological equipment, i.e. were distant, often had to abandon some of the technology aspects.

The study also identified *dependence on others* as a salient factor of successful integration of ICTs. It referred to the degree that the innovation required the cooperation, participation, or support of people not under the teacher's authority. The innovations with a low level of dependence, i.e. that were largely self-contained in that they only involved the teacher's own classrooms and pupils, were most successful. The level of success dropped as innovations became more dependent on others.

The CALL context: Moving towards normalisation?

Carol A. Chapelle's contribution to this overview of relevant literature and findings is slightly different from the rest. In her contribution to the "Handbook of research in second language teaching and learning", she presents an outline of the reasons for maintaining that technology is central to the concerns of second language research and teaching, and discusses issues of CALL pedagogy. So, (Chapelle, 2005) is in itself a recapitulation of the current state of the CALL field.

Her point of departure is the major shift in emphasis that has occurred in the course of only 25 years in relation to the importance of technology issues in L2 teaching; "since (…) 1983 (…), technology issues in L2 teaching have spread from the margins, and in the minds of some, are central to current theory and practice in L2 teaching. Even those who do not see technology as a central concern would probably agree that applied linguists need to recognize the ways in which technology affects their work" (Chapelle, 2005): 743. She notes that the acronym CALL agreed upon in 1983 is now used by journals and language professionals to denote a wide variety of activities related with technology and language learning.

Chapelle presents the basic assumption underlying all CALL efforts that ICTs shape and transform our societies, and points to examples of visions of the technology infused world of

language teaching and learning in the future. A common theme is a world in which the technology is an invisible but integral aspect of language use, “and therefore knowledge of technology is assumed of anyone who wishes to participate” (Bruce and Hogan, 1998) cited in (Chapelle, 2005): 743. Chapelle claims that their point is that language professionals need to recognize how technology is deployed strategically by the competent language user if they are to teach the language learner about and through technology. “[W]e should acknowledge the fundamental changes that IT is bringing to our societies and seek ways to use its power for transformative purposes” (Cummins, 2000) cited in (Chapelle, 2005): 743.

Chapelle suggests that the language required in the technology-shaped registers of English use is different from what it was before these new semiotic situations were created through the introduction of e-mail, discussion lists, and the like. She stresses that different registers for language use directly implies that the communicative language ability for the 21st century is systematically changing, and points to Warchauer who suggests that rather than skill in reading and writing, language learners need to acquire competence in reading/research and writing/authorship (Warschauer, 2000): 521 cited in (Chapelle, 2005).

Still, Chapelle draws attention to the fact that only one third (28%) of the “new research” had to do with measuring learning gains. She states that despite the variety of areas taken up in the CALL journals and books, most applied linguists would probably agree that among the critical areas of study for CALL should be empirical evaluation of the extent to which students learn language from working on CALL (Chapelle, 2005): 750.

Also teachers may be more interested in assessing the quality of writing, rather than the negotiation of meaning in working with CALL, Chapelle points out, and wants to see more attempts to examine the language gains made through working on CALL. The issue of quality needs to be explored, she maintains, perhaps through existing methods developed for the study of fluency, accuracy, and complexity. “In examining online conversation, Lamy and Goodfellow (1999) look for evidence of “reflective conversation” in which learners explicitly refer to the language and their learning, in contrast to “social conversation” in which no evidence of attention to language and learning appears” (Chapelle, 2005): 753.

Theoretical perspectives

> "(…) the quality of a theory is determined by the state of development of the particular discipline. The early stages of a science must be dominated by empirical work, that is, the accumulation and classification of data. That is why (…) much of educational research is descriptive. Only as a discipline matures can an adequate body of theory be developed" (Cohen & Manion, 1994): 16.

This chapter deals with the theoretical underpinnings of the current study. These range from simple concepts used for the purpose of classification, to more elaborate theories emanating from a particular view on the fundamental nature of teacher practice. Still, it is imperative to draw attention to the mainly *exploratory* and *empirical* character of this study. One of the hallmarks of exploratory studies is the *lack of* specific theories pertaining to the existence of relationships to be confirmed and tested, and the *presence of* empirical data from which new relationships might be discovered providing seeds for new hypotheses and theories. In short, this is primarily an empirical, not a theoretical study. Hence the research questions deal with the *identification of current ICT use and the ecology of associations of which high ICT intensity is an integral part*.

Since referring to a *theoretical framework* raises images of *one* overarching perspective à la the sociocultural which infuses the entire research approach, it is in the context of the present study more appropriate to talk about a ***conceptual*** *framework* defined in a wide sense, as 'the system of concepts, assumptions, expectations, beliefs, and theories that supports and informs (…) research Maxwell, 1996, p.25 cited in (Robson, 2002): 63. Moreover, the composite nature of the problem area suggests the use of conceptual framework***s*** in the plural. The areas thus conceptualised are *educational ICT use* and *teachers' practice in specific contexts*.

The problem area under scrutiny is EFL teachers' usage of ICTs. The composite and associated fields are primarily *ICT in education*, *didactics* and *EFL*. Teachers integrating ICTs in their classroom practice find themselves at the interface of these overlapping fields (Zhao et al., 2002), (Lund, 2004). Diagram 5 illustrates the intersection of school subject,

technologies and didactics in which the ICT-teacher must operate (adapted version of figure 1.1. in (Lund, 2004): 2).

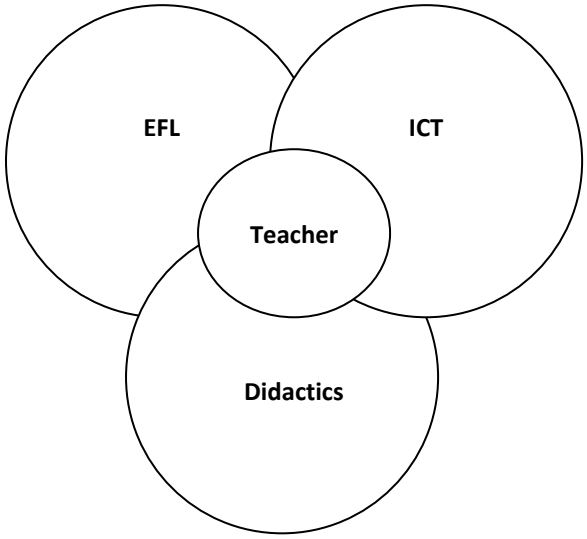

Diagram 5: Illustration of the position of the teacher at the interface between three overlapping fields of enquiry

Furthermore, the diagram shows the *interactive* relationship between the contextual factors. The developing nature of educational ICTs, EFL and (subject) didactics are constantly and mutually influencing each other, and thereby making an impact on the practice of the EFL teacher. Thus, the view adopted in this study is one which recognises the contributions from both ICTs and their affordances, and EFL and (subject) didactics.

Section 1: Classifying EFL teachers' ICT use

The first research question elicits information about the nature of ICT use in EFL classrooms. In order to highlight some characteristic properties of different uses of ICT, two different, but complementary, perspectives are employed to categorise the findings. First, by using the jargon of the field, a basic categorisation of the ICT tools and related usages is presented. Then, a very general and rather crude classification highlights elements in the main pedagogical direction expressed through the use of particular ICT tools and activities. All in all, the objective of the conceptualisation is to improve the overall understanding of the role ICTs play in the everyday teaching of EFL in Norwegian lower secondary schools, based on;

- an awareness of the characteristics of the main types of ICT tools and related usages; and

- an awareness of the general pedagogical direction expressed through different ICT use.

The first main objective is to map the nature of EFL teachers' ICT use. Apart from the fact that the tools are *digital*, it is striking how different they are from each other. They are so different, in fact, that putting them all under the heading 'digital tools' is not very helpful in explaining what these tools can do. Arguably, the most important aspect of e.g. Word processors, Web-based drill-and-practice and Integrated learning systems is not that they are digital, but that they can enhance the skill of writing, help rote-learning and help organise and assess achievement respectively. In order to clarify the role and character of the digital *tools and activities* encountered in this study, a structured overview and classification is called for. The present classification is a composite of two different, but overlapping categorisations ((Hinostroza, Labbé, López, & Iost, 2008) and (Mueller et al., 2008)) adapted to fit the purposes of this study.

Type of application	Examples	Educational use
1. General tools, tool-based software and general Internet use	Word processing, presentation, spreadsheet, and online research (general Internet use)	Becoming more and more important; require innovative and creative thinking from the teacher; quality is in the application, not the tool itself, since such tools are not dependent on particular content
2. Communication	E-mail, and web-based communication in general	Require a view of education as reaching beyond school, for which they offer huge potential; familiar in the out-of-school context
3. Subject specific and ready-to-use, software/web applications, including Computer-assisted instruction (CAI)	Specifically educational, drill-and-practice, related to a certain kind of content and relatively unsophisticated	Resource-based, skills-oriented learning. Offers individual learning opportunities without expensive development; appears to fit well with transmission models of teaching and learning
4. Assessment and organisation	Learning Management Systems (LMS), digital portfolios	Mainly organising pupils' work, feedback, process-orientation and assessment

Diagram 6: Classification of ICT applications and their educational use

This classification presents a more detailed and differentiated picture of the various digital tools, and presents terms which are common within the field. The present thesis will use

these descriptions as points of departure for the presentation of the nature of EFL teachers' ICT use.

The activities pupils and teachers engage in using ICTs in EFL classrooms reflect a pedagogical orientation or direction. By using three main theories of learning as theoretical lampposts, it is possible to illuminate some of the embedded pedagogical traits in EFL teachers' ICT use (Dede, 2008). The three schools of thought used in this study include;

- behaviourism;
- cognitivism; and
- constructivism.

Each school of thought is not a single unified theory, but rather a collection of theories distinct from each other, but loosely related by a common set of fundamental assumptions (Dede, 2008). Similarly, the uses of educational ICTs do not neatly cluster into discrete categories, but rather incorporate perspectives from more than one of these intellectual positions. For the purposes of the present study a complete presentation of the three positions is not called for. Instead, a simplified version, more attuned to the relative importance of Dede's perspectives in this study, is presented. The following three paragraphs are based on (Dede, 2008): 46-53.

Behaviourist theories of learning look at the relationship between stimuli and response, and measure learning according to the degree to which correct responses follow the presentation of stimulus. Behaviourist instruction uses immediate consequences to reinforce behaviours to be learned and to repress incorrect responses to a pedagogical stimulus, i.e. student motivation to learn is mainly extrinsic. The purpose of education, according to this school of thought, is for students to "acquire skills of discrimination (recalling facts), generalization (defining and illustrating concepts), association (applying explanations), and chaining (automatically performing a specified procedure). (…) Knowledge and skills are transferred as learned behaviors" (Dede, 2008): 46-47. Behaviouristic instructional technologies emphasise "factual knowledge and recipe-like procedures: materials with a few correct ways to accomplishing tasks" (Dede, 2008): 46-47.

Within the field of educational ICT, behaviourist learning theories are mainly associated with drill-and-practice applications (web-based or subject specific software), with their focus on developing isolated, discrete competences often out-of-context. It has been argued that 85% of the pedagogical software used in schools draw on behaviouristic principles, and have harmful effects on learning (Jonassen, 2000).

Cognitivist theories of learning look at the symbolic mental constructs which mediate the objective reality, and measure learning according to the extent to which students master building blocks of knowledge based on pre-existing relationships among content and skills. The role of an instructor is to organise and sequence the building blocks of knowledge to facilitate optimal mental processing. "Successful learning is dependent not only on what the teacher or pedagogical medium presents, but also on what the student does to process this input, storing and retrieving information organized in memory" (Dede, 2008): 48-50. The purpose of instruction, according to this school of thought, is to

- provide a deep foundation of factual knowledge and procedural skills;
- link facts, skills, and ideas via conceptual frameworks – organising domain knowledge as experts in that field do, in ways that facilitate retrieval and application; and
- help students develop skills that involve improving their own thinking processes, such as setting their own learning goals and monitoring progress in reaching these (Dede, 2008): 48-50.

Within the field of educational ICT, cognitivist learning theories are mainly associated with applications used to organise, sequence, and structure pupils' work and that help them assess their own progress. LMS and digital portfolios can be said to share properties of a cognitive nature.

Constructivist theories of learning look at how meaning is created by the individual and imposed on the world, rather than existing independently of the individual. "People construct new knowledge and understandings based on what they already know and believe, which is shaped by their developmental level, their prior experiences, and their sociocultural background and context" (Dede, 2008): 50-53. The role of instruction is to foster learning by organising rich, loosely structured experiences and guidance that

stimulate meaning-making without imposing a fixed set of knowledge and skills. According to this school of thought, goals for instruction include:

- Instruction is a process of supporting knowledge construction rather than communicating knowledge.
- The role of the teacher is a guide, rather than an expert 'transferring' knowledge.
- Learning activities are authentic and center on learners' puzzlement as their faulty or incomplete knowledge and skills fail to predict what they are experiencing.
- Teachers encourage students in reflecting on experiences, seeking alternative viewpoints, and testing viability of ideas (Dede, 2008): 50-53.

ICTs are by many seen as particularly conducive for constructivist learning activities, due to the accessibility of authentic material and applications suited for pupils' own exploratory uses in problem solving activities (Lund, 2004), (Salomon, 2000). "The computer is seen in the literature as a cognitive tool that has great potential to support a constructivist form of teaching and leaning" (Mueller et al., 2008): 1533. It is primarily the use of general tools and exploratory uses of Internet that can be said to have clear links to constructivist ideas about learning and teaching.

Later in this thesis, the identified ICT use among EFL teachers will be classified according to the conceptual framework presented above, and be analysed in terms of the main pedagogical direction of the activities involving the use of ICT using the simplified model of the three schools of thought.

Section 2: Theory of practice as ecological model for the study of ICT use

In chapter 1, I referred to the debate linked to the perceived lack of ICT use among lower secondary school teachers. One main point of disagreement concerned the role of teachers' so-called theory of practice. The directorate for education (Utdanningsdirektoratet) suggested that teachers' lack of reflection about their theory of practice could explain their resistance against integrating ICTs. Spokesmen for teachers' unions, by contrast, pointed out that their resistance might just as well emanate from high levels of reflection. Theory of practice refers to an individual teacher's values and rationales which have a bearing on his or

her actions in a particular context. Theory of practice is used as a theoretical point of reference in this study, partly because of the topical currency of the term, but primarily due to its relevance for the study of *contextual factors influencing teacher practices*.

In the introduction, I mentioned the debate in the wake of the release of the report from ITU Monitor 2009. The use of ICTs in lower secondary schools had dropped from 2008 to 2009, and this was regarded by the project manager as troubling. She blamed teachers' competence and their way of teaching. Her way of framing the situation, is in opposition to the approach adopted in this study, in that too much emphasis is placed on properties of teachers, with only the most rudimentary conception and characterisation of the environment in which teachers find themselves. Instead, this study rests on an *ecological* understanding of the educational context teachers are part of.

> "In ecological research, the properties of the person and of the environment, the structure of environmental settings, and the processes taking place within and between them must be viewed as interdependent and analyzed in systemic terms" (Bronfenbrenner, 1979): 41.

In keeping with the ecological approach, identified differences in ICT use between groups of EFL teachers should reflect "major *ecological* differences between the settings, as revealed by *contrasting patterns* of activities, roles, and relations" (Bronfenbrenner, 1979): 183. By adopting theory of practice as a theoretical point of reference, I bring the ecological perspective into the assessment of teachers' practice.

The second research question is posed to extract information about the ecology of factors in the school context of EFL teachers which are associated with and can account for ICT usage. Theory of practice depicts the particular relationship between teachers' theory and practice as an intimately linked entity which is most fully expressed through teachers' actions. This perspective goes hand in hand with this study's focus on teachers' actions with ICT, through which the underlying and complex patterns of associated factors emerge.

In addition to fitting nicely with an ecological conception of teachers' practice, theory of practice is associated with a *reflective-practitioner* approach to the promotion of educational knowledge. In order to place the reflective-practitioner approach in context, two other main approaches to the attainment of educational knowledge beg presentation: the *common sense* approach and the *science-of-education* approach (Oxford et al., 1998): 45.

The *common sense* approach holds that teachers "cannot draw readily upon either a clear set of theoretical principles or an accepted corpus of scientific research with which to solve concrete problems in their vocation; teachers need only a sound knowledge of their chosen subject and practical experience in the classroom" (Oxford et al., 1998):45. In contrast, the *science-of-education* orientation claims that "such 'folk' theories of the child's mind and uncritical ideas about the social role of education must be replaced by scientific knowledge derived from the work of expert authorities" (Oxford et al., 1998): 45.

The *reflective-practitioner* approach maintains that the former two orientations fragment the true relationship between knowledge and action. Instead, "teachers (…) should be reflective-practitioners, questioning beliefs and methods in their own experimental approach to schooling – psychology and sociology being tools or resources for the construction of new educational hypothesis to be tested against experience" (Oxford et al., 1998): 45. Similarly, reflective thought is a part of all problem-solving activity; problem-solving has to channel the creative impulses of imagination into precise ideas which can be tested in practice (Dewey (1933) cited in (Oxford et al., 1998): 46. That is, while practice provides insight, science must check illusion.

Theory of practice builds upon the kind of understanding found in this *reflective-practitioner* orientation. Theory and practice are understood as complementary in a system of reflection and action. Teachers' everyday practice is thus seen as an expression of the intricate entirety of a teacher's implicit and explicit knowledge, and is enveloped by the definition of theory of practice as "a person's private, interconnected, continuously changing system of knowledge, experiences, and values which influences a person's teaching practice at a given point in time" (Lauvås & Handal, 1990). Accordingly, classroom actions are understood as expressions of;

- an individual's *values*; and
- an individual's *rationales for action*.

Diagram 7 illustrates the relationship between a teacher's actions and his theory of practice (involving both values and rationales).

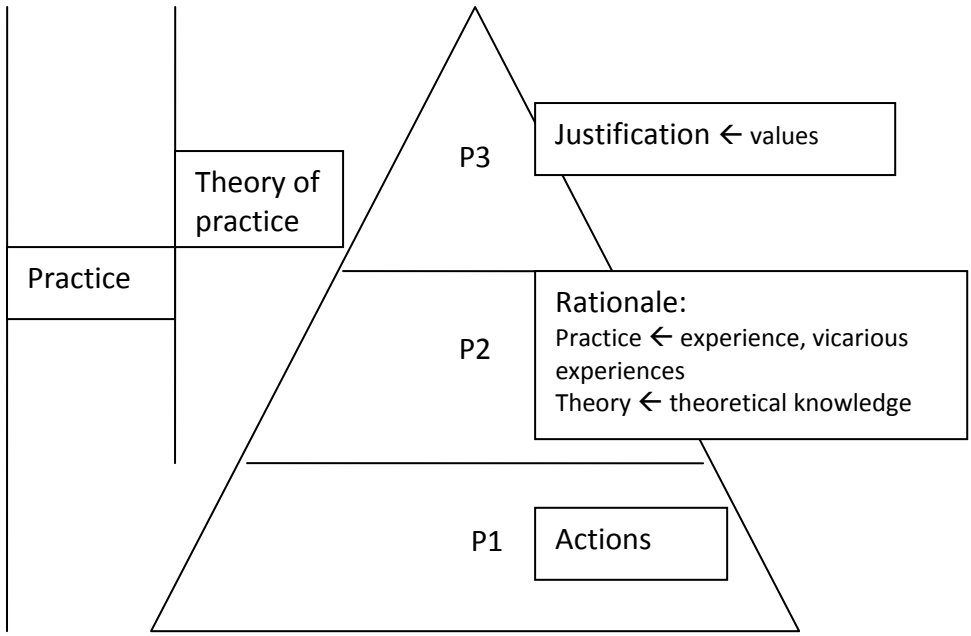

Diagram 7: Løvlie's 'practice triangle' illustrating the relationship between actions and 'theory of practice' (Lauvås & Handal, 1990)

The values serve as justification for actions, and are often unarticulated, e.g. notions about human dignity, democracy, equality. The individual can have a sense of what is the right and wrong, and act accordingly in a particular educational context, regardless of questions like effectiveness or rationale for action. So, even if these values are 'silent', they have a fundamental impact on classroom action. Background variables such as a teacher's age or gender might function as triggers for particular sets of values that can influence e.g. ICT use in EFL classrooms. *Values* and *rationales* for action overlap and complement each other along a continuum.

The rationales for action consist mainly of two types; (a) *experiences*, both personal and vicarious, and; (b) *theories*. The rationales for action in the case of ICT in EFL teaching might include considerations related to e.g.;

- the content in EFL lessons;
- the organisation of EFL lessons;
- strengths and weaknesses as a EFL teacher;
- the national curriculum;
- personal and vicarious experiences;
- ICT access and affordance;
- the effects on pupils' motivation and learning; and
- formal qualifications EFL and ICT.

By using theory of practice as a theoretical point of reference, one highlights the ecology or *system of associations* of which EFL teachers' use of ICTs is a part. ICT use is thus seen as a component of a larger and more complex system of factors where teachers' actions, values and rationales are acknowledged. The conceptual framework is chosen to throw light on and inform the enquiry into the second research objective relating to the identification of variables associated with EFL teachers ICT use. It is deemed open-ended enough to be appropriate for an exploratory investigation of a range of variables, and still focussed enough to be appropriate for putting the findings into an overarching theoretical framework which will make the findings meaningful, interesting and relevant.

Chapter 3: Research design and method

> "It is obvious that one can no more set out to experimentally identify (…) the causes of the French revolution than one can contemplate interviewing a gene." (Bhaskar (1979) cited in (Robson, 2002): 35).

In this chapter I will present the procedures used for obtaining the data required for answering the research questions, and conduct an evaluation of the overall quality of the adopted approach. The chapter starts with a presentation of the research design, followed by an account of participant characteristics, including a description of the population and sampling procedures. Then, a brief description of questions used to explore the constructs with potential links to teachers' ICT use is given, before an account of the data collection process is provided. The chapter ends with a discussion about the overall trustworthiness of the study and generalisability of the findings based on an evaluation of reliability and validity.

Section 1: Research design

A common point of departure for choosing a research design is the nature of the research questions sought answered. In short, the research strategy and the methods employed must be *appropriate* for the questions to be answered (Robson, 2002): 80. The strategy must also take into consideration the practical constraints of location, time, and resources. And finally, design is very much about style; the researcher's own ideals, preferences and ideas will ultimately influence the overall research design (Robson, 2002): 80.

In the current study, the starting point is the ambition to say something about the nature of ICT use among Norwegian EFL teachers' in lower secondary schools, and the system of elements associated with ICT intensity. From there, the overall research strategy developed. In order to explicate the essence of this overall research design, I will in the following elaborate on some key concepts. Those concepts are; 'quantitative', 'relational', 'exploratory', and 'pragmatic'.

First and foremost, the research objectives pointed clearly towards so-called *fixed* or *quantitative* designs. The survey method was seen as a fairly obvious choice due to the constraints of location, time and resources linked to a one-year Master's project. So, the current research design is *fixed* in the sense that a substantial amount of pre-specification, especially concerning the development of the self-completion questionnaire, took place before the main part of the research study. It is also *quantitative* in the sense that the gathered data is primarily in quantitative form, and statistical techniques are used to find answers to the research questions.

By choosing this research design, I could gather data from many teachers across the country. A qualitative design would severely limit the number and location of teachers. Also, the quantitative nature of the data opened up for using statistical analyses that were helpful in describing single variables, in showing correlations between variables, and in identifying underlying patterns of interactions in and between variables. Qualitative approaches could definitely provide "thicker and deeper" descriptions of a limited number of teachers' practice, since quantitative approaches necessarily have to simplify. However, qualitative designs could not accommodate for the identification of communalities between large numbers of teachers required in the current study. One might say that the strong internal validity of qualitative designs is paid for by a corresponding lack of external validity, whereas weaker internal validity is compensated by a corresponding presence of external validity in quantitative designs.

The fixed design in the current study is also *relational* in the sense that it measures the relationship between two or more variables. It does it without manipulating or changing the phenomena studied, i.e. it is non-experimental. Hence the relational design is suitable in situations where aspects of interest are not amenable to modification. Relational designs are particularly useful for descriptive purposes and in enhancing the understanding of a phenomenon, through identifying particular patterns of interactions (Robson, 2002): 155. These characteristics fit nicely with the focus of the current study which is to describe the nature of EFL teachers' ICT use, and to investigate the system of variables related to high ICT intensity.

A precondition for applying a relational design, however, is to have a quite clear idea (e.g. from previous research or other sources) of likely mechanisms and the contexts in which they will operate, in order to identify important variables and possible relationships to be studied (Robson, 2002): 156. This precondition for the use of a relational design is met, first and foremost, through recent teaching experience at a lower secondary school emphasising the use of ICTs (a so-called PILOT school), secondly, through the use of feed back on the items included in the questionnaire from 20 teacher trainees and 10 experienced teachers, and thirdly, through previous research and literature.

The design is also relational in a wider, *ecological* sense. By focussing on the *system* of variables related to high ICT intensity, I show that a particular practice must be understood in light of the interaction and mutuality with its environment. It follows that a change in *one* variable changes the entire *set* of variables. In the current study this perspective manifests itself through the large number of variables checked for their relation to ICT intensity, and through the choice of some of the statistical analyses performed on the data set.

This is also an *explorative* study. Primarily, it is exploratory by necessity. Few quantitative studies of teachers' subject specific ICT use in Norway have been carried out, with a corresponding lack of established hypotheses and theories required for confirmatory studies. So, the study is to some extent charting unknown waters, and consequently, anticipated outcomes of the study include the formulation of new hypotheses and the instigation of new studies. Secondarily, the design is exploratory by attitude. This is reflected in an ingrained curiosity on the behalf of the researcher, with concrete manifestations in the exploratory use of statistical techniques such as factor analyses and optimal scaling.

Finally, the design is *pragmatic* both in a concrete and in a more philosophical sense. On a concrete level, the pragmatic element relates to the practical constraints of time, resources, and one's own level of academic sophistication. Needless to say, each has a profound impact on the issue of design. This study is the basis for a Master's thesis and involves one year of work from start to finish, and the questions asked and the methods employed reflect that fact. On a more philosophical or methodological level, the pragmatic aspect refers to a general eclectic research approach. This involves choosing theories and methods on the

basis of ‘what works’ and makes sense, not on the basis of deep analyses of whether they are commensurable or not. The approach is deemed feasible, because of some fundamental beliefs shared by most researchers, including; the value-ladenness of enquiry; the theory-ladenness of facts; that reality is multiple, complex, constructed and stratified; and the underdetermination of theory by fact (i.e. that any particular set of data is explicable by more than a single theory)” (Robson, 2002): 43.

The four concepts, each in its own way, infuse the entire research process from underlying purposes and theories, via the expressed research questions, to the methods and sampling strategies settled on. They also accommodate for and help maintain the balance between the five interrelated aspects presented in diagram 8. Ideally, there should be some directionality in the process, in that purposes and theory feed into, and help specify, the research questions, which again determine the methods to be used and the strategy to be used in sampling. However, this should not to be taken to imply a once-and-for-all consideration of all aspects; the interactive nature of what goes on in this kind of project needs to be emphasised (Robson, 2002): 81-82.

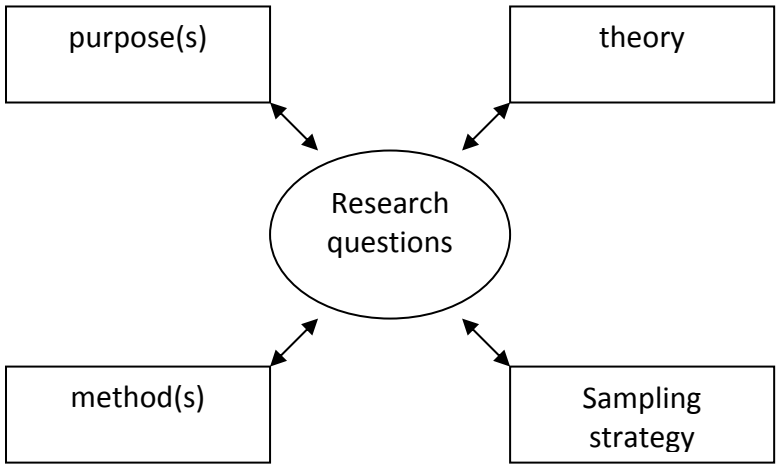

Diagram 8: Framework for research design (Robson, 2002): 82

Section 2: Participants

The final sample included 124 EFL teachers representing 66 lower secondary schools from 18 of 19 Norwegian counties ("fylke").[9] The majority of participants were female (86 female and 38 male). The age distribution of the sample was fairly even between the five age groups apart from slightly fewer teachers among the youngest (20-29) and oldest (>60).[10] In terms of teaching experience, the distribution was slightly skewed with relatively more participants with 7 years experience or less, and 15 years or more.[11] More than 60 per cent of the participants had 60 credits or less formal qualifications in the subject.[12]

The population in the current study is EFL teachers in Norwegian lower secondary schools, since the aim of the study is to say something about *national trends of ICT use among EFL teachers in lower secondary schools*. It is not possible to gather data from the entire population of EFL teachers, so a sample will have to do. Ideally, I would like to randomly select a sample of EFL teachers from a known population. In reality, the exact size of the population is not known, due to the fact that teachers teach more than one subject. So, an alternative approach was used.

First, a sample of schools, geographically stratified according to the total number of teachers in each region ("fylke"), was randomly selected. From a total number of 1161 lower secondary schools nationally (found in the national school data base), a sample of 172 schools from across the country was randomly selected. This meant that from a total number of 17049 lower secondary school teachers, the sample consisted of 2212 randomly selected teachers. The exact number of *EFL teachers* in the sample is impossible to determine from the information provided in the national data base. The response rate is therefore also impossible to calculate. What is certain is that approximately 5.6 per cent or 124 of the total sample of teachers answered the questionnaire, and provided the data upon

[9] See Appendix, diagram 38: Regional distribution of EFL teachers in the sample
[10] See Appendix, diagram 39: Age distribution in sample
[11] See Appendix, diagram 40: Teaching experience distribution in sample
[12] See Appendix, diagram 41: Formal English qualifications in sample

which the current study rests. The participants were the ones who regarded themselves, first and foremost, as EFL teachers.[13]

Section 3: Statistical analyses

The current study relies on quantitative data collected using an online survey. The data is analysed using a number of different statistical analyses. A general overview of these analyses is presented in this section, so that main functions of each statistical technique are understood before the commencement of actual analyses.

First, using descriptive or univariate (only involving one variable) statistical analysis, means (*M*) and standard deviations (*SD*) on individual items are found. The mean coefficient tells us something about the combined value of all the individual respondents' answers, and can thus be interpreted as a value signifying a central tendency. The standard deviation coefficient, however, tells us something about the degree to which the individual respondents' answers are spread out along the value axis, and can thus be interpreted as a value signifying degree of consensus (*low* value signifying *high* degree of consensus).

Second, by using bivariate (involving two continuous variables) correlation analysis it is possible to determine the degree to which two variables are associated or covary. If the two are negatively correlated, they are associated in the sense that an increase in one variable is associated with a decrease in the other. If they are positively correlated, an increase in one is associated with an increase in the other variable. It is important not to think in terms of causal relationships when we are dealing with correlation analysis, since an identified positive correlation between two variables does not necessarily mean that there is a causal link between the two.

Third, by using ANOVA (one-way between-groups ANOVA) it is possible to determine whether there are significant differences in mean scores between three or more groups (a categorical independent variable with three or more groups) in relation to a continuous variable. An example of a typical research question where ANOVA is useful could be: Is there

[13] See Appendix, diagram 42: Regional distribution of schools (total and sample), teachers (total and sample), and EFL teachers.

a difference in scores on beliefs in ICT-effects between low, medium and high ICT integrating EFL teachers? After establishing that there are significant differences, it is possible to run *post-hoc* tests to find out *where* these differences lie.

Fourth, by using standard multippel regression it is possible to determine how well a *set* of variables is able to predict a particular outcome, and determine the relative contribution of *each* of the variables that make up the model. Examples of typical research questions where multippel regression is useful could be:

- how well a *set of variables* is able to predict a particular outcome;
- *which variable* in a set of variables is the best predictor of an outcome; and
- whether a particular predictor variable is still able to predict an outcome when the effects of another variable are *controlled for* (Pallant, 2007):147.

Julie Pellant points out that multippel regression is based on correlation, but "allows a more sophisticated exploration of the interrelationships among a set of variables. This makes it ideal for the investigation of more complex real-life, rather than laboratory-based, research questions" (Pallant, 2007): 146.

Fifth, using exploratory factor analysis (Principal Component Analysis) makes it possible to identify underlying groups, patterns or dimensions (hereafter referred to as factors) in respondents' answers to a scale of items in the data set. Factor analysis is a 'data reduction' technique in the sense that it determines "the smallest number of factors that can be used to best represent the intercorrelations among a set of variables" (Pallant, 2007): 181.

> "It [Principal Component Analysis] takes a large set of variables and looks for a way the data may be 'reduced' or summarised using a smaller set of factors or components. It does this by looking for 'clumps' or groups among the intercorrelations of a set of variables. This is an almost impossible task to do 'by eye' with anything more than a small number of variables" (Pallant, 2007): 179

This technique is particularly useful for the creation of additive indices based on scales consisting of many variables connected thematically, rather than theoretically (which would

require the scale to be reliable). A case on point could be a scale consisting of variables linked to content in the national curriculum. By using exploratory factor analysis it is possible to identify underlying patterns in the teachers' answers, which in turn can be used to create additive indices, i.a. they become constructs made on the basis of empirical evidence rather than theoretical assumptions. However, factor analysis does not provide an interpretation or a label for each pattern or factor; it just shows which variables 'group together'. It is then up to the researcher to propose possible interpretations based on an understanding of the content of the variables, underlying theory and past research.

There are two main approaches to factor analysis, exploratory and confirmatory. Exploratory factor analysis is normally used in the beginning of research to "gather information about (explore) the interrelationships among a set of variables"(Pallant, 2007):179. Confirmatory factor analysis is used to "test (confirm) specific hypotheses or theories concerning the structure underlying a set of variables" (Pallant, 2007):179. In the present study an exploratory approach to factor analysis is most suited, due to the lack of previous research and a corresponding lack of specific hypotheses or theories pertaining to the different scales involved.

Due to the limitations of the Master's thesis format, I will not present in detail all the various assumptions met and statistical techniques used for the creation of the additive indices based on factor analysis. It will therefore not be possible to provide the reader with the opportunity to completely control the quality of the indices. Instead, I have included the relevant tables and figures in the Appendix (KMO, Bartlett's Test, Kaiser's Criterion, Scree Plot and Pattern Matrix). Furthermore, in cases where the results from the analysis did not make sense theoretically or logically, I have included comments as to how I solved the problem. All the additive indices included in the statistical analyses used to answer the reseach questions passed the standard quality controls imposed when conducting factor analysis (Pallant, 2007): 179-200.

Section 4: Materials and procedure

Each participant was asked to complete an online survey consisting of 248 items in all. The survey was developed based on existing literature, the guidelines in the national curriculum, personal experience and the responses from a focus group consisting of 20 teacher trainees and 10 experienced teachers. Each member of the focus group had completed the draft questionnaire by August/September 2008, and provided feedback regarding the items used and the absence of items they deemed important. On that basis existing items were altered or removed, and new items were included. There was no time to run a complete pilot test, which might have uncovered more weaknesses in the questionnaire. More details on the development of the individual items in the questionnaire are provided later in this section.

The main phase of data collection was conducted from November 2008 till March 2009, by which time 153 teachers had completed the questionnaire. The questionnaire was made available online, and the import of data to SPSS was catered for by the ICT department. Each headmaster of sample schools was contacted via e-mail informing them about the study and encouraging participation. A list of randomly selected stand-by schools from each region was used in cases where non-participation was declared. A minimum of two follow-up mails were sent to each headmaster. Still, it turned out to be exceedingly hard to get enough answers. In the course of the five months of data collection, I called up headmasters of sample schools and the ICT responsible in numerous counties in an effort to try and increase the response rate. When the total number of teachers had reached 153 in March 2009, the data collection process was terminated. Only 124 were retained after cleaning the data set for duplicates, *obviously* silly answers, and non-sample answers.

The survey included a comprehensive set of measures addressing both subject specific and ICT related constructs. The subject specific scales of items were related to self-perceived competence, content and activities, and organising teaching. Single-item questions were used to assess formal qualifications, experience, as well as to gain information about the participants' age and gender. The ICT related constructs included ICT intensity, ICT general positive belief, and ICT positive effects. Single-item questions were used to assess formal and informal ICT competence. Extracts of the scales of items used to measure each construct are included below.

A particularly important feature of this study is the way underlying patterns, dimensions or groups in teachers' answers form the basis for the development of new constructs. The lack of previous research on *subject specific influences on ICT use* and the corresponding lack of established theories or hypotheses meant that there were few ready-to-use, available theoretical constructs. Therefore an important part of the analyses involved identifying underlying patterns, groups or dimensions in the answers of EFL teachers on three subject specific subscales (self-perceived competence, content and priorities, and organising teaching). These underlying dimensions, groups or patterns in the data set formed the basis for the creation of additive indices or constructs that in turn could be measured for their association with ICT. For example; on the basis of teachers' answers to 21 items on the self-perceived competence scale, *four underlying dimensions, groups or patterns were identified*. Some items tended to group together, e.g. the self-perceived ability to organise project work 'grouped' together with the self-perceived ability to organise group work. The variables constituting the four underlying dimension were then computed into additive indices, which in turn were used as single constructs in subsequent analyses regarding their association with ICT use. The three scales of items on which this explorative approach was used, include items 2.3.1-22 (self-perceived competence), items 4.1.1-27 (content and activities), and items 4.3.1-16 (organising teaching).

Some of the subscales of questions needed only be computed into indices after establishing their reliability. In these cases the Cronbach's alpha (α) coefficient is provided. A case in point might be the *ICT general positive belief* subscale. Here all the individual items are picked out because previous research suggests that positive beliefs in ICT influence the use of ICT, hence all individual items are expressions of positive beliefs. A high Cronbach's alpha coefficient ($\alpha > .6$) indicates that the individual items measure the same underlying theoretical construct, and therefore they can be computed into a single additive index measuring *ICT general positive belief*. However, as mentioned, some subscales consist of items that do not have a predefined relationship with the use of ICT. The subscale *Content and activities*, for example, consists of 27 different items related to standard content and activities in the teaching of EFL. The main purpose of this subscale is to provide information about how differences in teachers' priorities regarding content and activities translate into

differences in ICT use. It is therefore necessary to identify underlying patterns, dimension or groups in the teachers' answers, on the basis of which the additive indices are computed. In order to find these underlying dimension, patterns or groups in the data set, the statistical 'data reduction' technique called factor analysis is used.

There are two reasons for using factor analysis in this study. First, by reducing a large number of variables to a more manageable number, it is possible to perform statistical analyses on a much wider set of data. This opens up for paths of investigation otherwise closed if faced with the complexity of numerous individual variables. Second, the results of the analysis are interesting *findings* in their own right by revealing 'groups' or patterns among the intercorrelations of a set of variables. This is particularly important when an exploratory approach to factor analysis is used.

Subject specific scale 1: Self-perceived competence (SPC)

The 21 items constituting the *Self-perceived competence (SPC)* scale included elements connected with the preparation and organisation of different kinds of activities, and the carrying out of central EFL teachers' duties such as correcting and assessing pupils' work.[14] The questions asked the teachers to rate the extent to which they found these different tasks challenging, using a 6-point, Likert-type scale (1 – *Can't do it*, to 6 – *no problem*). Since the scale was undergoing further analyses after the collection of the data set to identify constructs, the issue of reliability is not relevant and the Cronbach's alpha value is therefore not included. A small part of the questionnaire is shown below to illustrate the types of items included and the anchors used in the 6-point Likert-type scale.

2.3 EGEN KOMPETANSE I FAGET

Hvordan opplever du arbeid med tilrettelegging av undervisning innenfor ulike deler av engelskfaget? Kryss av på skjemaet nedenfor:

	Egen kompetanse	*Kan ikke gjennomføre*	*Svært store problem*	*Store problem*	*En del problem*	*Litt problem*	*Ingen problem*
1	Gjøre meg kjent med og kunne utnytte nye læremiddel på en god måte	○	○	○	○	○	○
2	Forberede og organisere kommunikasjonsaktiviteter	○	○	○	○	○	○
3	Forberede og organisere lytteaktiviteter	○	○	○	○	○	○
4	Forberede og organisere skriveaktiviteter	○	○	○	○	○	○
5	Forberede og organisere leseaktiviteter	○	○	○	○	○	○
6	Forberede og organisere undervisning i grammatikk	○	○	○	○	○	○

[14] See Appendix, diagram 43: Self-perceived Competence – descriptive findings

Previous research identified teachers' SPC or their so-called self-efficacy as a factor that could explain the degree to which ICTs were integrated in their teaching. By revealing patterns in the teachers' answers, main types of SPC can be identified and used as additive indices in analyses related to EFL teachers' use of ICT. Factor analysis showed that the SPC scale of 21 items could be summarised or reduced to four additive indices:[15]

- *SPC Basic language skills* (*M*=5.63; *SD*=0.45)
- *SPC Language and assessment* (*M*=5.33; *SD*=0.51)
- *SPC Innovative planning* (*M*=5.22; *SD*=0.65)
- *SPC Facilitative teaching* (*M*=5.00; *SD*=0.70)

The additive index *SPC Facilitative teaching* was created by computing items **2.3.**8; 12; 13; 14; 15. *SPC Innovative planning* was made on the basis of items **2.3.**1; 16; 19. *SPC Language and assessment* was the result of combining items 2.3.6; 7; 9; 10; 17; 18; 20; 22. *SPC Basic language skills* was created by computing items **2.3.**2; 3; 4; 5.

It is important to note, that when interpreting the factor analysis, I found that most variables loaded strongly on only one factor, but there were a couple of exceptions. In most cases where variables loaded on several factors, they were computed on the factor it showed the strongest loading. There is one notable exception, however. Item 2.3.3 refers to teachers' self-perceived competence in planning and carrying out listening activities. It loaded on factor two (*SPC Innovative planning*) and factor three (*SPC Basic language skills*). Despite of a slightly stronger loading on *SPC Innovative planning*, it was computed along with the variables loading on *SPC Basic language skills*. The theoretical inspection suggested that listening activities had more in common with reading, writing and communication, than with the ability to integrate ICTs in EFL teaching.[16]

The belief that one can plan and carry out activities such as projects and cross-curricula tasks loaded on the factor that was the basis for the additive index *SPC Facilitative teaching*. The label is the same as the one Hattie uses in his massive meta-meta-analysis for activities

[15] See Appendix, diagram 44, 45, and 46: KMO and Bartlett's test, Kaiser's criterion, Scree test
[16] See Appendix, diagram 47: SPC – Pattern Matrix

involving high degrees of pupil freedom for exploration (Hattie, 2009). The mean value (*M*=5.00) for this additive index indicates that teachers feel quite confident planning and carrying out these kinds of activities, but when compared with the other underlying dimensions, it is the one they are least confident about. Similarly, the fairly low standard deviation coefficient (*SD*=0.70) points to a fairly homogeneous set of answers. However, compared with the other main types of activities, it is the one where teachers show the least degree of consensus. A second main dimension uncovered is labelled *SPC Innovative planning*, and are based on items such as "learn new ICTs for teaching EFL", and "integrate new material". The high mean value (*M*=5.22) and relatively low standard deviation (*SD*=0.65) indicate that teachers are generally confident in their ability to integrate new material and use ICTs in their teaching, and that most teachers share that view. The next main pattern is called *SPC Language and assessment*, and refers to the degree of confidence teachers have when it comes to tasks such as correcting pupils' language, being a language model, and teach grammar. Overall, there is a general consensus among teachers that they can plan and carry out these kinds of tasks in their classes (*M*=5.33; *SD*=0.51). The teaching of writing, reading, communication and listening is labelled *SPC Basic language skills*, and are the types of tasks teachers feel most confident about planning and teaching (*M*=5.63). This view is shared by a large proportion of the teachers (*SD*=0.45). Overall, the process has shown the relative distribution of self-perceived competence related to important elements in the teaching of EFL. Moreover, the underlying dimensions discovered in the data set imply that some types of self-perceived competence tend to group together.

Subject specific scale 2: Content and activities

The 27 items constituting the *Content and activities* scale were created on the basis of the competence aims to be reached after grade 10, as defined in the national curriculum.[17] Consequently, the items were linked to the three main areas; *Language learning*, *Communication* and *Culture, society and literature*. The main area *Language learning* concerns knowledge about the language, language usage and insight into processes of language learning. The main area *Communication* focuses on how to use the English language for communication, through the use of basic language skills and appropriate

[17] See Appendix, diagram 48: Content and activities – descriptive findings

communication strategies. The last main area *Culture, society and literature* deals with cultural understanding in a broad sense based on the English-speaking world, and covers central themes connected to social issues, literature and other cultural expressions. The teachers were asked to rate the extent to which they emphasised the different content, using a 6-point, Likert-type scale (1 – *Not emphasised*, to 6 – *Strongly emphasised*). As was the case with the other subject specific scale, since the scale was undergoing further analyses after the collection of the data set, the issue of reliability is not relevant and the Cronbach's alpha value is therefore not included. A small part of the questionnaire is shown below to illustrate the types of items included and the anchors used in the 6-point Likert-type scale.

4.1 INNHOLD OG AKTIVITETER I FAGET
Hvordan vektlegger du følgende undervisningsinnhold og aktiviteter? Ranger fra ikke vektlagt til svært mye vektlagt.

	Undervisningsinnhold	*Ikke vektlagt*	*Svært lite vektlagt*	*Lite vektlagt*	*Noe vektlagt*	*Mye vektlagt*	*Svært mye vektlagt*
1	Elevene utnytter ulike situasjoner, arbeidsmåter og strategier for å lære seg engelsk	○	○	○	○	○	○
2	Elevene lærer om vesentlige språklige likheter og forskjeller mellom engelsk og eget morsmål og utnytter dette i egen språklæring	○	○	○	○	○	○
3	Elevene bruker ulike hjelpemidler kritisk og selvstendig	○	○	○	○	○	○
4	Elevene bruker grunnleggende grammatiske begrep for å beskrive formverk og tekststrukturer	○	○	○	○	○	○

One of the main objectives of this study is to supplement previous research by exploring the associations between ICT use and subject specific content and activities. The underlying dimensions in teachers' answers form the basis for the additive indices which are used in analyses in connection with research question 2. Factor analysis uncovered that the content and activities subscale of 27 items could be summarised or reduced to five additive indices:[18]

- *Core language* (*M*=4.83; *SD*=0.61) – items **4.1.**8: 9; 10; 11; 12; 13; 14; 15
- *Core accuracy and vocabulary* (*M*=4.70; *SD*=0.58) – items **4.1.**6; 7; 17
- *Core meta-strategies* (*M*=4.30; *SD*=0.63) – items **4.1.**1; 2; 3; 4; 5; 16
- *Core civilization* (*M*=4.24; *SD*=0.73) – **4.1.**19; 20; 21; 22; 23
- *Core literature and art* (*M*=4.00; *SD*=0.83) – **4.1.**24; 25; 26; 27

[18] See Appendix, diagram 49, 50 and 51: KMO and Bartlett's Test, Kaiser's Criterion, Scree Test.

Most variables loaded strongly on only one factor in the analysis.[19] However, there were two anomalies in the pattern which had to be addressed. First, factor five was constructed on the basis of a few variables, but only *one* that loaded strongest on that factor (item 4.1.18: communicate using digital media). Obviously, that factor could not be retained. The variable "communicate using digital media" was consequently not represented in the final set of factors and subsequent additive indices. Second, factor six (*Core literature and art*) consisted mainly of variables concerning the use of literature and art in language teaching. Yet, item 4.1.16 concerning the critical use of different sources loaded more than .3 only on that factor (since all measures below .3 are not presented). On the basis of a theoretical inspection, the item in question was computed along with the variables constituting factor three (*Core meta-strategies*) instead.

The descriptive findings show that teachers put most emphasis on content and activities dealing with the four basic skills of reading, writing, listening and speaking. This conclusion is supported by the high mean score on the additive index *Core language* (*M*=4.83; *SD*=0.61). Also helping pupils express themselves as accurately and precisely as possible is an important objective for most teachers. This is indicated by a high mean score on the index *Core accuracy and vocabulary* (*M*=4.70; *SD*=0.58). There is a step down to the next three indices – *Core meta-strategies* (*M*=4.30; *SD*=0.63), *Core civilization* (*M*=4.24; *SD*=0.73), and *Core literature and art* (*M*=4.00; *SD*=0.83) – on the list of most emphasised content and activities in the teaching of EFL. Overall, the process leading up to the creation of five additive indices has revealed the relative distribution of teachers' emphasis on central content and activities. In addition, the underlying dimensions imply that some types of content and activities tend to group together.

Subject specific scale 3: Organising teaching

The 16 items constituting the *Organising teaching* scale included elements intimately connected with the organisation of EFL teaching.[20] Some of the items are identified by previous research as particularly effective for pupils' learning (Ibsen, 2004) and (Hattie, 2009); some had been recommended by proponents as particularly helpful for so-called

[19] See Appendix, diagram 52: Content and activities – Pattern Matrix
[20] See Appendix, diagram 53: Organising teaching – descriptive findings

deep processing; and some reflected the everyday practice of the teachers who were chosen to pilot the questionnaire. Still others were included on the basis of my own experience as a lower secondary school teacher. In relation to the use of ICT, previous research (Lund, 2004), (Salomon, 2000) points to the particular advantages that might be gained by using ICTs in (social) constructivist learning environments due to their capabilities as tools for authentic exploration and communication. The items included among other things individual, group and project work, homework, use of textbook, and tests. The teachers were asked to rate the extent to which they emphasised these different ways of organising EFL teaching, using the same 6-point, Likert-type scale (1 – *Not emphasised*, to 6 – *Strongly emphasised*). The issue of the scale's reliability was not relevant at this point in the process. The entire *Organising teaching* scale is shown below.

4.3 ORGANISERING AV ENGELSKUNDERVISNINGEN
Hva legger du vekt på i organiseringen av din egen undervisning?

	Organisering	*Ikke vektlagt*	*Svært lite vektlagt*	*Lite vektlagt*	*Noe vektlagt*	*Mye vektlagt*	*Svært mye vektlagt*
1	Lede fellesundervisning	○	○	○	○	○	○
2	Veilede enkeltelever	○	○	○	○	○	○
3	Veilede grupper	○	○	○	○	○	○
4	Organisere undervisningen i prosjekt	○	○	○	○	○	○
5	Bruke prøver	○	○	○	○	○	○
6	Arrangere forestillinger o.l.	○	○	○	○	○	○
7	Hente inn ressurspersoner	○	○	○	○	○	○
8	Bruke lekser	○	○	○	○	○	○
9	Bruke lærebok	○	○	○	○	○	○
10	Bruke arbeidsplan	○	○	○	○	○	○
11	Bruke elevenes bakgrunnskunnskap og ferdigheter i engelsk	○	○	○	○	○	○
12	Bruke mine egne erfaringer	○	○	○	○	○	○
13	Stille høye faglige krav	○	○	○	○	○	○
14	Avklare forventninger til innsats og resultat	○	○	○	○	○	○
15	Slå ned på slurvet arbeid	○	○	○	○	○	○
16	Tett faglig oppfølging	○	○	○	○	○	○

By revealing patterns in the data set, main ways to organise the teaching of EFL can be identified and used in analyses related to teachers' use of ICT. On the basis of the results from the factor analysis, I decided to summarise or reduce the organising teaching subscale of 16 items to three additive indices:[21]

- *Coaching* (*M*=4.64; *SD*=0.49) – items **4.3.**2; 3; 10; 11; 12; 13; 14; 15; 16
- *Directing* (*M*=4.42; *SD*=0.52) – items **4.3.**1; 5; 8; 9

[21] See Appendix, diagram 54, 55 and 56: KMO and Bartlett's Test, Scree Plot, Pattern Matrix

- *Facilitating* (*M*=3.08; *SD*=0.76) – items **4.3.**4; 6; 7

The information gained from the full administration of factor analysis suggested a five-factor solution, not three-factor as I ended up with. However, a five-factor solution did not make sense theoretically; the variables loading on each factor did not have anything in common. Thus, I had to explore the data set further to try and identify the presence of logical patterns. This approach is condoned in the literature. "Tabachnick and Fidell (2007) recommend that researchers adopt an exploratory approach, experimenting with different numbers of factors until a satisfactory solution is found" (Pallant, 2007): p.182. I did this by setting the number of factors I wanted, before running the principal component analysis (thus disregarding Kaiser's criterion). I tried with different numbers of factors, and the only pattern that made theoretically sense was a three-factor solution explaining almost 50 per cent of the variance in the data set.[22]

Items related to keeping a close eye on pupils' work to give feedback, expecting good results, clarifying expectations to effort and results, and being hard on sloppy work loaded on the factor that was the basis for the additive index C*oaching*. The label is from (Oxford et al., 1998): p.34, where it refers to the language teacher as a coach who "reminds, encourages and prods the learner to perform well, that is, to "win" at the game of learning or at least play the best game possible". Of the ways to organise teaching presented in this study, coaching is most strongly emphasised (*M*=4.64). The teachers also generally share this approach to the teaching of EFL (*SD*=0.49). A second main dimension uncovered is labelled *Directing*, and is based on the use of tests, homework, class teaching, and the textbook in organising EFL classes. A fairly high mean value (*M*=4.42) and low standard deviation (*SD*=0.52) indicate that EFL teachers generally depend on these elements in their teaching. *Facilitative teaching* is much less emphasised by most teachers (*M*=3.08), and the opinions are more divided (*SD*=0.76). Checking the most common activity on this subscale, project work, still reveals low levels of emphasis (*M*=3.22) and the opinions are even more divided (*SD*=0.98). Overall, we have discovered the relative distribution of some main ways to organise EFL teaching. Moreover, the underlying dimensions discovered in the data set, even

[22] See Appendix, diagram 57: Organising teaching – Kaiser's Criterion

though the findings are not clear cut, imply that some types of organisation tend to cluster together.

ICT intensity

ICT intensity is a composite of the 14 items (α=.90) constituting the *ICT activities* scale (items 5.1.2-15),[23] and serves as the mechanism for the exploration of other variables' association with ICT use. The items relates to different types of ICT activities performed by pupils in the EFL classroom, from the use of learning platforms or Learning Management Systems (hereafter referred to as LMS) to producing digital text using word processors. The items were primarily selected on the basis of the computer related items included in (Mueller et al., 2008): 1527-28, but were adapted to meet the special context of Norwegian EFL classrooms. Five main types of ICT activities are covered by the items: on-line research, general tool use, subject-specific web or software use, communication, and assessment. The teachers had to rate the frequency of use, using a 6-point Likert-type scale (1 – *Never*, to 6 – *Very often*). The better part of the scale is shown below to illustrate the types of items included.

[23] See Appendix, diagram 58: ICT activities – descriptive findings

5.1 AKTIVITETER MED IKT I ENGELSKUNDERVISNINGEN

Hvor ofte legger du til rette for at elever bruker IKT i engelskundervisningen?
Ranger følgende aktiviteter fra aldri til svært ofte.

	Aktiviteter	*Aldri*	*Svært sjelden*	*Sjelden*	*Av og til*	*Ofte*	*Svært Ofte*
1	Jeg henter relevant informasjon og tips til oppgaver og undervisningsopplegg fra internett i forberedelsesarbeidet med undervisning	○	○	○	○	○	○
2	Elevene arbeider med engelskfaget innenfor en læringsplattform (f.eks. Fronter og It's learning)	○	○	○	○	○	○
3	Elevene arbeider med pedagogisk tilrettelagte nettressurser basert på læreverk for engelskfaget	○	○	○	○	○	○
4	Elevene arbeider med uavhengige engelskpedagogiske nettressurser (f.eks. nettsider, spill)	○	○	○	○	○	○
5	Elevene utveksler informasjon og erfaringer ved hjelp av digitale verktøy	○	○	○	○	○	○
6	Elevene produserer selv tekster ved hjelp av digitale verktøy	○	○	○	○	○	○
7	Elevene bruker spillpreget pedagogisk programvare for å trene engelskfaglige ferdigheter og kunnskap	○	○	○	○	○	○
8	Elevene arbeider med engelske tekster lastet ned fra internett	○	○	○	○	○	○
9	Elevene henter engelskfaglig datamateriale fra internett som de bruker, behandler og evt. presenterer	○	○	○	○	○	○
10	Elevene bruker ulike typer software for å arbeide med engelsk (f.eks. programvare for opptak av lyd)	○	○	○	○	○	○
11	Elevene bruker digitale presentasjonsverktøy	○	○	○	○	○	○
12	Elevene bruker teknologi for å kommunisere med hverandre og elever fra andre deler av verden	○	○	○	○	○	○
13	Elevene bruker programmer som gir opplæring i grunnleggende grammatiske begrep	○	○	○	○	○	○
14	Elevene bruker programmer som gir opplæring i engelsk og amerikansk historie og geografi	○	○	○	○	○	○
15	Elevene bruker digitale mapper som er del av vurderingsgrunnlaget	○	○	○	○	○	○

The additive index *ICT intensity* (*M*=3.47; *SD*=0.78) measures EFL teachers' overall use of ICT. The 14 items constituting the index are duly classified, categorised and analysed in chapter 4 since they show the frequency of different ICT activities, and thus provide answers to the first research question related to the nature of EFL teachers' ICT use. Here, however, the descriptive findings are not commented on. The high Cronbach's alpha coefficient (α=.90) suggested that the 14-item subscale was reliable, i.e. that the individual items measured the same underlying construct. I found it therefore appropriate to compute them into a new single index.

Two main types of ICT use

The 14 items constituting the *ICT activities* scale are also the basis for the creation of two additive indices measuring different *main types* of ICT use. These are *ICT for production and information management* (hereafter referred to as *IPIM*) (*M*=3.42; *SD*=0.88) and *ICT for drill*

and practice (hereafter referred to as *IDAP*) (*M*=3.54; *SD*=0.82). These indices are not made purely on the basis of theoretical assumptions, but are patterns that emerge from the data itself. Put more precisely, they are constructs made on the basis of empirical evidence found in the current study. They are in other words legitimate findings in their own right. I will provide a more thorough presentation of the characteristics of the two patterns of ICT use in chapter 4, when dealing with the findings related to the nature of teachers' ICT use. Here, on the other hand, the focus is on the procedures used to create the additive indices.

The additive index *ICT intensity* is created simply by computing the 14 items related to teachers' use of different ICT activities, after making sure that the subscale is reliable as expressed by a high Cronbach's alpha coefficient. Similarly, the indices for main types of ICT use are created by computing two different sets of items from the same ICT activities subscale. IPIM is a composite of items **5.1.**2; 5; 6; 9; 10; 11; 12; 15, and IDAP is a composite of items **5.1.**3; 4; 7; 8; 13; 14. However, IPIM and IDAP are not well-established categories based on previous research or theory. They emerge as patterns only through the exploratory use of factor analysis on the collected data in the current study.

Factor analysis was used to try and identify different main types of ICT use among the sample of teachers, by exploring the underlying factor structure of the data from the 14 items in the ICT activities subscale. The factor analysis suggested two factors that could be used to best represent the intercorrelations among the 14 items. Before additive indices were made on the basis of the factor analysis, I checked to see if the result made sense in light of previous research and a general understanding of the content. In this case the variables connected with the use of general tools, i.e. tools which to not contain any content of its own, all loaded substantially on factor one. The variables linked to the use of subject specific software, i.e. tools that contain language material for the pupils to work with, all loaded strongly on factor two. Since the proposed factors passed the theoretical inspection, the variables loading on the respective factors were computed into the two additive indices labelled *ICT for Production and Information Management* (*IPIM*) and *ICT for Drill and Practice* (*IDAP*).

I have tried to make labels that 'capture the essence' of the variables loading on each factor. They are meant to communicate some vital information about the nature of the variables underlying the additive indices. The first factor included variables related to digital text production, the use of LMS, and other general tools without content of their own, hence its label *ICT for Production and Information Management* (*IPIM*). Nearly all the variables loading strongly on factor two were subject specific software used for practicing language skills and knowledge, so it was called *ICT for Drill and Practice* (*IDAP*). These indices are basic tools used in further analyses required to answer the research questions.

ICT tools

The questionnaire also contained 16 items used to measure the use of specific ICT tools by both teachers and pupils. These items were not computed into composite constructs, but were kept as single variables. ICT tools covered by these items include mainly general tools, such as word processors, presentation tools, sound players and recorders, image and video editors, and Internet use in general. The use of Internet can naturally also take subject-specific forms through the use of e.g. drill and practice programmes. The teachers responded using the same 6-point, Likert-type scale as for ICT activities. All the items are presented below.

5.2 IKT-VERKTØY I ENGELSKUNDERVISNINGEN

Hvilke typer IKT-verktøy bruker du og/eller elevene i forbindelse med engelskundervisningen? Sett et kryss for hvert verktøy.

		Aldri	*Svært sjelden*	*Sjelden*	*Av og til*	*Ofte*	*Svært ofte*
1	Tekstbehandling (f. eks. Word)						
	Lærer	○	○	○	○	○	○
	Elever	○	○	○	○	○	○
2	Regneark (f. eks. Excel)						
	Lærer	○	○	○	○	○	○
	Elever	○	○	○	○	○	○

3	Presentasjon (f. eks. PowerPoint)						
	Lærer	○	○	○	○	○	○
	Elever	○	○	○	○	○	○
4	Bruk av internett (f.eks. Firefox, Internet Explorer)						
	Lærer	○	○	○	○	○	○
	Elever	○	○	○	○	○	○
5	Bilderedigering						
	Lærer	○	○	○	○	○	○
	Elever	○	○	○	○	○	○
6	Videoredigering						
	Lærer	○	○	○	○	○	○
	Elever	○	○	○	○	○	○
7	Lydavspilling (f. eks. Windows Media Player)						
	Lærer	○	○	○	○	○	○
	Elever	○	○	○	○	○	○
8	Lydinnspilling/opptak/redigering (for eksempel Audacity)						
	Lærer	○	○	○	○	○	○
	Elever	○	○	○	○	○	○

ICT general positive belief

The additive index *ICT general positive belief* (M=4.49; SD=0.87) measures teachers' beliefs in the positive contribution of central ICT affordances.[24] The index was created by computing the original subscale of four items on the *General ICT beliefs* scale (questionnaire no. 6.1.1.1-6.1.1.4), after having established that the scale was reliable (α=0.85). The items were in the form of predefined statements which were supposed to explain the relationship between ICT use and *good* results in the subject. A corresponding scale of statements regarding the relationship between ICT use and *poor* results was also included in the questionnaire, but is not used in this study. The teachers rated the degree to which they agreed with these predefined explanations on a 6-point, Likert-type scale (1 – *Strongly disagree*, to 6 – *Strongly agree*). The content of the statements can be seen in the table below.

[24] See Appendix, diagram 59: General ICT beliefs – descriptive findings

6.1 SAMMENHENGER MELLOM BRUK AV IKT OG GODE RESULTAT

6.1.1 Undersøkelser viser at det kan være en sammenheng mellom bruk av IKT og gode resultat i faget. Hvordan kan dette forklares?

		Svært uenig	Uenig	Litt uenig	Litt enig	Enig	Svært enig
1	IKT gir nye muligheter for lærerne til å presentere faglige emner på en mer interessant måte.	○	○	○	○	○	○
2	IKT gir tilgang på mer variert lærebøker og læremateriell på nettet.	○	○	○	○	○	○
3	Elevene i større grad selv kan bearbeide et faglig innhold og synliggjøre dette blant annet i digitale mapper.	○	○	○	○	○	○
4	Elevene i større grad kan hjelpe hverandre gjennom å samarbeide over nettet.	○	○	○	○	○	○

ICT positive effects

The additive index *ICT positive effects* (*M*=3.80; *SD*=0.81) is a composite of six items (items **7.1.**12; 13; 17; 20; 21; 22) from the *Fundamental beliefs* scale.[25] The six items were computed into one additive index after the Cronbach's alpha coefficient (α=.88) showed that the scale was reliable. The items were in the form of predefined statements. The construct is meant to measure EFL teachers' attitudes concerning the effectiveness of ICT for obtaining good results, the extent to which ICT supports their pedagogical approaches, and whether ICT supports the attainment of traditional and new subject specific objectives. The teachers rated the extent to which they agreed with the six statements using a 6-point, Likert-type scale (1 – *Strongly disagree*, to 6 – *Strongly agree*).

Section 5: Trustworthiness and generalisability

The conclusions reached in this thesis must naturally be seen in light of the potential weaknesses in the data collection process itself and in the possibility of a non-representative dataset. Three main sources of errors can be identified when it comes to the issue of representativity: (a) the online launch, (b) the voluntary aspect, and (c) the ICT aspect.

[25] See Appendix, diagram 60: ICT positive effects – descriptive findings

First, the survey was launched online. This may have kept older teachers from answering, and may have spurred more ICT competent teachers into answering. An alternative, paper-based survey to complement the online launch would have met this challenge to representativity and was in fact considered, but rejected on the grounds of lack of time and resources.

Secondly, even though headmasters and the ICT responsible at the selected schools were encouraged to go through the survey with the teachers, the most common approach was for the headmaster to inform the teachers about the survey and encourage them to answer. This might pose a challenge to representativity due to the possibility that the survey was answered by a disproportionately high number of ICT enthusiasts and highly motivated teachers in general. Teachers with below average English competence and motivation in general might therefore be under-represented. This challenge to representativity was reduced by the fact that the teachers of some individual schools actually did the survey together in the official meeting time with the help of an ICT responsible. However, due to the high number of questions (248 items) it took roughly 35-40 minutes to complete the survey, thereby accentuating the problem of reaching only the most motivated teachers. Perhaps the increase in information "richness" gained by the high number of items was paid for by a decrease in representativity.

And finally, the mere fact that the survey was designed to capture teachers' ICT priorities might have put off more traditionally oriented and perhaps older teachers and once again encouraged ICT enthusiasts and perhaps younger teachers. An opposite trend that might reduce the impact of this challenge to representativity is that some ICT sceptics might use the opportunity to let their voices be heard. Considering the three potential challenges to representativity together the survey might have reached a disproportionally high number of (a) highly motivated and competent English teachers, and (2) ICT enthusiasts and teachers below the age of 50.

The relative impact or relevance of the main findings in this study depends on their validity. The ambitious aim was to say something about the ICT priorities of Norwegian EFL teachers in lower secondary schools. This could be achieved by randomly selecting a representative

sample of EFL teachers from across the country, and from which it would be possible to statistically infer the relevance for the entire population of EFL teachers. In the current study, however, it is not possible to establish whether this aim is reached, since the exact response rate is not possible to establish due to the simple fact that the total population of EFL teachers is not known. It is also doubtful that 124 answers are adequate. However, a fairly balanced distribution of teachers in terms of geography, age and gender, educational depth and experience might be seen to strengthen the claim of validity of the findings.

Low participation does not necessarily imply poor data, though. If lack of participation is linked to the topic of a study, e.g. if teachers who don't use ICTs, don't bother answering the questionnaire, there is a problem of generalising findings to the population of EFL teachers. If lack of participation is random, on the other hand, the assumptions underlying the use of statistical inference are met.

There are also significant challenges related to self-reporting in general. There is some question as to how closely reported-philosophy matches actual behaviour. There might not be a close connection between espoused views and attitudes as expressed in a questionnaire, and teachers' actual practice. There may actually be little correlation between stated beliefs and actual practice. However, this threat to the validity of the findings finds its counterpart in the challenges involved in *directly observing* teachers' practice. The fact that the questionnaire consisted of 248 items related to a whole range of issues, might counteract to some extent the problem with espoused theories. When establishing entire 'clouds of correlations' based on the answers to all the 248 items, *main tendencies* rather than *clear-cut answers* are found and these might be considered less vulnerable to the possible effects of self-reporting. Still, in the future it would be useful to separate *views and attitudes*, that the teachers have, but which do not necessarily have an effect on their practice, from *strongly held convictions* that might have a more direct effect on practice. Despite the various threats to the validity of the findings, the *main trends* identified in this study are fairly well documented and can hopefully be used as points of departure in future research efforts.

Chapter 4: Results

The two research questions posed in this study are: "What characterises the use of ICTs in EFL classrooms, and what attitudes and knowledge do the teachers have regarding new technologies?" and "How is EFL teachers' reported ICT use associated with; a) their knowledge about ICT and their thoughts relating to the usefulness of and experiences with technology; and b) their background, subject specific priorities and qualifications?" In this chapter the findings related to EFL teachers' use of ICTs are presented first, before the account of the findings related to the system of associated variables which can help explain what is characteristic about EFL teachers with a high level of ICT-integration.

Section 1: State of ICT use, ICT competence and attitudes among EFL teachers

ICT use is center stage in this study. It is the single most important factor, as it is the point of departure for our journey of discovery. As outlined in chapter 3, a number of items in the questionnaire were constructed specifically for the purpose of illuminating ICT use. The individual questions were grouped in two scales: *ICT activities* and *ICT tools*, of which the former, *ICT activities*, is the most important one in this study. This is due to the more fine-tuned and fine-grained character of the questions asked. The *ICT tools* scale plays a supporting role, strengthening the findings reached using the main scale. Concerning EFL teachers' attitudes to ICT, the scales relating to the belief in positive effects of ICT on pupils' learning and general ICT positive belief, are used. Formal ICT competence relates to the number of credits of formal higher education, whereas informal ICT competence is measured via the respondents' need for ICT access in their spare time and whether they deem their total ICT competence as solid. Single variables used in the Self-perceived competence (SPC) additive index will also be used to strengthen the understanding of EFL teachers' view of their own ICT competence.

There are two main categories of results presented in this section. First, using descriptive, univariate statistical analysis, means (*M*) and standard deviations (*SD*) on individual items are found. These measures tell us something about the general frequency of use of a particular ICT activity or tool, and the degree to which there is consensus among the

teachers about that particular use.[26] Moreover, having the descriptive results from each variable lets us present a rank order of the ICT activities and tools based on their mean values, thereby, providing a general overview of the nature of EFL teachers' ICT use. The second set of results presented in this section tries to accommodate for the fact that there are *patterns of ICT use*, i.e. some types of ICT use tend to go together as described in chapter 3. By identifying these patterns we get access to a more differentiated picture of EFL teachers' ICT use. EFL teachers' ICT competence and attitudes are only analysed using descriptive statistics in this section. In the next section these will be viewed in light of the role they play in the total system of factors that are associated with the ICT intensity of EFL teachers.

In chapter 2 I elaborated on the *three* conceptual frameworks used in this study to briefly *classify*, *categorise* and *analyse* the nature of EFL teachers' ICT use. The *first* simply introduced and defined the common concepts used in the field to denote types of ICT tools and activities, and suggested some major challenges and affordances to each. The concepts needed in this particular study were devoted particular attention. These included;

- *general tools*, such as word processing, presentation tools, spreadsheets, and general web-resources;
- *subject-specific software* or *web-resources*, such as grammar practice programmes;
- *teacher tools*, such as LMS, and digital portfolios; and
- *communication tools*, such as e-mail.

The *second* perspective provides a slightly different angle by shifting the attention to the *purpose of ICT use*. The five main types of ICT use suggested from this perspective were;

- *online research;*
- *tool-based software use;*
- *subject-specific software use;*
- *communication; and*
- *assessment.*

[26] It is important to note, however, that the frequency of ICT use is not deemed to be a measure of quality, in and of itself, in the current study. The relative distribution of frequencies is primarily useful as basis for the correlation analyses used to determine the system of associations related to ICT use presented later in this chapter.

The first two conceptual frameworks have so much in common that it would be artificial to try and keep them separate. Instead, the two perspectives will be used simultaneously in the effort of classifying and categorising the identified ICT use among EFL teachers.

The last theoretical framework consisted of an extremely simplified version of some central characteristics of three highly complex learning theories – behaviourism, cognitivism, and constructivism. These characteristics are used in this study to throw light on some *main* pedagogical implications of the identified ICT use, and are not intended as a launch pad for thorough analyses.

Descriptive findings – general overview of teachers' ICT use

In this section I will first present the descriptive findings related to the *ICT tools* scale, before I elaborate on the results from the univariate analysis on the data from the *ICT activities* scale. The *ICT tools* scale consists of items used to obtain data about both pupils' and teachers' use of various ICT tools in class, whereas the items on the *ICT activities* scale are only related to pupils' use.

First, let us concentrate on the results from the univariate analysis conducted on the *ICT tools* subscale. What tools dominate in EFL teachers' practice? And what is the relative frequency of use of the different ICT tools among pupils and teachers?

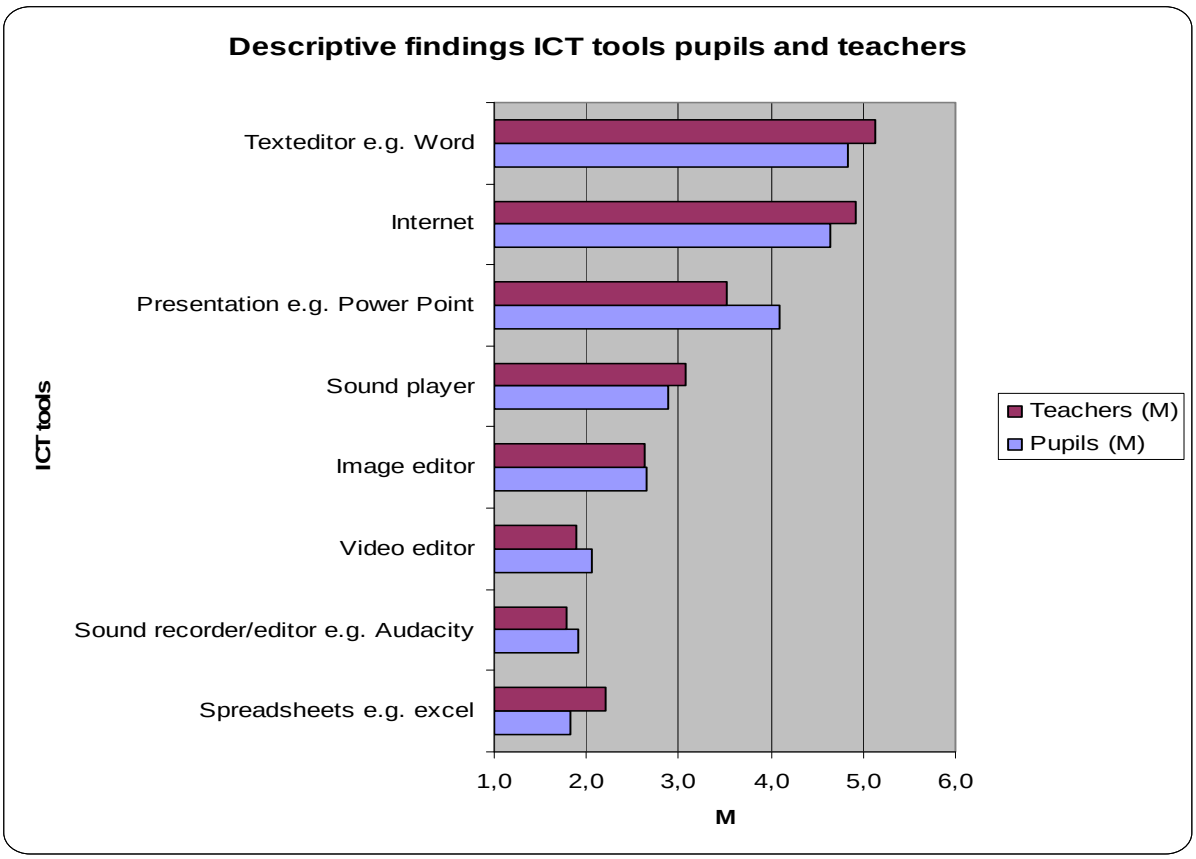

Diagram 9: Descriptive findings on the use of different ICT tools in the teaching of EFL

Diagram 9 clearly shows that there are three main types of ICT tools that are totally dominant in Norwegian EFL classrooms; digital word processors, Internet use, and digital presentation tools. These three tools are *fairly often* used by both pupils and teachers. The mean coefficients for the use of digital word processors are slightly higher for teachers (*M*=5.1; *SD*=1.1) than for pupils (*M*=4.8; *SD*=0.9), and the fairly low standard deviations suggest a fairly high degree of consensus regarding the use of digital word processors in EFL classrooms. Similarly, Internet use is a common activity for both teachers (*M*=4.9; *SD*=1.0) and pupils (*M*=4.7; *SD*=1.1), even though teachers' opinions are slightly more split than for the use of word processing. Digital presentation tools are slightly less used than word processors and Internet. The mean coefficients are much lower for teachers (*M*=3.5; *SD*=1.4) than for pupils (*M*=4.1; *SD*=1.1), and the opinions are markedly more split regarding teachers' use than pupils' use of presentation tools.

Diagram 9 shows that the other ICT tools included in this study are rarely used. Digital sound players (such as Windows Media Player) are used to some extent (teachers: *M*=3.1; *SD*=1.7.

Pupils: *M*=2.9; *SD*=1.5), but very high standard deviations suggest a high number of extreme values on both sides of the mean, indicating that many teachers use it fairly often, or hardly ever. Next on the list we find the use of image editors. Again, these are rarely used by teachers (*M*=2.6; *SD*=1.6) and pupils alike (*M*=2.6; *SD*=1.4), and a lack of consensus regarding their use is expressed through high standard deviations. Still, they are more often used than spreadsheets, video editors and digital sound recorders, which are very rarely used in EFL classrooms. It is worth noting, though, that EFL *teachers* use spreadsheets (*M*=2.2; *SD*=1.4) more often (or less rarely) than digital sound recorders (*M*=1.8; *SD*=1.2).

What about the distribution of frequencies between main ICT uses found in the analysis of the variables included in the *ICT activities* scale? Will the results complement and strengthen the findings emanating from the analysis of the *ICT tools* scale?

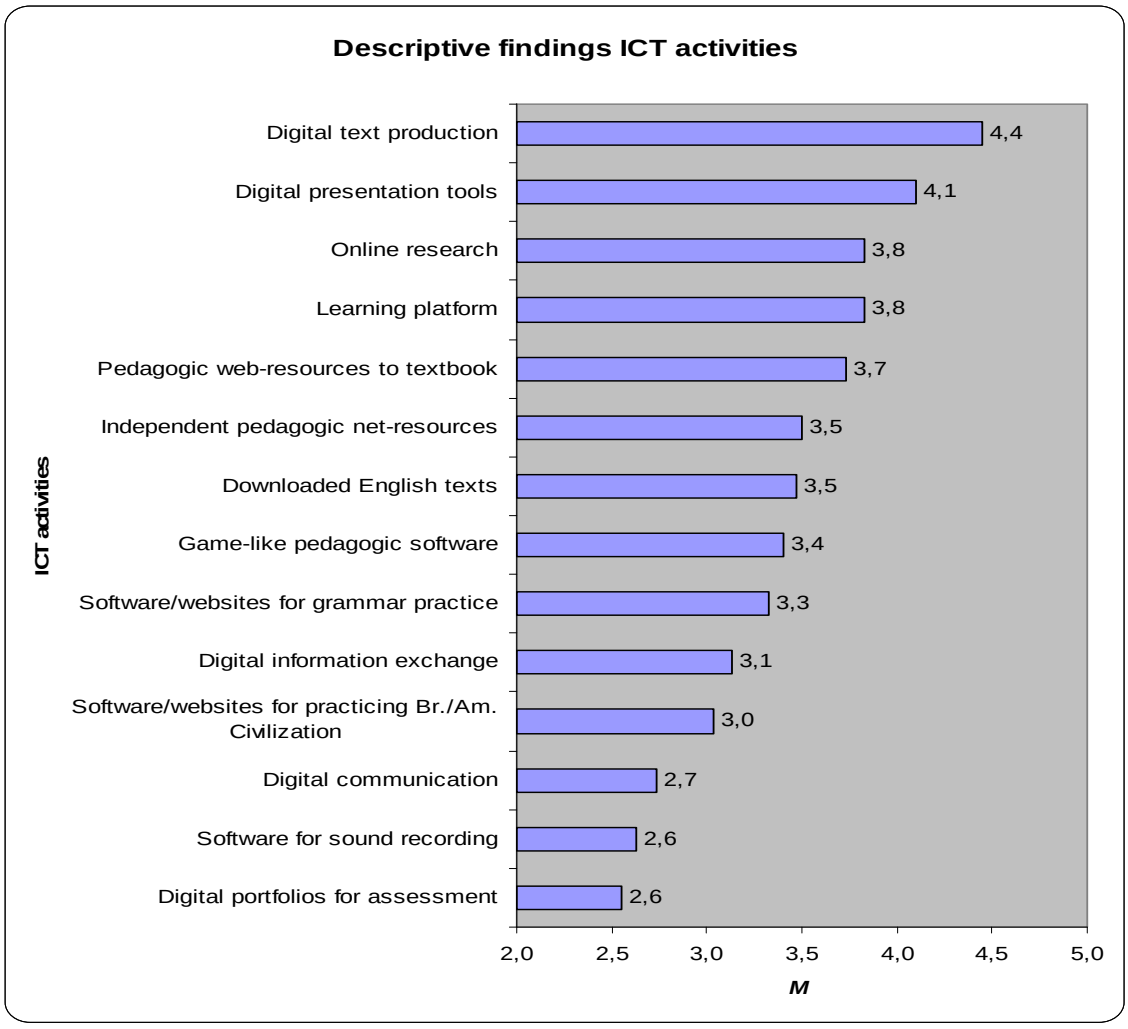

Diagram 10: Descriptive findings related to teachers' use of different ICT activities in the teaching of EFL

The findings presented in diagram 10 clearly complement the previous *ICT tools* findings. Most teachers *regularly* let the pupils write texts using digital word processors (*M*=4.4; *SD*=1.0) and use digital presentation tools such as Power Point (M=4.1; SD=1.1). The operationalization of Internet use is comparably refined and differentiated in this scale; *one* item in the *ICT tools* scale is turned into *nine* here. Three of these Internet-related activities are *sometimes* used. The first is the use of online research (*M*=3.8; *SD*=1.1), which simply means that pupils collect, use and present material found on the web. The next is the use of an LMS (Learning Management Systems) (*M*=3.8; *SD*=1.5) in connection with EFL lessons. The third is the use of pedagogic web-resources which are provided by publishers and linked to the content of the text book (*M*=3.7; *SD*=1.1).

Furthermore, diagram 10 tells us that other uses of Internet are found less often in EFL classrooms, e.g. pupils working on independent pedagogic web-resources (*M*=3.5; *SD*=1.0); pupils working on English texts found on the web (*M*=3.5; *SD*=1.1); pupils exchanging information and experiences using digital tools (*M*=3.1; *SD*=1.2); and pupils using digital tools to communicate with each other and pupils in other countries (*M*=2.7; *SD*=1.4). Rather surprisingly, digital portfolios are rarely used (*M*=2.6; *SD*=1.5) in connection with EFL classes.

The findings from the two scales – *ICT tools* and *ICT activities* – show that EFL teachers first and foremost make use of ICTs for text production and presentations. Internet is also used in a variety of ways, the most common ones being online research, the use of LMS, and pedagogic web-resources connected with the text book. Other activities are only rarely used in Norwegian EFL classrooms.

Factor analysis – identifying patterns of ICT use

The general overview helps us see the relative frequency of use of various individual variables expressed through mean values. The standard deviation coefficients add a measure of the degree of consensus regarding the use of a particular ICT tool or activity. However, by only looking at data emanating from one variable at the time (univariate analysis), the relationship between the different variables is not explored. Even though a measure of

variability is included for each variable through the standard deviation, systematic variability existing between the variables remains in the dark. This might create the impression that there is only *one* main way that teachers of EFL use ICTs in their teaching, while it is probably safe to assume that there are as many ways as there are teachers in this study. One way to reach a more refined understanding of this messy reality is to perform a qualitative study providing "thick" descriptions based on established theoretical frameworks. In the current study, however, we deal with aggregates based on quantitative data, so we must rely on the identification of underlying dimensions or patterns in the data set to determine main types of ICT use.

In chapter 3 we showed the *two* underlying dimensions, groups or patterns in the data set emanating from the items included in the *ICT activities* subscale. These two main patterns are gateways to a deeper understanding of the different ways ICTs are used by EFL teachers, and so need to be presented in more detail.

The variables constituting each of the two underlying dimensions were computed into two additive indices reflecting main types of ICT use: *ICT for production and information management* (*IPIM*) and *ICT for drill and practice* (*IDAP*). The similar mean and standard deviation coefficients for *IPIM* (*M*=3.4; *SD*=0.9) and *IDAP* (*M*=3.5; *SD*=0.8) show that they are equally often used and there is a similar degree of consensus regarding their use.

As mentioned in chapter 3, these indices are not made purely on the basis of theoretical assumptions, but are patterns that emerge from the data itself. Put more precisely, they are constructs made on the basis of empirical evidence found in the current study. So let us have a closer look at the variables constituting *IPIM* and *IDAP* respectively.

The variables constituting the additive index *IPIM* include digital word processing, presentation tools, LMS and digital portfolios. The label stems from the nature of these variables. The variables constituting the additive index *IDAP* include applications which contain relevant content and are ready-to-use for the practice of e.g. grammar or civilization topics, hence the label *ICT for drill and practice*. These applications are normally web-based and are often linked to the text book.

What is the association between the two main types of ICT use? Do teachers using one main type of ICT use rarely use the other, or do they tend to use both types?

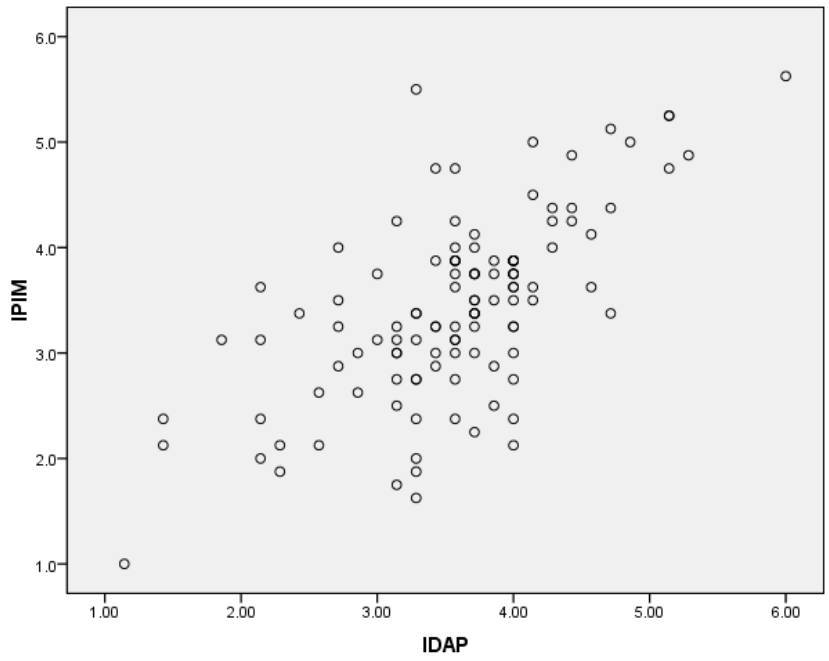

Diagram 11: Associations between IPIM and IDAP

Diagram 11 shows that the two main types are not mutually exclusive. In fact, the overlap between the two is substantial. There is a significant and strong positive correlation (r=.66) between the two, which means that teachers using *IPIM* a lot tend to use *IDAP* a lot as well. In fact, by squaring the correlation coefficient (0.66x0.66=0.44) and multiplying this 'coefficient of determination' with 100, you get a measure of shared variance expressed in per cent, which in this case is 44. So, one might say that IDAP accounts for nearly 44 per cent of the variance in respondents' scores on the IPIM index and vice versa.

We have seen the distribution of variables constituting the two main additive indices, providing the basis for the claim of having identified two main types of ICT use among EFL teachers. However, we have also seen that there is a high degree of overlap between IPIM and IDAP, thus weakening the claim of having uncovered two different types of use. So, in order to get a clearer picture of the situation, the two additive indices are correlated with the variables on the *ICT tools* subscale.

Bivariate correlations IPIM/IDAP and ICT tools

		ICT for production and information management	ICT for drill and practice
ICT for production and information management	Pearson Correlation	1.000	**.656****
	Sig. (2-tailed)		.000
	N	115.000	114
ICT for drill and practice	Pearson Correlation	.656**	1.000
	Sig. (2-tailed)	.000	
	N	114	119.000
5.2.1**teacher**: ICT-tools text editor e.g. Word	Pearson Correlation	**.491****	**.389****
	Sig. (2-tailed)	.000	.000
	N	115	119
5.2.1**pupils**: ICT-tools text editor e.g. Word	Pearson Correlation	**.637****	**.482****
	Sig. (2-tailed)	.000	.000
	N	115	119
5.2.2**teacher**: ICT-tools spreadsheets e.g. excel	Pearson Correlation	**.287****	**.238****
	Sig. (2-tailed)	.002	.009
	N	115	119
5.2.2**pupils**: ICT-tools spreadsheets e.g. excel	Pearson Correlation	**.473****	**.398****
	Sig. (2-tailed)	.000	.000
	N	115	119
5.2.3**teacher**: ICT-tools presentation e.g. PowerPoint	Pearson Correlation	**.604****	**.423****
	Sig. (2-tailed)	.000	.000
	N	115	119
5.2.3**pupils**: ICT-tools presentation e.g. PowerPoint	Pearson Correlation	**.578****	**.373****
	Sig. (2-tailed)	.000	.000
	N	114	118
5.2.4**teacher**: ICT-tools Internet	Pearson Correlation	**.474****	**.537****
	Sig. (2-tailed)	.000	.000
	N	114	118
5.2.4**pupils**: ICT-tools Internet	Pearson Correlation	**.555****	**.510****
	Sig. (2-tailed)	.000	.000
	N	115	119
5.2.5**teacher**: ICT-tools image editor	Pearson Correlation	**.409****	**.303****
	Sig. (2-tailed)	.000	.001
	N	115	119
5.2.5**pupils**: ICT-tools image editor	Pearson Correlation	**.424****	**.326****
	Sig. (2-tailed)	.000	.000
	N	115	119
5.2.6**teacher**: ICT-tools videoeditor	Pearson Correlation	**.377****	**.224***
	Sig. (2-tailed)	.000	.014
	N	115	119
5.2.6**pupils**: ICT-tools video	Pearson Correlation	**.355****	**.205***

	Sig. (2-tailed)	.000	.025
	N	115	119
5.2.7**teacher**: ICT-tools sound player, e.g. Windows Media Player	Pearson Correlation	**.324****	**.257****
	Sig. (2-tailed)	.000	.005
	N	113	117
5.2.7**pupils**: ICT-tools sound player, e.g. Windows Media Player	Pearson Correlation	**.326****	**.288****
	Sig. (2-tailed)	.000	.002
	N	112	116
5.2.8**teacher**: ICT-tools sound recorder/editor e.g. Audacity	Pearson Correlation	**.400****	**.361****
	Sig. (2-tailed)	.000	.000
	N	112	116
5.2.8**pupils**: ICT-tools sound recorder/editor e.g. Audacity	Pearson Correlation	**.415****	**.328****
	Sig. (2-tailed)	.000	.000
	N	112	116

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

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

Diagram 12: Correlation IPIM/IDAP and ICT Tools

Diagram 12 makes it possible to compare the two sets of correlations, and thus discern some main differences between IPIM and IDAP. The first striking difference concerns the use of word processors. Even though both types of ICT use are positively correlated with the use of word processors, the correlations are much stronger in relation to IPIM (teachers: *r*=.491; pupils: *r*=.637) than IDAP (teachers: *r*=.389; pupils: *r*=.482). Another interesting difference relates to the use of digital presentation tools. Again both IPIM (teachers: *r*=.604; pupils: *r*=.578) and IDAP (teachers: *r*=.423; pupils: *r*=.373) show significant positive correlations, but they are much stronger in the case of IPIM. So, the associations existing between the use of both word processors and presentation tools on the one hand, and IPIM on the other, are much stronger than the associations found between these tools and IDAP.

When it comes to the use of Internet, the tendencies are slightly different. IPIM shows stronger positive correlations to pupils' use, than to teachers' use (teachers: *r*=.474; pupils: *r*=.555), whereas IDAP displays the opposite with stronger correlations to teachers' than pupils' use of the Internet (teachers: *r*=.537; pupils: *r*=.510). All in all, IPIM shows a stronger correlation than IDAP in relation to *pupils'* use of the Internet, and IDAP shows a stronger relationship than IPIM regarding *teachers'* use. IPIM shows on the whole stronger correlations than IDAP in relation to the rest of the ICT tools included in this study.

EFL teachers' ICT competence and attitudes

Previous research has identified formal ICT competence as a variable with bearing on the use of ICT in teaching (Mueller et al., 2008). Some critics have questioned the ICT competence of Norwegian teachers, and blamed the modest use of new technologies in education on lack of skills. It is therefore important to look more closely at EFL teachers' formal and informal ICT competence.

EFL teachers in general have little or no formal qualifications in ICT. More than 70 percent have no formal qualifications, whereas 20 percent have 30 credits or less. Still, a majority of EFL teachers are very confident when it comes to their ICT competence. Almost 70 percent agree with the statement that their total ICT competence is solid. The impression of fairly ICT competent teachers is strengthened by the fact that more than 90 percent report that they need access to ICTs in their spare time. The EFL teachers' answers to individual variables from the self-perceived competence scale corroborate the findings. Here, nearly 80 percent claim they have few or no difficulties when it comes to learning how to use new digital tools, and almost 70 percent feel confident that they can make the most of digital tools' potential in the teaching of EFL. High mean values and low *SD* values show that most EFL teachers share this view.

Another highly salient variable identified by previous research as having impact on teachers' integration of digital technologies, is teachers' beliefs in the positive effects of ICT on pupils' learning and positive attitudes to ICTs more on a general basis (Mueller et al., 2008). First, what are the EFL teachers' general attitudes?

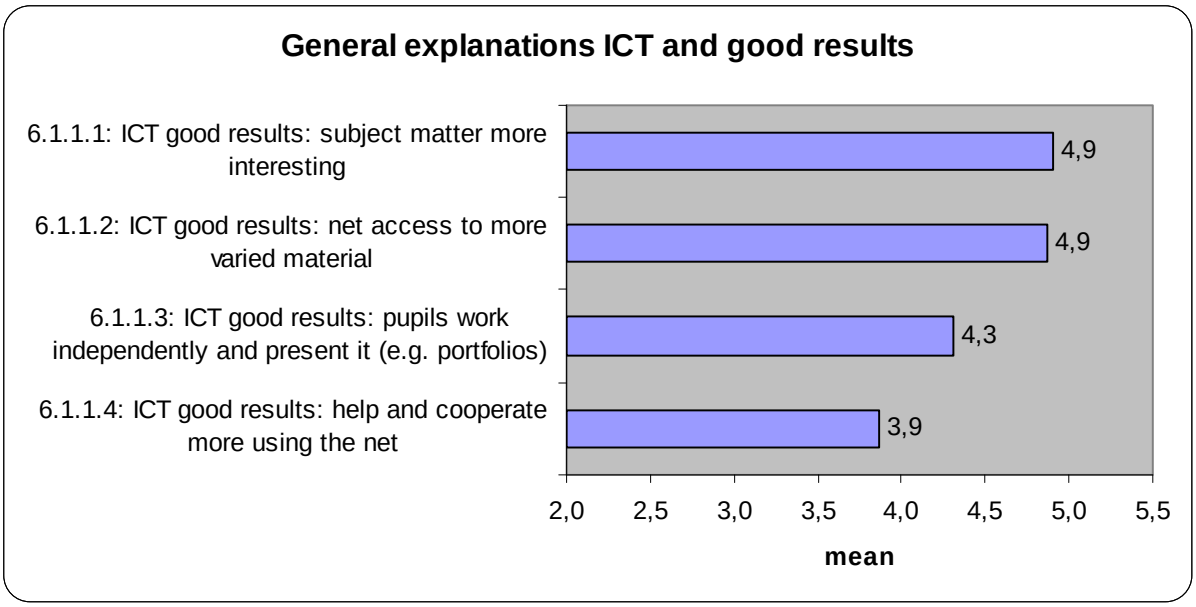

Diagram 13: General ICT positive – descriptive findings

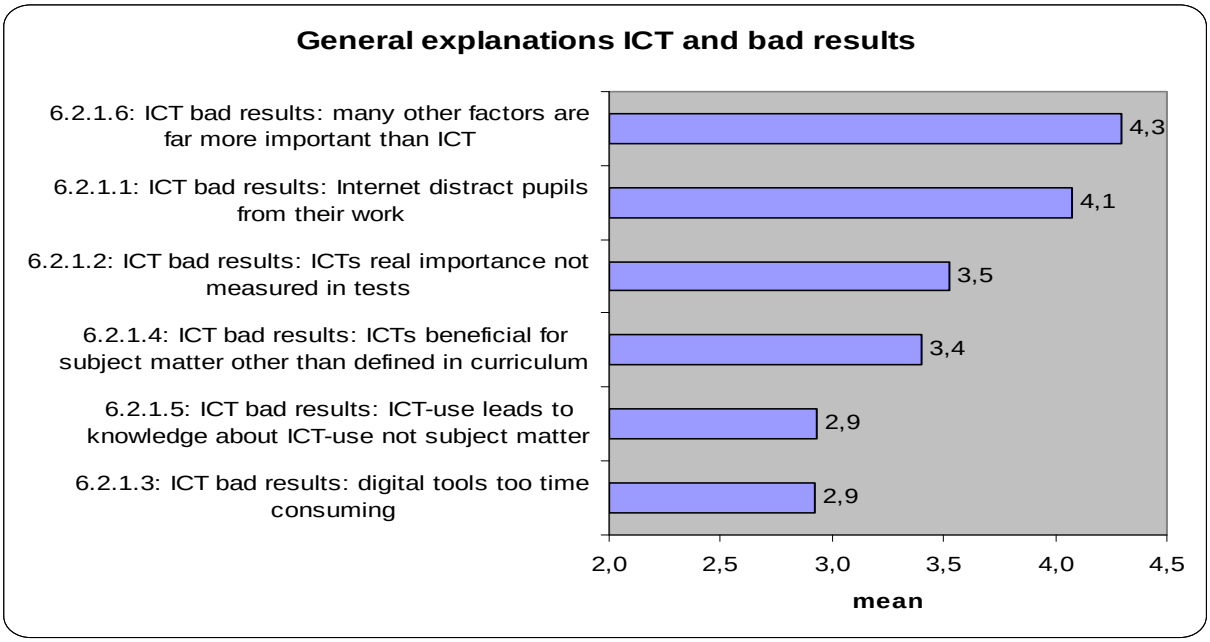

Diagram 14: General ICT negative – descriptive findings

Diagram 13 shows clearly that EFL teachers in general believe in positive effects of ICT due to the availability of more varied material and the opportunity to make subject matter more interesting. Also ICTs' contribution to the development of pupils' autonomous work and presentations is appreciated. However, diagram 14 shows that a majority of EFL teachers deem many other factors than ICT to be far more relevant for pupils' achievements. They

also see problems connected with pupils' use of the Internet since it can distract pupils' from their work. Are these results corroborated by the findings relating to the more direct effects of ICTs on different aspects of pupils' learning?

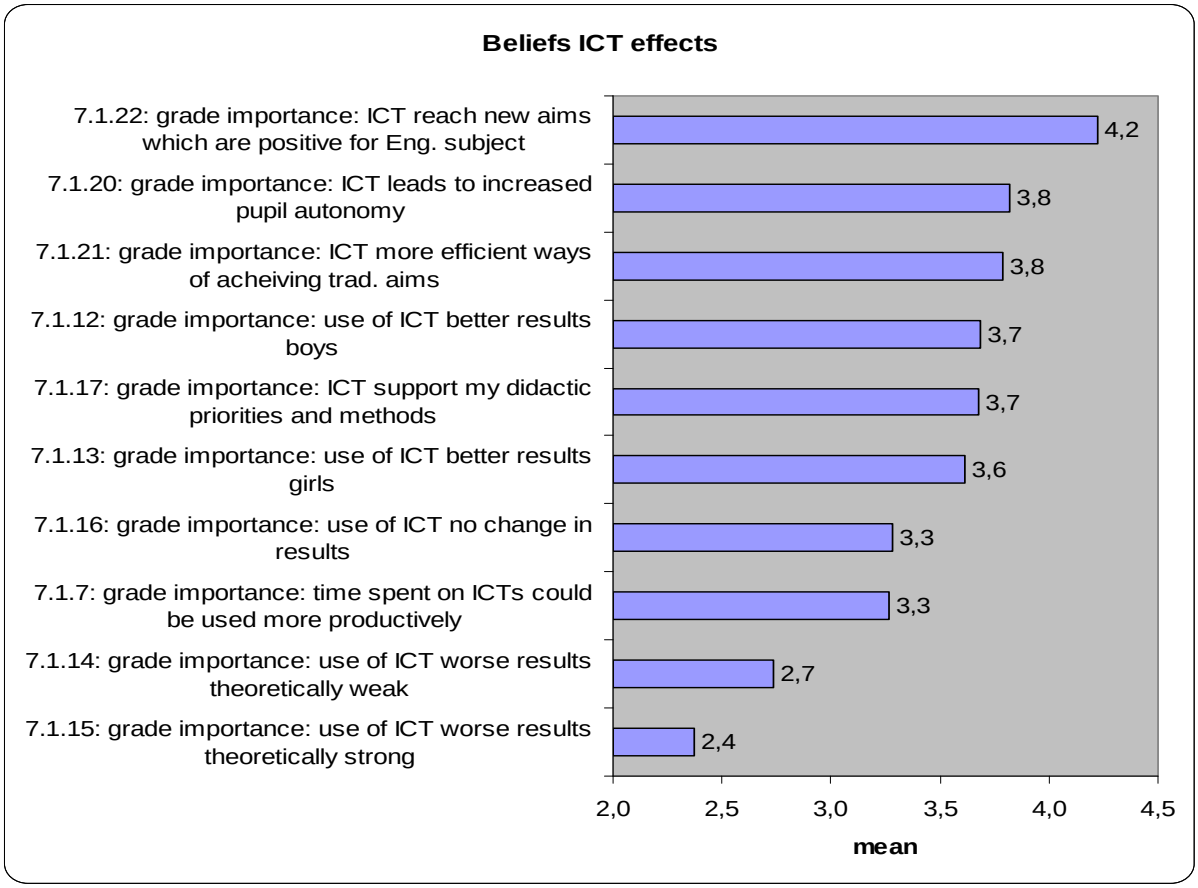

Diagram 15: Beliefs ICT effects – descriptive findings

Diagram 15 shows clearly that EFL teachers see more positive than negative effects of ICT. The variables with low mean values are related to negative or no effects of ICT, while variables with fairly high mean values are all related to the expectation of positive effects of ICT on pupils' learning. EFL teachers are particularly satisfied with the way ICTs make it possible to reach new aims which are positive for the English subject. Moreover, they also see ICT as a contributing factor to more efficient ways to reach traditional objectives, and are content with the way ICTs help develop pupils' autonomy.

Section 2: ICT use and the system of associations

The second main research question raised in this thesis was: "How is EFL teachers' reported ICT use associated with; a) their knowledge about ICT and their thoughts relating to the usefulness of and experiences with technology; and b) their background, subject specific priorities and qualifications?" The rationale for identifying this system of ICT associated variables was to get a clearer picture of observable characteristics of EFL teachers with a high level of ICT-integration. In chapter 5 the theoretical framework relating to 'theory of practice' is used to cast light on what this system of associations can tell us about ICT related differences between EFL teachers. This section is in other words dedicated to the identification of variables which are associated with and can account for EFL teachers' ICT use.

The three steps undertaken in this section to identify and understand the system of ICT associated variables include:

1. Identifying associations by comparing mean values;
2. Checking strength and direction of the identified relationships and identifying the 'cloud of correlations'; and
3. Determining the predictive strength of the identified system of ICT-related variables, and the relative contribution of particularly salient variables.

The first step involves using the statistical technique ANOVA in order to find significant differences in group values on a continuous variable. The additive index *ICT intensity* is transformed from a continuous to a categorical variable consisting of four groups in order to accommodate for ANOVA. Each of the four *ICT intensity* groups consist of 25 percent of the respondents according to their degree of ICT intensity, so that the first group consists of the 25 percent of the respondents using ICT the least, and the fourth group consists of the 25 percent using ICT the most. The differences between the four groups in relation to many variables, e.g. their belief in positive effects of ICT, are then analysed comparing mean values. Variables on which there are significant differences in mean values between the four groups are retained as part of the system of ICT associated variables.

The second step involves using the statistical technique bivariate correlation and multidimensional scaling (PROXSCAL). Bivariate correlation is used to check the *strength* of the relationships identified in the ANOVA analysis. The additive index *ICT intensity* is here in its original continuous form. Since this study is based on an *ecological* understanding of the educational context as elaborated on in chapter 3, it is necessary to not only identify the association between to variables at the time (bivariate), but to identify the associations existing between all the variables constituting the system as a whole. This is important because the statistical techniques used in this study must pick up on the idea that a change in one factor in an educational context influences the entire ecology of factors. Multidimensional scaling (PROXSCAL) is used to visually represent this 'cloud of correlations'.

The third step involves using the statistical technique multippel regression in order to determine the predictive strength of the identified system of ICT-related variables, and the relative contribution of particularly salient variables. This is important because it makes it possible to evaluate the saliency of the empirical evidence used when trying to characterise EFL teachers with high ICT-integration.

Step1: Identifying associations comparing mean values

The additive index *ICT intensity* is used in this study as a measure of the overall use of ICTs by EFL teachers. It is thus the key variable that all the other variables are tested against in the effort of identifying salient relationships. By comparing the mean coefficients of each of the four ICT intensity groups on e.g. the index *ICT general positive belief*, it is possible to determine whether there are significant differences between the four groups. If there is a significant difference, it is possible to reach a deeper understanding by *comparing the mean scores*.

In the following the focus is solely on variables producing *significant* differences in mean scores between the four ICT intensity groups. This entails that analyses showing *insignificant* results are not presented in detail. Analyses showing *significant* results, on the other hand, are elaborated on. For each group of indices checked for associations with ICT intensity, I will first present the ANOVA table showing the F-values and levels of significance, and then

present diagrams showing the important differences in mean scores. The F-value is an expression of the *magnitude of difference* between the four ICT groups' mean values, and thus an expression of the *strength of association* existing between the two variables (e.g. between *ICT general positive belief* and *ICT intensity*).

Before we move on to the analyses, a brief overview of the variables involved is required. **In step one**, background variables relating to the respondents' age, gender, experience, and level of education in English are checked. These are factors that might have an indirect impact on teachers' actions by influencing their general *values*.

In step two, the index *formal ICT competence* and variables *need access to ICTs on spare times* and *my total ICT competence is solid* are investigated for their relationship with *ICT intensity*. These variables are assumed to have a more direct impact on teachers' ICT use.

In step three, variables linked to the national curriculum are explored. These include the five basic skills and the three main areas in the national curriculum for English. These are variables that have a bearing on teachers' *rationale* for different actions, but are *extraneous* elements that do not necessarily reflect teachers' attitudes or beliefs.

In step four, indices expressing positive beliefs in ICTs in various ways are investigated. Here we find the two indices *ICT general positive belief* and *ICT positive effects*. These are assumed to be *intrinsic* elements of teachers' attitudes and beliefs, and thus have a direct influence on EFL teachers' *rationale* for using ICTs in class.

In step five, the indices created on the basis of the three subject specific subscales *self-perceived competence*, *content and activities* and *organising teaching* are investigated for their associations with *ICT intensity*. These are also assumed to be *intrinsic* elements of teachers' attitudes and beliefs and thus have a direct influence on EFL teachers' *rationale* for action.

ANOVA results

The first step involves checking background variables for significant associations with EFL teachers' ICT intensity. The ANOVA analysis showed that there were no significant differences in mean scores between the four ICT intensity groups in relation to the variables age, gender, experience and education. Based on this result, we can exclude the background variables from further analyses, and conclude that they do not play central roles in the system of ICT associated variables.

The second step involves checking the index *formal ICT competence* (*M*=1,7; *SD*=1,4) and the single variables *need access to ICTs in spare time* (*M*=5,1; *SD*=1,1) and *my total ICT competence is solid* (*M*=4,0; *SD*=1,4) for significant associations with EFL teachers' ICT intensity.

ANOVA

		df	Mean Square	F	Sig.
ICT ed. level	Between Groups	3	8.210	**4.682**	**.004**
	Within Groups	113	1.754		
	Total	116			
2.6.1: Need access to ICTs in my spare time	Between Groups	3	6.100	**5.635**	**.001**
	Within Groups	115	1.083		
	Total	118			
2.6.2: My total ICT competence is solid	Between Groups	3	14.601	**9.175**	**.000**
	Within Groups	117	1.591		
	Total	120			

Diagram 16: ANOVA – ICT intensity (binned) and formal and informal ICT competence

Diagram 16 shows that there are significant differences between the four ICT intensity groups in relation to *all three variables* in this group. The main thing to notice is the column marked **Sig.** If the sig. value is less than or equal to .05 (e.g. .004, or .001), there is a significant difference somewhere among the mean scores on the dependent variable for the four groups of ICT intensity. The most significant differences in mean values between the four ICT intensity groups are in relation to the single variable *my total ICT competence is solid*, followed by *need access to ICTs in my spare time* and *formal ICT qualifications*.

The results presented above do not tell us which ICT intensity group is different from which other group in relation to the three variables tested. So, in order to get a clearer picture of

the difference between the four groups, it is important to check and compare the mean scores. First, let us look at the mean scores in relation to formal ICT qualifications.

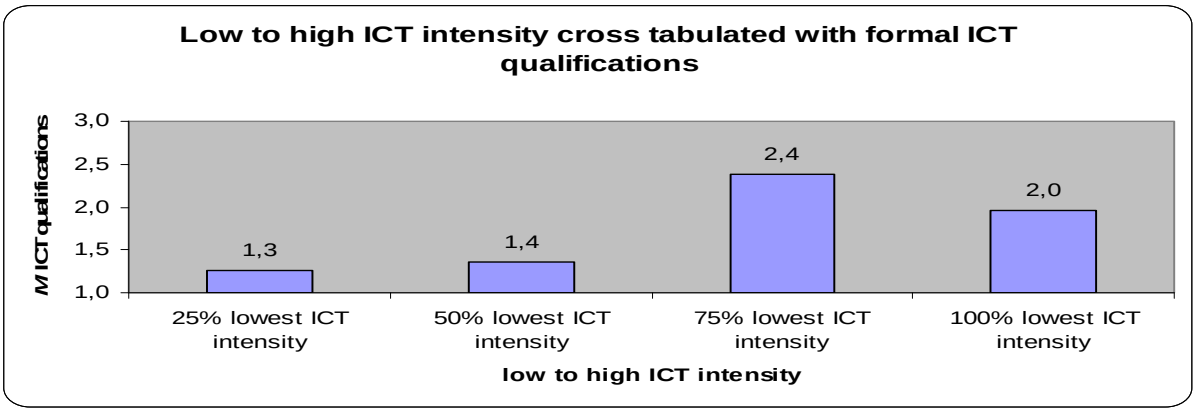

Diagram 17: Low to high ICT intensity cross tabulated with formal ICT qualifications

Diagram 17 shows the distribution of formal ICT competence between the four ICT intensity groups. The most striking feature is that the group with the *second* highest ICT intensity has the *highest* formal ICT competence. So, what can the mean scores relating to *need access to ICT in sparetime* tell us about the difference between the four groups?

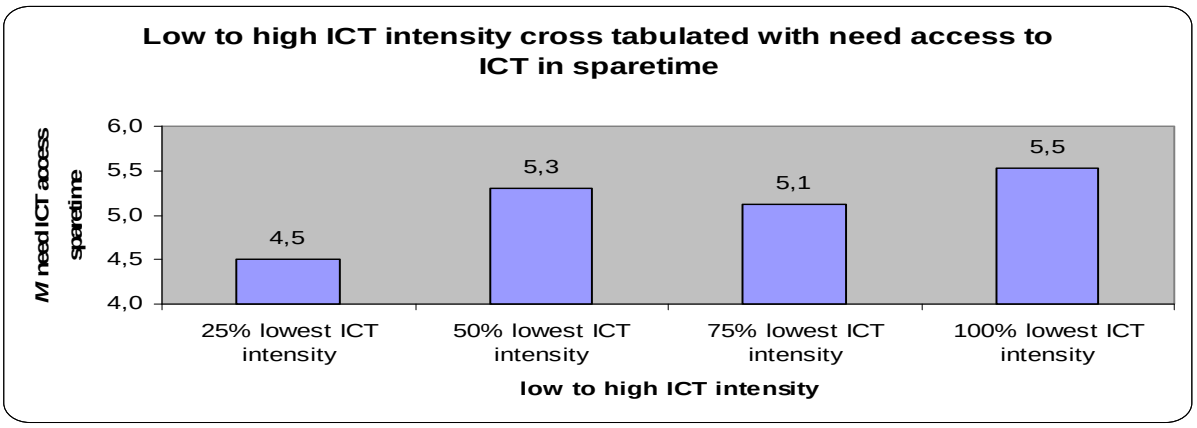

Diagram 18: Low to high ICT intensity cross tabulated with need access to ICT in sparetime

Diagram 18 shows the distribution of "need for ICT access in spare time" between the four ICT intensity groups. It is noteworthy that the group with the *second lowest* ICT intensity has the *second highest* need for spare time ICT access. Finally, what can the distribution of mean score on *self-perceived solid ICT competence* tell us about the group differences?

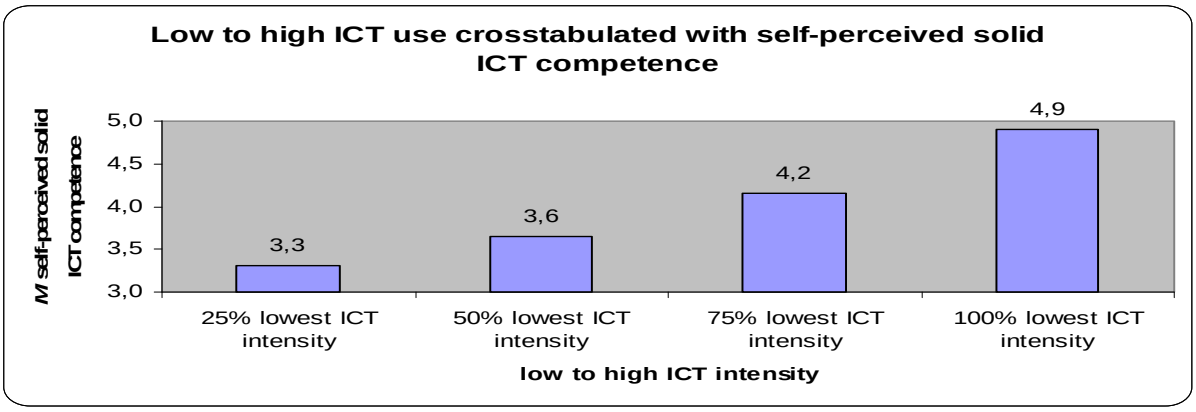

Diagram 19: Low to high ICT intensity cross tabulated with self-perceived solid ICT competence

Diagram 19 visualises the distribution of self-perceived solid ICT competence between the four ICT intensity groups. It clearly shows how self-perceived ICT competence corresponds closely with ICT intensity.

Based on the **results from step two**, we can conclude that both *formal ICT competence*, *need for ICT access in spare time*, and *self-perceived ICT competence* account for variance in EFL teachers' ICT intensity, and are therefore kept on for further analyses.

The third step involves checking the variables linked to the national curriculum for significant associations with EFL teachers' ICT intensity. The variables in question are the five basic skills (plus listening);

- *listening* (*M*=5,4; *SD*=0,6);
- *speaking* (*M*=5,4; *SD*=0,5);
- *writing* (*M*=5,2; *SD*=0,6);
- *reading* (*M*=5,2; *SD*=0,6);
- *calculation* (*M*=3,2; *SD*=0,9); and
- *digital competence* (*M*=4,2; *SD*=1,0).

Moreover, the three main areas in the national curriculum for English will be checked. These are;

- *language* (*M*=5,1; *SD*=0,6);
- *communication* (*M*=5,3; *SD*=0,6); and

- *culture, society and literature* (*M*=4,6; *SD*=0,8).

First, let us see whether some of the basic skills can account for significant differences between the four ICT intensity groups.

ANOVA

		df	Mean Square	F	Sig.
4.6.1: Basic skills: understanding oral Eng.	Between Groups	3	.768	2.184	.094
	Within Groups	110	.352		
	Total	113			
4.6.2: Basic skills: speaking Eng.	Between Groups	3	1.265	**4.969**	**.003**
	Within Groups	110	.255		
	Total	113			
4.6.3: Basic skills: writing Eng.	Between Groups	3	1.657	**5.136**	**.002**
	Within Groups	110	.323		
	Total	113			
4.6.4: Basic skills: reading Eng.	Between Groups	3	.478	1.310	.275
	Within Groups	110	.364		
	Total	113			
4.6.5: Basic skills: using calculation in Eng.	Between Groups	3	.967	1.043	.377
	Within Groups	110	.928		
	Total	113			
4.6.6: Basic skills: using digital tools in Eng.	Between Groups	3	12.622	**20.044**	**.000**
	Within Groups	110	.630		
	Total	113			

Diagram 20: ICT intensity (binned) and basic skills - ANOVA

Diagram 20 shows that there are significant differences between the four ICT intensity groups in relation to three of the basic skills, namely *speaking*, *writing* and *digital competence*. The most significant differences in mean values between the four ICT intensity groups are in relation to the basic skill *digital competence*, followed by *writing* and *speaking*. Having established that there are significant differences in mean values between the four ICT intensity groups, it is interesting to have a closer look at the actual differences in mean scores.

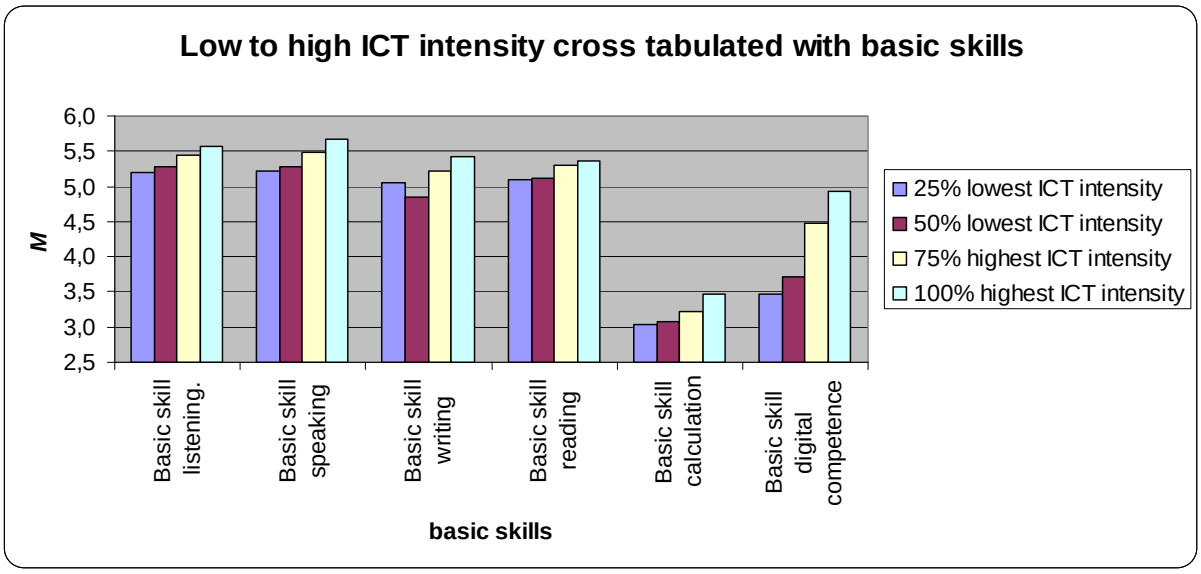

Diagram 21: Low to high ICT intensity cross tabulated with basic skills

Diagram 21 shows the distribution of mean scores on each basic skill seen in relation to the four ICT intensity groups. The distribution of mean scores clearly indicates that it is particularly in relation to the digital basic skills that the differences between the four groups are strong.

The emphasis EFL teachers put on different main areas as formulated in the national curriculum is also under scrutiny. So, are there any significant differences in mean scores between the four groups in relation to the three main areas?

ANOVA

		df	Mean Square	F	Sig.
4.5.1: Main areas in Eng.: language	Between Groups	3	.365	1.108	.349
	Within Groups	109	.329		
	Total	112			
4.5.2: Main areas in Eng.: communication	Between Groups	3	1.737	**4.817**	**.003**
	Within Groups	109	.361		
	Total	112			
4.5.3: Main areas in Eng.: culture, society and literature	Between Groups	3	.300	.494	.687
	Within Groups	109	.607		
	Total	112			

Diagram 22: : ICT intensity (binned) and main areas - ANOVA

Diagram 22 shows that when it comes to the three *main areas in the national curriculum for English*, there are significant differences between the four ICT intensity groups only in

relation to the main area *communication*. So, what can the mean scores tell us about the relationship between ICT intensity and the three main areas?

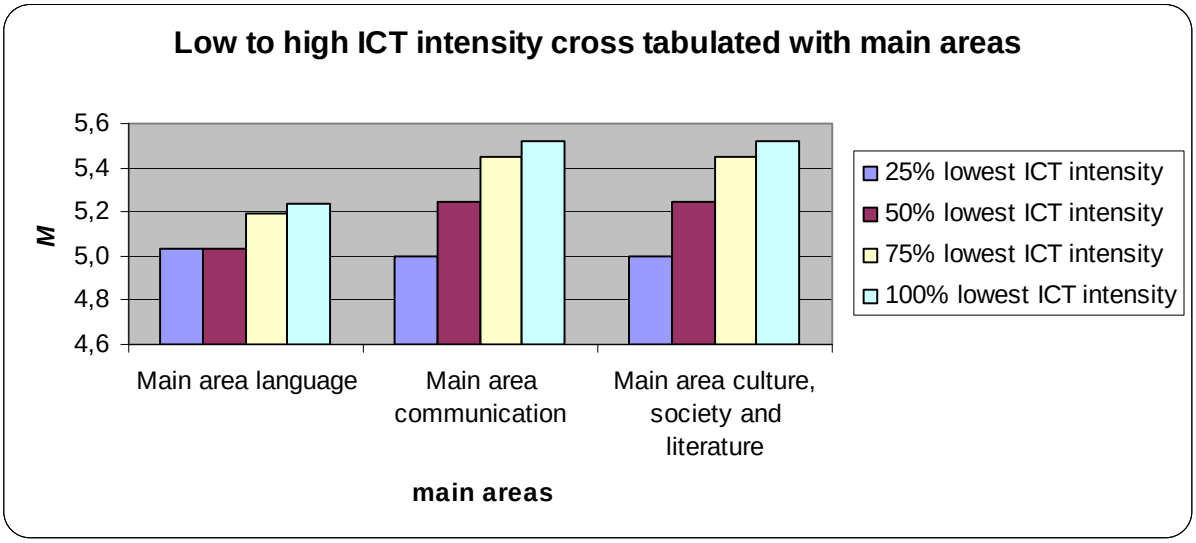

Diagram 23: Low to high ICT intensity cross tabulated with main areas

Diagram 23 shows the distribution of mean scores on each main area seen in relation to the four ICT intensity groups. It illustrates differences in mean scores on all the main areas, and only slightly more pronounced differences in relation to the main area communication. So, even if a difference of 0.5 points between the lowest and highest ICT intensity group I ssignificant, it does not seem to be very important in the system of ICT associated variables.

Based on the **results from step three**, we can conclude that the three basic skills *speaking*, *writing* and *digital competence*, and the main area *communication* account for variance in EFL teachers' ICT intensity, and are therefore kept on for further analyses.

The fourth step involves checking the indices expressing positive beliefs in ICTs in various ways for significant associations with EFL teachers' ICT intensity. The indices in question are *ICT general positive belief* (*M*=4,5; *SD*=0,9) and *ICT positive effects* (*M*=3,8; *SD*=0,8).

ANOVA

		df	Mean Square	F	Sig.
ICT Positive Effect	Between Groups	3	6.841	**13.787**	**.000**
	Within Groups	116	.496		
	Total	119			

ICT General Positive Belief	Between Groups	3	10.128	**19.881**	**.000**
	Within Groups	116	.509		
	Total	119			

Diagram 24: ICT intensity (binned) and ICT beliefs - ANOVA

The ANOVA analysis shown in diagram 24 reveals significant differences between the four ICT intensity groups in relation to both *positive ICT belief* indices. The most significant differences are in relation to *ICT general positive belief*. It is important to check the distribution of mean scores on each of these indices to reach deeper understanding of the identified associations. First, let us have a closer look at the *ICT positive effects* index.

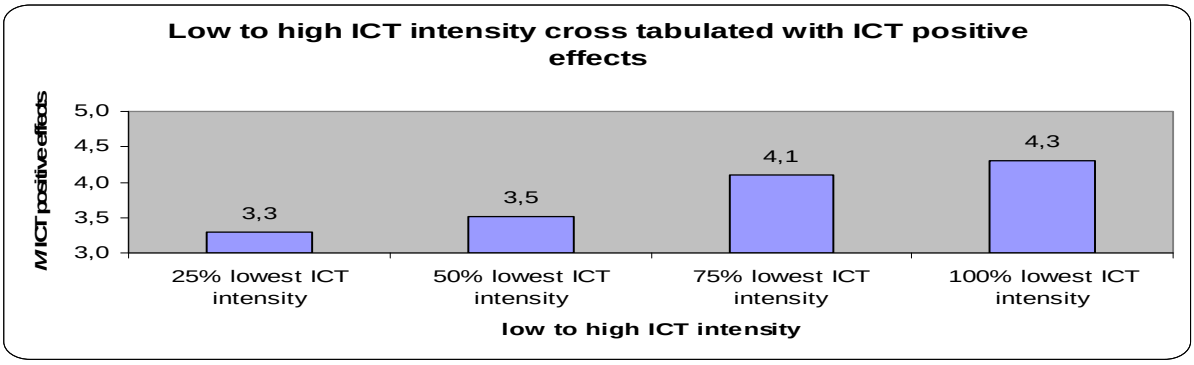

Diagram 25: Low to high ICT intensity cross tabulated with ICT positive effects

Diagram 25 clearly illustrates the positive relationship between ICT intensity and ICT positive effects. A mean value difference of 1.0 between the lowest and highest ICT intensity group tells us that the relationship is quite strong. Now, let us turn to the index ICT general positive belief.

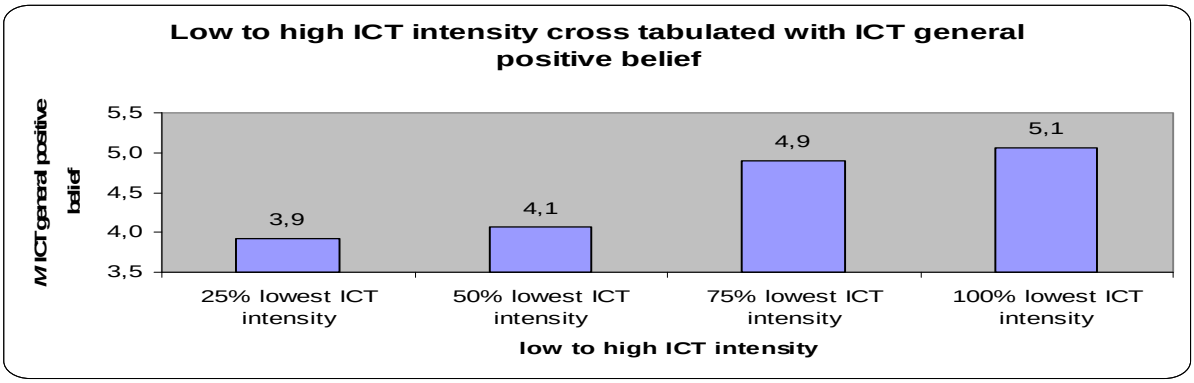

Diagram 26: Low to high ICT intensity cross tabulated with ICT general positive belief

Diagram 26 shows that the positive relationship between *ICT general positive belief* and *ICT intensity* is even stronger than for *ICT positive effects*. A mean difference of 1.2 implies the existence of a strong relationship between the two factors.

Based on the **results from step four**, we can conclude that the two indices *ICT general positive belief* and *ICT positive effects* account for variance in EFL teachers' ICT intensity, and are therefore kept on for further analyses.

The fifth step involves checking the scales linked to the subject specific elements of *self-perceived competence (SPC)*, *content and activities* and *organising teaching* for significant associations with EFL teachers' ICT intensity.

The four indices created on the basis of the *self-perceived competence (SPC)* scale are;

- *SPC Basic language skills* (*M*=5.63; *SD*=0.45)
- *SPC Language and assessment* (*M*=5.33; *SD*=0.51)
- *SPC Innovative planning* (*M*=5.22; *SD*=0.65)
- *SPC Facilitative teaching* (*M*=5.00; *SD*=0.70)

Let us first have a look at the ANOVA results for the four ICT intensity groups' relation to self-perceived competence (SPC).

ANOVA ICT intensity (binned) versus self-perceived competence indices

		df	Mean Square	F	Sig.
SPC Facilitative Teaching	Between Groups	3	1.080	**2.656**	**.052**
	Within Groups	110	.407		
	Total	113			
SPC Language and Assessment	Between Groups	3	.048	.175	.913
	Within Groups	110	.275		
	Total	113			
SPC Innovative Planning	Between Groups	3	2.718	**5.955**	**.001**
	Within Groups	110	.456		
	Total	113			
SPC Basic Language Skills	Between Groups	3	.159	.695	.557
	Within Groups	110	.229		
	Total	113			

Diagram 27: ICT intensity (binned) and Self-perceived competence (SPC) - ANOVA

Diagram 27 shows that there are significant differences between the four ICT intensity groups in relation to *SPC Innovative planning* and almost in relation to *SPC Facilitative teaching*. The most significant differences in mean values between the four ICT intensity groups are in relation to *SPC Innovative planning*. *SPC Language and assessment* and *SPC Basic language skills* do not account for variance in EFL teachers' ICT intensity. Access to the distribution of mean values adds to our understanding of the identified relationships, and is presented here.

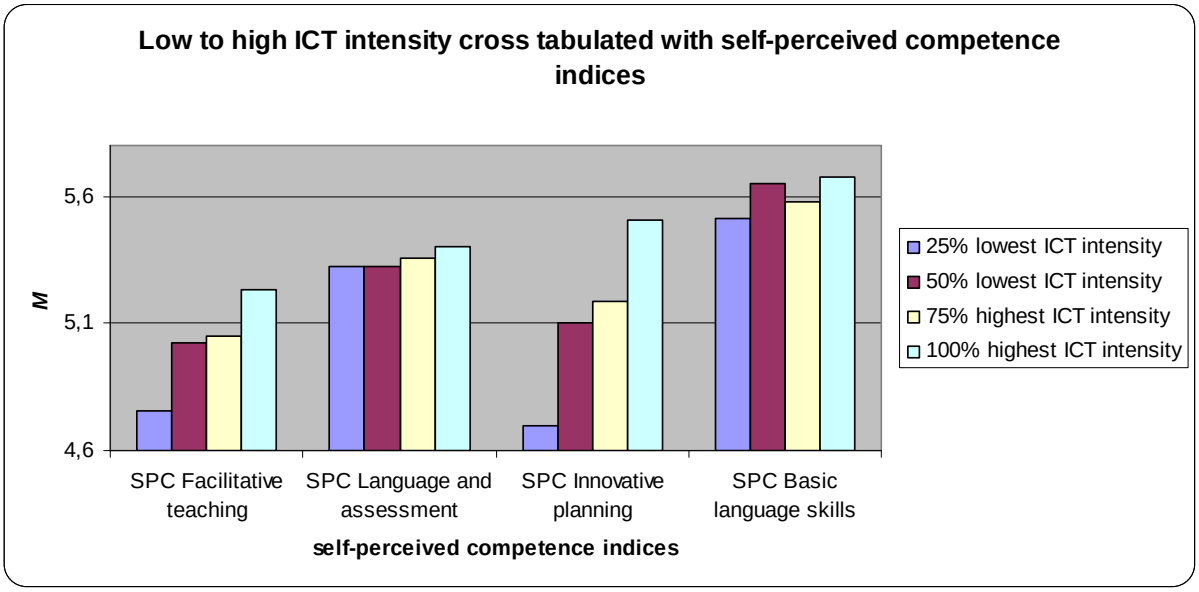

Diagram 28: Low to high ICT intensity cross tabulated with self-perceived competence

Diagram 28 visualises the relationships found between each SPC index and the four ICT groups. It shows clearly that the differences in mean scores are most pronounced in relation to innovative planning. It is also worth noting the consensus regarding the *language and assessment* and *basic language skills* indices between the four ICT intensity groups.

In chapter 3, five indices were computed on the basis of the underlying dimensions found in the content and activities scale. These were:

- *Core language* (*M*=4.83; *SD*=0.61)
- *Core accuracy and vocabulary* (*M*=4.70; *SD*=0.58)
- *Core meta-strategies* (*M*=4.30; *SD*=0.63)
- *Core civilization* (*M*=4.24; *SD*=0.73)

- *Core literature and art* (*M*=4.00; *SD*=0.83)

Are there any significant differences between the four ICT intensity groups in relation to any of these five content and activities indices?

ANOVA ICT intensity (binned) versus content and activities indices

		Sum of Squares	df	Mean Square	F	Sig.
Core Language Content and Activities	Between Groups	5,463	3	1,821	**5,505**	**,001**
	Within Groups	38,373	116	,331		
	Total	43,835	119			
Core Civilization Content and Activities	Between Groups	4,565	3	1,522	**3,091**	**,030**
	Within Groups	57,108	116	,492		
	Total	61,673	119			
Core Meta-Strategies Content and Activities	Between Groups	8,657	3	2,886	**7,361**	**,000**
	Within Groups	45,471	116	,392		
	Total	54,128	119			
Core Accuracy and Vocabulary Content and Activities	Between Groups	,766	3	,255	,761	,518
	Within Groups	38,915	116	,335		
	Total	39,681	119			
Core Literature and Art Content and Activities	Between Groups	7,020	3	2,340	**4,429**	**,005**
	Within Groups	61,278	116	,528		
	Total	68,298	119			

Diagram 29: ICT intensity (binned) and content and activities - ANOVA

Diagram 29 shows that there are significant differences between the four ICT intensity groups in relation to *Core language*, *Core civilization*, *Core meta-strategies*, and *Core literature and art*. This means that only *Core accuracy and vocabulary* is not associated with the ICT intensity of EFL teachers. The most significant differences in mean values between the four ICT intensity groups are in relation to *Core meta-strategies*. So, let us turn to the actual differences in mean values.

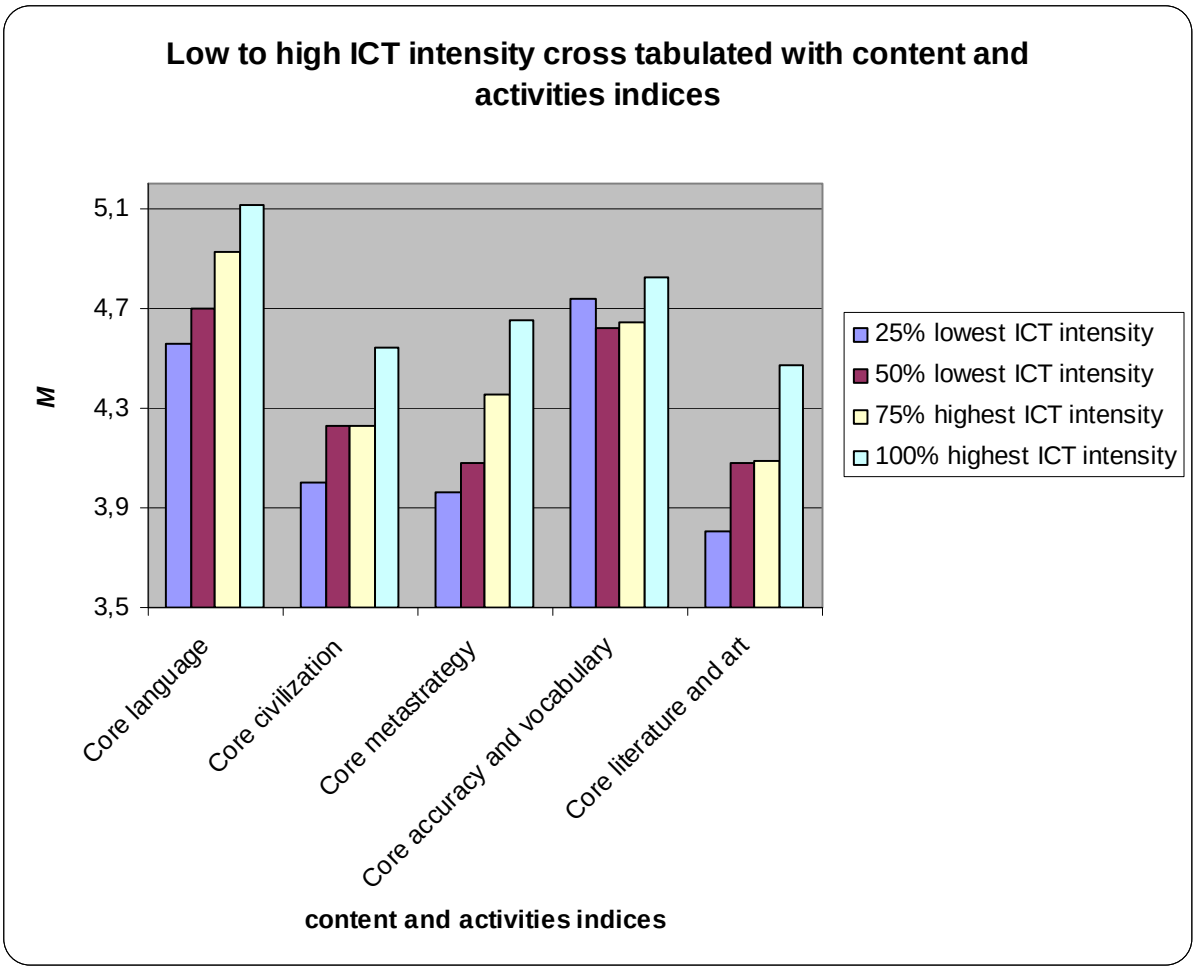

Diagram 30: Low to high ICT intensity cross tabulated with content and activities

Diagram 30 provides a clear picture of the way ICT intensity is associated with the four indices *Core language*, *Core civilization*, *Core meta-strategy*, and *Core literature and art*. It is also interesting to note the distribution of mean values in relation to *Core accuracy and vocabulary*, since the EFL teachers with the lowest ICT intensity clearly prioritise the kind of content and activities expressed in that index.

In chapter 3, the creation of three additive indices based on the underlying patterns identified in teachers' answers on the organising teaching scale, were accounted for. These are:

- *Coaching* (*M*=4.64; *SD*=0.49)
- *Directing* (*M*=4.42; *SD*=0.52)
- *Facilitating* (*M*=3.08; *SD*=0.76)

Let us turn to how these three indices are associated with EFL teachers' ICT intensity, by looking closer at the results from the ANOVA analysis.

ANOVA ICT intensity (binned) versus organising teaching indices

		Sum of Squares	df	Mean Square	F	Sig.
Organising Teaching Coaching	Between Groups	3,291	3	1,097	**4,904**	**,003**
	Within Groups	24,605	110	,224		
	Total	27,896	113			
Organising Teaching Facilitating	Between Groups	12,607	3	4,202	**9,189**	**,000**
	Within Groups	51,679	113	,457		
	Total	64,286	116			
Organising Teaching Directing	Between Groups	,667	3	,222	,799	,497
	Within Groups	30,901	111	,278		
	Total	31,568	114			

Diagram 31: ICT intensity (binned) and organising teaching - ANOVA

The ANOVA analysis shows that there are significant differences between the four ICT intensity groups in relation to both *Coaching* and *Facilitating*, but not in relation to the index *Directing*. This index is thus not associated with the ICT intensity of EFL teachers. The most significant differences in mean values between the four ICT intensity groups are in relation to *Facilitating*. Having established that there are significant differences, let us have a look at the actual mean values.

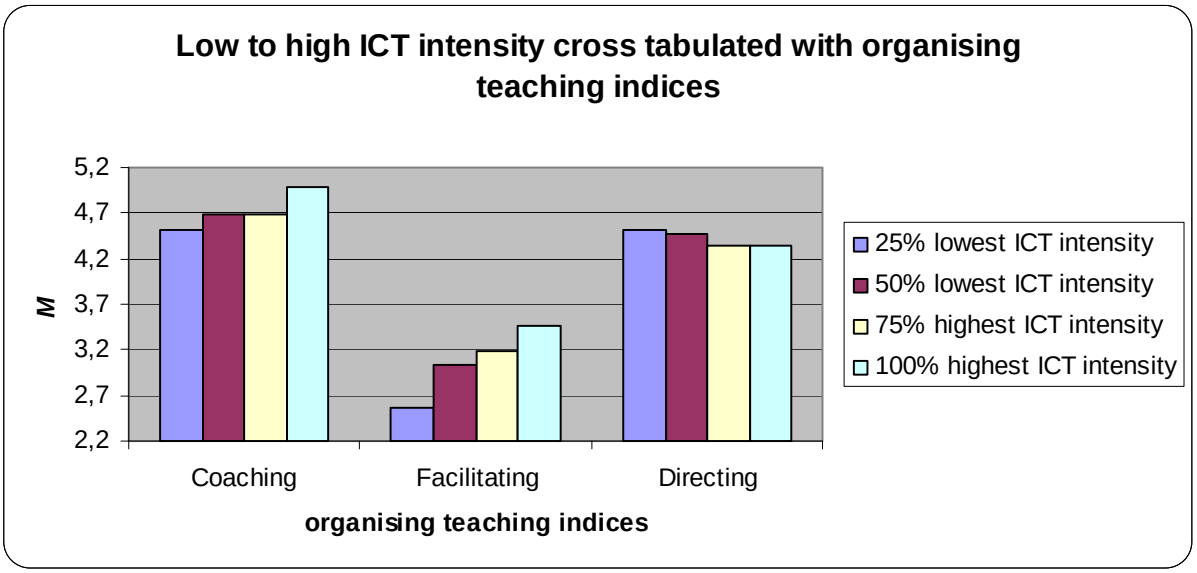

Diagram 32: Low to high ICT intensity cross tabulated with organising teaching

Diagram 32 clearly illustrates the the fairly strong positive relationship between *ICT intensity* and *organising teaching facilitating*, with a difference in mean score of 0.9. It also reveals that *organising teaching coaching* is fairly modestly associated with ICT intensity, even though the differences in mean values are deemed significant.

Based on the **results from step five**, we can conclude that the self-perceived competence indices *SPC Innovative planning* and *SPC Facilitative teaching*, the content and activities indices *Core language*, *Core civilization*, *Core meta-strategies*, and *Core literature and art*, and the organising teaching indices *Coaching* and *Facilitating* all account for variance in EFL teachers' ICT intensity, and are therefore kept on for further analyses.

The outcome of the five steps of ANOVA analyses is that we have separated the variables which are associated with ICT intensity from the ones that are not. In other words, we are closer to identifying the system of associations that can provide information about ICT related differences between EFL teachers. Here is the list of variables kept on for further analyses:

- *Formal ICT competence*
- *Need for ICT access in spare time (informal ICT competence)*
- *Self-perceived solid ICT competence (informal ICT competence)*
- *Basic skill speaking*
- *Basic skill writing*
- *Basic skills digital competence*
- *Main area communication*
- *ICT general positive belief*
- *ICT positive effects*
- *SPC Innovative planning*
- *SPC Facilitative teaching*
- *Content and activities Core language*
- *Content and activities Core civilization*
- *Content and activities Core meta-strategies*

- *Content and activities Core literature and art*
- *Organising teaching Coaching*
- *Organising teaching Facilitating*

Determining bivariate correlations and identifying the 'cloud of correlations'

The ANOVA results provided a list of variables associated with *ICT intensity*. Even though the diagrams provided a general picture of the nature of the identified relationships, the *strength of association* was not elaborated on in detail. So, in the following I will try to fine-tune and refine the general image of the identified associations.

In order to use the statistical analysis technique ANOVA, the continuous variable ICT intensity was transformed into a categorical variable consisting of four groups. ANOVA could then be used to investigate whether there were significant differences in mean values between these four groups in relation to different independent variables. Bivariate correlation analysis, on the other hand, is used to describe the strength and direction of the relationship between two *continuous* variables. So, when using correlation analysis, the variable ICT intensity is in its original, continuous state.

In order to obtain a measure of the strength and direction of the relationship, each variable on the list from the ANOVA analyses is correlated with *ICT intensity*.

Correlations

		ICT Intensity
ICT Intensity	Pearson Correlation	1.000
	Sig. (2-tailed)	
	N	121
4.6.6: Basic skills: using digital tools in Eng.	Pearson Correlation	**.677****
	Sig. (2-tailed)	.000
	N	121
ICT General Positive Belief	Pearson Correlation	**.574****
	Sig. (2-tailed)	.000
	N	120
ICT Positive Effects	Pearson Correlation	**.535****
	Sig. (2-tailed)	.000
	N	120
Core Meta-Strategies	Pearson Correlation	**.493****

	Sig. (2-tailed)	.000
	N	120
Organising Teaching Facilitating	Pearson Correlation	**.471****
	Sig. (2-tailed)	.000
	N	117
2.6.2: My total ICT competence is solid	Pearson Correlation	**.443****
	Sig. (2-tailed)	.000
	N	121
SPC Innovative Planning	Pearson Correlation	**.436****
	Sig. (2-tailed)	.000
	N	121
4.5.2: Main areas in Eng.: communication	Pearson Correlation	**.420****
	Sig. (2-tailed)	.000
	N	120
Core Literature and Art Content and Activities	Pearson Correlation	**.396****
	Sig. (2-tailed)	.000
	N	120
2.6.1: Need access to ICTs in my spare time	Pearson Correlation	**.378****
	Sig. (2-tailed)	.000
	N	119
4.6.2: Basic skills: speaking Eng.	Pearson Correlation	**.350****
	Sig. (2-tailed)	.000
	N	121
Core Language Content and Activities	Pearson Correlation	**.349****
	Sig. (2-tailed)	.000
	N	120
SPC Facilitative Teaching	Pearson Correlation	**.340****
	Sig. (2-tailed)	.000
	N	121
Core Civilization Content and Activities	Pearson Correlation	**.330****
	Sig. (2-tailed)	.000
	N	120
Organising Teaching Coaching	Pearson Correlation	**.306****
	Sig. (2-tailed)	.001
	N	114
ICT ed. level	Pearson Correlation	**.285****
	Sig. (2-tailed)	.002
	N	117
4.6.3: Basic skills: writing Eng.	Pearson Correlation	**.232***
	Sig. (2-tailed)	.010
	N	121

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

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

Diagram 33: ICT intensity correlated with identified ICT associated variables

Diagram 33 shows a rank order of the significant positive correlations, and corroborates thereby the results obtained from the ANOVA analyses. A correlation coefficient of *r*=>.3 is deemed strong in educational research, so there are several *very strong* associations between individual variables in the system of ICT associated variables and *ICT intensity*. A case in point is the very strong association existing between emphasising the development of pupils' digital skills as defined in the national curriculum and *ICT intensity*. A correlation coefficient of *r*=.68 equals a shared variance between *ICT intensity* and *digital basic skills* of more than 46 percent. Also two ICT attitude-related variables show very strong associations with *ICT intensity*. Remarkably, as many as *ten* of the identified factors in the system of associated variables showing correlation coefficients of at least *r*=.3, are intimately connected with the teaching of EFL. In other words, there are as many as *ten EFL subject specific variables* that are closely associated with ICT intensity.

A weakness with bivariate correlation analysis, however, is that isolated pairs of variables are analysed separately from other variables. Urie Bronfenbrenner is famous for his resistance to this kind of splitting up of reality for research purposes. His view was that in messy, real world situations, such as teaching EFL with ICT for lower secondary pupils, each variable is affected by every other variable. "[T]he explanations for what we do are to be found in interactions between characteristics of people and their environments, past and present (…)." (Bronfenbrenner, 1979). In other words, he believed that the main effects are to be found in the interactions between all the variables in a particular context; they are properties of systems. Following the logic of Bronfenbrenner, we need to acknowledge the existence of *ecologies of variables* in order to ask the good questions, gather the appropriate data, conduct the right analyses, and reach sensible conclusions.

Here, I will try to show the interrelationships (or relative distances) between the variables by using a statistical technique called multidimensional scaling (PROXSCAL). On the basis of the intercorrelations identified between all the variables, this technique creates an image depicting the complex relationships. So, variables that are close together have more in common than variables far apart.

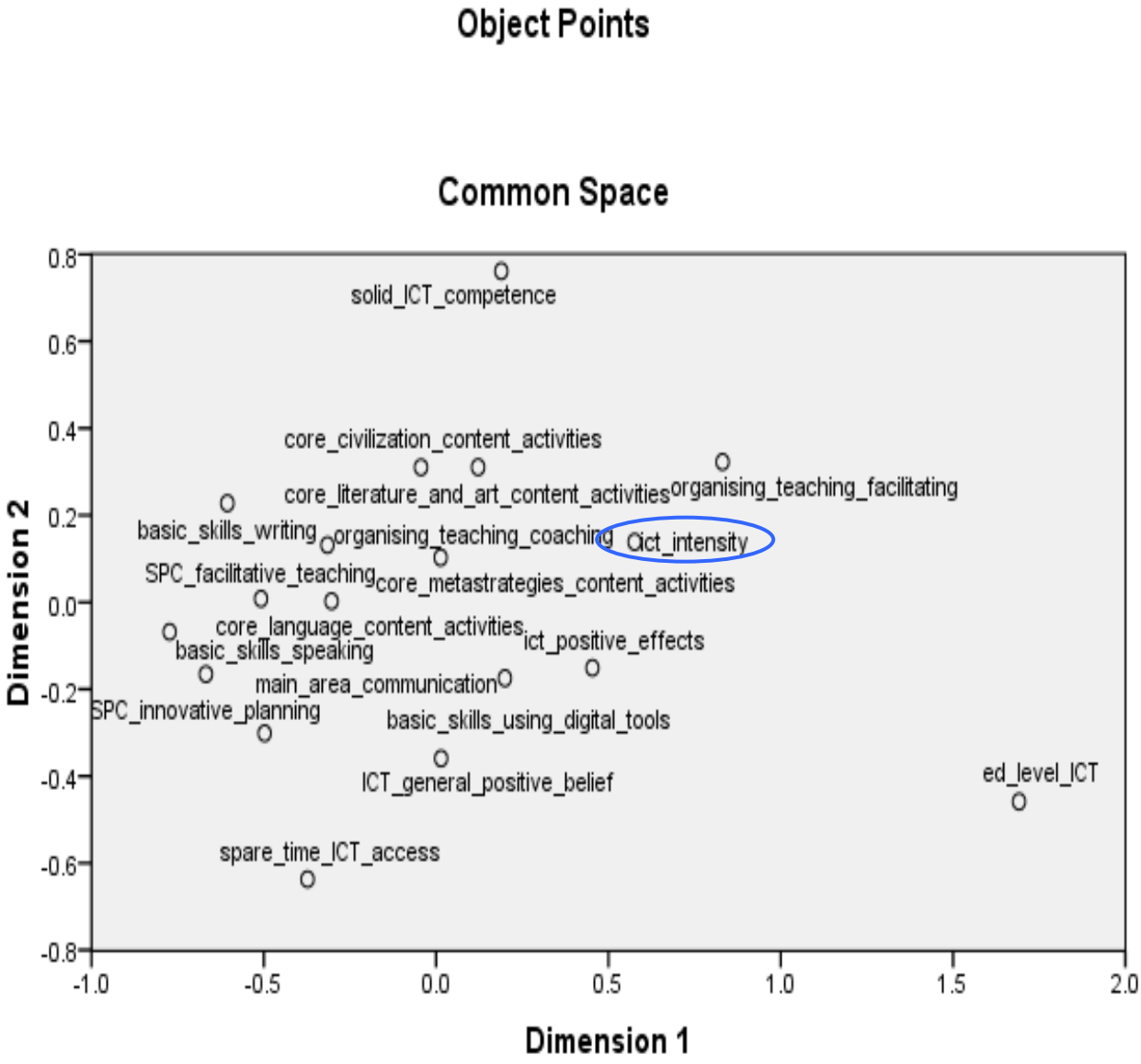

Diagram 34: Multidimensional scaling (PROXSCAL) – all variables in system of ICT associations

Diagram 34 shows that most variables cluster around the center of the image, signifying that they are closely associated with one another. The variable *formal ICT competence (ed_level_ICT)*, however, does not join the cluster of variables, and thus does not seem to have much in common with the other variables. The variable is shown to be peripheral to the system of variables explored in relation to *ICT intensity*, and the bivariate correlation analysis displays only a weak, but significant positive correlation of .285. Combined, these results suggest that formal ICT qualifications do not influence the use of ICTs in EFL classes to

any great extent. The variable is therefore excluded from further analyses, and we can conclude that it does not play a central role in the system of ICT associated variables. The basic skill *writing* does have a central position in the system of variables, but shows such a weak correlation (*r*=.232*) with *ICT intensity* that it is also excluded from new analyses. All the other variables show positive correlations with ICT intensity of *r*=.3 or stronger, and are central variables in the 'cloud of correlated events' as shown in diagram 34 above.

Determining the predictive strength of the identified system of ICT-related variables

Using both analyses of variance (ANOVA) and analyses of relationships between variables (bivariate correlation), as well as the multivariate analysis multidimensional scaling, a set of variables are retained for their close relationship with the variable *ICT intensity*. This set of variables can be understood as a *model for the prediction of ICT intensity among EFL teachers*, i.e. together they can account for much of the variance in EFL teachers' use of ICT. In practical terms this means that by knowing the scores of EFL teachers on the variables constituting the model, one should be able to predict their ICT intensity with some degree of accuracy. However, the strength of the model, i.e. *how much* of the variance in *ICT intensity* it can account for, is not yet analysed. In order to do that, one needs to conduct a standard multiple regression.

While bivariate correlation shows the relationship between two variables, *standard multiple regression* is used to explore the relationship between one continuous dependent variable (e.g*. ICT intensity*) and a number of independent variables or predictors (e.g. the variables constituting the system of ICT associated variables). Multiple regression is based on correlation, but opens for more advanced investigation of the interrelationship among a set of variables. As mentioned, this "makes it ideal for the investigation of more complex real-life, rather than laboratory-based, research questions" (Pallant, 2007):146. At this particular juncture, the purpose of using standard multiple regression is to explore:

- how well *the identified set of variables* is able to predict *ICT intensity*; and
- whether particular predictor variables are still able to predict an outcome when the effects of the other variables are *controlled for*.

In standard multiple regression all the independent (or predictor) variables are entered into the equation at the same time, and each is evaluated in terms of its predictive power, over and above that offered by all the others.

> "You would use this approach if you had a set of variables (…) and wanted to know how much variance in a dependent variable (…) they were able to explain as a group (…). This approach would also tell you how much unique variance in the dependent variable each of the independent variables explained" (Pallant, 2007): 147.

When running a regression analysis one would like to know how much of the variance in the dependent variable is explained by the independent variable, in other words one would like to know how good the model is. Looking at the results, R squared provides information about the amount of variance in the dependent variable (*ICT intensity*) which is accounted for by the set of independent variables. By multiplying the R-squared with 100, you get the measure expressed in percentage. So, the R-squared x 100 shows the per cent of variance of the dependent variable (ICT-intensity) predicted by the set of independent variables.
In other words, the higher the R-squared, the better the model, i.e. the higher the R-squared, the more variations in the dependent variable (ICT-intensity) are explained by the independent variables. So, what does the multippel regression analysis tell us regarding the model based on the system of ICT associated variables?

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.823[a]	**.677**	**.627**	.47418

a. Predictors: (Constant), Organising Teaching Facilitating, 2.6.2: My total ICT competence is solid, Core Literature and Art Content and Activities, 4.6.2: Basic skills: speaking Eng., ICT General Positive Belief, 2.6.1: Need access to ICTs in my spare time, SPC Innovative Planning, Organising Teaching Coaching, Core Civilization Content and Activities, 4.5.2: Main areas in Eng.: communication, ICT Positive Effects, Core Language Content and Activities, 4.6.6: Basic skills: using digital tools in Eng., SPC Facilitative Teaching, Core Meta-Strategies Content and Activities

Diagram 35: Model summary standard multippel regression – system of ICT associated variables

The results show that, in this case, the set of independent variables accounts for nearly 68 per cent of the variance in the dependent variable (*ICT intensity*). This result suggests that

the model is very good indeed as compared to some of the results reported in the journals (Pallant, 2007): 158. To assess the significance of the result, it is necessary to look at diagram 36 labelled ANOVA.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.788	15	3.053	**13.576**	**.000[a]**
	Residual	21.810	97	.225		
	Total	67.598	112			

a. Predictors: (Constant), Organising Teaching Facilitating, 2.6.2: My total ICT competence is solid, Core Literature and Art Content and Activities, 4.6.2: Basic skills: speaking Eng., ICT General Positive Belief, 2.6.1: Need access to ICTs in my spare time, SPC Innovative Planning, Organising Teaching Coaching, Core Civilization Content and Activities, 4.5.2: Main areas in Eng.: communication, ICT Positive Effects, Core Language Content and Activities, 4.6.6: Basic skills: using digital tools in Eng., SPC Facilitative Teaching, Core Meta-Strategies Content and Activities

b. Dependent Variable: ICT Intensity

Diagram 36: Significance level multippel regression – system of ICT associated variables

The ANOVA shows that the result is strongly significant (sig.=.000 really means p<.0005, so the odds that the finding is the result of chance are one to 50 000).

Let us also check whether particular predictor variables are still able to predict an outcome when the effects of the other variables are *controlled for*. This means that all the variance of *ICT intensity* explained by the combined intercorrelations of all the variables are cancelled out, leaving only the *unique contribution of each individual variable* over and above that of the others. In order to find out, the coefficients table needs to be analysed.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.688	.656		-1.050	.297
	2.6.1: Need access to ICTs in my spare time	.055	.049	.077	1.121	.265
	2.6.2: My total ICT competence is solid	.082	.043	.145	1.889	.062
	4.5.2: Main areas in Eng.: communication	-.041	.102	-.033	-.406	.686
	4.6.2: Basic skills: speaking Eng.	.101	.112	.069	.904	.368
	4.6.6: Basic skills: using digital tools in Eng.	.246	.068	**.310**	**3.629**	**.000**

SPC Facilitative Teaching	-.107	.103	-.092	-1.038	.302
SPC Innovative Planning	.125	.085	.117	1.471	.144
ICT General Positive Belief	.151	.076	**.168**	**1.991**	**.049**
ICT Positive Effects	.134	.079	.140	1.698	.093
Core Language Content and Activities	-.036	.112	-.028	-.323	.747
Core Civilization Content and Activities	-.031	.086	-.029	-.358	.721
Core Meta-Strategies Content and Activities	.158	.107	.136	1.472	.144
Core Literature and Art Content and Activities	.181	.091	**.176**	**2.002**	**.048**
Organising Teaching Coaching	-.167	.120	-.106	-1.386	.169
Organising Teaching Facilitating	.193	.072	**.187**	**2.681**	**.009**

a. Dependent Variable: ICT Intensity

Diagram 37: Coefficients multippel regression – system of ICT associated variables

The variables with the highest standardised coefficients in diagram 37 (ignoring any negative signs in front), are the ones that make the strongest unique contribution to explaining the dependent variable, when the variance explained by all the others as controlled for (Pallant, 2007):159. If we include only the variables making a statistically unique (sig.=<.05) contribution to explanining the dependent variable, we are left with four particularly salient variables. These are (rank order):

1) Basic skills: using digital tools in EFL (t=3.629, sig.=.000)
2) Organising Teaching Facilitating (t=2.681, sig.=.009)
3) Core Literature and Art Content and Activities (t=2.002, sig.=.048)
4) ICT General Positive Belief (t=1.991, sig.=.049)

Chapter 5: Discussion

This chapter starts out with a brief and focussed recapitulation of the main findings related to the two research questions posed in this study. On that basis, there is a theoretically informed discussion about what the quantitative findings can and cannot tell us about EFL teachers' 'theory of practice', followed by an elaboration of possible methodological consequences of the experience with the use of a qualitative concept like 'theory of practice' in a quantitative study.

Recapitulation of main findings

In the introduction, the overarching research objective was presented as being "to determine EFL teachers' actual use of ICTs, and identify the system of associated variables that can help explain what is characteristic about EFL teachers with high ICT-intensity". Two research questions were posed:

1. What characterises the use of ICTs in EFL classrooms, and what attitudes and knowledge do EFL teachers have regarding new technologies?

2. How is EFL teachers' reported ICT use associated with;
    a. their knowledge about ICT and their thoughts relating to the usefulness of and experiences with technology; and
    b. their background, subject specific priorities and qualifications?

Findings related to research question one

I will sum up the results relating to the first research question by looking at the descriptive findings through the lens of the conceptual and theoretical frameworks presented in chapter 2. First, it is clear that the use of *general tools* or *tool-based software* such as *word processors* and *presentation tools* is characteristic for ICT use in EFL classrooms. Especially teachers using ICT a lot for production and information management (IPIM-teachers), tend to let pupils use these tools to present their work for the teacher and the rest of the class. Teachers more inclined to use ICT for drill and practice (IDAP-teachers), on the other hand,

put less emphasis on the use of word processors and presentation tools. IDAP-teachers are more apt than IPIM teachers to use the presentation tools themselves, and less apt to let the pupils use them in their work. Similarly, IPIM-teachers let pupils use general web-resources for *online research*, whereas IDAP-teachers lean towards the use of more *subject specific web-resources and software* for the practice of grammar and civilization. When it comes to the use of *teacher tools*, the results show that IPIM-teachers, but not IDAP-teachers, use LMS and digital portfolios fairly often. *Communication tools* are rarely used by EFL-teachers in general.

In terms of the broad learning theories – behaviourism, cognitivism and constructivism – the overall tendencies suggest that IPIM-teachers are influenced by (social) constructivist ideas regarding the use of ICT in EFL classrooms. The open-ended use of general Internet resources, pupils' use of presentation tools and word processors, and fairly frequent use of LMS and digital portfolios all point in that direction. Still, it is important to keep in mind the considerable overlap between IPIM and IDAP-teachers. Yet, both the use of *subject-specific software* and *web-resources*, and *teacher-led* use of presentation tools, seem to suggest that IDAP-teachers lean more towards behaviourist and cognitivist models of learning and teaching.

EFL teachers in general have little or no formal qualifications in ICT. More than 90 percent of the respondents have 30 credits or less. However, this does not prevent them from reporting high levels of confidence in their ability to make use of ICTs. Around 70 percent regard their ICT competence as solid, and more than 90 percent say they need access to ICTs in their spare time. Nearly 80 percent claim they have few or no difficulties when it comes to learning how to use new digital tools, and almost 70 percent feel confident that they can make the most of digital tools' potential. High mean values and low *SD* values show that most EFL teachers share this view.

The findings show that EFL teachers in general have more faith in positive than negative effects of ICT. First and foremost, they appreciate the new opportunities that are available on the web, and see them as an enrichment of their current practice. Similarly, a majority of EFL teachers agree that ICTs make it possible for them to reach new objectives which are

positive for the teaching of EFL. The majority even deem that the use of ICTs is contributing positively to the attainment of traditional goals. Still, there is a clear tendency among EFL teachers to view ICTs as valuable, but not essential, for pupils' achievement. The findings suggest that most EFL teachers regard other factors in the educational context as far more important than ICTs in relation to the enhancement of pupils' skills and knowledge.

Findings related to research question two

In the effort to reach an answer to research question two, all variables – both ICT related and general – were in chapter 4 analysed to determine their relationship with EFL teachers' use of new technologies. All variables found to share a significant association with *ICT intensity* were included in a model of the system of ICT associated variables. Among the *ICT related* variables included in this model, were (rank order of significance):

- *Basic skills digital competence*
- *ICT general positive belief*
- *ICT positive effects*
- *Self-perceived solid ICT competence (informal ICT competence)*
- *Need for ICT access in spare time (informal ICT competence)*

All of these variables are very strongly or strongly correlated with EFL teachers' ICT intensity. Surprisingly, *formal ICT competence* is not on the list. The variable shows only a weak, though significant, correlation coefficient of r=.285 with *ICT intensity*. In other words, there is not a strong connection between EFL teachers' formal ICT qualifications and their ICT intensity, indicating that formal schooling in ICT has so far not led to a significant increase in the use of new technologies among EFL teachers. *Informal* ICT competence, on the other hand, is significantly associated with EFL teachers' frequency of ICT use.

The *general variables* showing significant associations with ICT intensity, were (rank order of significance):

- *Content and activities Core meta-strategies*
- *Organising teaching Facilitating*
- *SPC Innovative planning*

- *Main area communication*
- *Content and activities Core literature and art*
- *Basic skill speaking*
- *Content and activities Core language*
- *SPC Facilitative teaching*
- *Content and activities Core civilization*
- *Organising teaching Coaching*

All of these variables are strongly correlated with *ICT intensity* (*r*=>.3), and are thus part of the model of the system of ICT associated variables. It is noteworthy that as many as ten subject specific variables are on this list, suggesting that EFL teachers' subject specific priorities have major impact on their use of ICTs. General variables *without* significant positive association with ICT use include EFL teachers' age, gender, education (English) and teaching experience. It is interesting to note that ICT intensity is not linked to EFL teachers' formal qualifications in English, suggesting that EFL teachers with no formal qualifications and teachers with master degrees have the same overall ICT intensity. One would expect that EFL teachers with a master's degree would have a deeper and better understanding of the particularities of the subject, and were thus in a better position to make choices regarding the appropriate use of ICT in EFL teaching. By focussing solely on ICT intensity, the differences in the *quality* of the ICT use are not captured. Frequency of use should therefore not be used as a measure of quality.

The predictive strength of the model consisting of all the variables with a positive correlation with *ICT intensity* of at least *r*=.3 were tested using multippel regression analysis. The set of independent variables accounted for nearly 68 per cent of the variance in the dependent variable (*ICT intensity*). This finding suggests that the predictive strength of the model is very strong indeed; only 32 percent of the variance in the respondents' answers to the items constituting the additive index *ICT intensity*, is *not* accounted for. The variables that make the strongest *unique* and *statistically significant* contribution to explaining the dependent variable (*ICT intensity*), when the variance explained by all the others is controlled for, include; a) emphasis on the digital basic skill as formulated in the national curriculum; b)

enphasis on facilitative teaching; c) emphasis on literature and visual expressions; and d) a general belief in the positive influence of ICT on learning.

EFL teachers with high ICT intensity – common elements in their theory of practice

In chapter two, theory of practice was presented as the theoretical framework for the elaboration of the findings to research question two. Theory of practice was defined as "a person's private, interconnected, continuously changing system of knowledge, experiences, and values which influence a person's teaching practice at a given point in time" (Lauvås & Handal, 1990). Theory of practice has come up in the public debate regarding the use of ICT in education, as mentioned in the introduction. The directorate of education pointed out that teachers' lack of awareness of their theory of practice might be the reason why some teachers resisted the integration of new technologies in their teaching. Lektorlaget, on the other hand, noted that resistance to ICTs might as well stem from a well-developed awareness of their theory of practice.

As mentioned in chaptertwo, by using theory of practice as a theoretical point of reference, one highlights the ecology or *system of associations* of which EFL teachers' use of ICTs is a part. ICT use is thus seen as a component of a larger and more complex system of factors where teachers' actions, values and rationales are acknowledged. The conceptual framework was deemed open-ended enough to be appropriate for an exploratory investigation of a range of variables, and still focussed enough to be appropriate for putting the findings into an overarching theoretical framework which will make the findings meaningful, interesting and relevant.

EFL teachers with high ICT intensity share many characteristics with other EFL teachers. There is a general consensus among nearly all EFL teachers that the most important subject specific objectives are the development of pupils' language skills and their knowledge of language. Nearly all EFL teachers also report that they have few problems organising teaching for the purpose of developing pupils' language skills and knowledge. There is also a high degree of consensus regarding the most appropriate ways to organise EFL teaching. So,

it is mainly in connection with more peripheral aims and objectives that EFL teachers with high ICT intensity differ from their colleagues. The common features of their theories of practice are identified in the system of ICT associated variables and include, as mentioned before, the following variables:

- *Basic skills digital competence*
- *ICT general positive belief*
- *ICT positive effects*
- *Self-perceived solid ICT competence (informal ICT competence)*
- *Need for ICT access in spare time (informal ICT competence)*
- *Content and activities Core meta-strategies*
- *Organising teaching Facilitating*
- *SPC Innovative planning*
- *Main area communication*
- *Content and activities Core literature and art*
- *Basic skill speaking*
- *Content and activities Core language*
- *SPC Facilitative teaching*
- *Content and activities Core civilization*
- *Organising teaching Coaching*

From these findings it is hard to determine whether they are more or less "aware" of their theories of practice than other EFL teachers. It is probably more constructive to talk about the existence of different sets of theories of practice relating to different ways to make use of ICTs. One factor that might be a challenge for the high ICT intensity teachers, is the strong emphasis they put on the national curriculum and the development of pupils' ability to use digital tools. If this is seen as an objective in and of itself, it might distract attention from the attainment of central subject specific aims, particularly among EFL teachers without proper formal qualifications in English. Also, there is a danger that the selection of classroom activities is based on what is available in digital form, rather than on sound educational rationale. The more frequent use of project work and other approaches to EFL teaching which emphasise a facilitative teacher role, might also be less efficient in terms of reaching

measurable skills and knowledge (Hattie, 2009). However, as (Lund, 2004) points out, they might reach new and equally valuable objectives.

Theory of practice is a concept used to understand *individual teachers' practice* by looking at their unique and sometimes contradictory values and rationales. In many ways it is a *qualitative* concept in the sense that the focus is on understanding intricate individual processes not easily captured via quantitative research approaches. Still, 'theory of practice' was deemed fit to serve as a conceptual framework for the current study, due to the way it conceptualises the relationship between *actions* and *principles for actions*. The current study highlights certain variables in the educational ecology which have a bearing on EFL teachers' use of ICT. The individual EFL teacher's practice cannot be seen as separate from the social, historical and cultural context it is part of. So, even if theory of practice is a model intimately linked to individual actions and characteristics "er det gitt at den formes og utvikles i stadig interaksjon med miljøet rundt oss. PYT [praktisk yrkesteori] er forankret i vårt kjønn, vår sosial tilhørighet osv. slik dette har nedfelt seg i vår biografi. Arbeider vi sammen med de samme menneskene over lengre tid, vil våre individuelle PYT'er påvirkes av dette. Vi er ikke bare individualister, vi er også bærere av en felles kultur" (Lauvås & Handal, 1990): 115. The characteristics of quantitative approaches can be said to support the identification of these common traits.

It might be that quantitative explorations should aim at identifying *patterns of practice*; a refinement or adaption of the original *theory of practice* as developed by (Lauvås & Handal, 1990). Patterns of practice might be a more suitable term, as it highlights the shared properties of certain professional characteristics. A tentative definition of could be "the development and convergence of certain shared professional principles which generate and organise practices".[27]

By using this adapted, aggregated version of theory of practice, the attention is directed away from the teacher as an individual, autonomous social agent, towards his culturally and socially shaped professional principles which help generate and organise practices among communities of teachers. By placing too much emphasis on the individual teacher, the

[27] The idea is based on Bourdieu's concept of *habitus*. See (Lizardo, 2004).

salient systems of associations are not readily accessible or identifiable. By focussing on group characteristics instead, it is possible to discern salient *systems* of associations within an educational context. These systems of common features or 'patterns of practice' might be useful as an empirical basis for the formulation of educational policy.

Chapter 6: Conclusions and implications

In chapter three, the concepts 'quantitative', 'relational', 'exploratory', and 'pragmatic' were used to describe the research design of the current study. They all seemed ideal for an exploration of a research object that had not been thoroughly researched, and in relation to which there were hardly any established or well-documented models or theories. The quantitative aspect provided the opportunity for identifying main patterns and trends in the answers collected from many EFLteachers across the country. The relational element opened up for the study of potential associations existing in an ecology of variables in a complex educational context, thus enhancing the understanding of the research object through identifying particular patterns of interactions. The exploratory approach was reflected in the exploratory use of statistical techniques such as factor analysis and optimal scaling, and opened up for the discovery of associations not previously documented or identified. On the basis of "what works", the pragmatic aspect legitimised using a mainly qualitative theoretical framework in a quantitative study.

By charting these relatively unknown waters, a whole range of new opportunities for further research has emerged. First, salient associations identified in the current study could be the points of departure for new qualitative studies. Qualitative "thick descriptions" could serve to deepen our understanding of identified patterns. Second, relational findings could serve as a basis for conducting analytical studies, where the causal relationship between just a few variables is under scrutiny, thus leaving the ecological or systemic approach behind. Thirdly, the findings could spur the creation of new hypotheses, which in turn could be the basis for confirmatory studies. Finally, the pragmatic aspect could be left behind, and a more robust overarching theoretical framework could be applied in new efforts to reach scientific knowledge. Keeping these general approaches in mind, I would have liked to embark on two very different research undertakings. First, I would have liked to carry out a proper effect study. I find the issue of *quality* of ICT use so important that trying to measure learning outcomes seems to be one possible approach. Second, I would have liked to carry out a comparative, qualitative study. I would identify some "extreme cases" when it comes to the

use of ICTs in the teaching of EFL, and use observation and interviews to gain access to a fine-grained understanding of their different practices.

In chapter one, I elaborated on two dominant perspectives regarding what constitutes *quality* in ICT integration found in national plans and strategies for education. Each perspective is grounded on views about ICTs' ideal role and function in education. The first, labelled the *technocentric* view, is characterised by a strong faith in the affordances offered by new technologies. The process of integration into education is mainly based on considerations of what is technologically possible, rather than on what is educational desireable. Frequency of ICT use is thus a measure of progress and quality.

From the other main perspective, ICTs are seen as catalysts for pedagogic change. The proponents of this view claim that it is necessary to abandon traditional concepts of the teacher, the pupil and the curriculum subject to fully appropriate ICTs in education. The main focus is on the development of pupils' so-called '21st century skills', rather than the content of individual curriculum subjects. Since ICTs are the tools required for reaching this ideal state of affairs, frequency of use and pedagogic changes are seen as measures of quality. These two perspectives on *quality* in ICT integration are reflected in national plans and strategies.

Unfortunately, the massive political and economic investments in ICT in education have so far not paid off. International comparisons demonstrate that Norwegian pupils are trailing further and further behind their international counterparts in terms of acquired skills and knowledge, and ICTs are only integrated to a limited extent. A new approach to ICT integration in research and educational policy is required. This study is part of a larger trend in which the *content* in *individual curriculum subjects* is again at the fore. *Teachers* are once more acknowledged not for their adaptability, but for their mastery of a field of study. The trend points to a renewed emphasis on subject specific didactics in research and in the formulation of educational policy. Future ICT integration initiatives must be based on the understanding that the use of ICT must be intimately linked to the achievement of central subject specific objectives, or as one of the teachers in the sample put it: "IKT for faget, ikke faget for IKT".

Appendix

		Frequency	Percent
Valid	0	4	3.2
	Akershus	20	16.1
	Oslo	11	8.9
	Hedmark	7	5.6
	Oppland	2	1.6
	Buskerud	5	4.0
	Vestfold	6	4.8
	Telemark	9	7.3
	Aust Agder	3	2.4
	Vest Agder	5	4.0
	Rogaland	8	6.5
	Hordaland	19	15.3
	Sogn og Fjordane	1	.8
	Møte og Romsdal	2	1.6
	Sør-Trøndelag	9	7.3
	Nord-Trøndelag	3	2.4
	Nordland	1	.8
	Troms	2	1.6
	Finnmark	7	5.6
	Total	124	100.0

Diagram 38: Regional distribution of EFL teachers in the sample

1.1.1: Age

		Frequency	Percent
Valid	20-29	11	8.9
	30-39	41	33.1
	40-49	29	23.4
	50-59	29	23.4
	>60	14	11.3
	Total	124	100.0

Diagram 39: Age distribution in sample

2.2.1: Teaching exp. Eng

		Frequency	Valid Percent
Valid	1-3 ys	25	20.7
	4-7 ys	20	16.5
	8-11 ys	19	15.7
	12-15 ys	9	7.4
	>15 ys	48	39.7
	Total	121	100.0
Missing	System	3	

2.2.1: Teaching exp. Eng

		Frequency	Valid Percent
Valid	1-3 ys	25	20.7
	4-7 ys	20	16.5
	8-11 ys	19	15.7
	12-15 ys	9	7.4
	>15 ys	48	39.7
	Total	121	100.0
Missing	System	3	
Total		124	

Diagram 40: Distribution of teaching experience in sample

Ed. level Eng

		Frequency	Percent	Cumulative Percent
Valid	no ed.	12	9.7	9.7
	<15 credits	3	2.4	12.1
	15 credits	2	1.6	13.7
	30 credits	14	11.3	25.0
	60 credits	46	37.1	62.1
	90 credits	37	29.8	91.9
	Master	2	1.6	93.5
	Old master	8	6.5	100.0
	Total	124	100.0	

Diagram 41: Distribution of formal English qualification in sample

Counties	Schools in total	Teachers in total	School sample	Teacher sample	**Answers EFL teachers**
Østfold	42	920	4	36	0
Akershus	81	1938	17	221	20
Oslo	56	1235	15	210	11
Hedmark	41	734	7	91	7
Oppland	42	783	8	104	2
Buskerud	51	875	8	117	5
Vestfold	40	841	10	142	6
Telemark	43	628	10	133	9
Aust-Agder	29	369	4	48	3
Vest-Agder	40	704	6	84	5
Rogaland	93	1595	15	195	8
Hordaland	99	1711	21	266	19
Sogn og Fjordane	50	452	3	39	1
Møre og Romsdal	74	936	17	136	2
Sør-Trøndelag	67	970	7	84	9
Nord-Trøndelag	47	526	4	56	3
Nordland	129	897	6	78	1
Troms	79	606	7	91	2
Finnmark	58	329	6	81	7
IN TOTAL	1161	17049	172	2212	124

Diagram 42: Regional distribution of schools (total and sample), teachers (total and sample) and EFL teachers

Self-perceived competence subscale – rank order descriptive findings

	M	*SD*
2.3.5: Self-perceived competence: reading act.	5,71	,553
2.3.4: Self-perceived competence: writing act.	5,71	,524
2.3.10: Self-perceived competence: language model	5,70	,542
2.3.20: Self-perceived competence: correcting pupil language	5,68	,517
2.3.6: Self-perceived competence: grammar	5,63	,645
2.3.3: Self-perceived competence: listening act.	5,55	,736
2.3.7: Self-perceived competence: vocabulary	5,47	,670
2.3.2: Self-perceived competence: communication act.	5,46	,617
2.3.1: Self-perceived competence: integrate new material	5,42	,736
2.3.12: Self-perceived competence: group work	5,40	,837
2.3.17: Self-perceived competence: assessment	5,22	,822
2.3.16: Self-perceived competence: learn new ICTs for Eng	5,15	,942
2.3.9: Self-perceived competence: prepare theoretical material	5,14	,769
2.3.22: Self-perceived competence: good balance theory and practical usage	5,11	,724
2.3.13: Self-perceived competence: projects	5,10	,953
2.3.14: Self-perceived competence: creativity	5,07	,831
2.3.8: Self-perceived competence: intercultural comp.	5,06	,820
2.3.15: Self-perceived competence: cross-curricula	4,84	1,055
2.3.19: Self-perceived competence: use ICTs effectively	4,77	,957

2.3.18: Self-perceived competence: use pupil competence	4,74	,948
2.3.11: Self-perceived competence: individualise	4,56	1,069

Diagram 43: Self-perceived competence – descriptive findings

KMO and Bartlett's Test to show the factorability of data from the items on the SPC scale

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.873**
Bartlett's Test of Sphericity	Approx. Chi-Square	1246.822
	df	210.000
	Sig.	**.000**

Diagram 44: SPC - KMO and Bartlett's Test

Total Variance Explained: SPC scale

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	**8.266**	**39.364**	**39.364**
2	**1.775**	**8.452**	**47.816**
3	**1.517**	**7.224**	**55.039**
4	**1.351**	**6.433**	**61.472**
5	.917	4.365	65.837
6	.816	3.887	69.724
7	.782	3.723	73.447
8	.692	3.297	76.745
9	.662	3.151	79.896
10	.576	2.742	82.638
11	.515	2.450	85.088
12	.470	2.239	87.327
13	.433	2.061	89.388
14	.394	1.874	91.263
15	.350	1.665	92.928
16	.314	1.497	94.426
17	.287	1.369	95.794
18	.269	1.279	97.073
19	.240	1.144	98.217
20	.211	1.003	99.220
21	.164	.780	100.000

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Diagram 45: SPC – Kaiser's Criterion

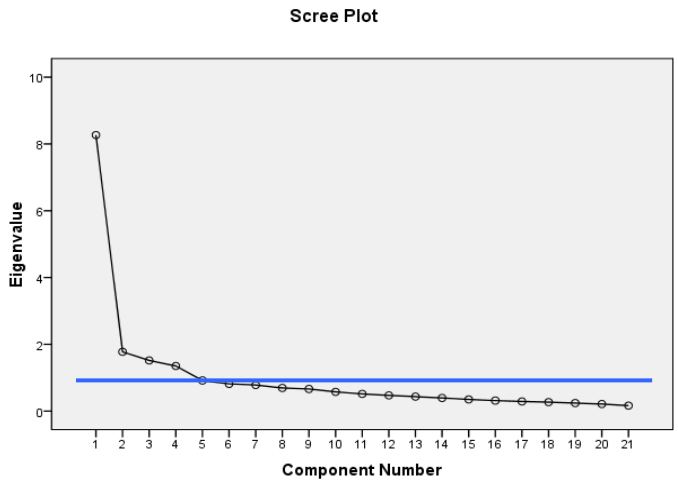

Diagram 46: SPC – Scree Plot

SPC - Pattern Matrix[a]

	Component			
	1	2	3	4
2.3.20: Self-perceived competence: correcting pupil language	.800			
2.3.17: Self-perceived competence: assessment	.694	.412		
2.3.10: Self-perceived competence: language model	.690			
2.3.22: Self-perceived competence: good balance theory and practical usage	.628			
2.3.6: Self-perceived competence: grammar	.515	-.302	.418	
2.3.9: Self-perceived competence: prepare theoretical material	.497			.493
2.3.18: Self-perceived competence: use pupil competence	.475			.333
2.3.7: Self-perceived competence: vocabulary	.451			
2.3.16: Self-perceived competence: learn new ICTs for Eng		.840		
2.3.1: Self-perceived competence: integrate new material		.690		
2.3.19: Self-perceived competence: use ICTs effectivly		.633		.431

2.3.3: Self-perceived competence: listening act.		.472	.420	
2.3.5: Self-perceived competence: reading act.			.743	
2.3.4: Self-perceived competence: writing act.			.718	
2.3.2: Self-perceived competence: communication act.		.307	.427	.336
2.3.12: Self-perceived competence: group work				.783
2.3.15: Self-perceived competence: cross-curricula				.778
2.3.13: Self-perceived competence: projects			.305	.735
2.3.14: Self-perceived competence: creativity				.589
2.3.8: Self-perceived competence: intercultural comp.				.527
2.3.11: Self-perceived competence: individualise	.353			.404

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 15 iterations.

Diagram 47: SPC – Pattern Matrix

Content and activities scale – rank order descriptive findings

	M	*SD*
4.1.8: Content and activities: read and listen to texts wide range of topics	5,25	,731
4.1.9: Content and activities: write and speak with some precision, flow and coherence	5,12	,709
4.1.13: Content and activities: read and understand texts different length and genres	5,03	,715
4.1.6: Content and activities: develop vocabulary wide range of topics	5,02	,636
4.1.15: Content and activities: write well-structured texts of different types	4,89	,783

4.1.10: Content and activities: adjust oral and written lang. to genre and situation	4,81	,720
4.1.7: Content and activities: use language as accurately as possible	4,70	,726
4.1.20: Content and activities: discuss young people's life-styles, values etc. in USA, UK++ and Norway	4,66	,906
4.1.21: Content and activities: history and geography UK and USA	4,64	,818
4.1.1: Content and activities: situations, methods and strategies to learn	4,60	,768
4.1.24: Content and activities: read + discuss literary texts poem, short story, novel or play	4,55	,894
4.1.14: Content and activities: adjust learning strategies to purpose and situation	4,53	,922
4.1.11: Content and activities: present current and cross-curricular topics	4,50	,920
4.1.16: Content and activities: use content from different sources independently and critically	4,47	,786
4.1.12: Content and activities: oral interaction current and cross-curricular topics	4,41	,924
4.1.22: Content and activities: describe conditions indigenous peoples in English-speaking countries	4,39	,964
4.1.17: Content and activities: discriminate between positive and negative phrases ind. or groups	4,38	,823
4.1.2: Content and activities: compare and contrast L1 and L2 to learn	4,30	,840

4.1.3: Content and activities: critical and independent use of various tools	4,22	,923
4.1.4: Content and activities: use basic grammatical concepts to describe lang.	4,11	1,022
4.1.5: Content and activities: pupils describe and self-evaluate progress	4,09	,891
4.1.23: Content and activities: recognise some regional accents from English-speaking countries	4,07	,890
4.1.26: Content and activities: describe theme and composition in texts	4,07	,981
4.1.18: Content and activities: communicate using digital media	4,02	1,088
4.1.27: Content and activities: make and discuss own oral or written texts inspired by literature and art	3,87	1,086
4.1.25: Content and activities: describe theme and composition in visual representations	3,53	,987
4.1.19: Content and activities: describe and interpret graphical representations of numbers and other data	3,49	,896

Diagram 48: Content and activities – descriptive findings

KMO and Bartlett's Test to show the factorability of data from the items on the content and activities subscale

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.893**
Bartlett's Test of Sphericity	Approx. Chi-Square	1711.310
	df	351.000
	Sig.	**.000**

Diagram 49: Content and activities – KMO and Bartlett's Test

Total Variance Explained: Content and activities

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	**10.567**	**39.138**	**39.138**
2	**2.216**	**8.207**	**47.345**
3	**1.657**	**6.137**	**53.482**

4	**1.354**	**5.015**	**58.497**
5	**1.182**	**4.377**	**62.874**
6	**1.080**	**4.000**	**66.874**
7	.872	3.228	70.102
8	.805	2.981	73.083
9	.715	2.647	75.731
10	.653	2.419	78.150
11	.581	2.151	80.301
12	.564	2.088	82.389
13	.514	1.903	84.292
14	.502	1.859	86.151
15	.474	1.757	87.908
16	.429	1.588	89.495
17	.364	1.349	90.844
18	.350	1.297	92.141
19	.342	1.266	93.406
20	.297	1.099	94.505
21	.289	1.071	95.576
22	.276	1.024	96.601
23	.256	.947	97.548
24	.191	.707	98.255
25	.168	.624	98.879
26	.158	.586	99.465
27	.144	.535	100.000

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Diagram 50: Content and activities – Kaiser's Criterion

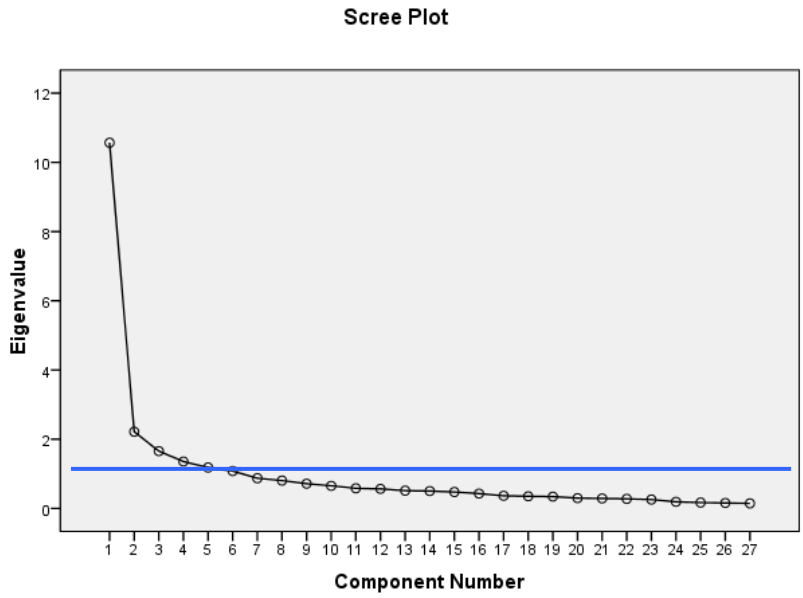

Diagram 51: Content and activities – Scree Plot

Content and activities - Pattern Matrix[a]

	Component					
	1	2	3	4	5	6
4.1.8: Content and activities: read and listen to texts wide range of topics	.787					
4.1.9: Content and activities: write and speak with some precision, flow and coherence	.746			.305		
4.1.13: Content and activities: read and understand texts different length and genres	.687					
4.1.12: Content and activities: oral interaction current and cross-curricular topics	.646				-.333	
4.1.11: Content and activities: present current and cross-curricular topics	.613				-.323	
4.1.15: Content and activities: write well-structured texts of different types	.592					
4.1.14: Content and activities: adjust learning strategies to purpose and situation	.516					
4.1.10: Content and activities: adjust oral and written lang. to genre and situation	.473			.308		
4.1.22: Content and activities: describe conditions indigenous peoples in English-speaking countries		-.820				
4.1.21: Content and activities: history and geography UK and USA		-.730				
4.1.23: Content and activities: recognise some regional accents from English-speaking countries		-.612				
4.1.20: Content and activities: discuss young people's life-styles, values etc. in USA, UK++ and Norway		-.605				

4.1.19: Content and activities: describe and interpret graphical representations of numbers and other data		-.531			-.432	
4.1.3: Content and activities: critical and independent use of various tools			.734			
4.1.1: Content and activities: situations, methods and strategies to learn			.718	-.393		
4.1.2: Content and activities: compare and contrast L1 and L2 to learn			.611			
4.1.4: Content and activities: use basic grammatical concepts to describe lang.			.601			
4.1.5: Content and activities: pupils describe and self-evaluate progress			.588	.308		
4.1.7: Content and activities: use language as accurately as possible				.764		
4.1.17: Content and activities: discriminate between positive and negative phrases ind. or groups				.523		
4.1.6: Content and activities: develop vocabulary wide range of topics				.491		
4.1.18: Content and activities: communicate using digital media					**-.745**	
4.1.24: Content and activities: read + discuss literary texts poem, short story, novel or play						-.784
4.1.27: Content and activities: make and discuss own oral or written texts inspired by literature and art						-.761
4.1.26: Content and activities: describe theme and composition in texts						-.759
4.1.25: Content and activities: describe theme and composition in visual representations					-.356	-.584
4.1.16: Content and activities: use content from different sources independently and critically						**-.345**

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 20 iterations.

Diagram 52: Content and activities – Pattern Matrix

Organising teaching scale – rank order descriptive findings

	M	*SD*
4.3.12: Organising teaching: use own experiences	4,94	,737
4.3.14: Organising teaching: clarify expectations to effort and results	4,88	,724
4.3.13: Organising teaching: expect good results	4,84	,722
4.3.16: Organising teaching: keep a close eye on pupils' work to give feedback	4,76	,685
4.3.9: Organising teaching: textbook	4,71	,752
4.3.1: Organising teaching: class teaching	4,70	,763
4.3.10: Organising teaching: work plan	4,64	,965
4.3.11: Organising teaching: use pupils' knowledge and competence	4,58	,888
4.3.2: Organising teaching: instruct individuals	4,54	,745
4.3.15: Organising teaching: hard on sloppy work	4,50	,832
4.3.8: Organising teaching: homework	4,27	,880
4.3.3: Organising teaching: instruct groups	4,03	,802
4.3.5: Organising teaching: tests	4,02	,704
4.3.4: Organising teaching: project	3,22	,976
4.3.6: Organising teaching: performances etc.	2,55	1,122

4.3.7: Organising teaching: inviting interesting people	2,40	1,080

Diagram 53: Organising teaching – descriptive findings

KMO and Bartlett's Test to show the factorability of data from the items on the organising teaching scale

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.720**
Bartlett's Test of Sphericity	Approx. Chi-Square	564.701
	df	120.000
	Sig.	**.000**

Diagram 54: Organising teaching – KMO and Bartlett's Test

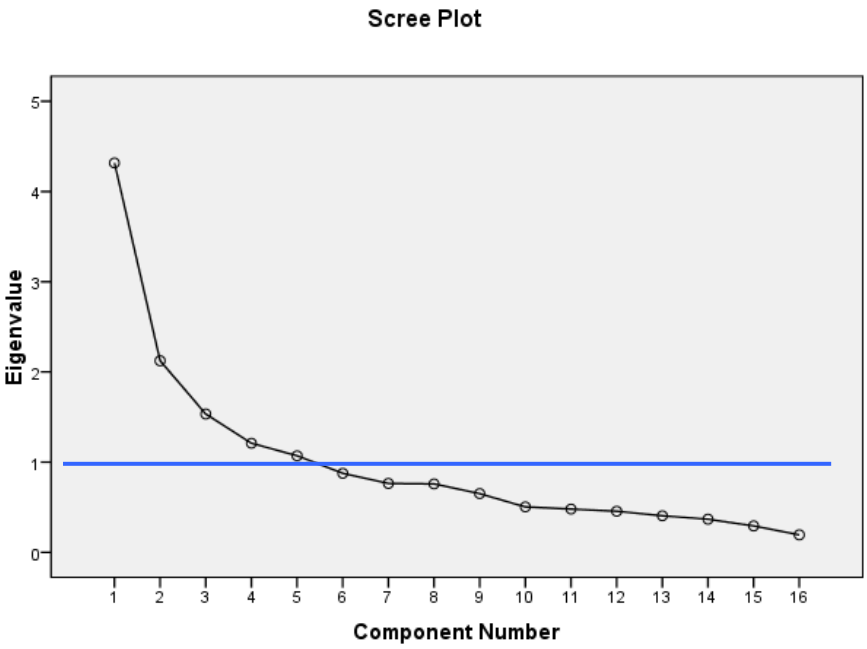

Diagram 55: Organising teaching – Scree Plot

Organising Teaching - Pattern Matrix[a]

	Component		
	1	2	3
4.3.16: Organising teaching: keep a close eye on pupils' work to give feedback	.785		
4.3.13: Organising teaching: expect good results	.738		
4.3.14: Organising teaching: clarify expectations to effort and results	.720		
4.3.15: Organising teaching: hard on sloppy work	.678		

4.3.12: Organising teaching: use own experiences	.630		
4.3.11: Organising teaching: use pupils' knowledge and competence	.554		
4.3.10: Organising teaching: work plan	.499		
4.3.2: Organising teaching: instruct individuals	.490		
4.3.3: Organising teaching: instruct groups	.477	-.422	
4.3.6: Organising teaching: performances etc.		-.812	
4.3.7: Organising teaching: inviting interesting people		-.792	
4.3.4: Organising teaching: project		-.764	
4.3.5: Organising teaching: tests			.748
4.3.8: Organising teaching: homework			.688
4.3.1: Organising teaching: class teaching			.552
4.3.9: Organising teaching: textbook			.547

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Diagram 56: Organising teaching – Pattern Matrix

Organising teaching - Total Variance Explained

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	**4.316**	**26.978**	**26.978**
2	**2.124**	**13.274**	**40.251**
3	**1.533**	**9.582**	**49.834**
4	1.210	7.560	57.394
5	1.070	6.689	64.083
6	.876	5.476	69.559
7	.764	4.773	74.331
8	.758	4.739	79.070
9	.651	4.068	83.138
10	.504	3.148	86.286
11	.480	2.999	89.285
12	.455	2.846	92.131
13	.405	2.533	94.664
14	.368	2.297	96.961
15	.293	1.828	98.790

16	.194	1.210	100.000

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Diagram 57: Organising teaching – Kaiser's Criterion

ICT activities subscale – rank order descriptive findings

	M	*SD*
5.1.6: ICT activities: pupils produce their own texts using digital tools	4,45	,974
5.1.11: ICT activities: pupils use digital presentation tools	4,10	1,068
5.1.9: ICT activities: pupils collect material from Internet which they use, develop and present	3,83	1,116
5.1.2: ICT activities: pupils use learning platform	3,83	1,538
5.1.3: ICT activities: pupils work with pedagogic net-resources linked to the textbook	3,74	1,146
5.1.4: ICT activities: pupils work with independent pedagogic net-resources (games, web-pages)	3,50	1,034
5.1.8: ICT activities: pupils work with English texts downloaded from Internet	3,47	1,053
5.1.7: ICT activities: pupils use game-like pedagogic software to gain knowledge and competence	3,40	1,111
5.1.13: ICT activities: programmes training pupils in basic grammatical terminology	3,32	1,066
5.1.5: ICT activities: pupils exchange information and experiences using digital tools	3,13	1,173
5.1.14: ICT activities: programmes training English and American history and geography	3,03	1,100
5.1.12: ICT activities: pupils use digital tools to communicate with each	2,73	1,364

other and pupils in other countries		
5.1.10: ICT activities: pupils use different types of software to learn English (e.g. sound recording)	2,63	1,149
5.1.15: ICT activities: pupils use digital portfolios as part of what is assessed	2,55	1,500

Diagram 58: ICT activities - descriptive findings

ICT general positive belief subscale – rank order descriptive findings

	M	*SD*
6.1.1.1: ICT good results: subject matter more interesting	4.91	.907
6.1.1.2: ICT good results: net access to more varied material	4.88	.922
6.1.1.3: ICT good results: pupils work independently and present it (e.g. portfolios)	4.31	1.156
6.1.1.4: ICT good results: help and cooperate more using the net	3.87	1.178
Valid N (listwise)		

Diagram 59: General ICT beliefs – descriptive findings

ICT positive effects subscale – rank order descriptive findings

	M	*SD*
7.1.22: grade importance: ICT reach new aims which are positive for Eng. subject	4,23	,906
7.1.20: grade importance: ICT leads to increased pupil autonomy	3,82	,930
7.1.21: grade importance: ICT more efficient ways of acheiving trad. aims	3,79	1,007
7.1.12: grade importance: use of ICT better results boys	3,69	1,095
7.1.17: grade importance: ICT support my didactic priorities and methods	3,68	1,195

7.1.13: grade importance: use of ICT better results girls	3,62	,996
Valid N (listwise)		

Diagram 60: ICT positive effects – descriptive findings

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