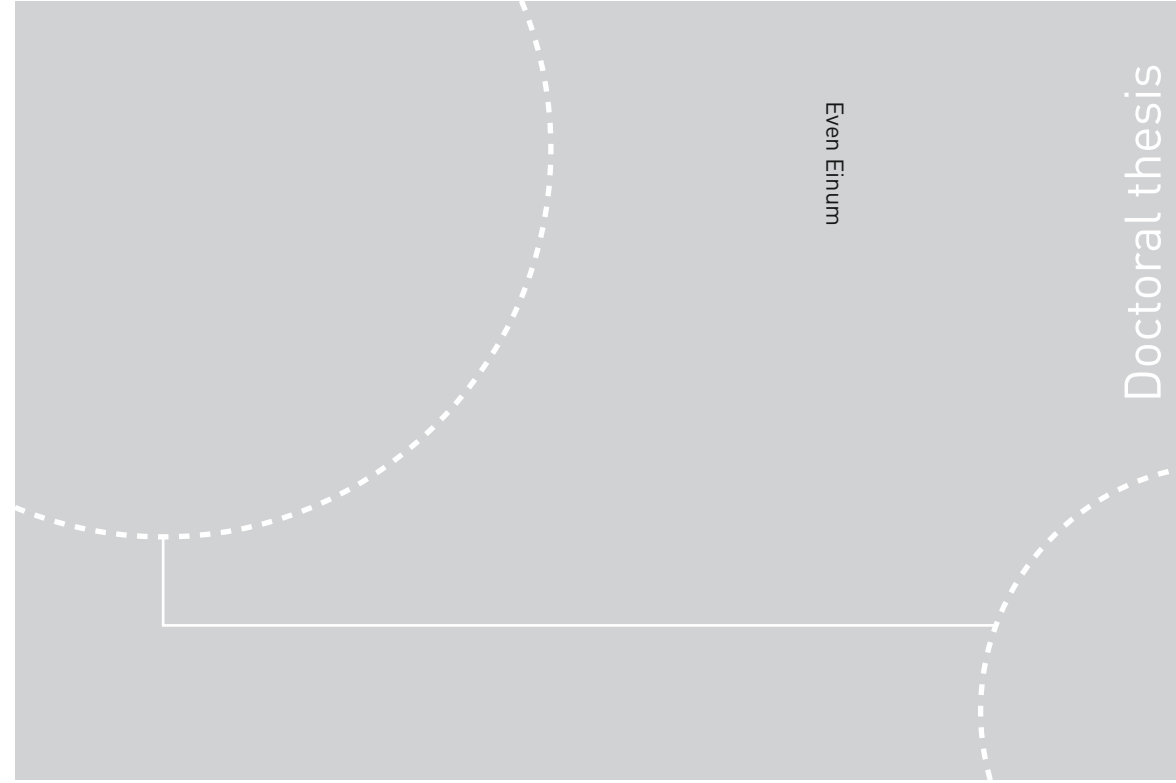


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Even Einum

Response Technology and Student-centring of Language Education

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Norwegian University of
Science and Technology

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Norwegian University of Science and Technology
Thesis for the Degree of
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Faculty of Social and Educational Sciences
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The words of the prophets are written on the subway walls and tenement halls

Paul Simon

Scientific environment

During this doctoral project, which lasted from August 2016 to July 2019, I have been employed by Trøndelag County Council (TCC) Department of Education, as a part of the University Schools Partnership project. Funded by TCC and the Research Council of Norway, the degree is provided by the Norwegian University of Technology and Science (NTNU), Faculty of Social and Educational Sciences (SU), Dept. of Teacher Education (ILU). I have had Associate Professors Lise Vikan Sandvik and Fredrik Mørk Røkenes from ILU as supervisors. Throughout the project, I have participated in County Council dissemination seminars and conferences, the ILU doctoral candidates' forum, the Nordic Educational Research Association (NERA) and a number of international conferences and seminars on educational technology.

Acknowledgements

When I started the PhD project resulting in this thesis, my eagerness was mixed with trepidation. Having observed the pale husks of formerly ambitious and energetic PhD students nearing the end of their project period, I harboured a certain concern for my future mental and physical wellbeing. In retrospect, this concern was wholly unjustified. I have been cocooned by support and competence throughout by teachers, academics, administrators, family, and friends for whom I have nothing but gratitude. Though my name stands alone on publications, I did not. It is therefore fitting that the words with which I conclude my three-year research and writing process should be words of thanks.

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During my project, I split my time between the upper-secondary school in which I gathered my data, and the Department of Teacher Education at NTNU. I have therefore been lucky enough to be taken in by what I now consider good colleagues in both institutions. I would therefore extend my thanks to the teachers at the school whose enthusiasm and interest in my research assured me that I was on the right track. These are also the colleagues whose efforts helped me gain access to considerable amounts of contextually relevant data from their classrooms, and, of these, I would especially like to thank my main teacher informants, Ms. Travers, Ms. Gregson, and Ms. Glossop, with whom I worked closely throughout. At NTNU, I have shamelessly disturbed my colleagues and fellow PhD candidates whenever I needed anything, and they have without exception, and at times with some relief, abandoned their

pressing tasks and made their expertise available to me, an effort I could not have done without.

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Abstract

This thesis reports on the findings of an exploratory doctoral project into the teacher and student practices and perceptions associated with applied response technology (RT) in upper-secondary language education. The thesis responds to the research question, *How do upper-secondary teachers and students apply and experience RT in language education?* To do so, the project applied a qualitative-dominant, mixed-methods, case-study research design to study the role of new educational technology in an empirical context whose use of RT has received limited academic attention. Also referred to as “clickers”, response technology is a system that allows students to respond to teacher questions through their digital devices, and that tallies and displays their responses for further use. This thesis presents the findings from the project through three articles published and submitted for publication in peer-reviewed journals, and an introductory synopsis. The latter consists of a presentation of the empirical context, the theoretical and conceptual background, and the methodological framework behind the thesis, as well as a summary of the articles and discussion of the contributions and implications of the thesis. The synopsis concludes with a discussion of limitations and suggestions for further research, along with some closing remarks.

Article I identifies student involvement as central to applied RT in language education. Building on classroom observations, interviews, and surveys, two forms of involvement were identified: active, where students explicitly comment through RT on the content or procedure of the education, and passive, where students’ answers to teacher input guide the way the teacher proceeds with the education. Students in general preferred passive involvement, recognising the teacher’s subject and procedural knowledge, and expecting its application. Therefore, findings in Article I indicate a shift towards student-centring through collaboration between active students producing—and agile teachers engaging with students in—a discussion of their production. This shared responsibility for the lesson is made possible through RT, which provides an alternative, anonymous communication channel through which students feel able to get involved and teachers gain access to student voices.

Article II builds on classroom observations and interviews to examine the RT-mediated interaction between teachers and students, and proposes a model for discursive lecturing, where student production can build on the discussions of previous responses in an iterative and student-centred process. Building on passive involvement, alternation between individual responses through RT and class discussions, and convergent and divergent cognition, the model shows how practices mediated by RT can enable students to handle complex tasks.

This happens because their preceding responses, starting with a response to an open, inviting initial question, have built on one another to provide the background necessary to successfully deal with such complexity. RT in such interactions allows productive activity to be relocated to the students, and to take place according to their needs and resources, because these can be representatively communicated to the teacher through RT. Furthermore, Article II suggests that the divergent/convergent nature of discursive lecturing mimics autonomous work, and that its discussion of responses enables students to critically evaluate their own production.

Article III combines findings from classroom observations, interviews, and RT responses to outline the ways in which language teachers ask questions and students respond through RT. RT questions and responses underwent content analysis, frequency counts in descriptive analytics, and analytic abduction. Here, a clear preference amongst teachers for the new text functionality (88.5%) over the somewhat more traditional multiple-choice functionality is identified, a preference motivated largely by the flexibility of open text. The analysis of the questions teachers asked during the 177 text votes and the 23 multiple-choice votes shows that teachers tend to ask content or formal questions two and three times more than procedural or personal questions; they attribute this to a negotiation between learning goals and student needs. Response analyses reveal four major types of text responses—genuine (83%), empty/deleted (6.5%), and resistance responses (5.3%), as well as meta comments (5%)—and the characteristics of these. Participation through text responses is found to be comparable to that of multiple choice, and to that reported in the mainly multiple-choice-based literature. However, findings suggest that students use participation with RT text functionality as an alternative to oral participation, because it reduces the risk of social or professional stigma while providing similar communicative potential.

This thesis, therefore, contributes to practice and research by providing a template for practical application of RT (Article II), by examining influences on such application (Articles I and III), and by mapping the nature of the expanded communication afforded by RT (Article III). A major trend throughout the thesis is how RT gradually recedes into the background of educational practice, becoming part of a setting in which teachers and students collaboratively shape language learning through the communication afforded by RT. This further argues that educational technology and student-centring of education both can be implemented in the interaction between teachers and students, and that such interaction can be promoted by communication made possible by technology.

Sammendrag (Norwegian abstract)

Hensikten med denne doktorgradsstudien er å undersøke hvordan elever og lærere i videregående skole tar i bruk og opplever responsteknologi (RT) i språkopplæringen. Responsteknologi, ofte kalt "klikkere", er systemer som gjør det mulig for elevene å svare på lærerens spørsmål ved å ta i bruk ulike digitale enheter. Teknologien samler og viser svarene deres for videre bruk i undervisningen. Til nå har denne pedagogiske teknologien fått begrenset faglig oppmerksomhet i videregående opplæring og språkopplæring, og denne studien baserer seg på et kvalitativ-dominant mixed methods kasus-studie som forskningsdesign for å undersøke bruken av denne teknologien. Resultatene fra studien presenteres gjennom tre artikler som publiseres og er til vurdering i fagfellevurderte tidsskrift og en innledende kappe. Kappen presenterer den empiriske konteksten, den teoretiske og konseptuelle bakgrunnen og det metodologiske rammeverket for studien, samt en oppsummering av artiklene og en diskusjon av avhandlingens bidrag og implikasjoner. Kappen avsluttes deretter med en diskusjon av begrensninger og forslag til videre forskning, samt noen avsluttende bemerkninger.

Artikkel I identifiserer elevenes involvering i undervisningen som sentral i anvendt RT i språkopplæringen i videregående skole. På grunnlag av observasjoner, intervjuer og spørreundersøkelser ble det oppdaget to former for involvering; aktiv, der elevene eksplisitt kommenterer innholdet eller gjennomføringen av undervisningen, og passiv, der elevenes svar på lærerens forespørsel påvirker måten læreren fortsetter undervisningen på. Studien viser at elevene i stor grad foretrekker passiv involvering, fordi de anerkjenner lærerens fag- og prosesskunnskap og fordi de forventer at lærerens kunnskap tas i bruk når læreren behandler svarene deres. Funnene i Artikkel I viser at elevsentrert undervisning muliggjøres når RT tas i bruk. Elevsentreringen vises i form av et samarbeid mellom aktive elever som produserer og fleksible lærere som går i dialog med dem rundt deres bidrag. Dette delte ansvaret for undervisningen gjøres mulig gjennom RT, som utgjør en alternativ, anonym kommunikasjonskanal, der elevene føler seg bemyndiget og i stand til påvirke, og lærerne får tilgang til elevstemmene.

Artikkel II undersøker RT-mediert samspill mellom lærere og elever gjennom observasjoner og intervju, og foreslår en modell for dialogisk undervisning, der elevproduksjon kan bygge videre på diskusjoner av tidligere svar i en syklisk og elev-sentrert prosess. Med utgangspunkt i passiv involvering, veksling mellom individuelle svar gjennom RT og klassediskusjoner, og konvergent og divergent tenking, viser modellen hvordan elevene kan gjøres i stand til å

håndtere komplekse oppgaver ved å ta i bruk RT. Dette er mulig fordi deres tidligere svar har bygget på hverandre, helt fra svaret de gav på det første, åpne spørsmålet, slik at de har den nødvendige bakgrunnen for å håndtere komplekse oppgaver. RT i slike interaksjoner gjør at produksjonen av språk og innhold i undervisningen overflyttes til elevene, og finner sted i henhold til deres behov og ressurser, fordi disse kan bekjentgjøres for læreren via kommunikasjonen i RT. Videre argumenterer Artikkel II med at den divergente/konvergente dynamikken i slik dialogisk undervisning ligner på selvstyrte arbeidsprosesser, og at diskusjonen av svarene gjør elevene i stand til å kritisk vurdere egne bidrag i slike prosesser. Artikkel III kombinerer funn fra klasseromsobservasjoner, intervjuer og besvarelser med RT, og skisserer måtene språklærere stiller spørsmål på og elevene svarer på via RT. RT-spørsmål og -svar gjennomgikk både innholdsanalyse, frekvenstillinger i en deskriptiv analyse og en analytisk abduksjon. Dette viser at lærere i stor grad (88,5%) foretrekker å benytte ny tekstfunksjonalitet som muliggjør dialog framfor den noe mer tradisjonelle flervalgsfunksjonaliteten, og de peker særlig på fleksibiliteten i åpne tekstsvare som avgjørende. Analysen av spørsmålene lærerne stilte i løpet av 177 tekst- og 23 flervalgsavstemminger, viser at lærerne stilte innholds- eller formelle spørsmål to til tre ganger så ofte som prosessuelle eller personlige spørsmål, noe de tilskriver en forhandling mellom læringsmål og elevenes behov. Tekstsvarene fra RT fordeler seg på fire responskategorier; oppriktige- (83%), tomme/slettede- (6,5%) og motstandssvar (5,3%), i tillegg til metakommentarer (5%). Det ble dermed også mulig å kartlegge kjennetegnene for disse kategoriene. Elevenes deltakelse gjennom tekstsvare ligger nære både deltakelsen med flervalgsvar i prosjektet, og deltakelsen rapportert i forskning på deltakelse med RT, som i stor grad er basert på flervalgsfunksjonalitet. Funnene tyder imidlertid på at elevene ser deltakelse med tekstfunksjonaliteten i RT som et alternativ til muntlig deltakelse, fordi den reduserer risikoen for sosial eller faglig stigmatisering, samtidig som den tilbyr lignende muligheter for kommunikasjon.

Denne avhandlingen bidrar derfor til praksis og forskning gjennom et rammeverk for praktisk anvendelse av RT (Artikkel II), ved å identifisere systemer som påvirker slik anvendelse (Artikkel I og III) og ved å kartlegge kjennetegn ved den utvidede kommunikasjonen som RT muliggjør (Artikkel III). En tydelig trend som vises i studien er hvordan RT gradvis blir en del av en kontekst der lærere og elever samarbeider om å forme språkopplæringen ved hjelp av RT-mediert kommunikasjon. Denne utviklingen antyder videre at pedagogisk teknologi og

elevsentrering av utdanning både kan implementeres i samspillet mellom lærere og elever, og at kommunikasjonen slik teknologi muliggjør kan fremme dette samspillet.

List of publications

Article I:

Einum, E. (in press). Involvement with Response Technology as Student-Centring of Language Teaching: Upper-Secondary Student and Teacher Experiences. *Nordic Journal of Digital Literacy*.

Article II:

Einum, E. (2019). Discursive lecturing: an agile and student-centred teaching approach with response technology. *Journal of Educational Change*, 20(2), 249–281. doi: <https://doi.org/10.1007/s10833-019-09341-7>

Article III:

Einum, E. (in press). Written participation with response technology—How teachers ask and students respond with applied text response functionality. *Computers and Composition*.

List of abbreviations

AI—Artificial Intelligence

BA—Bachelor of Arts

BYOD—Bring Your Own Device

CALL—Computer Assisted Language Learning

ECTS—European Credit Transfer and Accumulation System

ESL—English as a Second Language

FL—Foreign Language

GS—General Study program

ICT—Information and Communications Technology

LMS—Learning Management System

MA—Master of Arts

MALL—Mobile Assisted Language Learning

MOOC—Massive Open Online Course

NL—Native Language

PBL—Problem-Based Learning

QDI—Question-Driven Instruction

RT—Response Technology

R&D—Research and Development

S1—Sub-study 1

S2—Sub-study 2

S3—Sub-study 3

SL—Second Language

STEM—Science Technology Engineering and Mathematics

VS—Vocational Study program

List of tables

Table 1: Overview of thesis and sub-studies	10
Table 2: Overview of the articles	11
Table 3: Schematic representation of Don Ihde's human-technology relations	21
Table 4: Inclusion/exclusion criteria for this state-of-the-art review	32
Table 5: Three approaches in CALL	35
Table 6: The transfer to student-centred education through technology	42
Table 7: Methodological framework of the project.....	46
Table 8: Informants for S1 and S3 interviews figuring in the articles	53
Table 9: Field notes excerpt from an S3 observation	58
Table 10: Kvale and Brinkmann's (2015) seven stages of qualitative interviewing in terms of the overall execution of interviews in the project	62
Table 11: Data interaction in the mixed-methods study.....	68
Table 12: Illustration of analytic integration	71
Table 13: Adapted visualisation of correlations from Microsoft Excel	77
Table 14: An overview of the approximate correspondence of qualitative and quantitative terms	80

List of figures

Figure 1: Graphic situation of the subject of study within research on technology in education.....	33
Figure 2: The qualitative-quantitative continuum	50
Figure 3: Illustration of the mixed-methods research design	51
Figure 4: Screenshots from the RT iLike exemplifying the three forms of RT response data.....	59
Figure 5: First and second cycle coding	66
Figure 6: Coding visualisation	69
Figure 7: Analytic integration across qualitative and quantitative sub-studies	70
Figure 8: Coding of responses	73
Figure 9: Transcribed, paraphrased, and coded interviews	75

Table of Contents

Scientific environment	ii
Acknowledgements	iv
Abstract	vi
Sammendrag (Norwegian abstract)	viii
List of publications	xi
List of abbreviations	xii
List of tables	xiii
List of figures	xiv

Part I: Synopsis

1. Introduction	3
1.1. Project design and thesis structure	9
1.2. Statement of researcher background, aims, and stance	12
1.3. Empirical setting	14
2. Theoretical and conceptual framework	17
2.1. Ontology: Constructionism	18
2.2. Epistemology: Technoscience postphenomenology	20
2.3. Theoretical context of technoscience postphenomenology	24
2.3.1. Why postphenomenology rather than pragmatism or actor-network theory?	28
2.4. Current state of research	31
2.4.1. ICT in language education	34
2.4.2. Response technology (RT)	37
2.4.3. Student-centred learning	41
2.4.4. Research needs	43
3. Methodological framework	45
3.1. Research design	45
3.1.1. Case study	46
3.1.2. Mixed methods	48
3.1.3. Sampling and participants	52
3.2. Data collection	56
3.2.1. Observations	56
3.2.2. Interviews	60
3.2.3. Surveys	63

3.3.	Data analysis.....	64
3.3.1.	Coding, analytic memo writing, and constant comparative abductive analysis.....	65
3.3.2.	Data interaction and analytic integration.....	67
3.3.3.	Observations.....	72
3.3.4.	Interviews.....	74
3.3.5.	Surveys.....	76
3.4.	Ethical considerations.....	78
3.4.1.	Participant ethics.....	78
3.4.2.	Trustworthiness: credibility, transferability, dependability.....	80
4.	Presentation of articles.....	85
4.1.	Article I.....	85
4.2.	Article II.....	86
4.3.	Article III.....	87
5.	Discussion.....	89
5.1.	Empirical implications.....	89
5.2.	Theoretical implications.....	93
5.3.	Methodological implications.....	98
5.4.	Limitations and further research.....	100
6.	Concluding remarks.....	103
	References.....	107

Part II: Articles and appendices

Articles I, II and III

Appendices

Part I: Synopsis

1. Introduction

We had a lecture in English today, and when [the teacher] asked the question there was no one who answered, you know, but everybody probably had an answer in their heads. And then, [response technology questions] could have been smart for her part as well; so she got some answers. (English student, 27.11.2017)

By studying the conversations and practices around mediating technologies, we can gain more insight in the ways in which users take up with technological mediations; how they develop creative ways of appropriating these mediations and integrate them in existing practices and interpretive frameworks; how they see themselves in relation to the mediating technologies and to the phenomena they are perceiving or studying. (Verbeek, 2016, p. 197)

We were curious. Our curiosity was not limited, but was as wide and horizonless as that of Darwin or Agassiz or Linnaeus or Pliny. We wanted to see everything our eyes would accommodate, to think what we could, and, out of our seeing and thinking, to build some kind of structure in modeled imitation of the observed reality. We knew that what we would see and record and construct would be warped, as all knowledge patterns are warped, first, by the collective pressure and stream of our time and race, second, by the thrust of our individual personalities. But knowing this, we might not fall into too many holes, we might maintain some balance between our warp and the separate thing—the external reality. (Steinbeck, 2011, pp. 1–2)

These three quotes, from three very different sources, introduce this thesis on *response technology (RT)* applied for student-centring in upper-secondary language education. The first, from a 16-year-old English student, echoes comments from the student's teachers in observing a lack in the classroom practices, and suggests that response technology can act as a medium for the communication in the classroom to improve. The second, from Dutch postphenomenologist Peter-Paul Verbeek, suggests that studying the perceptions of users such as the English student will help us understand the role of technology in education, and in educational practice in particular. The final quote, by the American modernist author John Steinbeck, encapsulates the methodological attitude behind the exploratory mixed-methods design underpinning this thesis, where, when faced with a relatively unexplored phenomenon, a researcher would use all methods available to him to understand this phenomenon (Biesta & Burbules, 2003; Johnson & Onwuegbuzie, 2004).

This thesis presents the findings from an exploratory study of practices with rapidly evolving technology in the, for RT research, relatively unexplored context of upper-secondary language education (Kay & Lesage, 2009). In response to the research question, *How do upper-secondary teachers and students apply and experience RT in language education?*, this thesis will present emerging student-centring practices and changes in the communication, social, and professional processes made possible by the application of RT in language education in an upper-secondary school. To become student-centred, education needs to “provide interactive, complimentary activities that enable individuals to address unique learning interests and needs, study multiple levels of complexity, and deepen understanding” (Hannafin & Land, 1997, p. 168), and research has indicated that technology can contribute to student-centring by promoting student activity and teacher agility (see Chapter 2.4.3). This thesis finds this to be essential to student-centring with RT in this context, exploring new aspects of teacher and student roles in language education and competencies necessary when practicing a profession in an environment saturated by technology. Furthermore, although research has found RT to have a positive impact on learning, motivation, participation, and involvement (see Chapter 2.4.2), it is generally agreed upon that this is more contingent on associated practices than on the technology itself (Anthis, 2011; Stewart & Stewart, 2013; Landrum, 2015; Chien, Chang, & Chang, 2016). Therefore, this thesis outlines the nature of practices, teacher agility, and student activity with applied RT as they promote student-centring, classroom interaction, participation, and involvement.

Student-centred language didactics and RT—a delineation

Norwegian students start their native language (NL) education on a pre-school level, are introduced to their first foreign language, English as a second language (ESL), upon starting school at 6 years old, and study a second foreign language (FL) at secondary level from age 13. At upper-secondary school (ages 16–19), they are therefore familiar with a range of ways to learn language, having been exposed to the language subject didactics of teachers on all education levels below higher education.¹ Common to these is a particular focus on the *exercise* of language—language didactics strives to make students develop their reading, writing, speaking, listening, and conversation skills by using the language (European Council, 2001; Norwegian Directorate for Education and Training, 2019a). The promotion of communication and student activity is therefore essential in all language education, and what

¹ This thesis uses a Scandinavian understanding of the term *didactic* as pertaining to the practical teaching-studying-learning process (Kansanen & Meri, 1999). *Digital didactics* therefore denotes teaching, studying, and learning practices with digital resources, and *language didactics*, practices used in teaching, studying, and learning languages.

the above-cited English student was missing. Language didactics, beyond the grammar, spelling, and cultural knowledge of each individual subject, aims to promote student communication through practices and means that enable students to take active part in their language education. This thesis, therefore, studies how such student-centring (Jonassen & Land, 2012) can be achieved in language education in general, and suggests that the inclusion of ICT (Information and Communications Technology) and digital didactics can support communication and student activity.

The Norwegian education system is endowed with considerable resources in terms of technical infrastructure and digital solutions (OECD, 2015; Hatlevik, Egeberg, Guðmundsdóttir, Loftsgården, & Loi, 2013). High-speed internet and digital devices such as laptops, tablets, smartphones, and interactive whiteboards are common in Norwegian schools, and for language education, this has invited digital didactics and practice-based research that has tended to focus on text-related literacies (Skaar, 2016; Blikstad-Balas, 2016). In particular, the influence of digital tools such as computers and tablets on reading (Mangen & Kristiansen, 2013; Tveit & Mangen, 2014; Blikstad-Balas, 2016) and writing (Lund, 2008; Grüters, 2011; Kongsgården & Krumsvik, 2016; Skaftun, Iglund, Husebø, Nome, & Nygard, 2017) has been subject to research. These areas have shown digital tools to provide potential for language education, in many cases through multimodality (Løvland, 2007; Otnes, 2009, Jakobsen, 2019) and collaboration (Lund, 2008; Skaftun et al., 2017), but also challenges related to the transfer of decision making to students who might not have the skills necessary to comprehend and produce in a digital context (Tveit & Mangen, 2014; Blikstad-Balas, 2016). In terms of spoken interaction in language education, Norwegian research indicates that this can be promoted by alternating or preceding use of digital tools such as interactive whiteboards (Wølner & Gjertsen, 2015), online writing clients (Lund, 2008; Skaftun et al., 2017), or RT (Talmo, Sørensen & Fjeldstad, 2012; Einum, 2015). However, calls for more qualitative research into ICT practices (Erstad, 2010) and research into student strategies in ICT application in Norwegian schools (Hatlevik, Guðmundsdóttir, & Loi, 2015) remain especially pertinent for RT practices, whose limited research indicates increased student activity with digital tools, but hardly touches lower-education language learning contexts (see Chapters 2.4.1 and 2.4.2).

RT in an educational setting consists of digital tools or artefacts, which allow students to communicate in the classroom with the aid of devices connected to the internet (Beatty, 2004; Abrahamson, 2006; Caldwell, 2007; Lam, Wong, Mohan, Xu, & Lam, 2011). In the context

of this thesis, RT is not to be understood merely as hardware. In fact, its origins in separately produced hardware units known as *clickers* still lead many to think of the phenomenon merely as a set of new equipment, while modern RT avails itself of all available devices (often made available through *BYOD*, or Bring Your Own Device, policies), and more often than not relies on software and the internet for its functionality (Abrahamson, 2006). RT, then, covers a plethora of systems under a variety of names such as *ARS* (audience response systems), *EVS* (electronic voting systems), *PRS* (personal response systems), *SRS* (student response systems), and *CRS* (classroom response systems) (Kay & LeSage, 2009; Beatty & Gerace, 2009). This project will refer to these systems as *response technology* (RT), to avoid the connotations and specificity of each.² The systems possess a number of affordances,³ or potentialities, which allow them to be geared towards assessment, competition, and cooperation, and allow for a variety in input. Common to all, however, is that they facilitate communication between a group and an instructor, often condensing that communication to allow for immediate and targeted response. Despite the variety of RT functionality and its increasing presence in education, however, RT is under-researched in a range of educational contexts, such as upper-secondary education and language learning (see Chapter 2.4.2), and this constitutes a research gap this thesis aims to fill.

Guidelines for language education, student-centring, and ICT

This thesis studies RT as applied ICT in language education, and, internationally, the association of ICT and language education has been profound. According to the Common European Framework of Reference for Languages, a European language student should attain linguistic, sociolinguistic, and pragmatic skills as well as declarative knowledge, and be able to apply these for effective communication (European Council, 2001). ICT is increasingly becoming integrated in these skills, a component in this knowledge, and a medium for their acquisition, leading The Lisbon European Council Summit of 2000 to define ICT skills and foreign languages as two of five basic skills for lifelong learning (European Council, 2000).⁴ A competent language student is expected to be able to make a presentation through a video conferencing tool, showing a series of slides and reading incoming written comments, while

² For example, *electronic* being less specific than *digital*, *classroom* being restrictive, and *SRS* being the product name of one type of software.

³ “Affordance” is used in this thesis as the potential uses or roles embedded in technology (Norman, 1988), but also the use or role of technology as *perceived* by those who use it, based on their background and needs (Lee, 2007; Reinders & Stockwell, 2017). For instance, RT is often designed to afford learning, though it can also be used to increase one’s social standing with other uses, e.g., through humour.

⁴ The attention to digital and language competence is maintained in the Europe 2020 successor strategy to the Lisbon strategy, though in a more implicit manner (European Commission, 2010).

using socially, professionally, and culturally appropriate spoken language. As the nature of language and language use changes in the face of the multimodality and mediation afforded by rapidly evolving technology, language education practices adjust and language learning research has adjusted accordingly with the emergence of Computer Assisted Language Learning (CALL) as a research field. Covering a wide range of technologies and practices, from educational games to mobile communication technologies, and from online collaborative writing to blended learning, CALL studies the influence of technology on the way we acquire and use language (see Chapter 2.4.1).

The provision of digital resources and the importance of digital competencies in education are mandated in Norwegian law and governmental directives. The Norwegian ministries of finance, and education and research, highlighted the need for the Norwegian education system to adapt to the opportunities presented by the development of digital technologies in their whitepaper on long-term perspectives for the Norwegian economy and *Digitalisation strategy for the primary and secondary education and training 2017–2021*, respectively (Ministry of Finance, 2017; Ministry of Education and Research, 2017). Norwegian schools are required by law to supply digital educational resources and equipment to their students (Ministry of Justice, 2019a, 2019b). This is mirrored in the *Core Curriculum*, which emphasises the role of technology in society and education, and the curricula for the different domain subjects, which include digital competencies and technological knowledge (Norwegian Directorate for Education and Training, 1994; 2019a).

In the curricula for language subjects (native, second, foreign, indigenous, minority, and sign languages), Norwegian language education is expected to build competencies in sustainable and effective utilisation of digital tools and resources (Norwegian Directorate for Education and Training, 2019a). Furthermore, these curricula include criteria for digital skills within each subject, in line with the national curriculum from the latest reform (*The knowledge promotion*) and the *Framework for basic skills*, where digital skills are assigned equal importance to oral skills, reading, writing, and numeracy (Ministry of Education and Research, 2006; Norwegian Directorate for Education and Training, 2012, 2019a). As of 2020, new curricula and a new core curriculum will be in effect. While the former are in development and the latter ratified though not yet in effect, the focus on digital competencies remains in the publicly available documents (see Norwegian Directorate for Education and Training, 2019b, 2019c).

Student-centring has a long tradition in Norwegian education (Telhaug, 2006), and the new core curriculum continues this tradition into the future through sub-chapter 2.4, *Learning to learn* (Norwegian Directorate for Education and Training, 2019c, my translation). The current *Core Curriculum* signals the shared responsibility of teachers and students for developing productive student activity and autonomy, through phrases such as, “The young must gradually shoulder more responsibility for the planning and achievement of their own education” (Norwegian Directorate for Education and Training, 1994, p. 19). Student-centring is also pervasive in language subject curricula. Main subject areas, such as the one for language learning in foreign languages, require active students to “define own learning needs, formulate goals, choose work methods, use supporting resources, and evaluate work processes and achievement of goals individually and collaboratively” (Norwegian Directorate for Education and Training, 2019a, my translation). Reflected in the competence aims of the curricula, these guidelines necessitate a language education in which interactive student-centred, rather than transmissive teacher-centred, teaching and learning approaches are employed (Niemi, 2002; Jonassen & Land, 2012).

Language and digital competencies of Norwegian students and teachers

On national and international tests of reading, writing, and digital literacy, Norwegian students show an average to good level of mastery. National tests of 8th and 9th graders’ reading and ESL skills show a normal distribution across the levels of mastery (determined by curriculum skill definitions), with a skew towards higher levels on reading (Norwegian Directorate for Education and Training, 2018). A 2016 test of 8th graders’ writing skills showed the same normal distribution (Skar, 2017). Grade averages from lower- and upper-secondary education also reinforce the impression of Norwegian students having above-average mastery of languages (Norwegian Directorate for Education and Training, 2019d, 2019e). Similarly, the ICILS 2013 study (Fraillon, Ainley, Schulz, & Friedman, 2014; Thronsen, Hatlevik, & Loi, 2015)—which focused on international computer and information literacy and ICT learning environments in education—found that Norwegian students have digital skills above the ICILS average and many of the high-performing PISA countries. However, the same study found that a considerable segment of Norwegian students (24%) have severely restricted digital skills. This suggests that the increased attention given to digital skills in Norwegian guiding documents is justified, and that similar adjustments should be made by other international ICILS and PISA countries. Furthermore, because Norwegian students perform above the OECD average on reading performance in PISA, but align with

the same average for digital reading (OECD, 2015, 2019), it is important for educational practice to realise the integrated role of digital skills, and introduce digital elements to the training of other comprehension and production skills.

While competence requirements for employment of Norwegian secondary-school teachers ensure teachers' language competencies (Norwegian Directorate for Education and Training, 2017), whitepaper 11 (2008–2009) indicated a need for increased digital proficiency amongst Norwegian teachers. Digital proficiency is promoted in government guidelines and policies such as the *Professional Digital Competence Framework for Teachers*, created in response to whitepaper 11, and the *Promotion of the Status and Quality of Teachers* strategy (Ministry of Education and Research, 2009, 2014; The Norwegian Centre for ICT in Education, 2017). Despite this governmental framework, research reveals that teacher education and schools have yet to make considerable advances in order to meet the requirements of government directives (Tømte, Kårstein, & Olsen, 2013; Røkenes, 2016). This reflects international research criticising teacher education and schools for their slow uptake of digital tools and didactics (Tondeur et al., 2019; Baran, Bilici, Sari, & Tondeur, 2019; Valtonen et al., 2019).

1.1. Project design and thesis structure

According to Plano Clark and Creswell (2015), “The Introduction [sic] section of a research report includes information that indicates the researchers' purpose for conducting the research study, which includes specifying the study's focus, intent, framework, participants, and setting” (p. 186). In response to a research gap where RT meets language education in upper-secondary school, the main purpose of this exploratory mixed-methods case study was to contribute to the knowledge about student-centring RT practices, by studying its application in upper-secondary language education and the perceptions of teachers and students. The overall intent—“what the researchers want to learn about the specific topic” (Plano Clark & Creswell, 2015, p. 162)—therefore was to uncover practices and conditions that the informants themselves found relevant to language education, and in particular how they experienced the role of RT in these. This could potentially contribute to educational practice, research, and policy. The main research question was therefore:

How do upper-secondary teachers and students apply and experience RT in language education?

The study followed a multiphase mixed-methods research design, in which the overarching case study was divided into three constituent sub-studies: S1, S2, and S3 (see Chapter 2.4). Of

these, S1 and S3 were qualitative and S2 was quantitative, and each sub-study had its own research question. Table 1 provides an overview of the thesis and sub-studies.

Study purpose	To contribute to the knowledge about student-centring RT practices, by studying its application in upper-secondary language education and the perceptions of teachers and students.		
Main research question	<i>How do upper-secondary teachers and students apply and experience RT in language education?</i>		
Sub-studies	S1	S2	S3
Sub-study research questions	<i>What are the attitudes towards and approaches applied with RT in language education, and how can they be categorised?</i>	<i>How do language students and teachers perceive the application of RT approaches?</i>	<i>What is the outcome of targeted application of mapped and categorised approaches in language education?</i>
Sub-study aims	<ul style="list-style-type: none"> a. Based in the teachers and students themselves, to study attitudes towards and approaches used in initiation, implementation, and follow-up of education utilising RT. b. Establish a comparative basis for S2 and a provisional basis for S3. 	<ul style="list-style-type: none"> a. Based in emerging categories from S1, find a quantitative expression of the perceived nature of student-centred language education through applied RT. b. Map similarities and divergences in these perceptions between groups. 	<ul style="list-style-type: none"> a. In cooperation with teachers and students, interpret and evaluate emerging categories from S1 and S2 in terms of student-centring. b. Organise findings for publication.
Design	Qualitative descriptive case study	Quantitative descriptive case study	Qualitative interpretative case study
Sample	Teachers ($n_t = 12$) Students ($n_s \approx 240$)	Teachers ($n_t = 26$) Students ($n_s = 591$)	Teachers ($n_t = 3$) Students ($n_s = 159$)
Data	Complete observer as participant observations ($n=14$) Semi-structured individual and focus group interviews ($n=5$), and open-ended field interviews ($n=34$)	Teacher and student surveys ($n_{t+s} = 617$)	Field notes/material from S1 and S2 Complete observer as participant observations ($n=22$) Semi-structured individual and focus group interviews ($n=5$), and open-ended field interviews ($n=20$)
Analysis	Constant-comparative analysis	Descriptive and inferential statistics	Constant-comparative analysis and analytic abduction

Table 1: Overview of thesis and sub-studies.

The findings from the case study emerged throughout the execution of these sub-studies and were presented in Articles I, II, and III. Because the study was exploratory, all articles relied on findings from all three sub-studies, and article research questions or aims were therefore designed based on these findings, rather than on the research questions for each sub-study.

Table 2 presents an overview of the articles.

	Article I	Article II	Article III
Title	Involvement with Response Technology as Student-Centring of Language Teaching: Upper-Secondary Student and Teacher Experiences	Discursive lecturing: an agile and student-centred teaching approach with response technology	Written participation with response technology—How teachers ask and students respond with applied text response functionality
Journal	<i>Nordic Journal of Digital Literacy</i>	<i>Journal of Educational Change</i>	<i>Computers and Composition</i>
Research question/aim	<i>How do upper-secondary education language students and teachers perceive student-centring through involvement in the application of response technology?</i>	<i>How can student-centring in language instruction with RT be modelled and compared to similar models for RT-mediated instruction?</i>	<i>Aim: To map the characteristics and motivations behind the responses submitted through RT text functionality, the questions eliciting them, and participation with RT in language learning.</i>
Central findings	<ul style="list-style-type: none"> - RT is perceived to promote student involvement by mediating anonymous participation. - Two forms of involvement—active and passive—are distinguishable. - Students show a preference for passive involvement, in which their responses to questions influence subsequent teaching. - Involvement is therefore contingent on the teacher’s didactic competence in following up student responses. 	<ul style="list-style-type: none"> - RT-mediated interaction can be modelled iteratively and sequentially. - By introducing an open entry question and iteratively discussing and building on answers, teachers can promote student production and knowledge construction. - Alternating between responding through RT and discussing outcome collaboratively requires and promotes teacher agility and student autonomy. 	<ul style="list-style-type: none"> - RT text functionality expands the communicative potential in language education beyond that of multiple-choice functionality. - Text responses represent an alternative communication channel, through which students provide mainly genuine responses, but also empty responses, resistance responses, and meta comments. - High participation through RT text functionality is promoted by teacher follow-up of responses, anonymity, and the flexibility of the functionality. - Applied RT text functionality increases the communicative potential in education.

Table 2: Overview of the articles.

The articles therefore show that RT practices can student-centre language education by promoting involvement and participation (Articles I and III) and by allowing the communication necessary to build on the students’ own production (Articles II and III). By increasing the students’ impact on the lesson through increased communication, both through RT and in discussions based on responses (Articles I and II), education can be tailored to the learners’ needs and therefore promote learning. All articles, however, show this to be contingent on teacher agility in handling responses and adapting their teaching to promote student activity.

This thesis is organised into two parts; Part I: Synopsis and Part II: Articles and appendices. Part I consists of five chapters. This introductory *Chapter 1* contextualises the thesis in terms of project design, researcher background, and empirical setting. *Chapter 2* provides the theoretical and conceptual framework behind the thesis. First, it explains its constructionist view of reality and postphenomenological understanding of learning through experience and technology. Then, it outlines the current state of research in student-centring RT application in language education. *Chapter 3* expounds the methodological framework behind the thesis,

showing how the findings of this thesis were arrived at through research design, methods for data collection, and analysis. Concluded by a discussion of ethical concerns, both with regards to participants and the trustworthiness of findings, the methodological framework strives for transparency and invites further research. *Chapter 4* presents the findings through a summary of the articles, and *Chapter 5* discusses empirical, theoretical, and methodological contributions and implications of the thesis, as well as its limitations, and suggests directions for further research. Finally, *Chapter 6* offers some concluding remarks before the articles and appendices in Part II.

1.2. Statement of researcher background, aims, and stance

In qualitative-dominant research such as that reported on in this study, the researcher is the primary instrument of data collection and analysis (Johnson & Onwuegbuzie, 2004; Merriam, 2009; Lincoln & Guba, 1981). Because of this integral role, and in particular as a consequence of the embeddedness of the researcher within the empirical setting, transparency with regards to researcher background, aim, and stance is essential. This ensures what Lincoln and Guba (1985) describe for qualitative studies as *transferability* (external validity) and *dependability* (reliability). Because the generalisability of qualitative-dominant studies lies in their particularity and the subsequent replication of their findings in other contexts (Greene & Caracelli, 1997; Yin, 2009), it is important to account for the empirical setting as well as possible bias; practical, professional, and philosophical stance; experiential and theoretical background; and subjectivity of the researcher-as-instrument (Alvesson & Sköldbberg, 2008; Peshkin, 1988). This not only contributes to the framing of the study's findings in terms of context and process, but also supports their trustworthiness and application in further research.

As this study concerns the intersection of didactics and technology, it is useful to examine my background in terms of these two areas. My own primary and secondary education focused on general studies, before my shift towards the humanities in higher education. I hold BAs in English and History, an MA in English literature, and have completed the supplemental postgraduate teacher training at a Norwegian university. This qualified me for teaching at secondary and higher level, where I spent nine years predominantly teaching English to students at Norwegian upper-secondary schools and students looking to enrol in university study programs. Didactically, the variety of study programs has required me to assume an agile and responsive teacher role, in which both student-centring and experimental openness to new teaching methods and tools have been central. Furthermore, as part of a university

college, and an international research community, I accrued a background in didactics research that combined with my teaching background to qualify me for the PhD position resulting in this thesis.

Though technology was increasingly present during my own education, its adoption by teachers and the implementation of digital didactics was anaemic at best. Generally limited to administration, in the form of *learning management systems* (LMS), application of technology in education was largely a matter of private experimentation with Web 1.0 technology.

Though the term *digital natives*, which was applied to my generation of students, has later largely been discredited and abandoned (Hsu, Campbell, Coster, & Longhurst, 2014; Røkenes, 2016), my fellow students and I experienced a discrepancy between the variety of technology available to us and what was applied by the generation of teachers providing our education. This experience might have been instrumental as I myself became a teacher and attempted to introduce the level of technology application I was used to as a student in my classrooms. With my transition into higher education, my role as a consumer of technology expanded to include production, as I and my research environment produced, tested, and implemented response technology and other forms of digitally mediated education. In this role, I took part in the development of RT for classroom interaction and testing, and helped shape RT text functionality as a novel form for students to respond in. However, interacting with technologists, programmers, and other experimentally inclined teachers laid bare to me the limitations of technology in itself, and informed the view of technology and focus on methods of application that pervades this thesis, rather than on hardware or software specifics.

This background informed my personal and professional aims with this study. Finding myself in a classroom with access to cutting-edge technology whilst observing a discrepancy between, on one hand, existing educational practices and research, and, on the other, the didactic potential of the available technology, directly informed my aims. Personally, and professionally, I wanted my students to find my lessons relevant and constructive and saw research into RT practices as a potential way to achieve this, both for myself and for my teacher colleagues. Professionally, I saw the potential to remedy a research gap, and in the process provide the basis for teaching methods that could provide new patterns of classroom interaction and communication. I had observed these in my own classroom and noticed how my own practices had become more student-centred, but recognised that the novelty of my research would depend on my ability to limit the influence of my own background in the data gathering. My professional aim was therefore twofold. First, I wanted to study a context

similar to mine and identify needs expressed by informants, then allow RT with which I was familiar to be introduced into it and attempt to observe and analyse what happened. Second, I wanted to use the outcome of this analysis to formulate, implement, and evaluate teaching methods in response to the needs expressed by informants. In this way, I hoped to be able to contribute to both educational practice and research.

1.3. Empirical setting

The research presented in this thesis was undertaken at one of the biggest upper-secondary schools in Trøndelag County, Norway. The school hosted on average 1071 students per year during the project period (2016–2019). These are 16- to 18-year-olds from similar socio-cultural backgrounds, who follow eight different general and vocational study programs, the former consisting of three years in school and the latter of two in school and two years' apprenticeship.⁵ All students and teachers have laptops, all classrooms have interactive whiteboards, and most teachers and students have private smart phones, making the school a technology-rich environment (Yang & Huang, 2015). The school ranks on the national average in terms of grade scores and completion rates. The school employs 177 pedagogical personnel, each of whom holds at least a bachelor's degree in his or her subject with additional pedagogical studies. Of these teachers, 56 teach languages and many also teach a second subject, giving them each around 13.5 hours of teaching per week. Norwegian native or second language (NL/SL) and English as a second language (ESL) are obligatory common core subjects while students attend school, while foreign language (FL) subjects—Spanish, German, French, and Russian—are taken on general study programs for the first two, or for all three, years. All subjects are taught in accordance with national curricula (Norwegian Directorate for Education and Training, 2019a).

The project school as an empirical setting is more saturated by research and development than many others, because it is a university school. The University Schools Partnership project⁶ was initiated in 2016 in collaboration between the Norwegian University of Technology and Science (NTNU),⁷ the Trøndelag County Council,⁸ and Trondheim Municipality.⁹ It aims to

⁵ Starting in the autumn of 2016, some formerly vocational study programs were re-classified as general study programs. In this thesis, general studies are understood as the study program with exclusively common core subjects, while vocational studies are understood as any study program with a combination of common core subjects and program subjects (Norwegian Directorate for Education and Training, 2019f).

⁶ University Schools Partnership. (n.d.). Retrieved from <http://www.ntnu.edu/school-university-partnership>.

⁷ NTNU. (n.d.). Retrieved from <https://www.ntnu.edu/>.

⁸ Trøndelag County Council. (2017). Retrieved from <https://www.trondelagfylke.no/english/>.

⁹ Trondheim Municipality. (n.d.). Retrieved from <https://www.trondheim.kommune.no/english/>.

improve teacher education's integration with practice schools, and systematic research and development in primary school, and upper- and lower-secondary school, through improved teachers' R&D (Research and Development) skills and support for research into practice (University Schools Partnership, n.d.). The PhD position producing this thesis was funded by the Trøndelag County Council partner and the Research Council of Norway¹⁰ as a part of the Partnership and was accompanied by three PhD positions funded by the NTNU and two by Trondheim Municipality. Teachers at the school received 15 ECTS of research training and proceeded to develop and initiate R&D projects. This means that teacher and student informants for this thesis came from an empirical setting in which educational research was common.

¹⁰ Research Council of Norway. (n.d.). Retrieved from http://www.forskningsradet.no/en/Home_page/1177315753906.

2. Theoretical and conceptual framework

This presentation of the theoretical and conceptual framework underpinning this thesis will first progress from constructionist ontology to Don Ihde's technoscience postphenomenology in the epistemological crux of phenomenological thought. Building on this theoretical background of human-technology interaction, Chapter 2.3.1 will argue the relevance of technoscience postphenomenology as a theoretical lens for this thesis, in the face of alternative paradigms such as pragmatism (Hickman, 1990) and actor-network theory (Latour 2005). The technoscience branch of postphenomenology, which studies the role of technology in human experience, will be discussed in depth, because this thesis deals with technology in education as perceived by its users. This theoretical framework will therefore explain how reality in this thesis is understood as something constructed by humans, and that this construction is made in these humans' experiences—experiences that are often influenced by technology in some way or another. Because the articles of this thesis were highly conceptual and close to practice and therefore had little room for theoretical discussions, this framework will provide a backdrop for the discussion of theoretical implications of the thesis' findings in Chapter 5.2. The theoretical framework gives way to a conceptual one in Chapter 2.4, in the shape of an overview of the current state of research into ICT in language learning, RT, and student-centring, including an identification of gaps within this research. This state-of-the-art review (Krumsvik & Røkenes, 2016) of research on these central concepts will be used to situate the findings of this thesis in a wider research context, particularly in the discussion of empirical implications of the thesis' findings in Chapter 5.1.

The systems of ontology and epistemology that form the philosophical underpinnings of research methodology and methods are referred to using terminology such as worldview (Creswell, 2014), epistemology and theoretical perspective (Crotty, 2015), and theoretical paradigm (Denzin & Lincoln, 2018). However, this thesis relies on Guba (1990) and considers ontology-, epistemology-, and methodology-axiomatic elements of paradigms:

[Paradigms] can be characterized by the way their proponents respond to three basic questions. [...]

(1) *Ontological*: What is the nature of the 'knowable'? Or, what is the nature of 'reality'?

(2) *Epistemological*: What is the nature of the relationship between the knower (the

inquirer) and the known (or knowable)?

(3) *Methodological*: How should the inquirer go about finding out knowledge?

The answers that are given to these questions may be termed, as sets, the basic belief systems or *paradigms* that might be adopted. (Guba, 1990, p. 18)

As the exposition of the theoretical framework for this thesis progresses below, it is important not to see paradigms as incompatible in terms of ontological, epistemological, and methodological orientation. The novelty of the subject of research, and the reflexive attitude guiding the aims of this thesis, led to the pragmatic choice of mixed methods as a research method, because pragmatism seeks to use all available methods to study a phenomenon, and mixed methods combine both qualitative and quantitative methods (Biesta & Burbules, 2003; Johnson & Onwuegbuzie, 2004). Mixed-methods theory and pragmatic philosophy reject the incompatibility of methods thesis (Howe, 1988), and argue that because methods can be combined, the philosophical stance of the researcher informing these methods should also be pluralistic (Teddlie & Tashakkori, 2010). Therefore, it is possible to claim that reality is a construct created when the experiences of the inquirers meet, and that by seeking to uncover these experiences through any available method, we can say something both about that experience and that reality. Transparency in these choices of paradigms provides an essential framework for the research, whether those choices are directed by methods relevant for reaching research aims, or by a researcher's predisposition towards certain paradigms in the formulation of aims.

2.1. Ontology: Constructionism

Patton (2002) refers to the Thomas theorem, "If men define situations as real, they are real in their consequences" (Thomas & Thomas, 1928, p. 572), to illustrate constructionist ontology. Constructionists reject Cartesian dualism, in which reality is either objectively already in existence or subjectively conceptualised, in favour of ontological relativism, seeing reality as the product of human intentionality, as something constructed as humans engage with one another and the world (Patton, 2002; Crotty, 2015; Denzin & Lincoln, 2018). Coming into its own in the latter half of the 20th century, constructionism has its roots in *constructivism*, as propagated by, e.g., educational philosopher Jean Piaget, who studied how children constructed their reality (e.g., in Piaget, 1967). Constructivist ontology therefore holds reality as something constructed by the individual. Sociologist Peter L. Berger and phenomenologist Thomas Luckmann added a social dimension to this, integrating sociology and

phenomenology to outline constructionism in *The Social Construction of Reality* (1967), and Lincoln and Guba provided an outline for constructionist research in their 1985 *Naturalistic inquiry*. Constructionism builds on constructivism's philosophical stance that reality is created by the human, by including the situatedness of the creating human in physical, cultural, and social contexts (Crotty, 2015). Constructionism focuses on how the creation of reality is influenced by the human's environment, and this distinction from constructivism is encapsulated in a range of overlapping terms, such as "social constructivism" (Creswell, 2014), "social constructionism" (Berger & Luckmann, 1967), and "constructionism" (Patton, 2002; Crotty, 2015). Recognising the social aspect inherent in constructionism, and its relation to constructivism, this thesis uses Patton (2002) and Crotty's (2015) terminology. Burr (2003), in outlining the central tenets of constructionism, highlights its relativist nature. Constructionists have to be critical of taken-for-granted concepts and be attentive to the historical and cultural specificity of our understandings of reality. Furthermore, a constructionist view of reality requires an attentiveness to how social interaction and discourse influence the reality they construct.

The union of constructionist ontology with a phenomenological epistemology in this thesis is one that can easily be justified, in particular through the focus on intentionality.

Phenomenologists, such as Husserl, Merleau-Ponty, and Ihde, hold that learning happens in the human's intentional relating to the world (van Manen, 2016). Constructionists find reality in the construction of that reality, and phenomenologists provide an epistemological understanding of that construction, an influence particularly visible in *The Social Construction of Reality* (Luckman & Berger, 1967). Phenomenology and constructionism meet in recognising the human as the relativist locus for the formulation and interaction with reality. Therefore, in studying RT in upper-secondary language education through the experiences and meaning-making of those who interact with it, this thesis simultaneously relies on both constructionist ontology and phenomenological epistemology.

With regards to methodology, constructionism is generally associated with qualitative or mixed methods (Johnson & Gray, 2010; Creswell, 2014; Denzin & Lincoln 2018). Hence, constructionist ontology in this thesis is also present in both the application of a qualitative-dominant mixed-methods research design, and in the data gathering and analysis methods attentive to the individual and collective construction of reality, such as focus group interviews and constant comparative analysis. As the reality studied was that of applied RT within classroom interaction, it made sense to construct that reality together with teachers and

students engaging in such interaction. In data gathering, informants constructed realities through accounts in interviews and observed classroom activities, which provided a new reality to be constructed by my analysis. Even self-reporting through survey Likert scales and self-expression through response technology, which underwent quantitative analysis, described a reality as constructed by us. Therefore, the qualitative-dominant mixed-methods approach was entirely consistent with constructionist ontology (Johnson & Onwuegbuzie, 2004; Creswell, 2014; Denzin & Lincoln, 2018).

2.2. Epistemology: Technoscience postphenomenology

The epistemology of this thesis resides firmly within phenomenology, in that it recognises the subjects' *experience* as the locus for interaction with the world, and within specifically technoscience postphenomenology, in that it recognises the role of technology in this experience. Coined and expounded by the American philosopher of science and technology Don Ihde, technoscience postphenomenology provides the theoretical framework to understand the role technology such as RT plays in human experience and activity. In the following, a working version of this system of thought will be presented through Ihde's framework of human-technology relations, before Chapter 2.3 situates Ihde's technoscience postphenomenology in the context of the classical phenomenology of Husserl, Heidegger, and Merleau-Ponty, and the context of Dreyfus', Stiegler's, and Verbeek's postphenomenology.

When explaining the background for his technoscience postphenomenology (Ihde, 1986; 2009), Ihde draws on Heidegger (1996), Heelan (1967), and Achterhuis (2001) in emphasising the role of scientific instruments in human perception. Heelan's dichotomy between the everyday worlds created through direct experience and the scientific worlds created by instrument-generated experience forms the rough fundament upon which Ihde constructs his postphenomenological model for the perception of the life world through technology (Ihde, 1990a). Ihde uses the preoccupation of science with the smallest possible units, especially that of natural science, as an expression of how the need for applied technology for the perception of these units is sometimes insufficient, and problematises and obscures the process of experience. The application of technology in understanding the life world, he argues, may blur the lines between empirical reality and speculation. Technology, in other words, becomes an often necessary, but problematic, vehicle in the process of phenomenological reflection.

Ihde’s response to this is to pursue an understanding of the relations between humans and technology, itself a phenomenological endeavour (Ihde, 1974; van Manen 2016). By viewing technology as an integral part of a human-technology relation—i.e., as an agent in our experience of the life world rather than as separate objects detached from this process as mute elements of the life world to be experienced—Ihde goes beyond classical phenomenology as a markedly self-professed postphenomenologist. In his approach to the phenomenology of technology, Ihde argues that he recognises the complexity and role of technology on a level beyond that of classical phenomenologists such as Husserl, Heidegger, and Merleau-Ponty, a move which for him constitutes an extension of phenomenology into postphenomenology, rather than a break with or elevation of classical phenomenology (Ihde, 2009; van Manen, 2016). Despite this, it is important also to see Ihde’s contribution as a diversification of already existing notions in phenomenology—as, e.g., a vehicle for the Husserlian notion of intentionality, where the human’s experience of the world is directed (intended) towards something or towards the something’s intention, or as a dialogue with Merleau-Ponty’s embodiment phenomenology, where the world is constructed in the enlargement of body schemas through acquisition of habits or skills, or incorporation of objects (Brey 2000; Merleau-Ponty, 2012; van Manen, 2016).

Embodiment relations	(human-technology)-> world
Hermeneutic relations	human-> (technology-world)
Alterity relations	human -> technology (world)
Background relations	human-> (technology/world)

Table 3: Schematic representation of Don Ihde’s human-technology relations. Adapted from Ihde (1974; 1990).

Ihde conceives of four types of human-technology relations; embodiment, hermeneutic, alterity, and background relations (see Table 3).¹¹ In considering these, it is worth reminding ourselves that whereas this thesis considers technology in a narrow sense, as technical items with a mainly digital mode of operation, Ihde, as do many other science theoreticians, sees technology as any tool or artifact not of the biological and psychological human body.

The embodiment relation, which displays clear connections to Merleau-Ponty, sees technology as a representative or constituent part of the corporeal experience of humans, constituent as an extension of our body. Ihde describes the embodiment relation thus: “I take the technologies *into* my experiencing in a particular way by way of perceiving *through* such

¹¹ In the schematic representation of the relations, the adaptation includes vocabulary. Ihde (1974) uses “machine” rather than “technology”, while Ihde (1990) uses “technology”, but “I” rather than “human”.

technologies and through the reflexive transformation of my perceptual and body sense” (Ihde, 1990a, p. 72). In the process of experiencing, then, technology therefore becomes transparent to the human user, no more an external tool than the human’s eyes or arms. In the embodiment human-technology relation, technology acts as an aid to or extension of bodily perception, and as a vehicle for objective intention of the human, and not as the object of this intention. The relation can be schematised as follows: *(human-technology) -> world*. When a student uses a pen or computer to write, his glasses to read, his shoes to run, or his phone to call or voice message a fellow student, these technologies relate to the student in an embodiment relation. The pen and computer act as an extension of his inner monologue or voice, the glasses as an extension of his sight, the shoes as an augmentation of his feet or ability to run, and the phone as an extension of his spoken voice. However, the world he wants to influence by writing, the text he wants to understand, the distance he seeks to cover, or the student he wants to reach are disassociated from the technology itself. The human and the technology form a union that operates in a phenomenological reflection upon the object. In other words, the student’s perception of the life world is in this manner mediated through technology in an embodiment relation to the student.

The hermeneutic relation is Ihde’s clearest reinterpretation of Heelan’s instrument-generated experience, and can be schematised as *human-> (technology-world)*. If phenomenological reflection is the search for the things themselves as experienced by the subject, how can the subject experience the thing if it eludes perception? Ihde refers to the classic example of “instruments which probe the ultramicroscopic worlds of the atom” (Ihde, 1974, p. 276), as also used by Heelan, where the only way to experience the atom is to experience it in the way it appears to us through technology.¹² While all phenomenology is hermeneutic, in that it contains a descriptive-interpretative procedure, technology in a hermeneutic relation clearly emphasises the otherness of technology (Ihde, 1974; van Manen, 2016). The human can only experience the world as mediated by the machine, like a classical hermeneut could experience the author as mediated by text. Here, technology enters the phenomenological reflection in union with the object, a union to be experienced by the human (in contrast to the human-technology union of the embodiment relation). Thus, in the wider sense of technology as mentioned above, the geography student can experience a geographical area through a map, a

¹² The choice of wording here of the atom passively *appearing* to us rather than *presenting itself* is due to an understanding of Ihde’s focus on the active phenomenological subject (corresponding to that of Husserl), rather than on an active object (which appears more in the purview of Heidegger, Marion, and Figal).

science student can experience the acidity of a solution with a pH paper, or a history student can perceive a historic event through texts, recordings, or film. Hermeneutic human-technology relations allow the human to experience the life world, but only expressed through the language of technology, be it graphic symbols, alphabetic graphemes, or otherwise (van Manen, 2016).

The alterity relation was introduced by Ihde 30 years later than the other three relations, in his seminal 1990 *Technology and the Lifeworld: From Garden to Earth*. Alterity human-technology relations can be understood as contrasting embodiment relations. In alterity relations, technology is perceived as “the other” and is given human characteristics and qualities by the human agent of the relation. The term “alterity” is, in fact, borrowed from Levinas, who used it to describe the relations between a human and “the other”, be it another human or God (Ihde, 1990a). This contrasts embodiment relations where technology forms an entity together with the human and is experienced as a part of the self, while in alterity relations, technology constitutes an entity which is itself experienced as “the other”. Does this mean that a postphenomenological reflection performed by the human in alterity relations can only take as its object the experience of technology, and not the life world, as seemed to be the case with hermeneutic relations? Schematising alterity relations thus, *human -> technology (world)*, Ihde claims,

in alterity relations there may be, but need not be, a relation through the technology to the world [...]. The world, in this case, may remain context and background, and the technology may emerge as the foreground and focal quasi-other with which I momentarily engage. (Ihde, 1990a, p. 107)

The anthropomorphic aspect of the alterity relation is often evidenced in the application of technology to tasks and roles that could otherwise be performed or held by humans, and where technology represents a replacement, and often an effectivisation of this. Thus, a person struggling with an Excel exercise might claim that the program *refuses to do* what he asks of it or that it *deliberately corrupts* his processes, or a carpentry student might ask to use a band saw, because it *helps him complete the task* quicker. Here, technology appears in an alterity relation to the human, who endows it with human qualities and intentions. Similarly, Ihde highlights a human fascination with *artificial intelligence* (AI) or quasi-autonomous technology, and visual media such as film and TV (Ihde, 1990a). While the alterity aspects of AI technology should be apparent, the role of film/TV characters and visual media as substitutes for human contact is a more everyday example, albeit one viewed with some

concern by several technology theoreticians, including Ihde and, perhaps most expressly, by the postphenomenologist Hubert Dreyfus (Dreyfus, 1972; van Manen, 2016).

Background relations, as the name suggests, is of a more implicit character (Ihde, 1974). During the course of a day, we humans interact with a great number of technologies without being consciously critical to these. Assuming here the general definition of technology as something not of the biological or psychological human body, we leave our mattresses, take a shower, dress, and brew some coffee even before we leave the house, all without considering the sleeping, plumbing and hydraulic, thermic and textile, and chemical technologies we interact with. From the point of view of a postphenomenologist reflecting upon his experience of the world, technology in background relations may seem a non-entity. We relate to our experience of the life world without consideration of the technology that surrounds us and forms a part of what we experience. Ihde uses the expressions “inside a machine” and “in the technosphere” to express the human’s situation, although, as opposed to the hermeneutic relation, the human does not experience the life world exclusively with technology, but rather in a blend with technology (Ihde, 1974). Ihde schematises the background relations, with the human relating to the blend of the technosphere thus: *human-> (technology/world)*. There is a danger involved, however, in failing to recognise the background human-technology relations, and Ihde derisively likens the camper, who brings technological necessities such as a tent and boiling equipment in his attempt to experience nature (the life world) to an astronaut who is similarly cocooned in familiar technology, likely barring his experience of space. These complexities of humans’ “internalisation” of technology are a key issue in the intersection of phenomenology and technology, most notably in the technogenetic postphenomenology of Bernard Stiegler (Stiegler, 1998; van Manen, 2016).

2.3. Theoretical context of technoscience postphenomenology

Ihde’s technoscience postphenomenology is a useful theoretical perspective to apply, because it is situated within a larger context of phenomenology thought, both the early phenomenology as represented by Husserl, Heidegger, and Merleau-Ponty, and the newer postphenomenology of Dreyfus, Stiegler, and Verbeek (van Manen, 2016). In the following, this field as it relates to technology and Ihde will be presented leading up to a justification of postphenomenology as a theoretical framework in the face of two alternatives: pragmatism and actor-network theory. In the discussion, this theoretical background will be used to show the theoretical implications of the findings of this project.

Edmund Husserl, commonly regarded as the founder of phenomenology, is essential in the sense that he provided a limited, idealist ontology that later thinkers, most notably Heidegger and Merleau-Ponty, could react to, and an epistemology that included a language to frame phenomenological thought (van Manen, 2016). Ontologically, he presented his phenomenology as the culmination of Cartesianism, where he claimed primacy to the subject's experience of the transcendental object. Our thinking is always directed at some object (technical intentionality), and while the object is dynamic, e.g., it can be observed from different angles, in different contexts, our experience of a phenomenon cannot be questioned (Husserl, 1931; 1960). Ihde, especially in *The experience of technology* (Ihde, 1974), attempts to situate technology in this ontology, either as part of the immanent experience or as a part of the transcendental object. Furthermore, having stated the primacy of the experience, Husserl's epistemology aims at studying this experience through the dual processes of epoché or bracketing and reduction. He claimed we could return to the "things themselves" by striving to disregard the object in the world (which could be studied by natural sciences), suspend pre-existing experiences of it (epoché), and focus intently on the experience of the object (retrospective reduction) (Husserl, 1960). This relativist ontology favouring constructionist epistemology is one that has become characteristic of phenomenology (Rockmore et al., 1981). Ihde introduces technology into this epistemology, making it an element in the phenomenological reduction—how technology influences our experience of the object. Furthermore, Ihde's technoscience phenomenology itself can be seen as the outcome of a phenomenological reduction of technology as the transcendental object.

Heidegger's reaction to Husserl tended towards existentialism in reaction to idealist tendencies in Husserl's phenomenology (van Manen, 1990; Heidegger, 1996). Although Heidegger is concerned with the subject's situation as being in the world (ontology), phenomenologist thought has centred upon the intentional activity of *being* in the world, and the epistemological consequences of this activity (van Manen, 2016). Crucially, he argues that the subject cannot effectively bracket out the world and often we are not even consciously aware of the world (Heidegger, 1996). He identifies three levels of being or subject attitudes towards the objects in the world: *ready-to-hand*, where we are not aware of the objects as such and merely coping with the world; *unready-to-hand*, in which we are aware of the object because it diverges from the ordinary and requires attention; and *present-at-hand*, in which the object is considered theoretically, though it does not require attention as such. The latter two correspond to Husserl's phenomenology while the former constitutes the core (*Dasein*) of

Heidegger's *being in the world*. Crudely put, while Cartesian philosophers, including Husserl, had been trying to infer the world from the mind, Heidegger attempts to invert this thinking and study how our mind copes with the world. Heidegger's view of technology, therefore, is instrumental and traditional—it is the instrument that can be experienced, or through which we can experience the world (Heidegger, 1977). Ihde's technoscience phenomenology, by situating technology both with the human and with the world, relies on both Husserl (1931) and Heidegger (1996): technology can be part of the experience (Husserl) and the world from which that experience arises (Heidegger). However, Ihde also distances himself from what he calls Heidegger's traditional and romantic notions of technology as tools or objects, arguing their agency in human experience (Ihde, 1993).

Merleau-Ponty introduces the body to the phenomenological epistemology, in particular as the primary agent of perception. In *Phenomenology of perception* (2012), he retains the intentionality of Husserlian and Heideggerian thought—that the experience of the subject is always directed at something (the things in themselves, or *Das Ding an Sich*)¹³—but asserts that this intentionality is guided by the body. It is as embodied beings—through the skills of our bodies—that we are able to cope with the world. In perception, the body and mind are intertwined, and phenomenological reduction must involve a consideration of the embodied experience of the world. His introduction of the body as an element of the process of perception is significant for Ihde's consideration of technology as an element of the process of perception. This is particularly evident in Ihde's embodiment relations, where the amalgamation of body and technology is presented as instrumental to human perception (Ihde, 1974, 1991). Furthermore, Ihde's understanding of technology is analogous to Merleau-Ponty's of the body as essentially conducive to humans' relation to the world around them. Finally, Merleau-Ponty's notion of word and thought as existing in a similar relationship as body and consciousness is noteworthy (Merleau-Ponty, 1964). He sees body and language as converging as mediums for cognition, words as the embodiment of thought. Therefore, a development of media for Husserl's phenomenological reduction can be traced to Ihde's technology-mediated reduction, through Merleau-Ponty's mediation by the body and language, and Stiegler's mediation by technology building on the language mediation in Derridean *différance*, as will be seen below.

¹³ *Das Ding an Sich*, as the thing as it objectively exists, was originally formulated by Kant as a contrast to *Erscheinung* (phenomenon), the thing as it is subjected to experience (Kant, 2004). Husserl and Heidegger adopt the term, but forgo *Erscheinung* in favour of the intentional experience.

Before proceeding to Stiegler, the somewhat antagonistic views of technology in the phenomenology of Hubert Dreyfus need to be included. As a phenomenologist in the largely positivist environment of emerging computer science at MIT in the 1960s, Dreyfus rebelled against the notion that computers could mimic human cognition by manipulating a representation of the world in symbols. From his initial *Alchemy and artificial intelligence* (1965) through *What computers can't do* (1972) and *What computers still can't do* (1992), as well as his and Stuart Dreyfus' *Mind over Machine* (1986), he criticises this notion as predicated on false assumptions. Drawing on Heidegger and Merleau-Ponty, he holds that the human experience relies on a background of myriad internalised knowledge, of which we are not consciously aware (as the being or *Dasein* or the embodied subject), and which cannot be expressed in the symbolic systems of computer technology. In particular, his distinction between this, which he calls the *knowing-how*, and the *knowing-that*, the unready-at-hand that technology can do, illustrates his criticism (Dreyfus & Dreyfus, 1986). As the field of computer science conceded and adapted by using symbols to apply sub-symbolic systems like computational intelligence in the '80s and machine learning in the '90s, Dreyfus' vindication was coupled with the system at which he had directed his critique becoming obsolete (Crevier, 1993). However, for phenomenologists like Stiegler and Ihde, the philosophical implications of Dreyfus' critique are relevant, as it identified technology as a fallible interlocutor in the experiencing of the world, but admitted its relevance in this position.

Stiegler's technogenetic phenomenology provides the thematic link between the Heideggerian being in the world, with only a generic technological focus, and Ihde's epistemology of concrete technology-mediated perception. In his influential *Technics and Time 1—The fault of Epimetheus*, Stiegler builds on Derrida's concept of *différance*, the dialogue between the human and the world in which meaning is sought but never fully reached (Stiegler, 1998; Derrida, 1982). As he sees humans as prosthetic and adaptive in their relationship to technology, they need technology to interact with the world, and because technology retains human knowledge beyond the human lifespan (books, archeological artifacts), humans adapt themselves to technology to find meaning (Stiegler, 1998). This process of adaptation is empowering for humans in the face of more permanent technology, and *différance* therefore becomes a co-constitution of humans and technology. Learning, or meaning-making, becomes what he calls *epiphylogenesis*, engagement with the world as stored and expressed in technology (Stiegler, 1998). As such, Stiegler's phenomenology uses epiphylogenesis as a conscious orientation of both *différance* and Heidegger's unready-to-hand and present-at-hand

towards technology, while mere adoptive *différance* coincides more with Heidegger's ready-to-hand.¹⁴ This application of epiphylogenesis through *différance* in Stiegler's technogenetic phenomenology bridges Ihde's specific epistemological and ontological focus on technology with the general ontology of Heidegger (and per se Husserl), by explicitly modelling human-technology relations within an ontological context recognisable as the latter's.

Finally, Peter-Paul Verbeek has explicitly built on Ihde and on Latour's actor-network theory (Latour, 2005) to discuss the agency and morality of technology in human-technology relations, and this has led to his current interest in the development of a theory of technological mediation (Verbeek, 2016). Following *the empirical turn* of postphenomenology in the early 2000s and the shift away from humans towards material technology, Verbeek's mediation theory now returns to the human by considering how humans make sense of the world as represented or *mediated* by technology (Verbeek, 2005; 2016). He therefore somewhat complements both his predecessors, first Ihde by suggesting that in human-technology relations, the human and the world are constituted in the mediation of technology, and second Latour by suggesting that humans and technology are neither equal actors, but subjects and objects in constant negotiation (Verbeek, 2016). Therefore, the way to study postphenomenological mediation and human-technology relations, he suggests, is to study

[...] the conversations and practices around mediating technologies, [so] we can gain more insight in the ways in which users take up with technological mediations; how they develop creative ways of appropriating these mediations and integrate them in existing practices and interpretive frameworks; how they see themselves in relation to the mediating technologies and to the phenomena they are perceiving or studying (Verbeek, 2016, p. 197).

2.3.1. Why postphenomenology rather than pragmatism or actor-network theory?

Pragmatism, with its instrumentalism, would appear to offer a useful lens through which we could discuss the role of educational technology in the classroom (Ihde, 1990b). After all, RT is often referred to as an instructional *tool*, e.g., by Caldwell (2007), Kay and Lesage (2009), and Hunsu, Adesope, and Bayly (2016). However, seeing technology as tools by which we

¹⁴ In *Taking care of youth and the generations* (2010), Stiegler is concerned about humans' passive admission of technology geared towards imminent commercial purposes, which he claims leads to a form of proletarianisation.

constitute the world does not take into account the way we are influenced by technology ourselves, and this is where postphenomenology represents a wider-ranging alternative. Larry A. Hickman argues in his *John Dewey's pragmatic technology* (1990) that Dewey precedes Heidegger in making praxis through technology central in his philosophy. It is certainly true that both had an existentialist view of the world, where technology could be a means by which we gain knowledge about the world. Moreover, Hickman makes the argument that the instrumentalism that pervades pragmatism as propagated by Dewey had its foundations in this view of technology as tools. Science, the search for knowledge about the world, was seen by Dewey as interconnected with technology, and he “argued for a precedence of technology over science, based [...] upon a pragmatic theory of action” (Ihde, 1990b, p. viii). However, unlike Dewey’s pragmatism, Ihde’s postphenomenology does not only see technology as a means to understand the world: “What Dewey did not have, and what plays a very distinctive role in postphenomenology as I am defining it, was anything like the sophisticated theory of perception and embodiment which post-Husserlian philosophy developed” (Ihde, 1993, p. 3). By including the way technology affects the human, not only the world, thereby studying technology as the *relation*, or, in Verbeek’s words, the *mediation* between the human and the world, postphenomenology is able to provide a richer understanding of the role of technology (Verbeek, 2016). It is, however, important to recognise the impact of pragmatism on postphenomenology. Ihde moved phenomenology in a pragmatic direction, by being attentive to the pragmatic instrumentalism, discussing *technologies*—technological artefacts such as hardware and software—rather than *technology* in an abstract, romantic sense, as Heidegger did. He also conceded that “As a philosophy, phenomenology itself belongs to that family of praxis philosophies arising out of Hegel, Marx, pragmatism, and, in a derived sense, existentialism. Humans are what they are in terms of the human-world relation, but this relation in existence is actional” (Ihde, 1990a, p. 27).

Actor-network theory, like Ihde’s technoscience postphenomenology, seeks to describe the *networks* of relationships between humans and non-human *actors* through a flat ontology with generalised symmetry, where neither actor is considered as more important for the network than the other (Latour, 2005). For the discussion of RT in education, actor-network theory provides, at its core, a useful lack of distinction. When discussing technology, it is easy to think that technology determines how we act and develop, and to rely on technological determinism in one form or another. By doing so, we might either renounce the responsibility for our actions and development, or refuse technology in favour of social determinism. Actor-

network theory skirts this issue, by taking a descriptive approach to humans and technology, in which humans and technology are equal in the presumed irrelevance of their value or agency. However, this makes actor-network theory less relevant for studying RT in language education, because by not ascribing value or agency to the actors, it offers less explanation power than postphenomenology. In Ihde's technoscience postphenomenology, it is exactly the analysis of the distribution of agency that makes it possible to situate technology in the human-technology relation (Ihde, 1974). For instance, the agency of RT in relation to the human is different when a student uses the text functionality to communicate his thoughts, and when the teacher interprets the incoming text. Ihde's postphenomenology would, in these cases, ascribe embodiment value or agency to RT in the first case, and hermeneutic in the second. The egalitarian view of humans and technology from actor-network theory is also largely present in postphenomenology through Stiegler's technogenesis, but then in positive terms where both have varying levels of agency in cooperation with the other, rather than an equal disregard (Stiegler, 1998; van Manen, 2016). Furthermore, the study of how RT interacts with users in language education invites an agency discussion that is supported by the praxis orientation of postphenomenology, and the attention to instrumentalism as well as the perception and embodiment focus it has inherited from Merleau-Ponty, but less so by the symmetrical agency characteristic for actor-network theory.

Postphenomenology is therefore chosen as a theoretical lens for this thesis, because it includes the elements of pragmatism and actor-network theory that make the latter pair candidates for a theoretical perspective. Pragmatism moves postphenomenology away from classical phenomenology by turning from perception as an aloof and non-interactive reception of the world, to an interactive, mediated, and embodied activity. By recognising the agency of technology and studying the ways humans apply them, the praxis-orientation of pragmatism can also be found in postphenomenology. Ihde characterises postphenomenology as a move away from the essentialism of classical phenomenology towards *multistability*, where objects become what they are based on the way they interact with humans and the world, rather than having some stable qualities or essences (Ihde, 1990a). This multistability is also present in actor-network theory and tends to be used as a rationale to disregard the agency of actors, because this is generated in the relations between them (Latour, 2005). However, where this makes actor-network theory widely applicable and malleable, it also resists generalisability and makes the theory heterogeneous and diasporic (Law & Hassard, 1999). Postphenomenology is more moderate, interpreting multistability and therefore agency as

having distinguishable traits (Verbeek, 2016), and therefore lending itself to discussion through superordinate categories and terms, such as embodiment relations (Ihde), mediation (Verbeek), knowing-that (Dreyfus), and epiphylogenesis (Stiegler).

The articles of this thesis have been able to identify emerging practices that allow the users to present their diverse perceptions of the world, and they have done so by studying the relations between these actors (users and RT) through their own perceptions of these relations. These findings are therefore best discussed through a theory attentive both to practices (pragmatism) and the relationships between humans, technology, and the world (actor-network theory), but with a structured attention to how humans perceive the world, and how this is mediated by RT (postphenomenology).

2.4. Current state of research

As this thesis studies student-centring approaches with RT in language education, it can be situated at the crossroads of three fields of research; ICT in language education, RT in particular, and student-centred learning. A literature review serves to make this situation of the thesis apparent, as it presents central and up-to-date empirical literature from relevant fields, indicates foci and trends, and “justifies how the study addresses a gap or problem in the literature” (Dale Bloomberg, & Volpe, 2019, p.11). The following overview of the current state of research can most accurately be classified as a combined *overview* and *state-of-the-art review* (Krumsvik & Røkenes, 2016). State-of-the-art reviews aim to narratively present the current situation of an often evolving field and indicate directions for further research (Grant & Booth, 2009), which makes them an appropriate format for mapping research into the dynamic nature of ICT in education, and therefore also the pedagogical approaches involving ICT. Overviews are similar to traditional reviews in that they qualitatively evaluate the research field through thematically, chronologically, or conceptually organised rich description, but include elements from systematic reviews such as inclusion/exclusion criteria (Krumsvik & Røkenes, 2016). Because this chapter conceptually outlines the research on ICT in language learning, RT, and student-centring through rich description, and does so according to inclusion/exclusion criteria given below, the state-of-the-art review can be said to include strategies from overviews.

Two strategies were adopted to review the existing literature on RT, student-centring with RT, and ICT in language education. Database searches in ERIC, Web of Science, Proquest, Learntechlib, Google Scholar, Idunn, and Semantic Scholar were supported by snowball

sampling, where relevant articles are identified through citation, either through an article’s reference list, or through indexes of articles citing that article provided by most databases. For example, a Web of Science search for “clicker”, a commonly used term for RT, yields Caldwell’s 2007 review of the field and best-practice tips as the most-cited article. The same search provides Blasco-Arcas et al. (2013), who also figure in the list of articles citing Caldwell. The most-cited of these articles, Kay and LeSage (2009), does not refer to RT as “clickers” but as “Audience Response Systems (ARS)”, and would therefore not have appeared in a pure database search. Hence, the combination of database search and snowball sampling of articles both thematically and referentially maps out the research field, in this case by associating collaboration and engagement (Blasco-Arcas et al., 2013) and the need for an expansion of research contexts (Kay & LeSage, 2009) to the field as described by Caldwell (2007). Both strategies followed a set of inclusion/exclusion criteria, as given in Table 4.

	Included	Excluded
Subject	Education and educational research, educational technology, ICT and RT practices, student-centring, technology-mediated language learning.	Research not pertinent to these fields.
Timeframe	1997-2019	Pre-1997
Publication type	Peer-reviewed articles, books and book chapters, PhD dissertations, conference proceedings	Popular science articles, news articles, manuals and web pages (beyond functionality mapping), non-PhD theses.
Language	English, Norwegian, Swedish, Danish	Other
School level studied	Higher education (university, university college), lower education (primary school, lower- and upper-secondary school)	Kindergarten, pre-school, adult education

Table 4: Inclusion/exclusion criteria for this state-of-the-art review.

ICT’s ubiquitous presence in society and the increasing network capacity has influenced the way we communicate and access information (Kalantzis & Cope, 2017; Ott, 2017). In education, this has led to the emergence of e-learning—“instruction delivered on a digital device [...] that is intended to support learning” (Clark & Mayer, 2016, p. 8), and the sub-category mobile or m-learning—“learning across multiple contexts, through social and content interactions, using personal electronic devices” (Crompton, 2013, p. 4). RT, therefore, is both a part of m-learning, because the devices used are generally mobile and increasingly personal, and of e-learning, because it uses digital devices to support learning (Caldwell, 2007; Chien, Chang, & Chang, 2016).

Language education has similarly adapted, with the development of two discipline-specific fields of research and practice—Computer- and Mobile-Assisted Language Learning, CALL, and MALL (Kukulska-Hulme & Shield, 2007; Browne & Fotos, 2011; Viberg & Grönlund, 2013; Duman, Orhon, & Gedik, 2015).¹⁵ Research on the subject of this thesis, RT in language learning, can therefore be found within a wider research context of technology applied for learning purposes and language learning. As will become apparent in the review below, and as shown in the illustration of research fields in Figure 1, RT for language learning is a part of the subject-specific MALL and CALL, which also include a range of other technologies and practices. These research fields, represented by the lighter sector in the illustration, are subject-specific parts of the larger fields of e-learning, m-learning, and RT in education, each of which includes a range of technologies, practices, and subjects. For instance, RT research has tended to focus on STEM (science, technology, engineering, and mathematics) education, which falls within the larger, dark red, and non-language part of the illustration. RT in language learning as a research field can therefore be situated within a larger context of research along the dimensions of subject and technological specificity, represented as circumferential and radial dimensions in Figure 1.

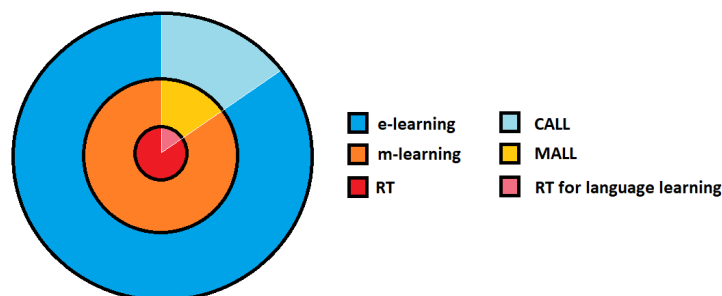


Figure 1: Graphic situation of the subject of study within research on technology in education.

In addition, the articles of this thesis present findings indicating new practices that student-centre language education. Therefore, the following review will commence with ICT in language education discussed through CALL and MALL research (2.4.1), and continue with a review of RT (2.4.2) before discussing the current understanding of student-centring (2.4.3),

¹⁵ A range of related fields pertaining to the use of ICT in language education is also in development, such as Technology Enhanced Language Learning (TELL) and Robot Assisted Language Learning (RALL) (van den Berghe et al., 2019; Zou, Xie, & Wang, 2018). Due to the emerging and sometimes overlapping nature and definitions of these fields, this thesis focuses on the overarching CALL and the superordinate to RT, MALL (see Chapter 2.4.1).

and identifying research needs (2.4.4). Identifying a gap in research on applied RT in language learning and lower-education contexts, the review will therefore progress inwards in the light-coloured, language learning section of Figure 1, and add the dimension of student-centring.

2.4.1. ICT in language education

CALL, since the coining of the term in 1983 (Chapelle, 2001), has come to include any digital technology—networked or otherwise—applied for language learning purposes (Levy & Hubbard, 2005; Deutschmann & Vu, 2015). Hence, in addition to personal computers, devices such as iPods (Abdous, Camarena, & Facer, 2009), tablet computers (Lan, Sung, & Chan, 2007; Kongsgården & Krumsvik, 2016), interactive whiteboards (Schmid, 2010) clickers (Egelandsdal, 2018), and smartphones (Leis, Tohei & Cooke, 2018) with or without recording capabilities have been found to be beneficial for learning, engagement, motivation, and student-centring in language learning contexts. Conversely, there are also studies that moderate these conclusions or even see negative outcomes of the application of such devices in language learning (Li & Walsh, 2011; Swanson, 2013; Golonka, Bowles, Frank, Richardson, & Freynik, 2014; Ziegler, 2015; Shamir-Inbal & Blau, 2016). However, there is a consensus that the effect of the devices themselves is highly dependent on the methods and pedagogical principles guiding their application (Burston, 2014; Aagaard, 2015; Boothe, Caspary, & Wickstrom, 2017). It must, finally, be added that educational settings below higher and adult education are underrepresented in CALL research (Liu, Moore, Graham, & Lee, 2002; Grgurovic, Chapelle, & Shelley, 2013; Plonsky & Ziegler, 2016). Zhao (2013) and Yamazaki (2014) point to a lack of communication between CALL researchers and primary- and secondary-school practitioners as a possible cause, with the former being interested in developing rigorous research designs and conceptual models for CALL (Ware & Hellmich, 2014), and the latter focusing on mastering ever newer forms of technology (Sharifi, AbuSaeedi, Jafarigohar, & Zandi, 2018). Approximating research to these settings and moving practice beyond technical mastery is therefore one of the challenges facing CALL.

The integration of ICT in language learning is an ongoing process. Bax, Warschauer, and Healey described the role of ICT in language learning in terms of three general approaches: restricted, open, and integrated, as shown in Table 5 (Bax, 2003, 2011; Warschauer & Healey, 1998; Warschauer, 2000).

Approach	View of language learning	View of technology	Student activity	Teacher role
Restricted	Structuralist, system-based	External, separate	Individual drills, tests, and clozes	Monitor
Open	Constructivist, system- and skills-based	External, separate	Individual practice, simulations, games, and social communication	Monitor/facilitator
Integrated, normalised	Social-constructivist, situated, social, integrated system- and skills-based	Integrated, ubiquitous	Collaborative work through computers	Facilitator/manager

Table 5: Three approaches in CALL, adapted from Bax (2003), Warschauer and Healey (1998), and Warschauer (2000).

Bax and Warschauer debated whether language education was able to apply integrated approaches, with Bax describing complete integration as a state of “normalization” where “computers (probably very different in shape and size from their current manifestations) are used every day by language students and teachers as an integral part of every lesson, like a pen or a book” (Bax 2003, pp. 24-25). Warschauer (2000) argued that such a state had been reached at that time. However, present thinking on CALL suggests that ICT integration is never complete, as technology and related practices develop and the requirements of complete integration change, but that aspects of normalisation such as physical, administrative, and curricular integration are indicative of sustainable CALL (Chambers & Bax, 2006; Farr & Murray, 2016; Kessler & Hubbard, 2017).

Currently, CALL covers a large variety of pedagogical approaches, such as online collaborative writing (Lund, 2008; Skaftun et al., 2017), multimodality (Hampel & Stickler, 2012; Guichon & Cohen, 2016), MOOCs (Sokolik, 2014; Friðriksdóttir, 2018), virtual worlds (Sadler, 2017; Henderson, Henderson, Grant, & Huang, 2018), and various forms of hybrid learning such as blended learning or flipped learning (Neumeier, 2005; Hung, 2015). These are technologies that allow communication, interaction, and information retrieval and production beyond physical boundaries such as the classroom, and which promote the combination of several modes of communication. Such Web 2.0-based approaches to language learning argue that integrated CALL approaches are increasingly being used (Browne & Fotos, 2011; Deutschmann & Vu, 2015). However, the complete normalisation Bax describes requires Web 3.0 approaches, in which the device is seamlessly interposed between the user and the communication/information,¹⁶ and despite rapidly developing technologies and associated pedagogical approaches, there is as yet little evidence of such

¹⁶ A Web 1.0 user can receive, but not edit, online information. Web 2.0 users engage with the web to interact with online information and other users, e.g., through blogging or chatting, while in Web 3.0, the user is monitored by online pages so that a ubiquitous internet provides information tailored to the user. Web 3.0, though still in a process of formulation, therefore entails a more active role of technology, beyond that of information depository (Web 1.0) or tool (Web 3.0) (Cronje, 2018).

complete integration (Hubbard, 2008; Deutschmann & Vu, 2015; Levy & Hubbard, 2016; Cronje, 2018).

Mobile-assisted language learning (MALL) is a subcategory to CALL, mirroring the relationship of m-learning and e-learning. The *mobile* part refers to devices that are portable and personal, inviting “new ways of learning emphasizing continuity or spontaneity of access and interaction across different contexts of use” (Kukulska-Hulme & Shield, 2008, p. 273). MALL is in a formative period; Kukulska-Hulme (2012) found that the field is still so young that there is no common understanding of how research in this area should be carried out, and Viberg and Grönlund (2012) call for a definition of the field through studies that examine how students’ practices change when using mobile devices in language learning, as distinct from using mobile devices in other subjects or from CALL in general. Viberg and Grönlund’s further observation that many MALL studies are limited in scope, sometimes reporting experiences from short interventions with small groups, also explains why there is no established academic language and no dominant theoretical approach to language learning with mobile devices (Stockwell, 2010, 2012; Balance, 2012, 2013). However, recent studies synthesising the field argue that MALL is taking shape, and suggest that practice is characterised by inquiry-based, informal instruction (Sung, Chang, & Liu, 2016) and that research shows a preference for sociocultural constructionism (Kukulska-Hulme & Viberg, 2018).

Applied mobile technology in language learning has been found to afford adaptability and sensitivity to context (Sampson & Zervas, 2013), to be adaptable and applicable to both individual (Bradley, 2015) and collaborative learning (Burston, 2018; Kukulska-Hulme & Viberg, 2018), and to provide *anytime, anywhere* communication, interaction, and learning (Stockwell & Hubbard, 2013; Burston, 2014). While there has been an increase in studies of learning effects of MALL (Sung, Chang, & Liu, 2016), effect sizes are moderate (Sung, Chang, & Yang, 2015) and highly dependent on instructional and technical design (Lecheler & Hosack, 2014; Kukulska-Hulme & Viberg, 2018). Sung, Chang, and Yang (2015) also found greater learning effects from using mobile devices with a diversity of teaching/learning strategies, such as both individual and collaborative work, and activities targeting wider subject areas than, e.g., just reading or writing.

MALL could therefore be considered in development, as the research field works to reconcile contradictory findings. For instance, MALL research reports increased engagement and motivation, in particular as a result of student-centring and collaboration mediated by mobile

devices (Palomo-Duarte, Berns, Cejas, Doderó, Caballero-Hernández, & Ruiz-Rube, 2018; Kukulska-Hulme & Viberg, 2018). Meanwhile, there is also research to temper these conclusions, as, e.g., Golonka, Bowles, Frank, Richardson, and Freynik (2014) find only weak to moderate support for the claims of engagement and motivation. Mobile learning can also lead to distraction and disengagement, due to the multitasking (Ophir, Nass, & Wagner, 2009; Blikstad-Balas, 2012; O'Bannon & Thomas, 2015) or changing environment associated with it (Reinders & Hubbard, 2013; Heflin, Shewmaker, & Nguyen, 2017). Finally, affective benefits from MALL seem contingent on teacher and student experience and skill (Gromik, 2012; Hsu 2011). Nikou and Economides (2017) found both student engagement and motivation with applied mobile devices depended on their perceived autonomy, and Botero, Questier, Cincinnato, He, and Zhu (2018) found that student acceptancy of MALL relates to the perceived usefulness (performance expectancy) of using mobile devices. In sum, these representative studies indicate that MALL remains a young research field in which conflicting findings are negotiated through further research.

2.4.2. Response technology (RT)

The articles in this thesis all include a section on the state of research into applied RT, and a thorough review of the literature pertaining to RT and involvement (Article I), RT and discursive lecturing (Article II), and RT writing and participation (Article III) can be found there. Therefore, the following section will give a general introduction to RT and to the current thinking on its effects on learning, motivation, participation, and involvement, and on the role of anonymity.

Having been in existence since the '60s but rising to didactic and academic prominence in the 2000s, RT is presently shedding its association with specifically designed hardware, often called *clickers*, and now takes the shape of online or installable applications (Abrahamson, 2006; Caldwell 2007; Hunsu et al., 2016). Such software provides an additional communication channel in or outside the classroom through which students can make contributions, often anonymous ones, through their smartphones, tablets, or computers, and teachers can receive and react to in real time a comprehensive and accurate snapshot of the class that this provides. Response technology (RT) has a pervasive presence in modern education, but—although the technology itself has no inherent or domain-specific limitations and is applied throughout the school system—research has previously focused on higher education and STEM subjects (Fies & Marshall, 2006; Schmid, 2007). This has left the field of applied RT in secondary-school language subjects virtually untouched by research (Kay &

Lesage, 2009; Cardoso, 2010). Although RT is being used by teachers and students in language classrooms, producing a limited corpus on reported practices, a significant research skew in the disfavour of language education still persists (Kay & Lesage, 2009). No suggested explanations for this can be found beyond suggestions of limited use (Cardoso, 2010), and notions that the divergent nature of questions in language and other human and social sciences is harder to reconcile with the digital format of RT than are the convergent questions of natural sciences (Crisp, 2007; Habel & Stubbs, 2014). However, with the introduction of open text response after 2015, an application largely unaddressed in the research field,¹⁷ divergent cognition communicated through RT is now a possibility, which provides a further relevance and need for research in language education. Articles II and III represent an effort to meet the above research needs, as they found RT multiple-choice and, particularly, text functionality to be conducive to divergent cognition and participation in upper-secondary language education. See the reviews in these articles and Chapter 5.1 in this synopsis for research contextualisation of RT text functionality, divergent cognition, and a situation of this thesis within this context.

RT has been found to benefit learning, motivation, participation, and involvement, though it must be noted that, beyond the novelty effect of RT on motivation (Lantz, 2010), most studies agree that the RT itself is less important for these benefits than the methods with which it is applied (Anthis, 2011; Stewart & Stewart, 2013; Landrum, 2015; Chien, Chang, & Chang, 2016). Many studies report positive effects from applied RT on learning (Mayer et al., 2009; Fitzpatrick, Finn, & Campisi, 2011; Keough, 2012; Jääskeläinen & Lagerkvist, 2017). However, the learning effects appear to be contingent on a variety of factors, such as the nature of the questions asked and whether they concern factual or conceptual knowledge (Beatty, Gerace, Leonard, & Dufresne, 2006; Shapiro et al., 2017), educational context and subject domain (Castillo-Manzano et al., 2016), and accompanying collaboration, such as peer learning and feedback (Nielsen, 2012; Egelanddal, 2018).

Caldwell (2007) reported that students and teachers found applied RT motivating, because its anonymity countered students' fear of making a mistake. Meanwhile, Stowell & Nelson (2007) established the same link between motivation, which they found increased with RT, honesty, and participation. Cain, Black, and Rohr (2009) found RT to motivate student

¹⁷ Introduced with the completion of the iLike RT software in 2014 (HiST iLike homepage. (n.d.). Retrieved from <http://www.histproject.no/node/725>); at the time of writing, open text response functionality is becoming increasingly common.

attendance and participation and Kay and Knaack (2009) found RT to motivate because it can “increase the overall energy” of secondary-school education (p. 388). These studies, along with Wang’s (2015) observation of student motivation from game elements in the software—which highlights the role of technology itself as a motivator—express the diversity of the field as well as the difficulty in constructing a unifying theory for RT motivation beyond that of general incentive theory (Cain et al., 2009; Hunsu et al., 2016).

The findings presented in the articles of this thesis, and, in particular, in Articles II and III, suggest that interaction in class, based on interaction through RT, student-centres the lectures and invites student participation. RT is often marketed as conducive to participation, with technical arguments such as ease of use, anonymity, and private accountability being provided as possible causes (e.g., Fies & Marshall, 2006; Stowell & Nelson, 2007). Graham, Tripp, Seawright, and Joeckel (2007) studied students’ perceptions of participation with RT and found that students who were reluctant to share opinions or ask questions did not differ from non-reluctant students, sharing a positive attitude towards participation with RT and highlighting its enabling aspect. Students who did not like classes that required participation saw this enabling aspect as a threat and had a negative attitude towards applied RT. Heaslip, Donovan, and Cullen (2014) highlight this study as one of few attempting to shed light on why students participate more, by exploring student perspectives, a gap pointed to also by Roschelle, Penuel, and Abrahamson (2004), Preszler, Dawe, Shuster, and Shuster (2007), and Kay and LeSage (2009). Heaslip et al. (2014), Bachman and Bachman (2011), and Habel and Stubbs (2014) represent a renewed effort to fill this gap. Their studies showed that students find RT easy to use, which makes them participate; that students consider participating both with RT input and with evaluation of the resulting list of answers as conducive to learning; and that they see their participation with applied RT as a contrast to their passive role in traditional lectures.

That RT is conducive to involvement, students’ activities, and role in shaping and directing education activities was the main finding presented in Article I. Students are happy to influence the lesson through RT (Graham et al., 2007), as long as they consider doing so conducive to reaching their learning goals (Trees & Jackson, 2007). Students therefore need to see their input followed up by the teacher (Articles I–III, Ludvigsen, Krumsvik, & Furnes, 2015; Dong, Hwang, Shadiev, & Chen, 2017), and see the effects of their input in the subsequent lesson (Laxman, 2011; Blasco-Arcas, Buil, Hernández-Ortega, & Sese, 2013). Bruff (2009) and Bachman and Bachman (2011) asserted that both students and teachers are

aware of the responsibility that comes with such involvement. Article I supports these assertions, which may explain student preference for passive involvement (having the teacher adapt the lesson based on their responses to subject-related questions, their comments on their own understanding, or their request for aid) over active involvement (explicitly deciding procedures or content). However, there is need for more research into the determinants and outcomes of involvement through RT (Henrie, Halverson, & Graham, 2015).

An additional issue that is ubiquitous, if not prominent, in the research on RT is anonymity. Anonymity is commonly cited as an integral factor promoting participation, involvement, and learning in higher education (Freeman, Blayney, & Ginns, 2006; Stowell, Oldham, & Bennett, 2010; Bojinova & Oigara, 2011, 2013; Latham & Hill, 2014) and only a few studies indicate a possible irrelevance of anonymity under certain conditions (Draper & Brown, 2004; Hinde & Hunt, 2006). Most studies reporting on anonymity emphasise immunity to professional or social repercussions as the main benefit of RT use, and the findings of this thesis, and of Vanderhoven, Raes, Montrieux, Rotsaert, and Schellens' 2015 study on 15- and 16-year-olds—one of the few with such a young sample—suggest that these notions might also be true for primary and secondary education. Despite this, the role anonymity plays, and what governs users' attitudes towards it, remains a secondary concern only perfunctorily explored in the literature.

In a Norwegian context, the research on applied RT is somewhat limited in scope, although it reflects the findings of international studies such as Roschelle et al. (2004), Caldwell (2007), and Beatty and Gerace (2009), which indicate that applied RT can represent a positive learning potential for students. Nielsen (2012), Arnesen, Korpås, Hennissen, and Stav (2013), Bjørkli (2014), and Wang (2015) are among those who have contributed the most in terms of approaches and applied RT. They argue, albeit from a higher-education perspective, that frequent use promotes learning, and Wang cites changed classroom dynamics as a possible cause. Nielsen's, Bjørkli's, and Arnesen et al.'s work is, however—like the majority of the research in the field—focused on the STEM subjects, while Wang focuses on game-based learning and a competitive element that is representative of only a portion of the applied RT. There is very little research into RT in Norwegian language education. Talmo and Stoica (2017), in their review of RT research in a Norwegian higher-education context, identified conceptual questions and RT use in combination with feedback and peer collaboration as the most central factors for language learning in higher education. In lower education, Einum (2015) explored the results of applied RT in formative assessment in ESL at the upper-

secondary level. The study—targeting grammar, linguistics, literature, and cultural knowledge in ESL—found indications that RT and associated approaches might promote learning to a larger extent than traditional language tuition on the secondary level. This was found to be contingent on the immediate feedback that RT allows, which is supported by Bjørkli’s and Arnesen et al.’s findings, and coherent with recent research done on RT and feedback in higher-education contexts (Ludvigsen, Krumsvik, & Furnes, 2015; Egelandstad, 2018; Ludvigsen, Ness, & Timmis, 2019). However, in a Norwegian context, there is a need to examine RT in education settings outside higher education and STEM subjects, and this thesis constitutes an effort in that direction.

2.4.3. Student-centred learning

Student-centred learning is tentatively understood as “a wilful, intentional, active, conscious, constructive practice that includes reciprocal intention-action-reflection activities” (Jonassen & Land, 2012, p. ix) performed by the student, rather than a transmissive imparting of knowledge from the teacher (Jonassen & Land, 2012). Covering a range of approaches to learning, it is often closely related to *self-regulated learning* (Boekaerts, 1997), *peer learning* (Mazur, 1997), *problem-based learning* (PBL) (Duch, Groh, & Allen, 2001), and *formative assessment* (Birenbaum & Dochy, 1996). The phenomenon has received increasing attention since Kember’s 1997 observation that it had no clear definition in the existing research. His literature review contrasted it with a teacher-centred focus on content and commented that research into teaching conceptions, as guides for teaching approaches and ultimately student learning approaches, might prove favourable in exploring beneficial student-centred approaches to learning. Such research was undertaken by, amongst others, Niemi (2002), who mapped the attitudes and experiences towards student-centred learning (which Niemi termed *active learning*) of teacher educators, student teachers, teachers, and students. She found that system culture, social constraints, and traditional attitudes towards roles were at odds with initiatives for implementation of student-centred approaches, and called for remedies to a “lack of knowledge about active learning methods and strategies and a lack of metacognitive knowledge at all levels of the educational system” (Niemi, 2002, p. 778).

The role of technology in student-centring of education lies in the way it facilitates student activity and teacher agility. Research points to a joint responsibility between students and teachers for implementing student-centred learning (Lowyck, Elen, & Clarebout, 2004; Jang, Reeve, & Deci, 2010), and Timperley (2008; 2011) examined the links between student-centred learning and teacher professional learning and development, and developed a cyclical

framework modelling this environment. Browne and Fotos (2011) describe the difference between pre-computer education and computer-based education (see Table 6) largely as a shift from traditional, teacher-led instruction with passive students, to one in which the teacher empowers and facilitates, agilely adapting the lessons to active, contributing students. The findings in this thesis collate this research on teacher-student collaboration and technology by describing an environment in which the collaboration inherent in student-centred education is facilitated by RT, which provides the means by which student activity can become known to the agile teacher. Article III describes the nature of this activity and Article I the agenda behind it, while Article II suggests a pattern by which the agile teacher can respond to it.

	Education in the Pre-Computer Society	Education in the Information Society
School	Isolated from society Information on school functioning is confidential	Integrated in society Information on school functioning is openly available
Teacher	Initiates and controls instruction Teacher-fronted instruction of the whole class	Empowers students to find appropriate instruction for their particular learning styles and strategy preferences Teacher as facilitator guides the students' independent learning; students often work in groups or pairs or singly
Student	Evaluates students Low emphasis on communication skills Mostly passive learning Learning mostly at school Little teamwork Answers questions from textbooks or teacher Low interest in learning	Helps students evaluate their own progress High emphasis on communication skills Actively in charge of own learning Learning at school and outside of school Much teamwork Asks questions; learns to find answers to questions High interest in learning

Table 6: The transfer to student-centred education through technology (adapted from Pelgrum (2001, p.164) by Browne and Fotos (2011), p.8).

In Browne and Fotos's description of education in the information society, technology serves two essential purposes relevant for student-centring: it promotes and scaffolds student activity. Technology may enable students to build their knowledge by engaging with one another and the world, e.g., in formulating goals and choosing work methods, information retrieval, analysis, and presentation (Shapiro, 2008). However, this does not mean that technology should take the place of the teacher; left to their own devices, students repeatedly have been found to "lack requisite self regulation skills" and fail to develop "theories or explanations and retained initial misconceptions", as well as being unable "to reflect or enact metacognitive processes" or "to develop coherent, evidence-based explanations" (Hannafin & Hannafin, 2010, p. 12). The motif of the teacher as a facilitator and collaborator is therefore

central to student-centring, with the teacher engaging with the students to negotiate their internal preconceptions and preferences with external requirements, such as curriculum goals (Shapiro, 2008; Hannafin & Hannafin, 2010). Technology can be employed to help the teacher provide such adaptive scaffolding for student activity (Hadwin & Winne, 2001; Jacobson & Azevedo, 2008; Brush & Saye, 2014), where changes in student needs and knowledge become visible to the teacher through technology, and the teacher can react by providing just-in-time support, as exemplified in Table 6 (Novak, 2011; Roschelle et al., 2010; Lee & Hannafin, 2016).

2.4.4. Research needs

Many literature reviews, including but not limited to Fies and Marshall (2006), Kay and LeSage (2009), and Aljaloud, Gromik, Billingsley, and Kwan (2015), point to a limited scope in the literature on RT and associated approaches. Much of the literature focuses on higher education and STEM subjects and tends to exclude pre-tertiary levels and the humanities. Perhaps most poignantly, Kay and LeSage were able to quantify this skewed focus in their literature review, identifying 59 out of 61 studies as focusing on higher education and STEM subjects. They speculated that this might be due to economic constraints in primary and secondary education, although the practical and ethical considerations associated with researchers gaining access to lower-education subjects and contexts might also account for some of the skew towards higher-education settings. The inclination towards STEM subjects is similarly unexplored, but Caldwell (2007), Crisp (2007), and Habel and Stubbs (2014) suggested that the question types and the technical element of applied RT might make it seem more relevant as a tool in these subjects. This, and the need for a broadening of focus, is echoed by Fies and Marshall (2006) and Kay and LeSage (2009), with the latter noting that research into non-STEM use might uncover either limited relevance in the humanities, or a need for different approaches or strategies.

The combination of MALL as a research field being in its relative infancy and the continual rejuvenation and emergence of educational technology and its affordances necessitates both exploratory and revisionist research. As new affordances and practices emerge, what it means for a student to respond and produce—and for a teacher to promote learning—changes, and future research should aim to identify these changes and how they support or conflict with previous practice. Methodologically, there is also reason to expect that an exploratory approach to practices akin to that adopted by Beatty et al. (2006)—where RT practices rather than concepts such as assessment, motivation, or learning are the unit of analysis—is likely to

produce knowledge of emerging practices readily applicable to education contexts and technology development. Such research can respond to and facilitate the gradual integration of technology into educational practice in a sustainable way, as it is grounded in practice and accounting for the needs and perceived relevance for technology. Communication between researchers, teachers, and technologists facilitated through research into technology-mediated language learning practices is likely to benefit the progression towards *normalisation* and integration in CALL and MALL (Bax, 2003, 2011; Warschauer & Healey, 1998; Warschauer, 2000).

The design of and findings from this doctoral project should be considered an effort to meet these research needs. The exploratory identification of involvement (Article I), discursive lecturing (Article II), and text responses (Article III) as central to language learning practices with RT in lower education, and the subsequent situation and negotiation of these with existing research and practices, exemplify a reflexive effort to reconcile the unknown with the known. Furthermore, in a school context where teachers are required—but are uncertain about how—to deal with digital forms of education (Norwegian Directorate for Education and Training, 2019a; Røkenes, 2016), the research presented in this thesis, sensitive to their contexts and needs, may provoke responses in research and practice that may further respond to the research needs within student-centring with applied RT.

3. Methodological framework

The following chapter discusses the methodology used in the project. Starting with a discussion of the research design, including sampling and participants (3.1), the chapter progresses with a discussion of the methods applied in data collection and analysis (3.2, 3.3). The chapter finishes with a discussion of ethical concerns: those regarding the treatment of participants, such as privacy and confidentiality, and those regarding research integrity, such as credibility, transferability, and dependability (3.4). In the research literature on applied RT, there is a focus on methodological transparency, to ensure reliability and transferability (see, e.g., Ludvigsen et al., 2015; Røkenes, 2016; Egelanddal, 2018). The articles are characterised by this transparency, and this chapter aims to mirror that focus. Due to the exploratory nature of the project, there is no one-to-one relationship between articles and sub-studies. Because of this, an exposition of the relationship between articles and sub-studies is included in the discussion of the research design.

3.1. Research design

The methodology and research design behind this thesis is best described as a qualitative-dominant, postphenomenological, mixed-methods case study (Teddlie & Tashakkori, 2009; van Manen, 2016; Merriam, 2009). Though accurate, such a complex description needs to be unpacked. As can be seen in Table 7, the thesis is based on three successive cases (S1–S3), each bounded in temporal, spatial, and thematic extent. The first and last of these cases are studied using qualitative research methods, while the second is approached with quantitative methods, and can as case studies therefore also be seen as bounded by aim and research design. Because mixed methods aim to use both qualitative and quantitative methods to answer a research question, the case study therefore exemplifies such a design. As the three studies come together to say something about the bounded phenomenon of applied RT in the language education of an upper-secondary school, they form a mixed-methods case study. Two out of three of the constituent case studies apply qualitative research methods, making the mixed-methods design qualitative-dominant. Finally, because the research relies heavily on the participating agents' experiences of the phenomenon of applied RT, such experiences being the main unit of analysis in postphenomenological research, the methodology and research design can be classified accordingly. In the following, these methodologies will be discussed as they informed this thesis.

Main research question	<i>How do upper-secondary teachers and students apply and experience RT in language education?</i>		
Sub-studies	S1 (Aug. 2016–Jun. 2017)	S2 (Apr. 2017–Jun. 2017)	S3 (Aug. 2017–Dec. 2017)
Sub-study research questions	<i>What are the attitudes towards and approaches applied with RT in language education, and how can they be categorised?</i>	<i>How do language students and teachers perceive the application of RT approaches?</i>	<i>What is the outcome of targeted application of mapped and categorised approaches in language education?</i>
Design	Qualitative descriptive case study	Quantitative descriptive case study	Qualitative interpretative case study
Sample	Teachers (n _t = 12) Students (n _s ≈ 240)	Teachers (n _t = 26) Students (n _s = 591)	Teachers (n _t = 3) Students (n _s = 159)
Data	Complete observer as participant observations (n=14) Semi-structured individual and focus group interviews (n=5), and open-ended field interviews (n=34)	Teacher and student surveys (n _{t+s} = 617)	Field notes/material from S1 and S2 Complete observer as participant observations (n=22) Semi-structured individual and focus group interviews (n=5), and open-ended field interviews (n=20)
Analysis	Constant-comparative analysis	Descriptive and inferential statistics	Constant-comparative analysis and analytic abduction

Table 7: Methodological framework of the project. Adapted from Table 1.

Because of the exploratory nature of the project, the presentation of findings is structured differently from the research design, and articles are structured in relation to findings rather than to the methodological design from the project’s initiation. Also, the article format requires a condensed presentation of background, methods, and findings. Because of this, only Article I explicitly draws attention to all three sub-studies, as its argument is contingent on reader familiarity with all three. While Articles II and III make little to no reference to S2, and discuss findings in terms of S1 and S3 data, their conclusions are corroborated by the quantitative findings of S2, without this being explicitly stated. The presentation of project findings through predominantly rich, thick description is in line with the constructionist ontology and postphenomenological epistemology of the project (see Chapter 2), but the absence of reported S2 data must not be mistaken with missing support in quantitative data.

3.1.1. Case study

Definitions of case studies abound, and they are often at odds with one another (see, e.g., Yin, 2014; Stake, 1981). Merriam (2009) attributes this to a confusion of “the case” (the unit of study) and “the case study” (the process of study). Relying on a selection of predecessors, she further defines a case as a bounded system of data and data context, and a case study as the “intensive, holistic description and analysis of [this] single, bounded unit” (Merriam, 2009, p. 203). Data collection in the case study (i.e., the process of study) should take place within an intrinsically bounded and delineated context of a case (i.e., the unit of study), and the

determination of these limits should be made based on the research question (Merriam, 2009). Furthermore, one case study can include several cases, presenting a hierarchy of case studies. In such multicase studies, the overarching entity to be studied is benefits from communalities between the bounded systems studied in each sub-study, and is referred to as the *quintain* (Stake, 2006). However, recognising the confusion of terminology, this thesis will forgo “quintain” for Merriam’s more common vernacular, referring to the overall research design as a “case study”, and the three constituent case studies as “sub-studies” (S1, S2, and S3).

As such, the definition of cases to study is a useful focusing and structuring device for the researcher, because he has to determine what is and is not part of the case. When refining the research question and therefore also the boundaries of the system to be studied (the case), the initial demarcation of RT rather than other forms of educational technology was joined by a limitation of subjects to language subjects, of school contexts to just one upper-secondary school, and of the period to 17 months. Further definition of the case occurred with the definition of the sub-studies—the cases appropriate for answering subordinate research questions—and their participant samples. While bounded by the same spatial and organisational settings as the case study, the sub-studies differed in time, sample size, and methods for data collection and analysis (see Table 7).

The case study design was particularly relevant for this project, because its main purpose was to study the phenomenon of applied RT in a specific context. Alternative research designs such as narrative research or grounded theory research were abandoned because of this focus. Narrative research designs focus on individual experiences as told through stories, while grounded theory focuses on theory construction through a rigid methodology (Plano Clark & Creswell, 2015). Because of this, both were originally considered for the project. However, the project’s aim was to study a phenomenon through multiple experiences and data sources, and to provide a limited theory by employing any available methods to study of a phenomenon within a limited and clearly defined context. Because the study of a case, as outlined above, is a study of the phenomenon of interest in context, and both the phenomenon and context define the case, this research design was adopted (Cronbach, 1975; Stake 2006). Furthermore, case studies are flexible in their requirements for research methods, because the methods will have to be chosen due to the requirements of both the phenomenon and the context (Plano Clark & Creswell, 2015). This was also in line with the methodological attitude towards the study purpose, as the project aimed to study the phenomenon with any available methods (Biesta & Burbules, 2003; Johnson & Onwuegbuzie, 2004).

A further classification of case studies based on intent provided a guide to method choice, that of descriptive, interpretative, and evaluative intent (Merriam, 2009). A descriptive case study will aim to provide rich, thick descriptions of a phenomenon, often because this phenomenon has yet to be researched, or to provide a basis for further research. Interpretative case studies add a theorising module, and to a greater or lesser extent go beyond mere description to a level of conceptual abstraction in order to formulate and evaluate theoretical assumptions. These two differ mainly in the post-data gathering stage of research, as different analytical methods are chosen to achieve the descriptive and interpretative aim. While sub-studies S1 and S2 both contained interpretative elements, they were situated closer to the descriptive end of a descriptive-interpretative continuum than was S3. This was because a considerable component of each case study was concerned with the exploratory gathering of approaches to RT in language education and of student and teacher perceptions. However, because there was a continuous parallel coding and categorisation process of increasing complexity throughout the overall case study, the latter qualified as an interpretative case study. This inevitably influenced S1 and S2. From the research questions in Table 7, meanwhile, S3 might appear to have been an evaluative case study. This, however, was not the case. An evaluative case study builds on rich, thick description and theorising explanation to pass judgment on the case. This is particularly relevant if the case study is intended to assess the viability of a program, an implementation, or the like, and, for qualitative research in particular, if there are “no reasonable indicators of programmatic success which can be formulated in terms of behavioural objectives or individual differences” (Merriam, 1998, p. 39). However, this was not the case in S3. It did not move the overall case study in an evaluative direction. S3, rather than evaluating the success of the emerging didactic approaches, provided an understanding of these approaches by exploring and expanding on them through new data in analytic abduction (Schurz, 2008; Fram, 2013). This made S3 an interpretative case study.

3.1.2. Mixed methods

The case study in this thesis followed a mixed-methods research design (Johnson & Onwuegbuzie, 2004; Creswell & Plano Clark, 2011; Creswell, 2014). Mixed-methods research attempts to combine qualitative and quantitative methods, which were previously considered two exhaustive methodological approaches of little mutual influence or consequence. In fact, when approaching a topic that has been subjected to minimal prior research efforts, and therefore adopting an exploratory research attitude, a mixed-methods design represents an appropriate approach, because it incorporates both qualitative and

quantitative research. In it, the research question is approached with both methodologies precisely because they employ different data gathering, analysis, and theorising strategies, with the presumption that one might illuminate areas that the other leaves obscure. Furthermore, a mixed-methods approach is likely to produce divergent findings, which can uncover complexities within the phenomenon that pure qualitative or quantitative methods might not (Teddlie & Tashakkori, 2010). Johnson and Onwuegbuzie (2004) highlight the synergetic and pragmatic values of mixed methods:

Philosophically, it is the “third wave” or third research movement, a movement that moves past the paradigm wars by offering a logical and practical alternative. Philosophically, mixed research makes use of the pragmatic method and system of philosophy. Its logic of inquiry includes the use of induction (or discovery of patterns), deduction (testing of theories and hypotheses), and abduction (uncovering and relying on the best of a set of explanations for understanding one’s result. (p. 17)

All data gathering, analysis, and theorising are situated within the dynamics between these two. This means that the qualitative methods are informed by quantitative methods in the sense that they build on the results of quantitative research, or that qualitative methods provide the basis on which quantitative research is performed. Mixed methods allow both descriptive and interpretative research to take place within the same study, and therefore merge well with the case study design used in this project (Teddlie & Tashakkori, 2010). Sub-studies 1 and 3 (S1 and S3) used predominantly qualitative methods while sub-study 2 (S2) used quantitative. The data gathering and analysis of S1, because it would serve as the basis for the data gathering of S2, always partially served a quantitative end. Likewise, as S1 and S2 would combine to inform the largely qualitative S3, they both interacted to serve a qualitative end, while the foundations of S3 were, at least in part, of a quantitative nature. This positioning of the thesis on a continuum between qualitative and quantitative paradigms rather than a dichotomic positioning in either, called *synechism*, is mixed methods’ resolution of any paradigmatic conflict between the two (Patton, 2002; Johnson & Gray, 2010). Figure 2 shows Teddlie and Tashakkori’s (2009) illustration of this continuum from pure qualitative (A) to pure quantitative (E). This thesis, relying more on the qualitative than the quantitative paradigm, is “qualitative-dominant mixed-method research” (B) rather than “totally integrated” (C) or “quantitative-dominant” (D) (Morse, 2003). This eclecticism of methods is

a central quality of mixed methodology and allowed insights into the subject of research that would have been unavailable had only one paradigm been followed.

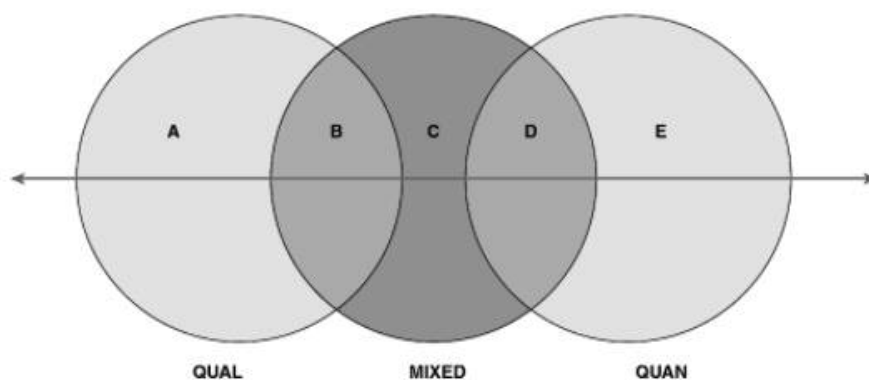


Figure 2: The qualitative-quantitative continuum (Teddlie & Tashakkori, 2009, p. 28).

Plano Clark and Creswell (2015) provide a classification of different mixed-methods research designs based on the relationship between qualitative and quantitative methods. The organisation of the three sub-studies presented in Table 7 can be classified as a multiphase research design, an advanced research design in which more than one qualitative or quantitative component is implemented at different points in time (Creswell, 2014; Plano Clark & Creswell, 2015). Figure 3 illustrates the organisation and classification of the sub-studies, applying Morse's (2003) notation, which is commonly used in descriptions of mixed-methods designs. The qualitative S1 and the quantitative S2 form the first two phases, sequentially and partially concurrent. These took place before the qualitative S3, which forms the third phase. What distinguishes "sub-study" from "phase" is therefore the latter's temporality, which is why the articles adopt "phase" rather than "sub-study". In S1, data were analysed progressively, and the findings from this analysis informed the data gathering of S2, which took place towards the end of S1 and the school year. S2 used quantitative methods to examine the emerging qualitative findings of S1 with a larger sample towards the end of the S1 data gathering and analysis period, which makes S1 and S2 a sequential exploratory mixed-methods study. By applying qualitative methods to investigate the coordinated findings from the S1/S2 mixed-methods study, S3 formed a sequential exploratory/explanatory mixed-methods study with S1/S2. While alternative mixed-methods designs were considered, such as designing S1 and S3 as one qualitative study with S2 embedded, or S1 and S2 as convergent

parallel studies or a qualitative-dominant embedded study, these were rejected on the grounds that the multiphase design presented describes data interaction more clearly.

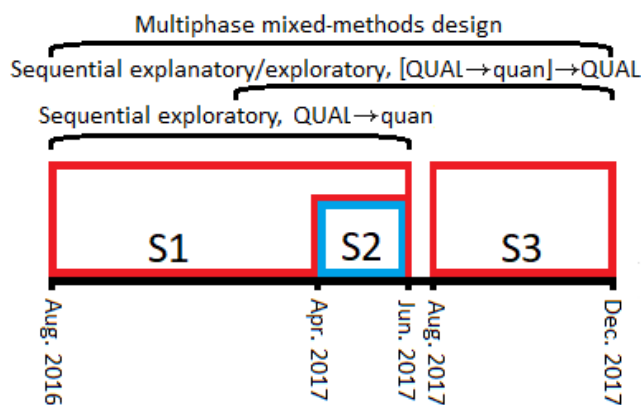


Figure 3: Illustration of the mixed-methods research design. Qualitative (red) and quantitative sub-studies (blue) are arranged according to Plano Clark and Creswell's (2015) classifications, and Morse's (2003) standard notation, where capitalisation indicates dominance and arrows sequentiality.

As two of three sub-studies are qualitative, the mixing of the methods was not even, which would require not only an equal role for qualitative and quantitative research in producing the project outcome, but also equality in the diversity and influence of the methods applied and in the resources allocated to their application. Paradigm emphasis, i.e., a consideration of the allocation of dominance within the research, was highlighted by, amongst others, Morgan (1998). Choosing to adhere more to one paradigm than another not only guided the combination of the two paradigms, as evidenced for instance in the interaction process between the forms of data collection and analysis, but also served as a clear manifestation of scientific attitudes, epistemological and ontological stance, and theoretical perspective (Crotty, 2015; Morgan, 1998). Thus, a constructionist ontology with a postphenomenological epistemology, underlining the social and collaborative effort in research, naturally favoured the more flexible and open-ended methods of qualitative research, while still recognising the plurality of respondents that a quantitative survey could reach.

The dynamics between qualitative and quantitative methods of data collection and analysis are closely linked to the concept of trustworthiness through triangulation (Morse, 2003; Teddlie & Tashakkori, 2010; Flick, 2018). Trustworthiness is an indicator of whether the elements that are used to construct the resulting theory are understood as representative of reality as the researcher, the subjects of research, or the audience of the research understand it

(see Chapter 3.4.2). In mixed-methods research, there are specific strategies on method level, within the qualitative part, and within the quantitative part, but, crucially, each of these parts serves as a check on the other. Creswell (2014) suggests a range of trustworthiness strategies, one of which is triangulation. Triangulation relies on diversity and multiplicity to indicate trustworthiness, in the form of different voices, different sources, different modes of data collection, and different analysis methods (Flick, 2018). Trustworthiness, then, is considered to be high if these display converging findings when applied in research. Mixed-methods research, where a multiplicity of methods is applied in response to the same research question, is therefore a form of triangulation (Flick, 2018). In the project, the facets of student-centring of language education were studied through observations and interviews (S1/S3, qualitative, a small group of teachers', students', and the researcher's voice) and questionnaires (S2, quantitative, a considerably larger group of students and teachers). These diverse methods provided converging and diverging findings, identifying the main findings of this research, and the triangulation provided by these diverse methods argues the trustworthiness of these findings.

3.1.3. Sampling and participants

The sampling for the project was closely tied to each sub-study, but all informants were sampled from the same time period, environment, and context—three terms at the project upper-secondary school—thus constituting a bounded system (Plano Clark & Creswell, 2015). This was conducive to research, as the researcher's workplace was in the same school, and informants were in close proximity and accessible for data gathering, member checking, debriefing, or the like. In general, the student groups studied were drawn from both general and vocational study programs, though the school subjects in focus remained the same, as these were taught across study programs. Vocational and general study programs, because of their practical and theoretical approach to teaching, generally require different approaches to the same material, making the inclusion of both a valuable source for data on teaching approaches.

The sample population for S1 was chosen by purposeful snowball or chain sampling (Patton, 2002). Such sampling starts by identifying participants that fit the sample criteria, and through them discovering and identifying further participants (Merriam, 2009). The main criteria for S1 teacher sampling were willingness to participate, an experimental attitude, and an interest in the field of research, because these were instrumental to generating qualitative data in S1. Prior to S1 initiation, a period of considerable information sharing about project aims and

background had taken place. Following the first volunteers, 18 teachers of vocational and general subjects and their classes from vocational and general studies were progressively involved in the sub-study, through snowball/chain sampling, and, of these, 12 were language teachers.¹⁸ For interviews, project teachers were asked or volunteered while students were approached by their teachers based on criteria (such as high or low attendance, experience with digital tools, etc.) arrived at through teacher-researcher discussions. Table 8 shows those of the S1 and S3 interview informants referred to in the articles, when they were interviewed, and, for teacher informants, the subjects they taught.¹⁹ Abbreviated language subjects in Table 8 are the NL Norwegian (Nor.), the SL English (Eng.), and the FL's Spanish (Spa.), French (Fr.), and German (Ger.).

Informant	S1/S3	Gender	Teacher/Student (vocational/ general study program)	Interviewed	Subject area
Ms. Gregson*	S1/S3	F	Teacher (VS/GS)	Fall 2016, Spring 2017, Fall 2017	Eng., Spa.
Ms. Travers*	S1/S3	F	Teacher (VS/GS)	Fall 2016, Spring 2017, Fall 2017	Eng., Fr., Ger.
Ms. Glossop*	S1/S3	F	Teacher (VS/GS)	Fall 2016, Spring 2017, Fall 2017	Nor., social sciences
Mr. Corcoran	S1	M	Teacher (VS/GS)	Fall 2016, Spring 2017	Spa.
Ms. Phipps	S1	F	Teacher (VS/GS)	Fall 2016, Spring 2017	Nor., Fr.
Mr. Todd	S1	M	Teacher (VS)	Fall 2016, Spring 2017	Nor., Eng., social sciences
Ms. Bassett	S1	F	Teacher (GS)	Spring 2017	Eng., Fr.
Mr. Malvern	S1	M	Teacher (GS)	Fall 2016	Nor., social sciences
Kirsti	S1	F	Student (GS)	Spring 2017	Languages
Alma	S1	F	Student (GS)	Spring 2017	Languages
Ronja	S1	F	Student (GS)	Spring 2017	Languages
Anna	S1	F	Student (GS)	Spring 2017	Languages
Vidar	S3	M	Student (VS)	Fall 2017	Languages
Egil	S3	M	Student (GS)	Fall 2017	Languages
Solveig	S3	F	Student (GS)	Fall 2017	Languages
Iselin	S3	F	Student (GS)	Fall 2017	Languages
Torgeir	S3	M	Student (GS)	Fall 2017	Languages
Aurora	S3	F	Student (VS)	Fall 2017	Languages
Runa	S3	M	Student (VS)	Fall 2017	Languages
Eirik	S3	F	Student (GS)	Fall 2017	Languages
Chris	S3	M	Student (GS)	Fall 2017	Languages
Adrian	S3	M	Student (VS)	Fall 2017	Languages
Isabella	S3	F	Student (VS)	Fall 2017	Languages
Anton	S3	M	Student (VS)	Fall 2017	Languages
Elin	S3	F	Student (VS)	Fall 2017	Languages

*Main teacher informants in S3

Table 8: Informants for S1 and S3 interviews figuring in the articles.

¹⁸ The choice of including non-language teachers in S1 was partially a reflection of the research field, in which findings from established research in non-language subjects informs research on language subjects, and partially in recognition of the generalisability of student-centred response technology didactics.

¹⁹ The languages each student informant studied is not presented, because some classes were small and the combination of teacher's subjects, student's subject, and their association in articles could potentially identify both.

In S2, the sample of 1100 students and 41 language teachers was chosen by purposeful maximum variation sampling (Onwuegbuzie & Collins, 2007; Merriam, 2009). Maximum variation sampling aims to include as diverse a sample as possible, to explore a phenomenon from several angles and find converging and diverging data patterns through this sample (Palinkas, Horowitz, Green, Wisdom, Duan, & Hoagwood, 2015). Students from all levels and study programs at the upper-secondary school, who had had language education and who might have been exposed to response technology, formed such a diverse student sample. It was expected that maximum variation sampling, in accordance with sub-study aims, would ensure that “[any] common patterns that emerge from great variation are of particular interest and value in capturing the core experiences and central, shared dimensions of a setting or phenomenon” (Patton, 2002, p. 234). The totality of the language teachers, teaching a range of six languages to the whole variety of student informants, was chosen on the same premise. The response rates were 64% for students and 78% for the teachers, and, keeping only those who had answered the survey in full, an effective sample size of 591 students (vocational studies 49.6% and general studies 50.1% of these) and 26 teachers was reached. This constitutes net samples of 54% and 63% for the respective groups.

Because a main aim in S3 was to explore, explain, and interpret emerging findings from S1 and S2, eligible teachers and classes for S3 were identified during the first-year execution of S1 and S2. The selection criteria for the sample were therefore to a large extent pertinent to the experience of the teachers involved, in order to provide a relatively constant level of response technology approach implementation throughout the data gathering period. The sampling for S3 therefore closely resembled the *theoretical sampling* of grounded theory, in which the sample is selected in response to the progressing data gathering and analysis (Glaser & Strauss, 1967; Charmaz, 2006; Merriam, 2009). Thus, the sampling of three language teacher informants, three foreign language classes, three second language classes, and two native language classes for S3, all from both general and vocational study programs, was made in tandem with the emergence of S1 and S2 findings. Also, because of the pool of qualified informants from S1, a measure of maximum variation sampling could be included, providing the above variation in language subjects and study programs. The three teachers, Ms. Gregson, Ms. Travers, and Ms. Glossop, as well as 13 of their students, were interviewed during S3 (see Table 8).

Influence of the emic researcher on informants

The researcher had background as an ESL teacher at the school in which the research was conducted and had his workplace in the same school, and the research was organised under the University Schools Partnership, in which collaborative research between teachers and researchers is a central principle (see Chapters 1.2 and 1.3). This influenced both the role of the researcher and the teachers. The emic role of the researcher as an insider provided levels of access and acceptance that would be unavailable to an etic, outsider researcher (Onwuegbuzie & Johnson, 2006). For instance, the high participation rates in S2 are likely attributable to teachers administering the survey to their classes for a colleague rather than for an outsider. The emic role of the researcher was also highly aggregative to data gathering, as it counteracted problems associated with power asymmetry, such as countercontrol (informants withholding information) and interviewer analysis monopoly (Kvale & Brinkmann, 2015; Erickson, 2018). However, the drawback of the researcher as immersed in the collegium is the danger of his *going native* and being unable to achieve a distance to the context that might be required for efficient analysis and data gathering. Furthermore, informants may have difficulties separating the role of emic researcher from that of fellow teacher, workplace acquaintance, or the like, and erroneously assume that the researcher is familiar with the same conditions as they are when providing data (Dwyer & Buckle, 2009). To minimise these drawbacks, researcher-informant relationships were formalised in the initiation of each sub-study, and a running dialogue between researcher, participants, and non-participants at the school was maintained to continually reassess and visualise the emic/etic role of the researcher.

As discussed in Chapter 1.3, the researcher and teacher and student informants operated in the context of the University Schools Partnership. A stated aim of the Partnership was to produce research relevant to the teachers, and to promote teachers' research into practices. This meant that teacher informants had participated in courses on teacher-student supervision and research and development, and that there were several teacher-led research projects running simultaneously at the school, creating an environment for practice-based research. Thus, informant teachers and students were able to provide valuable input that not only involved them in the data gathering process, but also ensured the relevance, reliability, and validity of the findings (Creswell, 2014). This competence in the school personnel justified and facilitated the above sampling procedures, and also allowed the ongoing dialogue calibrating researcher and informant roles throughout the project period (Corbin Dwyer & Buckle, 2009).

3.2. Data collection

In this thesis, both qualitative and quantitative methods for data collection were used. In the qualitative S1 and S3, open-ended field interviews and semi-structured interviews and classroom observations, including observations of RT responses, were used. In the quantitative S2, data were gathered through cross-sectional, non-experimental surveys. These data collection methods as they were applied in this thesis will be described below.

3.2.1. Observations

Observation as a data gathering method is widely used in qualitative research, where behaviour and body language as well as spoken interaction are relevant sources of data (Becker & Greer, 1957; Patton, 2002). Because observation relies on the observing subject, the data gathering method has often been criticised for being too subjective and therefore unreliable (Merriam, 2009). However, a researcher observes based on a system of predefined criteria and values, and therefore observes selectively and intentionally, recording observations relevant to his research question and theoretical fundament, and disregarding irrelevant observations (Patton, 2002). Observation becomes “a research tool when it is systematic, when it addresses a specific research question, and when it is subject to the checks and balances in producing trustworthy results” (Merriam, 2009, p. 118).

As the researcher enters the context to be observed, therefore, in this case, a classroom lesson, he will have made a number of weighted choices concerning the nature of the observations he intends to make and the role he wishes to play. A commonly deferred-to typology of participant observer roles is that of Gold (1958) (see, e.g., Baker, 2006; Merriam, 2009; Creswell, 2014), in which the observer acts on a continuum from *complete participant* via *participant as observer* and *observer as participant* to *complete observer*. During the observations, the researcher acted as an observer as participant, silently observing from the back of the classroom; both he and the the teacher and student informants whose practices he observed, were aware of this field relationship (Merriam, 2009). Having previously worked with the teachers as colleagues and maintaining daily contact with them because of common background and workplace, the researcher was naturally led to the adoption of this role. Furthermore, as a result of the sampling process, where teachers volunteered to participate in the doctoral project without other incentives than their own interest in R&D, and with the teachers also participating in interviews, the researcher and the teacher informants shared a common interest in the research field. Similarly, student informants were informed of the

researcher's role and the aim of the project prior to observations. These pre-defined researcher-informant relationships minimised the danger of the researcher going native and the artificiality of the researcher's presence in the informants' context, as he with this common understanding and repeated observations blended into the classroom context (Gold, 1958; Baker, 2006).

The 37 S1 and S3 observations were undertaken with an aim to explore the actions and reactions of teachers and students when they applied RT in their language lessons, the manner of RT responses and reactions to them, and the perceptions and attitudes they exhibited in this process (see Table 7). Observations were recorded through ethnographic field notes, which involved a descriptive and a reflective component (Emerson, Fretz, & Shaw, 2011; Merriam, 2009; Saldaña, 2009). The actions and reactions of the informants were described, immediate researcher interpretations were recorded alongside these, and analytic memos were added post-observation. An example excerpt from an S3 observation of RT practices, adapted from shorthand, is given in Table 9. This choice of procedure was made primarily to limit the intrusiveness of the observing researcher (as recording equipment would introduce a foreign and influential element to the situation), and to initiate analysis through the recording of events in accordance with project goals and epistemology.

S3 Observation

Ms. Travers,
20.09.2017, 1220-1400
2 year vocational studies, 17 Students
English

[...]

3rd vote: "List some of the contrasts in the movie (India vs. USA)" (text). Ms. Travers explains what a contrast is.

Answers: Food, India had poor people with a big heart/ america was greedy boogers, the people in India was friendlier and more happy to learn new things than the people in the USA would be.

Ms. Travers: Goes through these. "How would India compare to Norway?" One student answers "I think we have more money, but we are as interested in learning as there".

Other answers: the environment and the culture, the girl has to marry someone her parents decided for her.

Ms. Travers: Acknowledges this and talks a bit about it (how it was represented in the movie). A girl in the back says "Ah" when her contribution receives praise.

4th vote: "How does Todd's character develop during his stay in India?" (text)

Answers: Arrogant to nice, less touchy, gets nicer, was very confused by the culture but opened up to learning about it, initially thought it would be horrible, but ended up having a good time.

Memo: Ms. Travers clicks and emphasises the ones she goes through, so they remain visibly approved, or at least discussed.

Break

[...]

Analytic memo: Contributions were numerous, maybe more so than I expected from a combined vocational studies class.

Ms. Travers does not react negatively to negative contributions ("I didn't like the film"). She rewards participation.

Table 9: Field notes excerpt from an S3 observation (adapted).

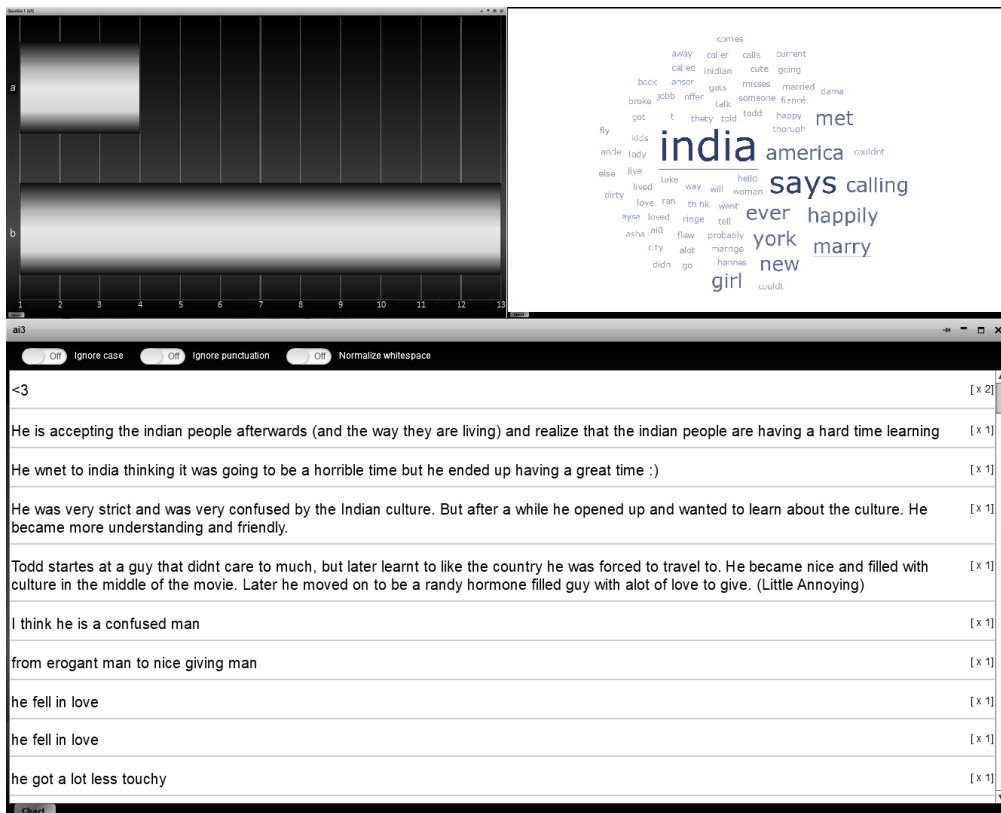


Figure 4: Screenshots from the RT iLike exemplifying the three forms of RT response data gathered: multiple-choice histogram, word cloud and text frequency list (Ms. Travers' English lesson, 20.09.2017).

Furthermore, observations included the registrations of RT responses, and teacher and student reactions to these. This was undertaken in a two-step process. First, the teacher's process of asking, students' process of responding, and all informants' reactions to and treatment of displayed responses were observed. Their behaviour, comments, and reactions were recorded, together with rudimentary descriptions of the observable outcome. Later, in collaboration with teachers, the uniformly anonymous student responses themselves, in the form of graphical multiple-choice distributions, word clouds, or text frequency lists, were extracted to complete the observation data. Figure 4 exemplifies the visualisation of these responses, taken from the same lesson as the field notes in Table 9. This combination of observed classroom practice and content provided an empirical fundament upon which interviews, surveys, further observations, and, eventually, project conclusions and theory were made.

Field observations require an entry and exit strategy (Patton, 2002; Bogdan & Biklen, 2007; Merriam, 2009). It was paramount in order to provide as rich and thick data as possible that

the teacher informants should themselves have an interest in participating and an inquisitive attitude towards the application of response technology in education. Thus, the entry strategy consisted of negotiation with gatekeepers: presenting the project in a number of teacher fora at the school, encouragement of teachers from school and department leaders, and individual contact based on the recommendations of these. As a result, entry was gained through invitations from teacher informants, and formalised through the signing of consent forms (see Appendices 2 and 3) in line with the ethical standards of the Norwegian Centre for Research Data (NSD). Defining an exit or disengagement strategy was challenging, due to the exploratory nature of the project and the researcher's workplace in the site of observations. With no way of knowing what would be a sufficient amount of data to describe a hitherto unexplored phenomenon, and with the researcher's continued presence in the field, how could the cessation of observations be determined and signalled? Merriam (2009) suggests that an exit strategy should be guided by practical and/or methodical considerations. In this project, the interaction of sub-studies with one building on the other, the unavailability of informants due to end-of-term exams, and data saturation as evidenced by the progressive analysis of data justified the phasing out of observations in S1 and S2. It is worth noting, though, that the disentanglement from the data gathering context of S1 was not complete, as a selection of informants from this sub-study became part of the entry strategy of S3, continuing on as core informants (see Chapter 3.1.3).

3.2.2. Interviews

Qualitative interviews have been a common research method in education research for decades, and are especially applicable in this project, as they give the researcher access to a phenomenon as experienced by informants and allow him to engage with the informants in producing knowledge about this phenomenon (Kvale & Brinkmann, 2015). Interviews are also considered central in constructionist research and postphenomenological methodology, which both emphasise the construction of reality through experiences and efforts of a group of subjects, and which formed the ontological and epistemological fundament for the doctoral project (van Manen, 2016; Crotty, 2015; Kvale & Brinkmann, 2015). A constructionist and postphenomenological theoretical fundament was also used to counter power asymmetry and its effects, where the researcher or some informants and their experiences are more dominant in constructing reality than others (Gubrium, Holstein, Marvasti, & McKinney, 2012). Therefore, interviews were done collaboratively, with the interviewer and interviewees together defining the relevant topics and developing the direction of the interview (van

Manen, 2016; Crotty, 2015; Kvale & Brinkmann, 2015). Furthermore, I adopted such a neutral and reflexive stance in order to reduce my own bias, recognising my role in the communal meaning-making of the interview (Alvesson & Sköldbberg, 2016; Kvale & Brinkmann, 2015; Creswell, 2014).

Throughout S1 and S3, a total of 64 interviews were conducted, and Table 8 above gives an overview of the informants for the interviews. The interviews ranged from brief, open-ended interviews of a few minutes (n=34+20) to long, semi-structured interviews of up to 1.5 hours (n=5+5) (Silverman, 2014). The former, more frequent, type provided insights into the situation of language and/or response technology teaching, insights into attitudes of teachers and students, and reflections around past or future classroom experiences. The semi-structured interviews—two with individual teachers, two with focus groups of teachers, and one with a focus group of students—allowed for deeper discussions of emerging issues from the observations and open-ended interviews.

Both types of interviews followed the seven stages of interviewing as formulated by Kvale and Brinkmann (2015) and shown in Table 10. The open-ended interviews differed from the semi-structured interviews in design and transcription. The former were short and took place in the field before or after related observations, while the latter typically lasted 1–2 hours and took place towards the end of each sub-study. Open-ended interviews were recorded as paraphrased field notes with key passages transcribed verbatim, and quickly member checked with the interviewee, while semi-structured interviews were recorded digitally and transcribed by the interviewer or an external professional. However, all interviews were thematised, were analysed, underwent trustworthiness checks (“verified”), and were reported in accordance with S1 and S3 aims. The design of semi-structured interviews also included interview guides (see 6 and 7) based on the research questions, and on data and findings from preceding observations, interviews, RT responses, and surveys. However, in line with the doctoral project’s epistemological and ontological fundament, and to avoid power asymmetry, the interviews were conducted with a sensitivity both to the guide and to the interviewees (Kvale & Brinkmann, 2015; Erickson, 2018).

1. Thematising	Informant experiences of applied RT and RT text functionality.
2. Designing	Individual, open-ended field interviews and individual/focus group semi-structured interviews with a reflexive, agile interviewer role (Creswell, 2014).
3. Interviewing	In accordance with interview guide, but following up on informant input, recorded.
4. Transcribing	In source language, Norwegian, without dialect. Verbatim, with limited discourse analysis notation or, for the field interviews, paraphrased (Silverman, 2014; Poland, 2002). See Chapter 2.4.
5. Analysing	See Chapter 2.4.
6. Verifying	Member checks, qualitative and quantitative triangulation against observation/response data and survey data (Creswell, 2014).
7. Reporting	In this thesis, through peer-reviewed journals, on international conferences and local and regional seminars.

Table 10: Kvale and Brinkmann's (2015) seven stages of qualitative interviewing in terms of the overall execution of interviews in the project.

Prior to the execution of semi-structured interviews, pilot interviews with teachers and students not to be involved in data gathering in the project evaluated the interview guides and allowed the researcher to gauge for the interview environment in this field of research, and develop his skill as an interviewer. This, combined with findings from preceding analyses, provided the structure for the interview guides and the semi-structured focus group interviews. Emerging findings, such as those presented in the articles, were discussed in terms of background/existing conditions and traditions; general impressions and experiences; specific experiences and applications of RT; teacher and student roles; and attitudes and experiences with participation, motivation, involvement, and learning. However, as an interviewer, the researcher adopted an inquisitive and reflexive stance in the interviews in order to reduce his own bias and counter power asymmetry and its effects (Creswell, 2014; Kvale & Brinkmann, 2015; Alvesson & Sköldböck, 2016; Erickson, 2018). In this way, the interviews were conducted with a sensitivity both to the interview guides and to the interviewees, and the informants and researcher collaborated in defining the relevant topics and develop the direction of the interview.

Interviews served a crucial role in relation to field observations, where the findings of one informed the data gathering of the other (see Chapter 3.1.2). If performed before, open-ended interviews with teachers would elaborate on the context of the upcoming observation, guiding the subsequent observation data gathering of the researcher and conceptualising the lesson for the teacher. If performed after, open-ended interviews would serve as an immediate member check on the field notes taken, and highlight issues for further analysis (Creswell, 2014). Furthermore, informants would continue to apply RT in their lessons, even with the researcher unavailable for observation, and report the outcome and experiences back to the researcher in the form of open-ended interviews. Finally, while most of these interviews took place with individual informants, meetings where teachers shared their experiences and the researcher shared preliminary findings were conducted, and these were treated as interview situations.

The constant dialogue between observations and interviews therefore not only served to access more data, but also to triangulate these (Lincoln & Guba, 1985).

3.2.3. Surveys

Survey research is a quantitative method that gives access to a larger sample than many other methods, and allows the researcher to gauge respondents' characteristics or attitudes through their generally numerical responses, in order to make inferences about trends in a larger population (Fowler, 2014; Creswell, 2014). A case study survey is non-experimental in that it does not administer a treatment to a test group for comparison with a control group, and can therefore not describe causation (Chmiliar, 2010). However, it can provide a distribution of responses to the questions asked, which can be used to analyse not only how the sample relates to the topic of each question, but also relationships between response distributions (Gable, 1994; Chmiliar, 2010).

S2 employed survey as its method of data collection, and based a student survey and a teacher survey on the preliminary findings in S1 (see surveys in Appendices 4 and 5). Through an increase in sample size, a survey could indicate whether the emerging findings of S1 were representative, not only for the school, but also, by extension, for a wider population.

Therefore, a retrospective non-experimental correlational case study design was applied with two cross-sectional surveys (Shadish, Cook, & Campbell, 2002; Creswell, 2014). In layman's terms, the surveys did not administer or withhold any treatment, but measured the association between groups and variables with two surveys asking about attitudes and experiences with a phenomenon informants had encountered previously, administered at only one point in time. A sample covering the totality of language students ($n=1100$) and the native, second, and third language teachers ($n=41$) at the upper-secondary partner school was invited to take the survey, and an effective sample of 591 students and 26 teachers did so in full. High response rates were conducive to analysis, as it increased the probability that correlations between groups and variables were statistically significant, making it possible to make reliable inferences about the population from the sample. Teachers responded to the survey during department meeting time and students received, responded to, and submitted theirs through their teachers at the conclusion of the school year and S1. This timing, well before exams, was expected to allow the surveys to tap into as much informant experience as possible, without the practical and cognitive limitations the exam period was expected to inflict on informants. To minimise storage of data on external, third-party servers, both surveys were administered on paper.

Both surveys were based on S1 findings; targeted frequency of RT use; and perceptions of student anonymity, participation, involvement, motivation, and learning facilitation in conjunction with applied response technology in language education (see Appendices 4 and 5). The S1 informants' counsel was sought in the shaping and framing of the surveys (see Timperley, 2008; McTaggart, 1997). Questions and statements were also quality-checked by colleagues within education research and by an external expert in quantitative methods. Finally, the student survey was piloted with students at the preparatory course for engineering at the Norwegian University of Technology and Science (NTNU), under the presumption that they, having recently completed either general or vocational studies, represented a suitable group for quality evaluation. The surveys, one for the students and one for the teachers, consisted of four sections. One was biographical (A); one concerned the frequency of use (B); and one addressed respondents' attitudes towards applied response technology in the four subsections defined from S1 findings: participation (Cp), motivation (Cm), involvement (Ci), and learning facilitation (Cl). The surveys concluded with a qualitative element (D) in the form of a text box at the end. In sections A and B, informants responded to biographical or frequency-of-use questions through alternatives appropriate for such questions, and, in D, informants were allowed to write whatever they felt was yet necessary to communicate. In section C, informants responded to statements through five-point Likert scales ranging from "strongly disagree" to "strongly agree". Apart from the phrasing of the statements (statement Cp5 for students: "I am more likely [...]"; and for teachers: "The students are more likely [...]"), the only difference between the surveys was the removal of the "Which year are you in?" question and the restructuring of the age alternatives into fewer and wider options for the teachers in the biographical section, to preserve anonymity in a smaller sample group. This similarity was maintained to allow for comparison between teachers and students.

3.3. Data analysis

In analysis, data were coded and categorised using the constant comparative method in combination with abductive logic in the form of analytic abduction (Schurz, 2008; Fram, 2013). Quantitative data, prior to being coded and incorporated into the S1/S2 analysis, was analysed using descriptive and inferential statistics, and all analysis was accompanied by analytic memo writing. The following chapter will first introduce these methods and show how they were applied to guide data interaction and analytic integration in the project. After this, the application of these methods of analysis to interview, observation, and survey data is discussed.

3.3.1. Coding, analytic memo writing, and constant comparative abductive analysis

Coding is a heuristic process of labelling and linking during which the researcher moves from his collected and recorded data material to a condensed superstructure of codes (Charmaz, 2006; Saldaña, 2009). This process most often, but not always (as, for instance, with consistent *in vivo* coding), involves a reduction. However, the analytic movement of the process is a cyclical one, in which the data material is focused into a code that is then linked to other data associated with that code to make categories. This makes the coding and categorisation process as the application of first- and second cycle coding (Saldaña, 2009). First cycle coding methods aim at fracturing data into segments as an initial analytical approach to the data. The properties of the intended fragments and the criteria for fracturing and code formulation are a matter of method, where the appropriate coding method is chosen based on the research question, and epistemological and ontological considerations. Following the reworking of the data with such a selection of methods in the first cycle of coding, the emerging codes undergo a process in second cycle coding similar to that of the data in the first cycle (Smith & Osborn, 2007). In second cycle coding, codes are compared, reorganised, synthesised, fractured, and condensed into categories. Sometimes further condensed into core categories, these categories form the basis upon which conclusions are drawn and theory is constructed (Saldaña, 2009; Fram, 2013).

Figure 5, a collection of screenshots from QSR NVivo 11 adapted for readability, illustrates the first- and second cycle coding of two observations from S1. In the first one, a student responded to favourable feedback on his anonymous contribution by breaching that anonymity. In the second, the student accompanied the display of his contribution with a similar breach. These data were given the two first cycle codes “Anonymity and feedback” and “Anonymity and contribution”, and Figure 5 shows an adapted visualisation from data on the left to codes on the right. In S1 second cycle coding, these and other data were subsumed under the category “Anonymity”, and the bottom section of Figure 5 shows a representation in which categories are found on the left, followed by codes and data on the right.

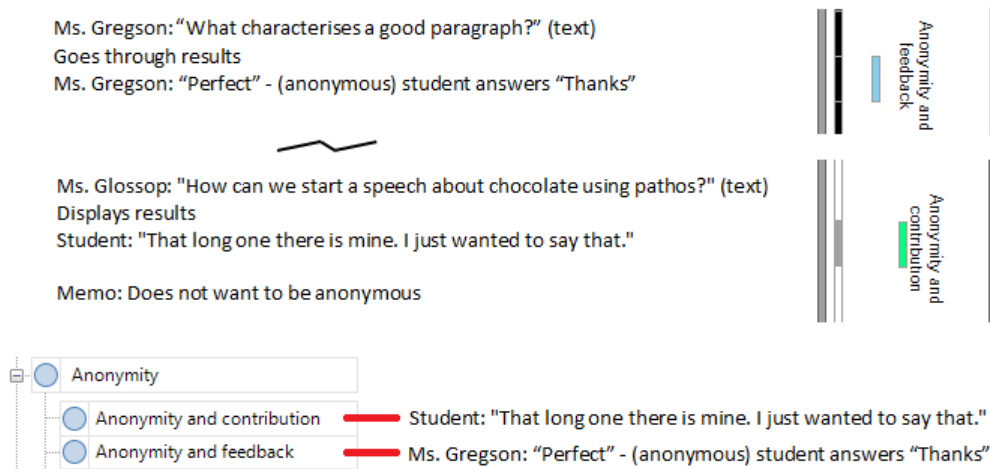


Figure 5: First and second cycle coding. Simplified illustration from QSR NVivo 11.

Parallel to first- and second cycle coding, where the researcher engages with the data, the researcher engaged with the coding process through analytic memo writing (Reichertz, 2007; Saldaña, 2009; Merriam, 2009). Memos serve to analyse the coding process, the strength and weaknesses of codes and categories, the conditions affecting the generation of codes and categories, and the attitudes of the researcher. They are a valuable tool in effectively defining the codes and categories that emerge and to speed up the formulation of these, but also constitute a depository from which they can be discovered and formulated. To exemplify, Saldaña (2009) identifies a diversity of memo categories, but recommends the initial production of analytic memos (because memos are by their nature analytic) to avoid the restraints of genre delimitations on the reflective process of memo writing. In the continuation, though, the analysis of analytic memos could involve a categorisation of the memo itself as a coding memo, theoretical memo, memo on role patterns, etc., as a tool for identifying emerging codes, categories, issues, qualities, or the like. With such a movement between data, codes, categories, and memos, the conclusions and theories arrived at through constant comparative coding and categorisation are the synthesis of codes and categories as building blocks, and the analytic memos that form the cohesive glue connecting them.

Constant comparative analysis originated with grounded theory and involves comparison within all levels of analysis (Charmaz, 2006). The constant comparative process is not linear. In fact, data gathering, coding, categorisation, and theory formulation "blur and intertwine continually, from the beginning of an investigation to its end" (Glaser & Strauss, 1967, p. 43).

This allows analysis to occur alongside data gathering, and entails a constant recalibration and re-evaluation of codes and categories, because the need to re-examine data and codes or to gather further data arises. This negotiation inherent in constant comparison is logically justified in analytic abduction (Peirce, 1955; Schurz, 2008; Fram, 2013). By repeatedly returning to a previous level of analysis to attempt to find validation, the researcher will attempt to infer the best explanation (abduction) for his assumptions. This process is not compatible with linearity, as would be the case with induction, but with constant and cyclical negotiations of codes with data, categories with code, and theory with categories. This cyclical negotiation includes reassessment, leading to codes being modified or added to accommodate conflicting data, categories being adjusted with the inclusion of new codes, and the theory being based on ultimately saturated categories (Holton, 2007). Thus, a category is not formed and accepted as a valid inference from a cogent set of codes, but is repeatedly evaluated against these codes in an attempt to qualify it as the most likely category subsuming those codes (Glaser, 1965; Charmaz, 2006). This evaluation removes assumptions in accordance with the principle of Occam's razor, or principle of parsimony, in which the hypothesis with the fewest assumptions is taken to be the most abductively valid one (Eiter & Gottlob, 1995).

3.3.2. Data interaction and analytic integration

Because the mixed-methods design of the project was sequential throughout, data collection in one sub-study would rely on data collected in the previous. Progressively gathered data therefore served to inform the interview guides, the survey questions, and observations of the project. Table 11 shows how field notes and a memo from S1 observations were brought up in a semi-structured focus group interview with students, informed questions in the survey, and were negotiated against S3 observations and interviews. Another visualisation regarding data coded and categorised as "active involvement" can be found in Article I.

Category: Participation				
S1 Observation	S1 Interview	S2 Survey	S3 Observation	S3 Interview
Ms. Gregson, 01.11.2016, 1300–1530 2-year general studies, 12 Students Spanish Vote 5: (Translation Norwegian-Spanish) – “[In Norwegian] Now, I’m reading a book” – “Book”: “bug”, “libro”, “livre”, “...” Memo: What is this an expression of? NOTEWORTHY	Kirsti, Alma, Ronja, Anna 07.03.2017, 1300–1400 Interviewer: I saw that you were going to translate “book”. You were going to submit some text, right? In that vote, you [the students] delivered “bug”, or [...] “livre”, which is French. Is it easier to try; to write “livre” or “bug”?	Cp1 “It is easier for me to participate and be active in language lessons when we use response technology then when we don’t” (M=3.54) Cp6 “If the teacher asks us to vote for or write what we find difficult, and we can be anonymous, I will do so” (M=4.09)	Ms. Gregson, 29.08.2017, 0815–1005, 1-year vocational studies, 10 Students Spanish Vote 6: (Translation Norwegian-Spanish)— “[In Norwegian] I speak”— “Hablo”, “I speak”, “Yo hablo”	Aurora, Runa, Eirik, Chris, 14.12.2017, 0815–0945 [Shows student contributions] Interviewer: What do you think makes students write something, even if they do not answer the question properly? [...] What do you think the students were thinking here? Is it easier to guess?

Table 11: Data interaction in the mixed-methods study.

In second cycle coding, categories were formed based on focused coding of data similarly coded in first cycle coding (Saldaña, 2009). Charmaz (2006) introduced focused coding as a development from axial coding, a concept that was maintained by other grounded theory constructionists like Corbin and Strauss (2008). Focused coding differs from axial coding in that it avoids the researcher applying external analytical frames to the material, and was presented as a streamlined development from axial coding by Saldaña (2009). Data with similar first cycle codes were grouped, or lumped, together under a tentative category name in an abductive and alembic process of organisation and reorganisation until data saturation was achieved (Charmaz, 2006; Saldaña, 2009). In this process, the trustworthiness of the categories was improved through the triangulation inherent in abductive analysis, through member checks and through codeweaving. The latter, as defined by Saldaña (2009), involved “the actual integration of key code words and phrases into narrative form to see how the puzzle pieces fit together” (p. 187). The combination of these quality checks guided the focused coding.

Name	Sources	References
1. Attitudes	70	4084
1.1 Anonymity	29	172
1.2 Participation	57	1001
1.2.1 Participation background	14	240
1.2.2 Participation in contribution (production)	20	194
1.2.3 Participation in evaluation	28	111
1.2.4 Roles in participation	14	141
1.2.5 Meta	31	175
1.2.6 Anonymity and participation	11	82
1.3 Motivation	23	204
1.4 Involvement	59	1190
1.5 Learning	39	447

Figure 6: Coding visualisation. QSR NVivo 11 screenshot.

First cycle codes from S1 observations and interviews were focus-coded in QSR NVivo 11, resulting in a hierarchy of second cycle categories with subordinate first cycle codes, as visualised in Figure 6. Findings from survey analysis, such as correlations and distributions, were holistically coded, and the subsequent focused coding included the categories from S1. In other words, the integration of S1 and S2 was an abductive evaluation and modification of S1 categories against S2 first cycle codes, where organisation and reorganisation led to the categories most likely to explain S1 and S2 data (Eiter & Gottlob, 1995; Charmaz, 2006). These categories provided the focus of data gathering in S3, and the process of focus coding the first cycle codes from S3 against the categories established by S1/S2 analysis led to the empirically saturated categories and the main findings of the project. Second cycle coding based on analytic abduction therefore became the analytic tool by which the analyses of qualitative and quantitative data were integrated, evaluated, and coordinated to present empirically based findings in the project, and this progress is visualised in Figure 7, adapted from Article III and Figure 3.

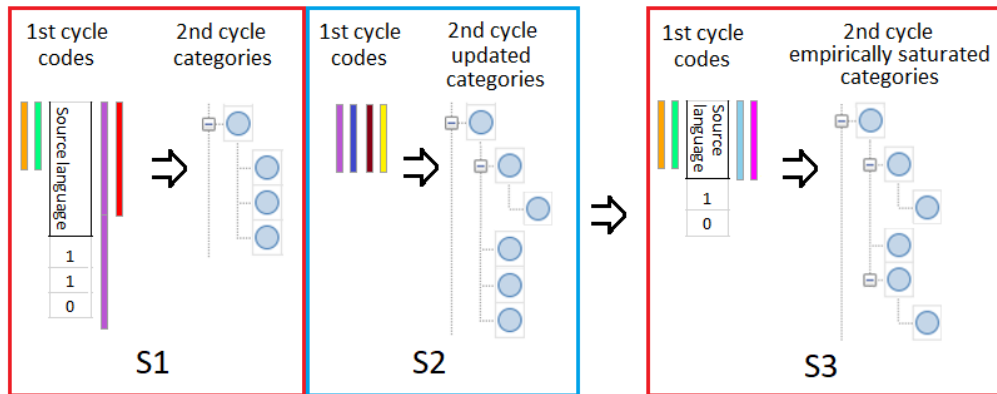


Figure 7: Analytic integration across qualitative (red) and quantitative (blue) sub-studies. (Adapted from Article III and Figure 3).

S3 analysis attempted to draw conclusions and formulate theory in response to the research question through analytic abduction. These conclusions as presented in this thesis, though tentative in response to a previously uncharted area of research, provide an end point for the overall case study, and a start point for possible further research. In accordance with the research design, and through the process of analytic abduction, S3 can therefore also be seen in a dialogical relationship with the previous sub-study pair. This dialogue consisted of comparing S3 interview and observation data with the data in S1/S2 categories, and evaluating whether the data could be coded into these. If not, constant comparative analysis of new data for comparison, adjustment, and/or expansion of categories was performed. Theory formulation was undertaken when such abductive analysis had led to empirical saturation of the categories, categories were organised through ordering and reordering and diagramming, and theory was formulated in rich, thick description (Charmaz, 2006; Schurz, 2008; Saldaña, 2009; Merriam, 2009).

	Data	1 st cycle coding	2 nd cycle coding
S1 Observation	Vote 5: (Translation Norwegian-Spanish)—“[In Norwegian] Now, I’m reading a book”—“Book”: “bug”, “libro”, “livre”, “...”	Participating with incorrect answers	
S1 Interview	Memo: What is this an expression of? NOTEWORTHY Interviewer: I saw that you were going to translate “book”. You were going to submit some text, right? In that vote, you [the students] delivered “bug”, or [...] “livre”, which is French. Is it easier to try; to write “livre” or “bug”?	Trying despite uncertainty	
S2 Survey	Cp1 “It is easier for me to participate and be active in language lessons when we use response technology than when we don’t” (M=3.54) Cp6 “If the teacher asks us to vote for or write what we find difficult, and we can be anonymous, I will do so” (M=4.09)	Anonymity and participation	
S3 Observation	Vote 6: (Translation Norwegian-Spanish)—“[In Norwegian] I speak”—“Hablo”, “I speak”, “Yo hablo”	Trying despite uncertainty	
S3 Interview	[Shows student contributions] Interviewer: What do you think makes students write something, even if they do not answer the question properly? [...] What do you think the students were thinking here? Is it easier to guess?	Motivations for trying	

Table 12: Illustration of analytic integration. Screenshots from QSR NVivo 11.

Table 12 can serve to illustrate the above described analytic integration, building on data from Table 11, and the visualisations of the system of codes and the process of analytic integration (Figure 6 and Figure 7). An S1 classroom observation where RT text functionality was used for translation had provided a range of attempted translations, also into other languages, and the coded data and an analytic memo helped identify an emerging first cycle code—“Participating with incorrect answers”. In an S1 student interview with students studying NL, ESL, and FL, student interpretations of the episode were invited, e.g., through the question in Table 11. At this point, similar episodes had suggested that RT made it easier to attempt a translation, and student responses confirmed this, providing the first cycle code “Trying despite uncertainty”. S1 second cycle coding eventually subsumed the two codes into the

category “Participation in contribution” under the core category “Participation”. This invited participation items in the S2 survey, and responses on two items suggested that students find RT itself less important than its affordances for anonymity with regards to participation, which added a first- and eventually second cycle code of anonymity to the now updated category. S3 observation data from a new FL class showed the same profusion of attempted translations as S1 data. The appropriateness of this data for the “Trying despite uncertainty” code from S1 was evaluated, and sufficient points of correspondence between data were found to include this S3 data in the original S1 code, providing an abductive testing and empirical strengthening of the participation category. A similar development of the participation category from S1 interviews was found in an S3 interview with NL and ESL students, who gave further insight into the motivations for participation, leading to yet another abductive testing and modification of the category against the new, coded material.

3.3.3. Observations

In S1 and S3 analysis, field notes and RT responses from observations were subjected to a coding process in accordance with the constant comparative method, which also involved writing of analytic memos (see coding examples in Chapters 3.3.1 and 3.3.2.). Field notes were imported into QSR NVivo 11, and RT multiple-choice and text responses were exported from the RT software into Microsoft Excel (QSR, n.d.). In QSR NVivo 11 and Microsoft Excel, respectively, field notes and responses underwent first cycle, initial, coding, in which the qualitative data were broken down into discrete parts using a range of coding strategies (Charmaz, 2006; Holton, 2007; Saldaña, 2009).

The field notes and responses were initially subjected to provisional coding, according to a list generated by the theoretical and conceptual framework, and the project and sub-study research questions (Miles, Huberman, & Saldaña, 2014). This list of provisional codes included such codes as “communication/mediation”, “RT integration”, “influencing the lesson”, and “student-teacher interaction”, relying amongst others on Ihde (1990) and Verbeek (2016), Warschauer (2000) and Bax (2011), Graham et al. (2007), and Jang, Reeve, and Deci (2010), respectively. Thus, provisional coding provided an early mediation between the study background/design and the data as they appeared. For instance, by negotiating such a list of presuppositions with emerging data, the categorical bracketing of presuppositions about the phenomenon central to classical phenomenology was found to be contrary to research aims, and was replaced with postphenomenological researcher reflexivity (Aagaard, 2015; van Manen, 2016). In first cycle coding, the field notes were subjected to attribute,

descriptive (holistic and process), and simultaneous coding for data management, providing a detailed inventory of data interconnectivity (Saldaña, 2009). Responses underwent content analysis (Holsti, 1969), and were coded with the same strategies as the field notes, albeit without the process coding, which was not suitable for the unit of analysis (content, rather than actions). Figure 8 shows the analysis of three text responses from an observation in the teacher informant Ms. Travers' English class. The three responses have been subjected to simultaneous attribute and descriptive (holistic) analysis in Microsoft Excel. The second response (Response ID 22.2.4) was accompanied by an analytic memo, because the student included his or her own personal background and opinions in the response.

Session ID	Data ID	Teacher	Weekday	Date	Subject	Class	Students present
22	MsTrO4	Ms.Travers	Tue.	03.10.2017	English	[Class]	29

Session ID	Vote ID	Response ID	Content	Response							Content	Question					Comments	
				Multiple choice	Numerical	# of characters	Genuine	Empty	Resistance	Meta		Source language	Q: Divergent/ convergent	Formal	Content	Personal/ procedural		Noteworthy
22	2	1	Aotearoa, maori, kiwi, wellington	0	0	33	1	0	0	0	0	What do you know about New Zealand?	1	0	1	0	0	
22	2	4	I have friends there, Nice country, far away	0	0	44	1	0	0	1	0		1	0	1	0	1	Own experiences
22	2	5	Idk fam	0	0	7	0	0	0	1	0		1	0	1	0	0	

Attribute	Attribute	Descriptive (Holistic)	Attribute	Descriptive (Holistic)
Simultaneous Coding method				

Figure 8: Coding of responses. Adapted screenshot from Microsoft Excel.

The choice of first cycle coding methods was due to several methodological concerns. One was the S1 research question, where description and organisation were central. Another one was the observation data's role in relation to the interviews and S2 surveys. As these would be formulated based on the attributes and structures arrived at in the analysis of observation data, similarities, differences, frequency, sequence, and correspondence expressed through coding were paramount. Finally, as project research questions involved both practices and content, and because S3 was going to refine findings from S1 observations to reach conclusions about such practices and content, process and holistic coding were deemed appropriate strategies for

observation coding (Miles, Huberman, & Saldaña, 2014). Here, coding was clearly motivated by mixed-methods methodology.

3.3.4. Interviews

Interviews, once recorded, were transcribed. Rather than being a value-free “act of transferring words from a tape to a page, [...] transcription is an act of translation between two vastly different media” (Gubrium et al., 2012, p. 529); and Mishler (1991) argues that transcription is a form of analysis. In it, elements such as paralinguistic communication (body language, pitch), proxemics (physical distance, eye contact), timing (pauses, verbal fillers) and interview context might be excluded consciously or unconsciously by the transcriber (Mishler, 1991; Uhrenfeldt, Paterson, & Hall, 2007). However, what to transcribe and the manner in which transcription is performed depend on the research question, methodological choices, and time and resources available for the transcription process (Kvale & Brinkmann, 2015). Due to the latter, semi-structured interviews were transcribed either by the researcher/interviewer, or by an external transcriber according to agreed-upon procedures, after which the transcription was reviewed by the researcher. The semi-structured interviews were transcribed in source language, Norwegian, without dialect, and verbatim, with limited discourse analysis notation (Silverman, 2014; Poland, 2002).

Open-ended interviews were recorded in writing, and the transfer from spoken to written word therefore was made through paraphrasing, with key passages quoted verbatim and member checked with the informants. Transcripts and paraphrased open-ended interviews were stored for coding in QSR NVivo 11, and, where available, interview recordings were added and coordinated with transcripts for easy access in the analysis. Passages for use in publication were translated into English and language teacher informants and external language professionals were consulted to ensure the accuracy of the translations. Figure 9 shows examples from a transcribed semi-structured interview (translated) with teacher informants and a paraphrased open-ended interview with another teacher informant.

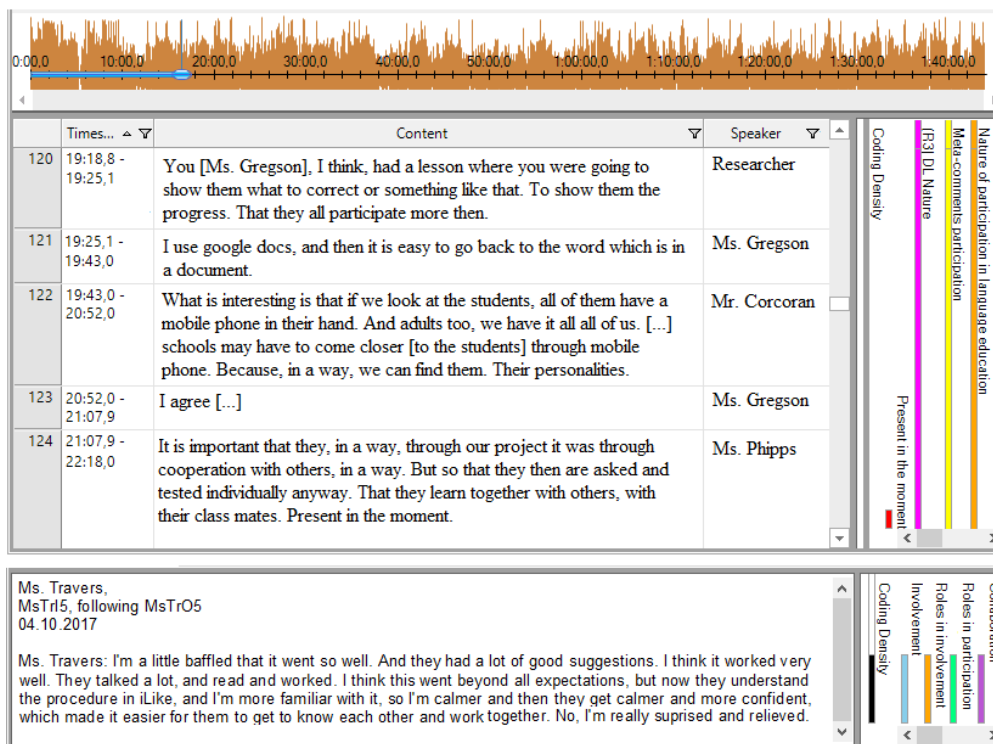


Figure 9: Transcribed, paraphrased, and coded interviews. Screenshot from QSR NVivo 11.

Interview data were coded similarly to observation data, but the interviewees’ role in shaping the discourse warranted also more elemental and exploratory coding methods. Hence, first cycle simultaneous coding methods such as attribute, holistic, and process coding were applied, as in the analysis of observation data, but with the addition of in vivo coding, where the code is a direct quotation from the informant (Saldaña, 2009). In interview analysis, application of these elemental, descriptive, and exploratory coding methods—which analyse increasingly complex units of data—allowed a study of the dynamic between the general and the specific in the interviewees’ accounts, which ultimately provided a fundament for rich, thick description of RT application. Figure 9 includes a number of holistic codes applied to the transcribed and the paraphrased interview data, as well as an in vivo code for the language teacher Ms. Phipps’ comment—“Present in the moment”. Holistic coding, in which units of data above word or phrase level are analysed for underlying themes or issues (Dey, 1993; Saldaña, 2009), was found to be particularly applicable in the analysis of interview data. This was first due to the narrative nature of the interviewees’ accounts, second due to the

indications of what to focus on from the field note analysis and, third, due to time constraints before the initiation of S2 and the end of data gathering at the conclusion of S3. Finally, the analysis process was aided and the coding validated through member checking (Creswell, 2014). The researcher's workplace during the analysis was in close proximity to the informants, and ambiguities in the recorded material as well as coding decisions and emerging patterns could be discussed with informants. Such discussion extended also to department meetings with teacher informants, where analyses were presented and discussed.

3.3.5. Surveys

The analysis of the data material from the surveys used descriptive and inferential statistics as a primary means to map the teachers and student groups, and their similarities and differences (Plano Clark & Creswell, 2015). The statistical software IBM SPSS Statistics 24 was applied as a primary tool for distribution analysis, treatment of missing responses, factor analysis/alpha, bivariate correlation analysis, and multivariate regression analysis to map the perceptions of the students, and similarities and differences between groups based on gender and study program (IBM, n.d.). In this process, Christophersen (2012), Ringdal (2014), and Ulleberg & Nordvik (2001) were applied for reference. Because no treatment was administered to some groups and treatment was withheld from others, the analysis of similarities and differences provided a non-experimental expression of the perceptions of the subjects and the correlation between groups. The biographical section of the surveys (A) and the frequency-of-use section (B) provided parameters along which the attitude sections (Cp-CI) could be compared. After examining the variables for skewness and kurtosis, cases with missing responses were excluded, leaving a sample of N=591 students and N=26 teachers. It must be noted here that, because of the limited sample size of teacher informants, inferential statistics led to fewer significant correlations between teacher statements than between student statements, and comparison between students and teachers would largely rely on the outcome of descriptive statistics analysis. An examination of the larger student sample for Kaiser-Meyer-Olkin measure of sampling adequacy (.906) and Bartlett's test of sphericity (<0.05) determined that this sample was appropriate for factor analysis, which was then executed. Factor analysis of section C identified four factors that consisted of variables within participation (Cp), motivation (Cm), involvement (Ci), and learning facilitation (CI), respectively. Chronbach's alpha test for internal consistency and scale reliability was applied to the items within each factor, revealing them to be internally consistent ($\alpha = [.721, .864] \geq .7$), and making the survey a reliable measuring tool. Next, bivariate correlation analyses of

factor-based variables and variables from sections A and B were conducted. Here, gender, study program, and involvement were found to be of interest and subjected to more thorough hypothesis testing. Comparisons were made based on significant Spearman's ρ correlations bolstered by Student T-tests administered for intersections of particular relevance or interest. Spearman's ρ correlations were flagged for significance and their correlation strength visualised using conditional rules in Microsoft Excel on tables imported from SPSS, as shown in Table 13. This allowed not only easy identification of relationships between variables and sections (Cp-CI) but also the ability to graphically map similarities and divergences between student groups. Finally, multiple regression analysis examined the relationships between involvement as dependent variables and participation, motivation, and learning facilitation as independent variables.

	Gender	Study program	Participation	Motivation	Involvement	Learning facilitation																
Gender A1	-																					
Study program A3	0,066	-																				
Participation	Cp1	0,049	0,029	-																		
	Cp2	-0,057	-0,012	,219"	-																	
	Cp3	-0,060	-,112"	,346"	,202"	-																
	Cp4	-0,073	-,106"	,288"	0,065	,685"	-															
	Cp5	-0,067	-0,021	,262"	,323"	,253"	,277"															
	Cp6	-,192"	-,140"	,251"	,141"	,347"	,428"	,303"														
Motivation	Cm1	-0,001	0,064	,484"	,098"	,289"	,307"	,184"	,264"													
	Cm2	-0,036	0,049	,417"	0,075	,245"	,266"	,197"	,223"													
	Cm3	-0,060	0,031	,341"	,108"	,311"	,368"	,187"	,291"													
Involvement	CI1	-,126"	0,020	,107"	0,059	,206"	,281"	,135"	,256"	,298"	,265"	,350"										
	CI2	-,199"	-0,029	,370"	,221"	,320"	,366"	,302"	,384"	,453"	,454"	,429"	,381"									
	CI3	-,101"	0,029	,305"	,184"	,294"	,335"	,273"	,334"	,385"	,405"	,407"	,300"	,637"								
	CI4	-,157"	0,026	,339"	,208"	,355"	,390"	,278"	,361"	,450"	,423"	,421"	,303"	,665"	,677"							
	CI5	-,149"	0,006	,339"	,223"	,348"	,404"	,297"	,363"	,457"	,434"	,445"	,337"	,647"	,613"	,837"						
	CI6	-0,057	,105"	,296"	,211"	,239"	,269"	,313"	,190"	,387"	,376"	,358"	,264"	,469"	,494"	,580"	,564"					
Learning facilitation	CL1	-,125"	-0,058	,095"	0,031	0,070	0,075	,154"	,187"	,122"	,145"	,157"	,226"	,240"	,227"	,223"	,189"	,170"				
	CL2	0,016	-,099"	,291"	,166"	,163"	,192"	,277"	,124"	,396"	,416"	,355"	,184"	,396"	,392"	,390"	,391"	,423"	,204"			
	CL3	-0,050	-,089"	,168"	-0,027	,122"	,087"	0,051	,173"	,130"	,170"	,120"	0,021	,170"	0,072	0,063	,094"	-0,026"	0,032	0,016		
	CL4	0,033	0,049	,371"	,125"	,215"	,252"	,212"	,228"	,405"	,400"	,372"	,235"	,381"	,444"	,428"	,451"	,409"	,186"	,448"	,088"	
	CL5	0,023	0,040	,276"	,119"	,250"	,253"	,228"	,286"	,344"	,342"	,381"	,226"	,393"	,454"	,453"	,427"	,383"	,174"	,412"	0,060	,586"
	CL6	0,025	0,066	,285"	,148"	,198"	,236"	,295"	,179"	,358"	,357"	,381"	,241"	,412"	,452"	,422"	,412"	,403"	,211"	,472"	0,003	,492"

Table 13: Adapted visualisation of correlations from Microsoft Excel. Darker colour represents higher significant correlation ($p>|.3|$).

In a qualitative-dominant mixed-methods design, the S2 survey would naturally take a secondary position, but, although the main results of survey analyses were presented in

Article I, they also figured in the background material for Article II and Article III. In Article III, observation data (responses) were also quantified and subjected to descriptive statistics analysis to support qualitative analysis of content and participation. The strengths of surveys as a method in this project were in their influence on qualitative analysis. The participating informants could strengthen or weaken the assumptions of the qualitative analysis by numerical triangulation. The latter elements might not otherwise have been available with qualitative methods, as they would require unfeasible numbers of interviews. In this way, the data gathering and analysis of S1 and S2 communicated in a mixed-methods study to adjust and refine the emerging categories. Also, internally, the combination of informants' replies in sections A through C and an open text response field (D) indicated unexpected elements relevant to the research. The analysis of individual responses to the survey were used to clarify qualitative statements submitted in the D section, and this mixed-methods form of analysis was not only illuminating, but also justifiable because respondents could be expected to assume the analyst to be familiar with their quantitative responses when they formulated their statements in section D.

3.4. Ethical considerations

Ethical considerations pervaded all parts of this doctoral project from planning to execution and publication. In social science and qualitative-dominant mixed-methods research, where the researcher is the main research instrument studying other humans, "issues of harm, consent, privacy and the confidentiality of data[, as well as] honesty, integrity and the responsible reporting of data" is paramount (Lune & Berg, 2017, p. 43). The first group of issues concerns the ethics towards the participants in the project, while the second concerns the ethics in the professional handling and reporting of data. In the following, participant ethics and credibility (internal validity), transferability (external validity), and dependability (reliability) will be discussed as they related to the project.

3.4.1. Participant ethics

Four philosophical principles are considered to be at the core of ethical research: autonomy, beneficence and non-maleficence, and justice (Beauchamp & Childress, 2001; Wassenaar, 2006). For research to be ethical, it should respect individuals' right to decide about their participation, it should attempt to maximise benefits to the informants and avoid risk or harm to them, and it should be just in the sense that those who contribute to research should benefit from it. This project applied a number of safeguards to ensure autonomy, and from this

autonomy, researcher and informants were able to identify and attain benefits, identify and avoid harm, and ensure justice.

At project initiation and with the emergence of S1 findings, the research design including interview guides and surveys was submitted to the Norwegian Social Science Data Service (NSD) for ethical evaluation (project no. 52049, see Appendices 1 and 4–7). The NSD found that the project complied with its ethical standards, and the standards for processing of personal data. This approval was of particular importance, as the majority of the informants in the project were minors. The NSD recognised the relevance of student informants, and agreed that they could consent to participate, as long as no sensitive information was gathered. Furthermore, the NSD concluded that collection, storage, and anonymisation of data would be executed in accordance with Norwegian law and the organisational guidelines of the Norwegian University of Technology and Science (NTNU). In addition to this, project approval from county authorities and the upper-secondary school from which informants were sampled was secured upon project initiation.

With administrative validation of autonomy secured, individual consent was sought from the informants. Participation in the project was voluntary, and participants were informed verbally and in writing before data collection. In S1 and S3, informants received consent forms, which they chose whether to sign or not (see Appendices 2 and 3). These included information on voluntary participation, privacy, anonymity, and the option to opt out, or to end and retract their engagement and contribution at a later date. While NSD required no consent from students for observations and surveys, on the grounds that students remained anonymous in the recording of field notes and survey responses, information about participation and the possibility to opt out was provided in both cases. The S2 surveys also included a section informing the participants of the ethical framework behind the study, that responding to and submitting the survey was voluntary, and that doing so was equivalent with informed consent.

To maintain confidentiality and anonymity, all informants were given pseudonyms in the recording of field notes and the paraphrasing/transcription of interviews. The identification key was stored securely away from the data, together with the consent forms which identified project participants. These working pseudonyms were maintained throughout analysis, and then altered in accordance with a second key for publication. At the completion of the project (31.07.2019), digital recordings of interviews and consent forms were deleted, leaving a completely anonymised body of data.

With limited research in existence on applied RT in upper-secondary language education contexts, informants could not be guaranteed that participation in the project would benefit them (beneficence) or justify their effort (justice). However, the researcher made an effort to ensure that potential informants were briefed about the project, RT functionality, and the general state of research in the area. This and repeated meetings and interviews continually evaluated the potential benefits and drawbacks with project participation. Because sampling was based on voluntary participation, and informants could leave the project without giving a reason, informants themselves continually evaluated the beneficence of the research. Finally, care was taken not to hinder or impede the teacher informants' work or student informants' learning (non-maleficence). Teachers were subject to organisational directives and study plans, which were given priority when conflicting with data gathering. All data gathering was discussed beforehand, with teacher informants, school administrators, and external professionals such as university staff, to evaluate the probability of data gathering impeding student learning. To exemplify, students were invited to focus group interviews in periods with no teaching, or measures were taken to ensure they did not miss out. Also, one teacher informant consented to the researcher observing lessons, but later retracted this consent, leaving the gathered data related to that teacher inadmissible.

3.4.2. Trustworthiness: credibility, transferability, dependability

Quantitative, qualitative, and mixed-methods studies use different terminology with varying degree of overlap to discuss trustworthiness, whether findings are true and consistent, and, in mixed-methods studies, this terminology is not yet thoroughly established or generally applied (Creswell, 2014; Onwuegbuzie & Johnson, 2006; Teddlie & Tashakkori 2010; Miles, Huberman, & Saldaña, 2014). Table 14 shows the approximately equivalent terms in quantitative and qualitative methodology, but it is worth keeping in mind that, because of the fundamental differences between the two methodologies, there is no one-to-one relationship (Yilmaz, 2013). Here, the qualitative terms will be used when not explicitly discussing quantitative methods, because of the lack of uniform mixed-methods terminology and the dominance of qualitative methods in the project.

Aspect	Quantitative term	Qualitative term
Truth value	Internal validity	Credibility
Applicability	External validity/generalisability	Transferability
Consistency	Reliability	Dependability

Table 14: An overview of the approximate correspondence of qualitative and quantitative terms. Adapted from Lincoln and Guba (1985) and Yilmaz (2013).

Credibility is an indication of whether the participants of a study see the findings as true and whether they make sense in the context from which they sprang (Lincoln and Guba, 1985; Yilmaz, 2013). Several measures were implemented to ensure credibility, and the researcher's situation in the school where data were gathered contributed favourably to this. Member checking of the analysis was frequently applied. In interviews, students and teachers were invited to interpret data and discuss the researcher's and their interpretations. Likewise, in frequent meetings on school and department level, findings and the analyses behind them were presented and contrasting or confirming analyses invited. Finally, the researcher's close proximity to informants meant that any uncertainty in the analysis of data, e.g., in the interpretation of observed episodes or of informant statements, could be discussed with the relevant informant with relative ease. In these member checking processes, as well as in data gathering, care was taken to balance the emic and etic roles of the researcher, to avoid confirmation bias. This was done by the researcher providing as rich a description of findings as possible and by also discussing contrasting findings, to counter any effects on the analysis by the collegiality of researcher and informants. One example of this, which relies on the triangulation of findings from the mixing of methods, concerns the role of anonymity with applied RT. In surveys, the variables that measured anonymity lacked internal validity (Chronbach's $\alpha = .484$), i.e., they did not support any valid inferences about anonymity and RT, but suggested that anonymity was unimportant. Qualitative findings, however, highlighted anonymity as central to the application of RT. When informants were consulted, the discrepancy identified through triangulation was considered to be due to insufficiencies in the survey measuring tools: the items addressing anonymity were too broad and unspecific to accurately describe the reality, which had been more accurately described in interviews about specific observations. The evaluation of credibility therefore drove analysis, and provided more detailed and credible findings.

Transferability is a somewhat contentious issue in qualitative research and, in particular, in case studies, which deal with clearly bounded systems, and therefore explicitly limit their conclusions to those systems (Miles, Huberman, & Saldaña, 2014). Lincoln and Guba (1985) argued that the burden of proving transferability of quantitative findings lies with the reader and replicator, and that the researcher should aim to provide rich, thick description to accommodate this. Flyvbjerg (2006) emphasised this generalisability of case studies from their interaction, or prospective interaction, with other studies, maintaining that:

knowledge cannot be formally generalized does not mean that it cannot enter into the collective process of knowledge accumulation in a given field or in a society. A purely descriptive, phenomenological case study without any attempt to generalize can certainly be of value in this process and has often helped cut a path toward scientific innovation. (p. 227).

Therefore, the transferability of findings in this case study relies on its methodological transparency and the rich, thick description of the phenomenon studied, which invites replication. Findings were arrived at by comparing the data they built on with other data from the same and other sub-studies, modifying the findings based on this comparison and repeating the process (see Chapter 3.3.1). This process of analytic abduction ensures that the findings not only are credible, but also that they carry value beyond mere illustration, and beyond the local situation. The application of abductive analysis, the strong credibility in the project, and the refraction in its postphenomenological approach—which allowed many voices to be heard and aspects to RT in an educational setting to be studied—suggest strong ecological validity and transferability to the findings (Schmuckler, 2001). It is therefore probable that findings might also be valid outside language subjects, outside upper-secondary education, and outside of Norway.

With regards to transferability, the triangulation effected by the methods applied in the three sub-studies, as well as the combination of purposeful and maximum variation sampling in the project, aimed to support transferability (Merriam, 2009). In particular, the maximum variation sampling in S2, which provided a Kaiser-Meyer-Olkin measure of sampling adequacy of .906 and predominantly significant correlations, indicated external validity. When these S2 findings were included in the constant comparative and abductive movement between data in the analysis, and informed the maximum variation sampling for S3, the transferability of project findings was strengthened. Thus, the application of a transparent mixed-methods design was conducive to transferability through sampling adequacy, replication, and the rich, thick description of applied RT that it afforded.

Dependability relates to whether the findings are consistent throughout the study (Lincoln & Guba, 1985). It is therefore distinct from reliability, which is the extent to which findings can be replicated in the same context (Merriam, 2009). Because the project studied informants' experiences of a phenomenon and the researcher was the main instrument, many of the measures taken to ensure credibility—concurrence between informants and the researcher about the findings—also ensured dependability. Member checking, triangulation, and

transparency about methods of data gathering and analysis also aimed to show that, given the data and the manner in which data gathering and analysis was performed, the findings were dependable. The transparency of methods throughout the thesis, therefore, has been implemented in the interest of the trustworthiness of findings.

4. Presentation of articles

This thesis attempted to answer the research question *How do upper-secondary teachers and students apply and experience RT in language education?* and presents its findings in Articles I–III. This chapter will provide a summary of these articles, including research questions or aims, their situation within the doctoral project, research methods, and key findings (see also Chapter 1.1). More detailed exposition of the findings can be found in the respective articles. There is a clear interconnectivity between the articles: as Article I discusses student involvement as a perceived central tenet to RT application, Article II proposes a model for RT application, and Article III maps the communication and participation afforded by RT application. The articles show how RT promotes student-centring of language education by affording a form of communication that allows the progress of education to be based on the students' production, as well as supporting student-centring by promoting student involvement and participation. The findings presented in these articles, and summarised here, are then discussed in terms of their empirical, theoretical, and methodological implications in Chapter 5.

4.1. Article I

Einum, E. (in press). Involvement with Response Technology as Student-Centring of Language Teaching: Upper-Secondary Student and Teacher Experiences. *Nordic Journal of Digital Literacy*.

Article I combined sub-studies 1 through 3 (S1–3) in a mixed-methods approach to the research question *How do upper-secondary education language students and teachers perceive student-centring through involvement in the application of response technology?* First, data on student and teacher informants' perceptions of response technology (RT) from qualitative observations and interviews, as well as from quantitative surveys, identified involvement to be central to the application of RT. Because *involvement* as understood by the informants could be described succinctly as “students' activities and role in shaping and directing education activities” (Article I), the article was able to distinguish and position involvement within the discourse on engagement in the research field. Second, a further distinction between *active* and *passive involvement* was found, where the former has students actively communicating their procedure or content preferences through RT, while the latter has their responses to subject-related teacher questions and their unsolicited comments on content or procedure (*meta comments*) followed up by the teacher. A combination of passive

and active involvement was found to be beneficial, although both teachers and students were aware of how student-centring through student involvement transferred the responsibility for the procedures from the teacher to the increasingly collaborating teacher and students. Third, the anonymity and expanded potential for communication afforded by RT were seen as conducive to student-centring and involvement, although the outcome of efforts to increase student involvement with RT seems contingent on students seeing providing input as facilitating their production, and the teacher following up on student responses. Article I ties together research in the field of applied RT on feedback (Ludvigsen et al., 2015; Egelandstad, 2018) and empowerment (Graham et al., 2007), and its conclusions on involvement find practical expression in Article II's discursive lecturing and Article III's findings on participation and the nature of RT text responses.

4.2. Article II

Einum, E. (2019). Discursive lecturing: an agile and student-centred teaching approach with response technology. *Journal of Educational Change*, 20(2), 249–281. doi: <https://doi.org/10.1007/s10833-019-09341-7>.

Article II—in response to the research question *How can student-centring in language instruction with RT be modelled and compared to similar models for RT-mediated instruction?*—proposes discursive lecturing as a model for RT-mediated language instruction. It further compares this model to its most similar predecessor, Beatty, Gerace, Leonard, and Dufresne's model for Question-Driven Instruction (QDI) (2006), and situates it in a wider context of RT procedures through a negotiation with the prevailing standards of RT application as discussed by Chien, Chang, and Chang (2016). Article II builds on observation and interview data from S1 and S3, and refers to these as the initial and the intervention phase. For reasons of coherence, S2 quantitative findings were excluded from Article II, but only after ensuring that these did not conflict with the qualitative findings presented in the article.

Discursive lecturing was formulated in the meeting of informants' perceived and observed challenges in the language classroom, and their perceived and observed successes. To counter lack of participation and low levels of reflection, an inversion of the traditional lecture format was proposed, and S3 saw the implementation and evaluation of a procedure in which the students produce in response to teacher questions and class discussions. The iterations of discursive lecturing were found by informants to invite participation and critical thinking, to visualise the many facets of the topic under discussion, to train students in executing and

concluding a process, and to incorporate both divergent and convergent cognition with ease. Discursive lecturing can student-centre the language instruction by soliciting and building on student responses. However, this was found to require agile teachers able to adapt to the often unexpected nature of student contributions, and active students who make these contributions. Article II suggests that the class discussion of responses and response distributions of each iteration provides the teacher with the input and time necessary to formulate a request for the next iteration, and that student production is promoted by building on their previous contributions and the teacher's treatment of their responses. As such, Article II reaffirms conclusions on passive involvement from Article I, and outlines the need for Article III's study of participation and the nature of the students' responses.

The iterative model for discursive lecturing arose from the empirical context of this thesis, but it was found to coincide in some aspects with Beatty et al.'s QDI model, most notably in the application of RT questions and in an iterative dynamic between teacher and student activity. However, the discursive lecturing model contributes to the empirical discourse on RT application by providing a greater student-focus and sequentiality than can be found in the QDI model, or, in fact, in Chien et al.'s synthesis of RT procedures. Analysing and building on student responses through iterations building on one another, rather than on questions pre-planned by the teacher, is facilitated by text response functionality, a comparatively new affordance in RT and the unit of study in Article III.

4.3. Article III

Einum, E. (in press). Written participation with response technology—How teachers ask and students respond with applied text response functionality. *Computers and Composition*.

Article III aimed to map the characteristics and motivations behind the responses submitted through RT text functionality, the questions eliciting them, and participation with RT in language learning. It drew on S1 and S3, which in this article were referred to as the *initial* and the *calibration phase*, and built explicitly on interview/observation data, and gathered text responses from these sub-studies, though its conclusions were also in line with S2 findings. Applying analysis through constant comparative coding, content analysis, frequency counts in descriptive statistics, and analytic abduction, questions were found to target formal, content, or personal/procedural knowledge. Similarly, four response categories could be identified: *genuine*, *empty* (deleted), and *resistance responses*, and meta comments. In the language learning context studied, teachers asked more formal and content than personal/procedural

questions, and students overwhelmingly (83%) made genuine attempts to answer these questions. There were both questions and responses that fit into several categories, and, in particular, meta comments and resistance responses tended to be appended to genuine responses. Interview and observation data suggested that this was evidence of students' familiarity with RT's anonymous communication affordance and increasing digital competence. It also suggested that purely disruptive resistance responses, a concern among teacher users, were relatively few, and that the inclusion of resistance elements might serve either as a pseudonym in reaction to anonymity, or to ensure social success in the potential absence of professional success. The tone and format of submitted responses were similar to speech and other forms of short, written communication, such as SMS or online text messages, suggesting that text responses draw on, complement, and to some extent substitute these forms of communication.

The wish to increase participation in classroom communication was found to be the main motivator behind the teachers' preference for text over multiple-choice functionality, and the average participation rate of 76.4% was found to depend on the teacher following up on responses, which in turn could promote participation in subsequent discussions. Finally, there is evidence to suggest that, in this handling of text responses, students consider their anonymous contributions detached from themselves, and more as class products than individual products, the pedagogical and social implications of which should be the subject of further research. In all, the conclusions of Article III show that RT writing maintains the intersubjectivity and rhetorical literacy of technology-mediated online writing (Selber, 2004; Lund, 2008) and the social interaction of digital writing in the classroom (Hyland & Hyland, 2006; Skaftun et al., 2017) by visualising the variety of responses and allowing discussion of these. However, because RT text responses tend to be short, anonymous, and as quick to produce as a spoken statement, Article III contributes to the field of technology-mediated writing by showing how RT can make text production a dialogic, fluid process of communication, in which oral and written production are approximated.

5. Discussion

The main purpose of this thesis was to contribute to the knowledge about student-centring RT practices, by studying its application in upper-secondary language education and the perceptions of teachers and students. The findings arrived at in the pursuit of this purpose provide contributions directly applicable to educational practices, such as the discursive lecturing procedure or an understanding of the nature of RT questions and responses. They also carry implications for how to understand student-centring, authority, autonomy, collaboration, and the interaction of teachers, students, and technology in language education. This chapter will discuss the findings of this thesis in terms of their empirical, theoretical, and methodological implications. It will do so in reference both to the theoretical, conceptual, and methodological frameworks presented in Chapters 2 and 3, and to the context of classroom practices and educational policy from which the findings sprang, presented in Chapter 1. In this manner, the discussion will build on the articles to discuss overarching themes and issues beyond the scope of each article. Finally, the limitations of this thesis will be discussed, accompanied by suggestions for further research.

5.1. Empirical implications

The chief empirical implication of this thesis is its contribution to the knowledge of didactical application of RT in upper-secondary and language education. Article I found that RT can allow the students to become more involved in their education, while Article II identified new student-centring practices made possible by RT. Both articles found teacher agility and responsiveness to the students' RT contributions to be important, and Article III assists such agility by mapping and creating a system for interpretation of these contributions. Furthermore, Article III establishes the link between student contributions, teacher response, and participation through RT and following applied RT. In the following, the empirical implications of these findings will be discussed, first in terms of how RT has the potential to promote authority based on knowledge and ability to collaborate, then with regards to how new practices such as discursive lecturing are made possible by new affordances for written communication in RT, and finally how this thesis expands the empirical context of research into RT and RT practices into upper-secondary and language education contexts. Many of these implications rely heavily on RT as a medium for communication, which allows for expressions of knowledge, opinion, or sentiment to be made available, and therefore provides the basis for adjustment of professional and social patterns and practices in education.

Involvement and authority

The thesis contributes to the research field on engagement with RT, one that has tended to discuss involvement only tangentially, focusing more on participation and motivation (Henrie et al., 2015). However, students' preference for passive involvement may explain the focus in the research field, as only active involvement tends to be considered in the literature (Graham et al., 2007; Bruff, 2009; Bachman & Bachman, 2011). The findings of this thesis therefore suggest that RT can be used to make students' thinking and production available, which in turn facilitates passive involvement. Passive involvement necessitates a sharing of authority between students who are empowered by expanded communicative potential and the teacher who invites contributions and agilely responds to them. Hence, the teacher controlling the opening and closing of votes is not evidence that the functionality of RT acts a constraint on the students' empowerment (Graham et al., 2007), first because it is the functionality by which authority is transferred and returned, and second because this dynamic, which characterises passive involvement, is mandated by the students. The findings of this thesis further show indications that knowledgeability, rather than social power, is the currency of the RT-infused classroom, as students become involved through RT to avail themselves of the teacher as an expert/referent, rather than a legitimate authority (Levin & Nolan, 2014, see Ch. 5.2). Therefore, the sharing of knowledge resulting from students' contributing and the teacher's responses can be seen as a sharing of authority. Because this thesis found little evidence to the contrary, and some support as shown by Articles II and III, the nature of teacher authority in RT practices should be investigated further, in light of Article I's conclusions on involvement.

RT-mediated collaboration between students and teacher

Another empirical contribution of this thesis lies in its implications for the teacher and student role in student-centred language education mediated by RT. Project findings indicated that RT afforded a shift towards collaborative practices between active students and agile teachers. According to data from the project, whether students become active participants in their own learning processes depends on their perceived influence on these processes. This is why student-centring requires authentic initiation tasks (Grabinger & Dunlap, 1995; Elen, Clarebout, Leonard, & Lowyck, 2007), and subsequent activity attuned to the students' production, building on student responses to the initial task (Bruner, 1999; Timperley, Kaser, & Halbert, 2014). In this manner, the student's learning finds its genesis in the reality the student inhabits and maintains perceived relevance for the student. This requires a teacher

assuming an agile role, relying on content, procedural, and didactic knowledge more than on prepared plans to support student activity. One implication of the empirical findings of this thesis is that, as teacher-student collaboration is supported by RT communication, students and teachers develop their proficiency in actively participating and agilely adapting the education. Throughout the project period, teachers and students were increasingly found to rely on each other when faced with challenges. Given a diverse and challenging list of responses, teachers would invite the students to discuss the responses and students would solicit the teacher's competence in doing so. Teacher and student impressions of RT-mediated language teaching indicated that, when the teacher is forthright about the potential for difficulties and shows agility in handling them, students become procedurally better at handling setbacks in their own work (see in particular Article II). Therefore, the findings of this thesis argue that RT can student-centre language education by enabling students to actively direct their own learning and by assisting teachers in agilely supporting this activity, and that these proficiencies are developed by the collaborative interaction between students and teachers resulting from the RT-mediated communication. As such, this thesis illustrates how RT can combine students' autonomy and self-regulation (Boekaerts, 1997; Browne and Fotos, 2011; Nikou & Economides, 2017) and teachers' agile feedback (Bjørkli & Arnesen, 2015; Ludvigsen et al., 2015; Egelandstad, 2018) in a collaborative system where peer learning is expanded to include the teacher (Mazur, 1997).

Discursive lecturing model

The model for discursive lecturing presented in Article II might be the most readily applicable empirical contribution of this thesis. Although models for single-voice sessions or sequences of these exist, such as those of Beatty et al. (2006) and Chien et al. (2016), these do not model RT-mediated interaction as a continual process based on student responses. This thesis suggests that the locus of the production and progression of RT-mediated instruction can be moved from the teacher's prepared questions to the students' responses. This essentially inverts the traditional lecture format that informed earlier models. Representatives from the research and practice field might argue that such new practices give the teacher little time to prepare a question to transition from one iteration to the next, time which in earlier models was found in the preparation of the lesson. However, this thesis suggests that the room for this teacher agility can be found in the discussion of student responses, incorporated into the model. A further implication for practice is also that the need for teacher agility is related to the richness of the material presented by the new and relatively unresearched RT text

functionality. Where previous models were guided by multiple-choice distributions, the inclusion of text functionality in the discursive lecturing model increases both the communicative potential and the need for teacher agility to exploit this potential.

RT text functionality

Because of the novelty of the RT text functionality in language learning, this thesis' findings regarding the nature of the outcome and application of this functionality can be considered an empirical contribution. Teacher informants, having been presented with a range of RT with diverse functionality, showed an overwhelming preference for the text functionality, motivated largely by the diversity of student production it afforded. The distribution between the question and answer categories identified in this thesis show that upper-secondary language teachers prefer to use the text functionality for formal and content questions, while students predominantly make genuine attempts to answer these questions. Participation through text functionality—averaging 76.4% and not diverging significantly from participation through multiple choice—was found to be motivated by the teacher's handling of answers, anonymity in contribution, and increased student proficiency in dealing with diverging or erroneous information. This thesis uses RT text functionality to combine the interactivity and rhetorical literacy identified in online writing (Selber, 2004; Skaftun et al., 2017) with classroom interaction, to expand communicative and dialogic space of the latter (Wegerif, 2013). By doing so, it creates an empirical platform from which further studies can be launched of the characteristics of questions and responses mediated through RT text functionality, and which can inform classroom practice.

Expansion of empirical context

A final, empirical contribution of this thesis is related to the context in which the findings arose. First, RT research tends to be skewed towards STEM subject domains and higher education (Fies & Marshall, 2006; Schmid, 2007), and there is an identifiable lack of research from lower and language education contexts (Kay & Lesage, 2009; Cardoso, 2010). By studying language learning in a Norwegian upper-secondary school, therefore, this thesis contributes to empirically expand RT research into these new contexts. Second, the findings arose in the context of the University Schools Partnership (see Chapter 1.3), which means that informants had experience with research into educational practices, and that the researcher was always present in the empirical context. This meant that the empirical findings included emic perceptions that might have been inaccessible, given a different context. It also meant an increase in the amount of data extracted from the contexts, as informants, non-informants, and

school administrators were willing to make an effort to provide rich data. One empirical implication of this is, therefore, that—coupled with an inviting approach to informants—the richness of empirical findings can be positively influenced by a context conducive to data gathering. Finally, in the context of national educational policy and international literacy tests (see Chapter 2.4.1), the empirical findings of this thesis imply that the integration of RT and the development and implementation of RT practices can be relatively rapid, because teachers and students develop their digital literacy collaboratively when their social interaction is mediated in part through RT. While it is important to recognise that applied RT is just one of many forms of CALL or e-learning, this thesis makes an empirical contribution towards meeting national curricular and policy demands for teachers' and students' digital literacy, and to improve national scores in international literacy tests.

5.2. Theoretical implications

The theoretical contributions of this thesis might not be as immediately apparent as empirical or methodological contributions, because all three articles were conceptual, and an exploratory study necessarily must emphasise empirical findings and methodological transparency. However, the main theoretical implication of this thesis is its contribution to the theoretical discourse on the influence of technology in education. In the following, therefore, facets of this discourse will be discussed. In the articles, a postphenomenological approach to technology has intermittently been referenced, and the implications of the findings of this thesis will be discussed from this theoretical perspective initially. Then, the implications of the thesis' findings on RT for language education and student-centring specifically, and for the dynamics of authority and autonomy in education, will complete the discussion of theoretical implications.

Contribution to the theoretical discourse on the influence of technology in education

There is a marked theoretical confluence found throughout the findings of this thesis of Ihde's background relations (see Chapter 2.2), Warschauer and Healey, and Bax' discussion of integrated technology in CALL (see Chapter 2.4.1), and of the concept of Web 3.0. Both observations and informant perceptions from interviews indicated that RT, both in terms of the software and the hardware employed, tends to recede into the background with time and assume a more mundane and less perceptible role in the interactions in education. A postphenomenological reading of this would be that RT has become transparent to its user. It has faded into the *technosphere* (Ihde, 1974) and become a part of the internalised knowledge of humans, the *knowing-how* (Dreyfus & Dreyfus, 1986). Much like a lamp or a shower,

users' competence and familiarity with RT allow them to use the technology while focusing on the process and expected outcome, rather than on the technological artefact itself, which Ihde called *background relations* (Ihde, 1990a) and Dreyfus *transparent coping* (Dreyfus, 1991). Similarly, in Web 3.0, technology is seamlessly integrated between the human and the world, and takes both into account to deliver modified, adapted versions of one to the other. With RT text responses, for instance, the teacher can receive an ordered list of contributions that might or might not reflect the cacophony of contrasting opinions in the class, opinions that may be presented through the short, quick language typical of mobile communication. In both cases, RT has influenced the user's perception, but, because of the background relations between RT and the user, this might not be apparent to the latter. Finally, the findings of this thesis indicate that, by fading into the technosphere, RT is approaching "[...] the stage of 'normalisation', namely when it is used without our being consciously aware of its role as a technology, as a valuable element in the language learning process" (Bax, 2011, p. 1). Therefore, one theoretical implication of this thesis is the vindication of Bax in the discord about the integration of ICT in language education. The state of integration, which Warschauer (2002) claimed had been reached in 2002, might now be a possibility, at least for RT, though this is contingent on the transition of RT into background relations in subsequent application of the findings of this thesis.

The findings of this thesis on participation with RT imply that the transition of RT into background relations coincides with a co-constitution of the student and technology. RT seemed to let students, who otherwise felt unable to participate, do so in class. By expanding the users' potential for communication, RT seems to have entered into embodiment relations with them. Just as the phone allows its user to relate his thoughts to a distant relative, RT enables the product of the student's cognitive processes—knowledge, opinions, frustrations, and the like—to be mediated (Verbeek, 2016). Without this extension of the self, students might not be able to communicate these products, but they do so by co-constituting themselves as students with technology. Stiegler's concept of *technogenesis*—in which humans relate to the world as cyborgs through technology (Stiegler, 2010), operationalised through Ihde, and ultimately Merleau-Ponty's *embodiment*—neatly accounts for the role of RT in education. Furthermore, this naturalisation, or the fading into the technosphere, of RT also indicates that the digital competence requested by curricula can be learned through the negotiation of digitally and non-digitally mediated learning. Curricula and governmental guidelines may require teachers and students to be cyborgs, but discerning cyborgs, who co-

constitute technology in their everyday educational practice and evaluate the appropriateness of the technology with which they engage with the world. This thesis saw little evidence of a wear-out effect of RT, as discussed by Wang (2015), but more of a transition from novelty to practical utility. Therefore, its main contribution to the understanding of the educational technology user is that of an inextricably linked, but active, human, who draws on his humanity in the application of technical functionality to enhance education. Article I's conclusions on involvement, Article II's emphasis on the creation of a dialogic space, and the variety and volume of text responses presented in Article III all argue that technology in education cannot be conceived as external to the user, but must be seen as constitutive.

Interview and observation data show that teachers and students perceive RT primarily as a tool that they can use for practical purposes, e.g., to discuss subject material or visualise their competence. The emphasis on anonymous communication of competence and views, the competence in transitioning between using RT and discussing, and the relatively minor percentage of resistance answers (Articles I–III) suggest that RT is viewed in terms of how it empowers users and allows them to act, through embodiment and hermeneutic relations. Yet, when the informants discuss RT, they also do so in terms of how they perceive themselves while using RT, e.g., they feel safe enough to communicate their worries or are concerned that they might lose authority because of technical problems or resistance answers. This suggests that teachers and students are digitally competent enough to evaluate how technology influences the world and how it influences themselves. Apart from Dreyfus, who vehemently emphasised the fallibility of technology, no technoscience postphenomenologist attempts to ascribe more value to one understanding of technology than to another (see, e.g., Ihde, 1990a; Stiegler, 1998; Verbeek, 2016). In both schools and postphenomenological thinking, technology is viewed as something through which its users can more effectively engage with the world, but also as something that co-constitutes the user. A theoretical implication of this thesis is therefore that the discourse in schools concerning the role of technology in education takes place along similar conceptual lines, in particular those of embodiment and technogenesis, to the more general postphenomenological discourse on technology in society.

Language education and student-centring

The main theoretical implication of the thesis for language learning is the reconceptualisation of the dialogic space in the language classroom through the polysemy and multimodality of expression that RT affords. As the many different characteristics of text responses and the resulting discussions in discursive lecturing have shown, RT can widen the dialogic space in

the language classroom by visualising polysemy. RT allows a range of meanings to become accessible in discourse, which in itself is desirable in language learning. Furthermore, the diversification of expression—combining oral, written, and digital production skills in manners akin to discursive lecturing—widens the discursive space not only for what is being communicated, but also how. This exercise of polysemy through the application of diverse skills promotes a further deepening of the dialogic space, in which the facets of the content and the process of communication are given expression.²⁰ “Technologies that support drawing and writing can thus be thought of as a way of deepening dialogues, by turning transitory talk and thoughts into external objects that are available to learners for discussion and shared reflection” (Wegerif, 2013, p. 144). The findings of this thesis therefore contribute to the argument that technology enhances communication, and adds to language learning through semi-textuality—the combination of speech, writing, and digital skills—as evidenced particularly by discursive lecturing (Article II). While Ludvigsen, Ness, and Timmis (2019) found similar findings from RT in university psychology lectures, the influence of RT on the dialogic space is particularly relevant in language education, where analysis and mastery of dialogic spaces inform most curricular aims.

A further implication for student-centring in language education is that, for language education to allow students to develop, their involvement in the learning process, both in design and production, has to form the basis of each lesson. The findings of this thesis have shown that this can only be reconciled with traditional, pre-designed lectures with great difficulty, and so to educate active students, teachers will have to become agile. This entails a relocation of the teacher’s pedagogical workload to the context in which they interact with the students, which can be assisted by the communicative affordances in RT. Rather than preparing lectures and tasks to be delivered, and assessing students’ production after the lesson, teachers will have to make themselves knowledgeable enough to invite and react appropriately to student input in class. In other words, language teachers aiming for student-centring need to rely on their subject knowledge and skills in digital and language didactics, rather than on their pre-planning. This thesis found that, by doing so, language teachers can promote student-centring in the form of continuous, active student participation, student proficiency in process and learning management, and, subsequently, the operationalisation of the students’ responsibility for their learning. RT has shown itself as a valuable medium for

²⁰ See, e.g., Article II, in which an example of Ms. Glossop’s initial widening of the dialogic space through the request for arguments through RT was followed by further widening through discussions, and deepening through discussion and RT-mediated analysis of the arguments.

this operationalisation, as well as for teacher agility, because it can serve as a conduit for student activity, which requires teacher response.

As evidenced by the literature (Chapter 2.4), MALL theory is at present nascent, consisting of partial and substantive theories on learning and engagement (Kukulka-Hulme, 2012). There is an identifiable tension between mobile technology as conducive to learning and engagement through the collaboration and autonomy it affords (Palomo-Duarte et al., 2018; Kukulka-Hulme & Viberg, 2018; Nikou & Economides, 2017) and mobile technology as detrimental due to the distractions it affords by promoting multitasking (Blikstad-Balas, 2012; O'Bannon & Thomas, 2015). This thesis supports the former camp by indicating how purposeful multitasking can be combined with both collaboration and student autonomy through a blended application of writing and speaking tasks. The literature indicates that varying learning strategies and maintaining a dialogue about the work process—which promotes student involvement and reveals students' performance expectancy—are necessary conditions for the success of MALL (Sung, Chang, & Yang, 2015; Nikou & Economides, 2017; Botero et al., 2018). Discursive lecturing that blends RT-mediated tasks with individual or collaborative tasks, and bases these on student input, suggests that such a form of student-centring silences dissonance within MALL theory and contributes to the formulation of formal MALL theory.

Negotiating teacher authority and student autonomy

This thesis also contributes to theoretical discourse by showing how the interposition of RT provides the means for interaction that modifies and links both teacher authority and student autonomy. Throughout the data gathering for this thesis, issues related to authority and autonomy kept resurfacing in interviews, in particular how informants perceived an increase in student autonomy to be at odds with traditional, legitimate teacher authority.²¹ The concern with technology as a threat to teacher authority is in line with an ongoing discourse concerning technology as an alternative source of authority, and whose voices are to be heard and respected in the classroom (Cornelius & Herrenkohl, 2004; Nussbaum & Diaz, 2013; Puttick, Drayton, & Karp, 2015). The findings of this thesis indicate that the teacher agility and collaboration necessitated by inviting student production and input through RT brings the teacher's expert and referent authority to the fore, while legitimate and coercive/reward

²¹ Levin and Nolan (2014) provide a framework of four types of teacher authority, with reference to French and Raven's (1959) framework of sources of social power: *coercive/reward*, based on the teacher as dispenser of punishment or rewards; *legitimate*, based on the institutional, formal, or legal position of the teacher; *expert*, based on the teacher's knowledge and didactic skills; and *referent*, based on the student's identification and positive relationship with the teacher.

authority is considered less important. In other words, students see the teacher more as someone who can give subject- or process-related input, and someone they can expect a constructive dialogue with, rather than as an appointed leader who judges their input. There is no suggestion that technology somehow usurps teacher authority; instead, it has the potential to alter the composition of teacher authority into something more attuned to student interaction. Additionally, Article I in particular shows how students welcome autonomy, but prefer to stop short of complete autonomy, considering the teacher an expert and referent authority whose inclusion is of benefit to them. This implies that RT can be used to recalibrate and amplify authority and autonomy, respectively, while fears of authority loss remain unsubstantiated by this thesis.

5.3. Methodological implications

The methodological implications of this thesis stem largely from two central characteristics of the research project: the novelty of state-of-the-art RT and associated practices as units of observation, and the novelty of upper-secondary language education as the context for the study of these units. These necessitated an exploratory methodology, which meant that a mixed-methods research design was found to be suitable for answering research questions and that transparency of methods was essential for the trustworthiness of findings. Furthermore, the situation of the researcher and research process within the context being studied was found to have implications for how findings from this context were arrived at, and, ultimately, how trustworthy they were.

Mixed-methods research

A methodological contribution of this thesis to the research field is the relevance of a mixed-methods research design to study rapidly evolving educational technology and classroom practices (Johnson & Onwuegbuzie, 2004; Creswell & Plano Clark, 2011; Creswell, 2014). The multiphase interaction between qualitative and quantitative sub-studies created an environment in which applied RT could be approached from different methodological angles, and the findings evaluated and refined. Though qualitative dominant, this synechism provided a reflexive approach to the research question, and was essential to the richness of the findings (Johnson & Gray, 2010). The negotiation of qualitative and quantitative data was particularly interesting when combined with the situatedness of the research. Both researcher and informants were familiar with the context in which both types of data were gathered, and the discussion of data, especially in sub-study 3 (S3/second phase) interviews, provided both triangulation, member checking, and more qualitative data.

Transparency of methods

This thesis has taken an exploratory approach in a relatively new field. Because of this, a central methodological contribution of this thesis is the thorough and transparent manner in which the articles and this introduction have strived to communicate the research design and methods. When studying the unexplored, it is important to trace every methodological step that led to our findings, not only because it informs the analysis and reception of those findings, but also because it invites replication, refinement, and application of the research process and findings. In the articles, the research design and methods of data analysis pertaining to the topic of each article were discussed and, where necessary, visualised through figures and screenshots. In this thesis synopsis, a comprehensive exposition of designs and methods was provided in Chapter 2.4, as a methodological system reflected in the articles. This allows evaluation of the findings on the basis of either each article, or the thesis as a whole. Within RT research, and partially in response to the rapid evolution of RT itself, there is already an emphasis on methodological transparency (see, e.g., Ludvigsen, Krumsvik, & Furnes, 2015; Røkenes, 2016; Egelandsdal, 2018). This emphasis makes research into RT dynamic, adaptive, and responsive to change, and constructs the methodological fundament called for in MALL (Viberg & Grönlund, 2012; Kukulska-Hulme, 2012; Duman, Orhon, & Gedik, 2015) and in RT research in general (Kay & Lesage, 2009; Hunsu et al., 2016).

Contextually situated research

A final methodological implication stems from the situatedness of researcher and research. The main research instrument, the researcher, has a background as an upper-secondary language teacher, and had his main workstation at the school in which data gathering took place (see Chapter 1.3). He was thus able to take an emic approach in which no informants considered him out of place, providing access to richer and thicker descriptions of RT in language education. Furthermore, the close proximity of researcher and informants let the former take informant needs and views into account in planning and member checking, while the latter were able to consult or inform the researcher according to their needs. Meanwhile, due to transparency with regards to the emic and etic aspects of the researcher role in the methods applied, researcher and informant teacher roles were sufficiently diverse both in the project and at the workplace to preclude the researcher going native (see Chapter 2.4). The implication of this is that the presence of the researcher in the research context also outside of formal data gathering sessions has the potential to increase the efficiency and impact of

research methods and the trustworthiness of findings, and to ensure the relevance of methods and findings to the context and informants from which they sprung.

5.4. Limitations and further research

Despite the novelty of the findings of this thesis, it is not without limitations, and while limitations related to articles are discussed in each of them, respectively, the limitations of the thesis as a whole will be discussed below. In addition, though the thesis can be seen as an effort to bridge a gap in the research, it has also served to identify parts of the gap it could not cover, and to reveal new areas in need of research. This chapter will therefore also include suggestions for further research into applied RT.

In terms of its findings on educational practice, the limitations of this thesis concern mainly the procedures it was able to study and present, and the selection of subjects to study. Throughout data gathering and analysis, several procedures using RT were identified, and, of these, abductive analysis identified discursive lecturing as the most central, and therefore the appropriate allocation of the remaining project time and resources. However, the chat function available in online collaborative writing, representing an expansion of that dialogic space sharing many characteristics with RT, and a sequential questioning strategy with applied RT, were candidates for this position. Furthermore, informant teachers applied RT generally to classroom practices, making findings valid primarily for this setting and limiting the thesis' impact for the location-unspecific aspects of MALL. These procedures and others indicate a limitation of the thesis, but also identify the ripeness of RT practices for research. Additionally, the practices studied emerged from a limited language learning context. The thesis has not discussed, to any great extent, the differences between gender, age, or study program or between language subjects. While quantitative data show little or no difference between genders, ages, or study programs, and this was supported by qualitative data, in-depth study of these aspects were abandoned in favour of issues more prevalent in the data. Furthermore, qualitative data indicate that the shorter the experience students have with the language, as with foreign languages (e.g., Spanish, German, French), the larger the share of formal questions used by teachers. Although care was taken to make the language orientation explicit in data gathering, informant teachers teach multiple language and non-language subjects, using RT in either or in cross-curricular lessons, and student informants likely have experiences with RT from multiple subjects. It is therefore important to recognise that there are internal variations within language subjects not discussed in this thesis, and that the experiences communicated by informants might also be partially based on and valid in other

educational contexts. However, this, preliminary mapping of RT in other subjects at the school and the existing research on applied RT indicate that there is no reason to expect findings to be relevant only for upper-secondary language education practice. Further research should therefore not only aim to study related practices in similar contexts and differentiate findings between different language subjects, but also evaluate the transferability of findings to other subjects and study levels.

The literature on applied RT has studied its effects on a range of factors, such as involvement, participation, motivation, and learning, as well as the role of anonymity (see Chapter 2.4), yet this thesis has mainly limited itself to discussing the two former. Though all these factors can be found in previous research, and also came to the surface in S1 and S3, precipitating their inclusion in the S2 survey, involvement and participation were clearly perceived by informants as more central to applied RT in language learning. However, the attention afforded these does not entail irrelevance of motivation, learning, and anonymity. There is evidence, both in previous research and in the data behind this thesis, that motivation caused by applied RT is closely related to involvement and participation in inviting student engagement (Fredricks et al., 2004; Henrie et al., 2015; Hunsu et al., 2016). In particular, the visualisation of content and procedures, as well as the identification and covering of knowledge gaps, were described by informants as motivating. Furthermore, though no experimental measurement of learning was made, findings suggest that learning can be *facilitated* by RT, by allowing students to perform more complex tasks than otherwise, through the participatory patterns and the interaction in the new communicative spaces afforded by RT. Finally, the thesis has only discussed anonymity as it intersects with the main topics in each article, and has therefore not been able to discuss the tensions between anonymity and credit, student and class identity in anonymous interaction, and teachers' and students' perceptions of anonymity in general and specific settings. Data suggest that teachers and students see anonymity as transformative rather than as a concealer of identity, allowing social and professional identities to develop through expression without identification, and individual identities to engage with class identities as manifest in the body of anonymous responses. Though issues related to motivation, learning, and anonymity are only hinted at in this thesis, they play a definite role when RT is applied in language learning, because RT changes the way students and teachers act in the classroom. This indicates potential directions that future exploratory research in the field might take, which are identified, yet not sufficiently discussed, by this thesis.

In a qualitative-dominant study studying practices and perceptions such as this, both benefits and limitations follow from the roles and relationships of researcher and informants in the research context. While the benefits have been discussed above, it is important to recognise that informants were volunteers from a technology-rich School University Partnership school, in which practice-based research was an integral part of everyday life. Furthermore, teacher informants had undergone research training through the Partnership, and mirrored the researcher's background in educational practice and research. The informants' familiarity with technology and research enabled them to reflect on applied RT in ways which informants from other contexts might not. This benefits the research in terms of a clearer understanding of applied educational technology and delineation of roles, especially that of the emic/etic researcher, and therefore limits *confirmation bias* and the *Hawthorne effect*.²² However, it also makes the practices and perceptions of the informants context-specific and allows only substantive theories to be built, rather than formal ones. Furthermore, this thesis, by focusing on practices and perceptions, made little effort towards experimental measures of applied RT. While these limitations signal a need for similar studies in similar and different contexts, this thesis has attempted to promote transferability of findings and accommodate such studies through methodological transparency and rich, thick description of context, participants, and findings. The mixed-methods design and analytic abduction applied in this project argue that the practices and perceptions of informants may carry value beyond this case. When carrying and reconfiguring the research design to other cases, the research field will likely benefit from juxtaposing informant practices and perceptions with experimental expressions of applied RT.

²² *Confirmation bias* is people's tendency to register information that conforms to their preconceptions, whether these are made individually or collectively (Wason, 1968). *The Hawthorne effect* is the tendency of informants in research to act differently than they would otherwise do, due to their informant status (Landsberger, 1958).

6. Concluding remarks

This thesis answered the research question *How do upper-secondary teachers and students apply and experience RT in language education?* through an exploratory mixed-methods case study. While several practices surfaced, most aimed to and succeeded in increasing communication and student-centring in language education. The iterative practice of discursive lecturing (Article II) expresses many of the communalities in RT practice; it takes as its starting point the students' background and builds on their responses to agilely assist them in actively constructing their own knowledge. Students and teachers in particular appreciate the communicative potential of RT text functionality (Article III), because allows students freedom of expression and a medium to use it. Because of this, students find it easier to influence the way in which language education takes place (Article I), and teachers feel more able to adapt their teaching in accordance with student input. In the application of RT in language education, there is an observable teacher-student collaboration, and a dynamic between social and professional communication mediated, in particular, by the anonymity that RT can provide.

At the initiation of the doctoral project, teachers expressed a need for increased participation and communication in their lessons, and this thesis arguably shows that RT can be applied to meet this need. The dynamics between RT votes and discussions, similarities of text responses to oral communication, and the informants' expressed experience of communicative enabling all argue that RT can represent an additional channel of communication that can expand what is being communicated, not only how it is communicated. As argued in the introduction to this thesis, the promotion of this communication is in itself an aim for language education (see Chapter 1). However, this communication is contingent first on students feeling enabled to respond (that questions are possible for them to answer), and second on their responses having consequence for the subsequent procedures (that their effort is validated). Findings suggest that students are able to relate professionally to their responses and the feedback on these, preferring to attempt to answer and promote a discussion of topics and responses, rather than not participate.

Furthermore, informant experiences suggest that the collaboration necessary for the RT practices promotes a renegotiation of identities in the classroom. At the most practical level, the anonymity of RT allows a detachment of responses from students' personal and social identity, leaving responses an expression of professional identity, and the list of responses an

expression of the class as a whole. This is conducive to professional discussions of responses, as shown above, and provides potential for the student-centring of language education mandated by curricula and the needs of the students themselves. In addition, the need to adapt to student responses transforms the teacher identity from that of a legitimate authority and dispenser of knowledge to an expert/referent authority and collaborator in knowledge construction (Levin & Nolan, 2014). Likewise, findings suggest that students are aware of their transfer from passive recipients to actively involved, increasingly autonomous producers. Having a say in what happens next not only conveniently makes what happens next relevant for them, but also gives them partial responsibility for what happens next. The above-mentioned professionalism in dealing with visualised responses, as well as responses and statements suggesting students experiment with ways of answering, developing both language and digital skills, argue that students see their identity as language learners as a more active one when RT is involved.

Another important suggestion arising from this thesis is that with use, technology becomes integrated in education. Findings show that with use, RT itself becomes secondary, replaced by the interaction it affords. Philosophically and theoretically, this is not new. Heidegger called this relation between the human and technology *ready-to-hand*, Ihde *background relations*, and Bax *normalisation* (see Chapters 2.4.1, 2, and 5.2). Yet educational practice with technology is in danger of remaining focused on technology itself in the *unready-to-hand*, *alterity relations*, or *restricted or open approach*, because development and availability of alternative technology is rapid and ever-present. It might therefore be appealing to reject one form of technology in favour of alternatives, when that form of technology is still in alterity relations, and provides users with unexpected outcomes or difficulties. However, this thesis has shown that, when teachers and students collaboratively deal with unexpected outcomes and difficulties, technology can become integrated and allow new practices to emerge. In this sense, technologies are

transformational in that they change the quality, field and possibility range of human experience, thus they are non-neutral.[... They] must be understood *phenomenologically*, i.e., as belonging in different ways to our experience and use of technologies, as a human-technology relation, rather than abstractly conceiving of them as mere objects (Ihde, 1993, pp. 33–34).

This thesis therefore suggests that, in the same way as RT receded in favour of interaction and educational practices mediated by RT, other forms of technology might do the same and

thereby build both digital and other skills simultaneously. In the case of RT, this process of receding into the background was contingent on collaboration between the teacher and students in actively producing and agilely reacting to the use of RT, which allowed this shift to happen, further arguing that successful technology implementation is a product of human interaction and evidenced by technology transparency.

As discussed in Chapter 5, this thesis has implications for practice, research, and educational policy. By taking an open and exploratory approach to a rapidly changing phenomenon in a little-studied context—that of applied RT in upper-secondary language education—this thesis is able to suggest ways in which RT can be used in similar contexts. This is because findings were arrived at by abductively analysing data *arisen from the context*, arguing that research methods and findings are transferrable to other contexts. There is reason to expect that students will react to increased, student-centring communication similarly in, e.g., Italian lower-secondary mathematics education as in Norwegian upper-secondary language education. Similarly, the expansion of research to this new context and this, at the time of writing, state-of-the-art functionality (see Chapter 2.4) not only expands the empirical context of RT research, but argues the interconnectedness of technology, communication, involvement, participation, and student-centring in this context as well as contributing to the field of MALL. Theoretically, this thesis resonates with technoscience postphenomenological thinking, suggesting technology in education can be understood by the ways in which it mediates experiencing and learning. Finally, this thesis suggests ways in which teacher and student digital skills can be developed collaboratively in order to meet policy requirements in Norway, particularly in the face of requirements in the new curricula and core curriculum due in 2020 (Norwegian Directorate for Education and Training, 2019b,c, see Chapter 1). As such, this thesis' findings on student-centring through applied RT in language education suggest ways in which educational practice can adapt to both to the needs of students and to educational directives.

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Part II: Articles and appendices

Article I

Involvement with Response Technology as Student-Centring of Language Teaching: Upper-Secondary Student and Teacher Experiences

Abstract

Response technology (RT) is frequently applied to engage students in education, but research on RT has only perfunctorily studied student involvement in decision-making in secondary education. Because such research is also scarce in language learning, this study aimed to identify and examine how students and teachers experience student-centring of language teaching through RT-mediated involvement. A qualitative-dominant, mixed-methods case study design provided data through observations, interviews, and surveys, which was analysed through constant comparative coding and categorisation, descriptive statistics, and analytic abduction. This identified two forms of involvement—active and passive—which entered into a dynamic, student-centring, relationship-guiding practice, and between which teachers' and students' decision-making roles varied. By combining RT and involvement, this study provides an introduction to an area of research which may further unlock the potential of RT for student-centring of education.

Keywords: Involvement, Response technology, ICT, Language Teaching

1. Introduction

Response technology (RT) has a pervasive presence in modern education, where teachers use it to involve students in lessons. In existence since the 1960s but rising to didactic and academic prominence in the 2000s (Abrahamson, 2006; Caldwell 2007), RT provides an additional communication channel inside or outside the classroom. Students can make contributions—often anonymously—through their smartphones, tablets, or computers, and teachers can receive and react to a real-time, comprehensive, and accurate snapshot of the class. Research into the application of these tools reports beneficial effects for dimensions such as engagement (Blasco-Arcas, Buil, Hernández-Ortega, & Sese, 2013; Henrie, Halverson, & Graham, 2015), motivation (Hunsu, Adesope, & Bayly, 2016), participation, and learning (Stowell & Nelson, 2007), most often as a result of expanded communicative capabilities compared to traditional teaching (Keough, 2012).

Although RT use by teachers and students in language classrooms has resulted in a small corpus on reported practices, little research looks at RT in language education (Kay & Lesage, 2009; Habel & Stubbs, 2014). Furthermore, Penuel, Boscardin, Masyn, and Crawford (2006), Kay and Knaack (2009), and Ludvigsen, Krumsvik, and Furnes (2015) remain the only comprehensive studies of RT in lower-education settings. Because RT's focus—

communication—is both a means and an aim in language subjects (Savignon & Berns, 1987), there is a need to unlock RT’s potential with research into the attitudes and perceptions which motivate and guide its use in language teaching in lower education. Such research may steer the field towards methods of application and best practices in this context.

Taking a mixed-methods approach to teacher and student attitudes towards applied RT in language teaching at a Norwegian upper-secondary school, this case study attempts to answer the research question, *How do upper-secondary education language students and teachers perceive student-centring through involvement in the application of response technology?* The findings of this study, arrived at through an exploratory approach to applied RT including observations, interviews, and surveys, highlight the relevance and potential of research into applied RT in general, and into involvement through RT in particular.

2. Background

2.1. Response technology

RT in an educational setting uses digital tools allowing students to communicate in the classroom through internet-connected devices (Abrahamson, 2006; Caldwell, 2007). In the context of this project, RT is not simply hardware, although its origins in separately produced hardware units known as “clickers” still leads many to think of it in this way. However, modern RT uses all available devices, often through “bring your own device” (BYOD) policies—as well as a plethora of web-based software (Caldwell, 2007; Beatty & Gerace, 2009)—to facilitate communication between a group and an instructor, often condensing that communication to allow immediate and targeted responses. Due to a lack of uniform nomenclature (Fies & Marshall, 2006; Kay & LeSage, 2009), this study will refer to these systems as “response technology” (RT). Research by Roschelle, Penuel, and Abrahamson (2004) and Beatty and Gerace (2009) focus on a practical rather than theoretical orientation. However, a generative theory of learning can be discerned through the literature’s constructivist and behaviourist focus on RT’s affordances for student activity as well as its orientation towards student engagement, participation, motivation, and learning (Hunsu, Adesope, & Bayly, 2016; Landrum, 2015).

Internationally, research on applied RT in education focuses almost exclusively on higher education in STEM, economics, and medicine, with limited studies in primary and secondary education and other disciplines (Kay & LeSage, 2009). Several positive effects of RT have been shown by Arnesen, Korpås, Hennissen, and Stav (2013), Keough (2012), and

Egelandsdal and Krumsvik (2017). In the search for best practices, research has found engagement in the form of involvement and participation aided by anonymity to be conducive to student-centring of education, promoting student learning and motivation (Roschelle, Penuel, & Abrahamson, 2004; Aljaloud et al., 2015). Communicative, interactive, and student-active environments—commonly promoted in language education (Bruner, 1981; Meyers & Jones, 1993)—were reported by Mazur (1997) and Bruff (2009) as indicators of successful RT application. However, despite this and frequent calls for diversification in disciplines and education levels (Simpson & Oliver, 2007; Kay & LeSage, 2009), Bruff (2014) indicated such diversification has been limited in extent.

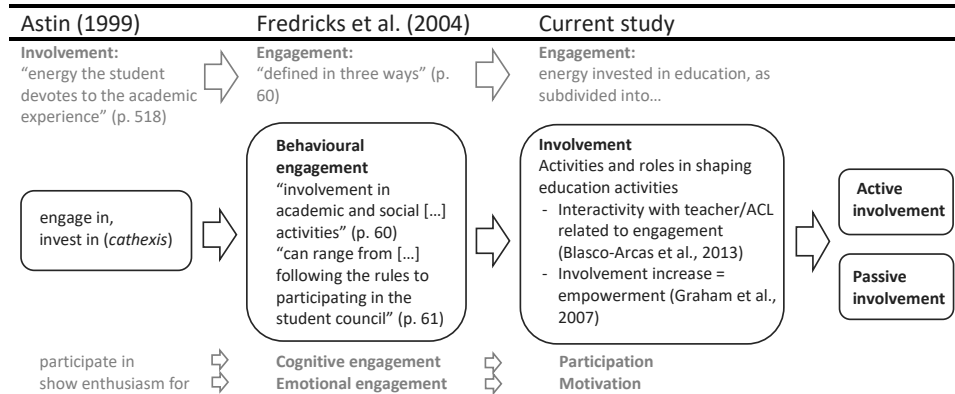
In Norway, research remains sparse. Bjørkli (2014), Arnesen et al. (2013), and Wang (2015) argue that frequent use promotes learning, and Wang cites changed classroom dynamics as a possible cause. Similarly, Ludvigsen et al. (2015) and Egelandsdal and Krumsvik (2017) found learning benefits from application of RT in conjunction with peer discussions and self-assessment. Furthermore, Ludvigsen et al. (2015) is among the few studies exploring student attitudes towards applied RT through a significant portion of qualitative data; this allowed them to suggest increased involvement for students, due to “real feedback dialogues” made possible by RT altering communicative dynamics in lectures. While these studies represent the central Norwegian research, they were conducted on relatively small samples of STEM or psychology students in higher education, and in general discuss involvement only tangentially to learning. To date, few studies have been conducted on applied RT in primary and secondary education language teaching in Norway.

2.2. Involvement

The literature shows a general consensus that involvement and engagement are related, and that RT fosters engagement (Boscardin & Penuel, 2012; Blasco-Arcas et al., 2013). However, a uniform understanding of the terms and their relationship remains elusive (Blasco-Arcas et al., 2013; Henrie et al., 2015). This is likely due to two seminal works that present the terms differently. Astin defined involvement as “the amount of physical and psychological energy that the student devotes to the academic experience” (Astin, 1999, p. 518), and included a variety of behavioural terms—amongst them “engage in”—as hyponyms (see Fig. 1). Later, Fredricks, Blumenfeld, and Paris (2004) represented engagement as consisting of cognitive, behavioural, and emotional dimensions. As these are similar to involvement, participation, and affect/motivation, and different studies rely on different predecessors (e.g., Kay &

Knaack (2009) and Trowler (2010)), the exact nature of and relationship between the terms is unclear.

Figure 1. Involvement in the literature and the current study



This study recognises Astin’s definition as widely applied to engagement in the literature, and therefore uses involvement as synonymous with Fredricks et al.’s behavioural dimension in line with Astin’s engagement/investment. From a student-centring point of view, this means involvement is students’ activities and role in shaping and directing education activities. This definition further resonates with Blasco-Arcas et al.’s identification of an intersection of “engagement”, “interactivity with the teacher”, and “active collaborative learning” (ACL), and with Graham, Tripp, Seawright and Joeckel’s (2007) understanding of an increase in involvement as “empowerment”. Taking a cue from Blasco-Arcas et al., this study distinguishes between active and passive involvement; in the former, the involved party actively makes decisions in the classroom, while in the latter, the involved party provides the background upon which decisions are made. Fig. 1 situates these terms within existing terminology.

The literature suggests that interaction with RT promotes student-centring by promoting involvement, yet calls for research on this dimension. Graham et al. (2007) point out that empowering students—making it easier to participate and to evaluate their own performance—is preferable to forcing student participation; students welcome the opportunity to choose or not to choose to influence the lesson. Trees and Jackson (2007) echo this, arguing that students’ sense of expediency, relevance for their learning activities, and expected usefulness of feedback determine their involvement. They are aware of the commitment which accompanies involvement, something Bruff (2009) and Bachman and

Bachman (2011) term academic responsibility and accountability. Laxman (2011) and Egelandstal and Krumsvik (2017) found that students reacting to replies and follow-up led primarily to engagement in the form of participation, but also made them more involved in directing one another’s learning and the learning in class. Furthermore, Ludvigsen et al. (2015) and Dong, Hwang, Shadiev, and Chen (2017) found the teacher’s willingness to heed students’ input was crucial to student learning and involvement, but echoed Henrie et al.’s (2015) notion of limitations, calling for further research into involvement with applied RT.

3. Methods

This study took a postphenomenological approach to the research question, using observations, interviews and surveys in a mixed methods design to explore participant experiences with applied RT in language education (Merriam 1998; Johnson & Onwuegbuzie, 2004; van Manen, 2016). Technoscience postphenomenology (Ihde, 1990) combines a focus on users’ experience of the world with attention to how this experience is mediated by technology (Verbeek, 2016). In order to access these experiences, a multiphase mixed-methods case study design, using both qualitative and quantitative methods of data collection and analysis, was applied to construct theory through three phases (Merriam 1998; Johnson & Onwuegbuzie, 2004; Creswell, 2014). The qualitative, initial phase (P1: Aug. 2016 to May 2017) and its quantitative, calibrating phase (P2: April-May 2017) formed a sequential exploratory design where findings from P1 were tested against the larger sample of P2 (Creswell, 2014). The coordinated findings from these informed the third, qualitative intervention phase (P3: Aug. 2017-Dec. 2017), which sequentially tested these findings through analytic abduction and added a final, sequential explanatory/exploratory qualitative phase to the overall case study (Creswell, 2014). Table 1 illustrates data interconnectivity from the three phases.

Table 1 Illustration of interaction within the mixed-methods case study

Category: Active involvement				
P1 Observation	P1 Interview	P2 Survey	P3 Observation	P3 Interview
Ms. Gregson, 17.01.2017, 2GS, Spanish Vote 1: (Should we practice translation from Spanish to Norwegian or vice versa?) – Majority for the latter. Memo: A semblance of democracy.	Kirsti, Alma, Ronja, Anna, 07.03.2017 Interviewer: Do you feel you get to influence what you do and how you do it? Anna: We could possibly have been given more opportunities to influence [the lessons]. It would have been easier for people to say what they needed if they had the opportunity, in a way.	Q16 “It is important to me to influence content and methods in the lessons” Q19 “Response technology makes it easier for me to tell the teacher how I want to work” Q20 “Response technology makes it easier for me to tell the teacher what I want to work with”	Ms. Travers, 29.08.2017, 1GS, English Vote 2: (What should be included in a text about New Zealand?) Student text responses: Maori, rugby, Wellington, spiders, sheep, zipline, James Cook, dance, Kiwi-bird	Aurora, Runa, Eirik, Chris, 14.12.2017 Interviewer: Would you like to decide how to work, or would you like [the teacher] to decide? Chris: It’s a bit of both, really. Runa: She knows a bit better what we need to practice, so then she can [...] adapt it.

In language teacher Ms. Gregson's Spanish class, active involvement was observed when students were invited to actively decide how to proceed, and four students were subsequently interviewed about their experiences with such involvement. Based on P1 analysis, the P2 survey items Q16, 19, and 20 were formulated to gauge the experiences of a larger and more diverse sample. The coordinated findings informed the P3 intervention, where other observations in Ms. Travers' English class and student interviews refined the category of active involvement and allowed theory formulation.

3.1. Participants

The sampling for the project was closely tied to each phase, but all informants were sampled from the same time period, environment, and context—three terms at a Norwegian upper-secondary school—thus constituting a bounded system (Plano Clark & Creswell, 2015). Student groups were drawn from both general (GS) and vocational (VS) study programs, though the school subjects in focus remained the same, as these were taught across study programs.¹ All data collection, analysis, and storage were approved by the Norwegian Social Science Data Service (NSD) and complied with NSD ethical standards. Participation was voluntary, participants were informed verbally and in writing before data collection, and their names were replaced with pseudonyms in the analysis.

The sample population for P1 was chosen by purposeful snowball or chain sampling (Merriam, 2009; Patton, 2002). Based on their willingness to participate, 18 teachers of vocational and general subjects (including 12 language teachers²), and their classes, were progressively involved. In P2, the effective sample of 591 students (49.6% VS, 50.4% GS) and 26 language teachers was arrived at by purposeful maximum variation sampling (Merriam, 2009). Teachers and students who had given or received language education and who might have been exposed to RT constituted the entirety of attending participants, which allowed for a wider understanding of the experiences from P1. Finally, three teacher informants, one third-language class (VS/GS), two second-language classes (VS/GS), and two

¹ For the purposes of this article, general studies (GS) are understood as the study program with exclusively common core subjects. Vocational studies (VS) are understood as any study program with a combination of common core subjects and program subjects. This is somewhat in conflict with changes in the re-classification of study programs starting in autumn 2016 (Norwegian Directorate for Education and Training. (n.d.). Finn utdanningsprogram. Retrieved March 15, 2018, from <https://www.udir.no/laring-og-trivsel/lareplanverket/utdanningsprogram/>)

² The choice of including non-language teachers in P1 was partially a reflection of the research field, in which findings from established research in non-language subjects informs research on language subjects, and partially in recognition of the generalisability of **student-centred** RT didactics.

native-language classes (VS/GS) formed the P3 sample. Teacher and class characteristics were monitored during the first-year execution of P1 and P2, which combined with emerging categories to inform theoretical sampling for P3. Eligibility also depended on the P1 activity of teachers, to provide relatively constant implementation of RT approaches throughout the data gathering period.

3.2. Data collection

During the two qualitative phases, data was gathered through observations and interviews. Acting as a “observer participant” (Merriam, 2009; Creswell, 2014), I recorded observations through field notes with descriptive and reflective components (Plano Clark & Creswell, 2015; Saldaña, 2009). The actions and reactions of informants were described, my immediate interpretations recorded alongside these, and analytic memos added post-observation. This observation data provided the basis for 39 interviews in P1 and 25 in P3. These interviews ranged from brief, unstructured, or open-ended field interviews of a few minutes (P1n=34, P3n=20) to long to semi-structured interviews of up to 2 hours (P1n=5, P3n=5) with interview guides piloted with teachers and students. The former type provided insights into teacher and student attitudes, reflections around past or future classroom experiences, and the situation of language and/or RT teaching in general. The semi-structured interviews allowed for deeper discussions of emerging issues from the observations and unstructured interviews. P1 interviews gathered interviewees’ experiences with themes such as ICT- and RT-mediated teaching, teacher and student roles, and anonymity, involvement, participation, motivation, and learning. In P3 interviews, conducted after the P3 intervention, experiences from the intervention were discussed in relation to expectations, the themes from P1 interviews were re-examined, and informants were invited to evaluate the intervention. All interviews followed the seven stages of interviewing as formulated by Kvale and Brinkmann (2015), adjusted to the characteristics of their type.

The findings from P1 observations and interviews formed the basis for two cross-sectional surveys in P2. Following a biographical and frequency-of-use section, teachers and students were asked to express their perceptions of student anonymity, participation, involvement, motivation, and learning facilitation with applied RT in language education. They did this by responding to statements on these topics through Likert scales, which ranged from strongly disagree to strongly agree. P1 informants, colleagues within education research, an external expert in quantitative methods, and an external focus group of students were consulted to ensure the quality of the questions (see Timperley, 2008; McTaggart, 1997). Immediately

following P1—to reduce the impact of variables and administered on paper to avoid storage on external servers—the surveys followed a retrospective, non-experimental correlational case study design (Shadish, Cook, & Campbell, 2002). The surveys were identical, with the exception of phrasing (students: “I am...”, teachers: “The students are...”) and a reduction of biographical options for the smaller teacher sample to preserve anonymity. This allowed for comparisons between teachers and students.

3.3. Analysis

In P1 analysis, both field notes and recorded interviews/interview transcripts were subjected to a coding process using the constant comparative method, which also involved writing analytic memos (Saldaña, 2009; Fram, 2013). Field notes and interview recordings were imported into and transcribed in the CAQDAS software NVivo 11, and subsequently underwent a coding and categorisation process. The interviews—conducted in the informants’ native language, Norwegian—were transcribed and analysed in that language, and key passages were translated into English for publication. Both field notes and interviews underwent “initial coding” (breaking down qualitative data into discrete parts, as described by Saldaña (2009) and formerly called “open coding”), but in combination with different coding methods.³

The field notes and interviews were initially subjected to provisional coding, according to a list generated from the research question. In first-cycle coding, the field notes were subjected to attribute, descriptive, and simultaneous coding for data management, providing a detailed inventory of data interconnectivity (Saldaña, 2009). The attributes and structures, similarities, differences, frequency, sequence, and correspondence arrived at through this coding were paramount, as they provided the basis for the later interviews, surveys, and intervention. The interviewees’ role in shaping the discourse of interviews warranted less grammatical methods and more elemental and exploratory methods. Hence, holistic, *invivo*, and process coding were applied in pursuit of approaches to student-centred education as actions, attitudes, and conditions, as sanctioned by the study’s design (Saldaña, 2009). In second-cycle coding, categories were formed based on focused coding of both observation and interview codes (see Fig. 2). Data with similar first-cycle codes were grouped together under a tentative category name in an abductive and alembic process of organisation and reorganisation until data saturation was achieved (Saldaña, 2009). In other words, by repeatedly revisiting previous

³ For detailed descriptions and discussions of these methods, see Saldaña (2009). For a discussion of constant comparison outside of Grounded Theory, see Fram (2013).

levels of analysis, second-cycle categories were re-negotiated, focused and refined until they qualified as the most likely explanation for the data and codes they encompassed (Peirce, 1955; Schurz, 2008; Fram, 2013).

For the survey data from P2, IBM SPSS Statistics 24 and descriptive statistics were used to analyse the attitudes of the teacher and student groups. Because no distinction was made in the treatment of groups, the analysis of similarities and differences provided a non-experimental expression of informants' perceptions. The biographical section of the survey was used to identify groups, and the frequency-of-use section was kept apart from the attitude section in the analysis, though subjected to the same level of analysis and comparison.

Comparisons were made based on distribution means and significant Spearman's ρ correlations bolstered by Student T-tests administered for intersections of particular relevance or interest.

P3 analysis attempted to formulate theories through analytic abduction. P3 interview and field observation data was compared with P2 findings and P1 categories to see if it could be coded into these. If not, constant comparative analysis of new data for comparison, adjustment, and/or expansion of categories was performed. Theory formulation was then undertaken upon theoretical saturation of the categories, whereupon categories were organised through ordering and reordering and diagramming, and theory was formulated in rich, thick description (Saldaña, 2009; Merriam, 2009). Validity of findings was ensured through member checking (Creswell, 2014) and triangulation through analytic abduction (Schurz, 2008)

Figure 2. NVivo 11 screenshot: Coding visualisation

The screenshot shows the NVivo 11 interface. On the left, a tree view under 'Nodes' shows '1st Cycle' and '2nd Cycle' expanded. Below it are 'Cases', 'Relationships', and 'Node Matrices'. At the bottom left, there are buttons for 'Sources' and 'Nodes'. The main area on the right is titled '2nd Cycle' and contains a table with columns 'Name', 'Sources', and 'References'.

Name	Sources	References
1. Involvement	59	1190
1.1. Passive involvement	47	803
1.2. Active involvement	22	150
1.3. Basis for involvement	21	125
1.4. Hindrances to involvement	8	46
1.5. Peripheral	7	20
2. Participation	46	412
3. Motivation	23	204
4. Learning facilitation	39	416
5. Anonymity	29	172
6. Meta	31	175
7. Attitudes general	23	123

4. Results and discussion

From the data, a complex understanding of involvement emerges in which involvement is central to student-centring of language education with RT. Besides students actively making decisions regarding execution of education through active involvement, passive involvement also appears to be central. Here, the teacher plays the active part by interpreting student responses to teaching and letting that inform further teaching. RT serves to let the teacher know which content students prefer or which work method they would like to apply, but it also serves to define the content itself or to let the teacher know students' status and needs, allowing the teacher to adapt lessons accordingly. Furthermore, findings suggest the collaborative aspect of both types of involvement—as well as the educational value in letting one inform the other—are important to teachers and students involved in RT-mediated upper-secondary education language teaching.

In the surveys, teachers echoed student attitudes throughout, making student attitudes indicative for both groups (see Table 2). Involvement (Q16-21) was considered more central in the application of RT to language education than participation, motivation, and learning facilitation. The means of all questions in the involvement section, both for students ($M_{si} = 3.62$, $SD_{si} = .76$) and teachers ($M_{ti} = 3.90$, $SD_{ti} = .64$), exceeded those of the other sections, ($M_{sx} \in [3.44 (SD = .57), 3.62 (SD = .76)]$, $M_{tx} \in [3.59 (SD = .53), 3.90 (SD = .64)]$). While only negligible correlations ($p < .3$) were found between the variables and gender or study program for the students, the involvement variables were uniformly in favour of female

students, indicating they are somewhat more preoccupied with involvement than male students. The highest significant correlations were found between variables Q19 and Q20, indicating that content and work methods are equally important in active involvement ($\rho_s=.826$, $\rho_t=.904$, both $p<0.000$)⁴. This pair further enters into a strong system of coherence with Q17 and Q18, indicating the connectedness of active and passive involvement, particularly because Q18—a variable measuring attitudes towards the latter—has the highest mean in the section. The involvement variables correlate well to motivation variable Q13 and learning facilitation variable Q26. This indicates students (and teachers) perceive involvement as connected to motivation for language learning and that the teacher’s response to student contributions is seen as an element of involvement.

Table 2. Key quantitative data from student responses (Pearson’s *r*)

	Q6 Frequency of use in languages	Q16 M/SD: 3.71/0.976	Q17 M/SD: 3.72/1.019	Q18 M/SD: 3.77/0.938	Q19 M/SD: 3.65/0.998	Q20 M/SD: 3.68/0.984	Q21 M/SD: 3.19/1.107	Q13 M/SD: 3.42/1.034	Q26 M/SD: 3.47/0.827	Q12 M/SD: 4.09/0.986
Q1: Gender (Female/male:1,2)	-0.055 ($p<0.180$)	-.126 ($p<0.002$)	-.199	-.101 ($p<0.014$)	-.157	-.149	-0.057 ($p<0.169$)	-0.001 ($p<0.972$)	0.023 ($p<0.572$)	-.192
Q4: Study program (GS,VS:1,2)	-.180	0.020 ($p<0.627$)	-0.029 ($p<0.482$)	0.029 ($p<0.488$)	0.026 ($p<0.530$)	0.006 ($p<0.888$)	.105 ($p<0.010$)	0.064 ($p<0.120$)	0.040 ($p<0.336$)	-.140 ($p<0.001$)
Q16: It is important to me to influence content and methods in the lessons.		1	.381	.300	.303	.337	.264	.298	.226	.256
Q17: RT makes it easier to tell the teacher what I find difficult, e.g., through votes.		.381	1	.637	.665	.647	.469	.453	.393	.384
Q18: RT makes it easier for the teacher to find out what I need to work on.		.300	.637	1	.677	.613	.494	.385	.454	.334
Q19: RT makes it easier to tell the teacher how I want to work.		.303	.665	.677	1	.837	.580	.450	.453	.361
Q20: RT makes it easier to tell the teacher what I want to work with.		.337	.647	.613	.837	1	.564	.457	.427	.363
Q21: RT makes it easier to tell the teacher how I react emotionally to the teaching.		.264	.469	.494	.580	.564	1	.387	.383	.190
Q13: Using RT can make me want to work more in language lessons.		.298	.453	.385	.450	.457	.387	1	.344	.264
Q26: Teacher feedback on RT questions can help me with what I am working on.		.226	.393	.454	.453	.427	.383	.344	1	.286
Q12: If the teacher asks us to vote for what we find difficult, and we can be anonymous, I will do so.		.256	.384	.334	.361	.363	.190	.264	.286	1

$p<.000$ (2-tailed) unless otherwise indicated

4.1. Passive involvement

In our context, Trees and Jackson’s (2007) link between the teacher’s pedagogical commitment to student contributions and involvement was identified as passive involvement, succinctly exemplified by Mr. Malvern’s social science lesson with his first-year GS students.

⁴ Equal variances assumed throughout.

Mr. Malvern—who was also that class’ native language teacher and therefore pursued the learning goals of both subjects—wanted students to practice discussing and writing argumentative texts. After students read a short text, they were asked to anonymously identify their position on a five-point Likert scale in Google Docs. Then, noting that the distribution was skewed to one side, Mr. Malvern invited them to prepare for a discussion by submitting two sentences explaining their position. After this and a brief discussion of some of the contributions, students were asked to submit arguments for and against, using previous submissions as support. In this case, students were not asked directly how they would prefer to work or which content they would like to work with. Mr. Malvern used their contributions and their attitudes to help them learn how to approach argumentative writing. Here, RT was applied to allow many students to contribute the material which the teacher might otherwise have had to provide himself. This made students, rather than just the teacher, a central influence on the process. Numerous cases of such passive involvement were found in observations and throughout the interviews, such as with the language teachers Mr. Todd and Ms. Gregson, and the students Anna and Kirsti:

And then they have to be able to write a vocationally evaluating text. What is a vocational evaluation? Then we have to discuss that with them. What is a vocational evaluation for you, when you are in the workshop and are about to do something which is hard and demanding. What is it, in fact, what is it that makes it vocational and what is it that we can’t write when we write vocational evaluations? (Mr. Todd)

We used the text function to write a research question for the theme ‘The British Royal Family’. [...] We had to discuss the difference between theme and research question, but then we went through and evaluated their research questions. Some were too wide, some too narrow and some too unclear. (Ms. Gregson, paraphrased)

And when we started [the process], I took a student who had written a bit, and it was quite well written, and I put it up on the projector, because then everybody could see what I could see. (Ms. Gregson)

Anna: [The teacher can] find out what people know and not, too. Help us with what we do not know.
Kirsti: And you see [...] that others are failing, so you dare to try. You’re not alone.

In addition to indicative student contributions to be diagnostically taken into consideration by teachers, both students and teachers indicated the evaluative level of communication afforded by RT was crucial for passive involvement. In fact, in the survey (See Table 2, Q12), students

particularly emphasised being able to provide metacognitive comments on their own work, their own processes, and their own attitudes and concerns. However, the neutral score on Q21 indicated that students, by commenting on such matters, aim more to have lessons adapted to them than to actively influence them. In other words, students' primary aim with meta-comments is to receive aid or praise; they had only a secondary interest in exercising active, executive influence, preferring the teacher to make the decision to follow up on their comments. In the observation data, there was a proliferation of anonymous, metacognitive comments such as "I don't understand anything" and "I am enjoying this (good teacher)". This suggested that, when unable or unwilling to answer the question, students nevertheless provided evaluative comments, hoping to inform the teacher of their needs and opinions. This combines with the quantitative data to paint a nuanced picture of student involvement. It ranges from merely wanting to actively decide content and work methods to making their sentiments and preferences known for the teacher's consideration. While identifiable as passive involvement in this study, the relevance of such findings for other elements of Astin's (1999) "involvement" and Fredricks et al.'s (2005) "engagement" invites further research into the wider ramifications of both findings and passive involvement.

4.2. Active involvement

Observation data show students as willing participants in active involvement, which confirms data from the survey, because they seem equally positive to defining work methods and content themselves. This is evidenced by amongst others Ms. Travers' English lesson in first-year GS. Ms. Travers—in preparation for a project on English-speaking countries—asked students to brainstorm about a selection of countries through the text function in the RT iLike. This provided a list of pointers which were screened by Ms. Travers, and then provided a basis for students' subsequent process. Students then made plans for how to apply this data to their projects. As suggested by Trees and Jackson (2007), the high participation on the requests (n=10, mean participation=64%) and the long lists they produced indicate that students appreciate being involved in this definition process and also see its relevance for the upcoming procedure as long as the teacher makes clear the motivation for such invitations to involvement.

Interview data provides further insight into the dynamics of active involvement. Both teachers and students prefer active involvement to appear in a collaborative negotiation, rather than the

teacher deciding content and work method or providing students with *carte blanche*, i.e., relinquishing all influence. The same interviews suggest the preference for collaboration is aided by the concurrent sharing of responsibility for the process and product. This serves either to avoid potential blame for a failure or to promote perceived positive effects of involvement for either of the collaborating parts. Such effects can include increased student competence in language or choice of work methods as promoted by teachers, or the inclusion of the teacher's expertise and subsequent responsibility for the process and product, as indicated by students.

Active involvement through collaboration generally consists of the teacher providing a menu of topics and/or work methods, and the students expressing which they prefer. Alternatively, the students respond to the teacher's request with possible topics or work methods from which the teacher chooses. The language teacher Mr. Corcoran gives an example of the former:

[...] what's important to do, so that students consider themselves involved, is to provide, for example, three or four alternatives. OK, who wants to take that one? We have, for instance, had some projects about music on VG2 [second year]. And then we came up with four suggestions, which were; you can choose between making a Kahoot - those who want to, in groups, make a Kahoot about music, and in dance - there were two groups who found a dance from Latin America which they danced in front of the others, and it was the third which was "beat for beat" - to sing in front of the others and choose two three songs and make a small sketch like [a game show]. And some chose the one, someone chose the other, and then they have influence, right? They can choose. (Mr. Corcoran)

Mr. Corcoran expresses a common desire with language teachers to provide students with power to define their own processes, not only in choice of general topic, but also content specialisation. Students also request more active involvement, and specify conditions which help them get involved. They need to be asked about their preferences as directly and clearly as possible, be allowed to respond anonymously, and be heard. Ludvigsen et al's (2015) conclusions on feedback dialogues as conducive to involvement are relevant here, as the evaluation and consequence of the students' active involvement is considered important by teachers and students. The students Anna, Alma, and Ronja exemplify the need for active involvement:

Anna: We could possibly have been given more opportunities to influence [the lessons]. It would have been easier for people to say what they needed if they had the opportunity, in a way.

Alma: That the teacher tells [us] about the possibilities and...

[...]

Alma: Those kinds of surveys and so on, yes.

Ronja: Just hands out a sheet and 'write what you want more and less of'. Or on its learning [an LMS] or something.

Alma: Yes, because it is also anonymous as well.

[...]

Anna: And who you are, what you need help with, what you want to work with - there is so much that play a role. It is because of this that it is important for the teachers to check. It should maybe be adapted more to each person, I think.

4.3. Integration of passive and active involvement

Observation and interview data from Ms. Travers's English lesson with her first-year GS students show the benefit of integrating passive and active involvement in a lesson. She started a lesson halfway through a project by specifically requesting metacognitive comments with a list of questions about the work process and its challenges. Hoping to encourage students' passive involvement, Ms. Travers explained, "[we] only got to do the first question [How is the work going?], because the students wrote everything in that vote, and we needed to do a lot of follow up from that." Anonymous student replies included

It's going good, but we haven't had much time working on it because we have had so many other things to work on

It's going very good. But the frames for the presentation is a little unclear.

Not Good, We need longer time

it is not going so well, its hard to get started and know how much you are going to write about each topic

Ms. Travers continued; "I had to spend some time clarifying formats and structure. [... I also] looked at how to use the time we had efficiently [...] I asked if they had a clear plan for their further work, and they responded 50-50, [yes and no]. When I went around in the classroom afterwards, the students said 'It was I who said that... but now I think it's clear'." Here, Ms. Travers was interested in how the students were coping with their projects, for which they had been given definition power over content and work method. A planned application of meta-questions showed that approximately half the students evaluated their process as successful. The remaining students had methodological concerns and were eager to discuss their requests

and suggestions, and to hear Ms. Travers' responses. Student involvement was requested on the meta level, and the outcome as received through RT was immediately used to help students make their own content and work method choices. Ms. Travers applied RT to first promote passive involvement with a validation orientation. She wanted to give students the opportunity to provide material which she could validate and respond to. This allowed her to assist students' efforts to exercise active involvement. Through Ms. Travers' feedback, they were equipped to respond to challenges in their own chosen content and work method and decide how to proceed. Graham et al.'s (2007) notion of "empowerment" through RT is here exemplified and framed as passive and active involvement. The teacher can use the former to give students the tools to exercise the latter.

In language education, there is therefore an observable interaction between involvement in deciding content and work methods, and involvement through meta-comments on these, where the latter can moderate and inform the former. The results suggest that the collaborative involvement of students and teachers through RT-mediated exchange of meta-questions and meta-comments can positively influence students' involvement in deciding content and work methods. The relevance of passive, validation-oriented involvement for active, production-oriented involvement is further supported by quantitative data. Some of the highest significant correlations in the students' and teachers' surveys are between items regarding involvement in deciding content and work methods, and giving meta-comments (Q19-21; $\rho_s = [.550, .826]$, $\rho_t = [.505, .904]$). In this sense, these findings concentrate and amplify Ludvigsen et al.'s (2015) suggestions of the dialogical aspects of feedback as conducive to involvement.

4.4. Roles and workloads

Laxman (2011) and Dong et al.'s (2017) caveat that involvement is contingent on teacher direction and reaction is echoed by teachers and students. Students consider the initiative for involvement to lie with the teacher, as Anna and Alma's comments above illustrate. They consider it the teacher's responsibility to invite and provide initial suggestions in these decision-making processes. Furthermore, students expect the teacher to be a controlling authority, and provide a stamp of approval on their contributions, guided by theory. There seems to be a consensus between teachers and students about this aspect of the teacher role, expressed by amongst others Ronja and echoed by teachers: "It's good [that the teacher shows] us what's right and what's wrong. Like trying to add a reason why ... I mean 'he wrote like that because he maybe thought like this, but it is maybe like that'. Put it a little bit in

perspective rather than ‘this was all wrong’ in a way.”

In active involvement, student-centring requires students to actively contribute in decision making. Both students and teachers expect processes in the language classroom to involve collaborative effort. In these processes, the teacher and the student provide different competencies, but at the same decision level. In terms of involvement, this means that teachers want students to define content and work methods, justify their choices, and exercise their influence through communication with one another and the teacher. In fact, teachers largely equate involved students with procedurally active students who define their process and product, and execute and evaluate them, developing critical thinking skills and a meta-language about language and learning. This process requires students to actively involve themselves and influence it, and to be given the means to do so by a Socratic teacher enabling students to communicate their suggestions and evaluations: “that is why I like iLike [an RT], because I can see where the students are, and the students can see where they are themselves” (Ms. Gregson). Meanwhile, students want the teacher to provide confirmation or correction between their activity and language theory or the curriculum. This argues that Blasco-Arcas et al.’s (2013) findings that student interactivity with the teacher is central to engagement through collaborative learning, are also relevant to involvement in our context. The dynamics of involvement and interaction of roles, evident amongst others in Ms. Travers’s project initiation above, further illustrates the relevance of RT in facilitating involvement by making such interaction possible.

Echoing the notions of commitment and accountability in the literature (Bruff, 2009; Bachman & Bachman, 2011), teachers and students are aware of the added work that comes with added involvement, which could indicate why many students seem to prefer passive involvement. Ms. Gregson explains she wants to transfer some of the workload, including decision power, onto students. The language teacher Ms. Bassett notes that “in my experience, students can become less interested in involvement as they grow older. They trade involvement for expediency. They want to be told what to think and how to work, in order to get a good grade”. Though RT might facilitate involvement, active involvement might not be desirable for students who associate assessment with traditional teacher-centred learning. Quantitative data does not show that disillusion with involvement increases with age: there is no significant correlation between age and involvement. In fact, taking on the added workload of active involvement or not seems more dependent on gender than on other biographical

factors such as age and study program (see quantitative results above). However, the conflict between Ms. Bassett's perception of student attitudes towards involvement and those expressed by students in the survey might be one of attitudes in practice and in general. Students may want to influence decisions taken in the classroom in general, but if they consider letting the teacher make decisions more expedient in practice, they will do so, e.g., if they prefer not to participate or require the teacher's competence. This supports Graham et al.'s (2007) conclusions for higher education: that students welcome the option to get involved, though they may choose not to. Runa's comments highlight a preference for passive influence over active, and indicate what motivates students' will to influence the lesson:

Runa: She [the teacher] knows a bit more what we need to practice, so then she can make it... adapt it.

Interviewer: So it is better if she gives you a task and sees you struggling with something, and then makes tasks to work on that?

Runa and Chris: Yes.

5. Concluding remarks

This case study attempted to answer the research question: *How do upper-secondary education language students and teachers perceive student-centring through involvement in the application of response technology?* In doing so, it attempted to contribute theoretically to the research field on RT didactics by crystallising the involvement dimension and situating it in educational practice. In light of limited previous research, this study further represents an empirical addition of context to the literature. Teachers and students in this study identified active and passive involvement as central to student-centring of language teaching in secondary education with RT. They showed a positive attitude towards active involvement, where work methods and content could be defined in a collaborative space mediated by RT. However, whether as a result of tradition or from a desire to avoid the responsibility inherent in making decisions, students seemed to think of involvement more as passively being taken into consideration. Recognising the teacher's competence on the subject area and familiarity with the curriculum, students preferred to collaborate by having the teacher suggest appropriate measures in response to their contributions and negotiate a plan for further progress. This suggests that a sequential combination of RT-mediated measures for passive and active involvement might help student-centring in language teaching. RT's relevance for involvement in this context, therefore, appears to be its potential to ease communication and facilitate interaction based on students' participation.

The determinants suggested here for active (expediency and competence considerations) and passive (teacher reactions to contributions) involvement—while reinforcing Ludvigsen et al. (2015) and Graham et al.'s (2007) conclusions—are somewhat limited in scope. Further research is needed into what influences and results from involvement as understood here, and while Einum (2019) found RT involvement transformative for educational practices, this role needs to be studied further. Also, Astin (1999) and Fredricks et al. (2004) indicated a communality and interaction between involvement, participation, motivation, and learning, and this provides a theoretical framework in which research can expand the knowledge on RT-mediated involvement. Furthermore—considering limitations from the study's small-context approach to language education at a Norwegian upper-secondary school—the results should be tempered and refined through diversified context, contrast, and replication. The democratising affordances of RT need to be studied in more depth to provide best practices which can be applied to promote involvement in language teaching in primary and secondary education and beyond.

6. References

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Article II

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Article III

Written participation with response technology – How teachers ask and students respond with applied text response functionality

Abstract

Response technology (RT), systems where students respond with personal devices or clickers and teachers follow up on the tallied responses, has been widely adopted and researched in education. However, limited academic attention has been directed at the nascent text response functionality, which lets students compose their own responses rather than select from the teacher's multiple-choice alternatives. This case study uses observations, teacher and student interviews, and extracted responses from upper-secondary language education to map the extent of and motivations behind teachers' application of and students' participation with RT text response. Teachers, wanting to engage and involve students in the learning process, asked formal, content, and personal/procedural questions, which students would largely (83%) make a genuine attempt to answer. Students, motivated by a wish to be involved and a desire for social and professional recognition, participated on par with multiple-choice participation rates reported in the literature (76.4% vs. 74.1%). They also provided meta comments on the learning process, responses resisting the intention of the question, and empty responses deleted prior to submission. This study therefore suggests that RT text response facilitates a considerable expansion of student-centred classroom communication, and should be further researched.

Keywords: Response technology; text response functionality; digital didactics; digital classroom writing; written participation

1. Introduction

Since the turn of the millennium, response technology (RT) has risen to prominence both in classrooms and in education research, where has been found to benefit student participation (Stovell & Nelson, 2007; Barr, 2017), learning (Mayer et al., 2009; Egelandstad & Krumsvik, 2017), and engagement (Heaslip, Donovan, & Cullen, 2014; Dong, Hwang, Shadiev, & Chen, 2017). RT has experienced an evolution from custom-made hardware called "clickers" to software used with computers and smartphones, and from rudimentary multiple-choice functionality to a variety of response modalities (Kay & Lesage, 2009; Hunsu, Adesope, & Bayly, 2016). In particular, the inclusion of text response functionality, where students can compose text snippets themselves rather than choose among multiple-choice alternatives

created by the teacher, represents a radical expansion of the didactic affordances of RT¹. However, as the development and inclusion of this functionality is relatively recent, academic analysis and development of analytic structures for understanding, evaluating, and developing its implementation in the classroom is absent at the time of writing, constituting a knowledge gap. Tangential research fields such as online writing, RT multiple-choice functionality, and RT-facilitated participation have been subject to academic attention (e.g., Ware, Kern, & Warschauer, 2016; Beatty, Gerace, & Dufresne, 2006; Habel & Stubbs, 2014). However, this has yet to extend to the questions asked and the responses given through RT text response functionality, as well as to the extent and nature of student participation in the creation and processing of such written responses.

The present article attempts to remedy this situation by mapping the extent of and motivations behind teachers' application of and students' participation with RT text response in upper-secondary language teaching. Through a two-phase qualitative case study design, language teachers and students of the native language (Norwegian), English as a second language (ESL), and foreign languages (FL: French, German, and Spanish) participated for one-and-a-half school years (Aug. 2016–Dec. 2017) at a Norwegian upper-secondary school. The analysis of initial-phase observations, RT responses, and interviews from the first school year provided a rudimentary understanding of applied RT text response, which was tested in a subsequent calibration phase. In all, observations of 12 teachers and their classes, 64 interviews, and 200 RT votes and 2902 responses from 192 students provided the results discussed in this article.

The aim of mapping application of and participation with RT text response is achieved by first reviewing tangential literature, to illustrate and position the knowledge gap regarding RT text response. Then, methodological transparency informs the presentation of research methods, to encourage further research, before the outcomes of those methods are presented and discussed. The majority of text response questions and responses were directed at subject matter, with teachers requesting formal or content responses and students largely attempting to provide genuine answers. The text response functionality was further found to provide a channel for procedural and personal questions and comments. Crucially, for participation, text response functionality constitutes an alternative and complementary classroom communication channel to the one of spoken interaction. The successful use of this channel

¹“Didactic”, in this article, is used in a Scandinavian understanding of the term as pertaining to the practical teaching-studying-learning process (Kansanen & Meri, 1999).

was found to depend on the wider variety of text response functionality affordances than those of multiple-choice functionality, and the teacher's agility in responding to the variety of response types these affordances allow. While the empirical lens of the study is upper-secondary language education, the generality of RT text response functionality suggests its findings are likely to be valid and applicable beyond this context. Therefore, the typologies and conclusions on participation presented here should provide a basis for further research within this still-nascent area of research on RT-mediated digital didactics.

2. Previous research

2.1. Response technology

Response technology (RT) refers to any type of hardware or software in which student responses to a teacher request are tallied and displayed for the teacher, typically as a graphic distribution or a response list. Originating in 1966, response systems had a renaissance at the turn of the century with handheld devices called “clickers” (Abrahamson, 2006; Judson & Sawada, 2002). Appearing under a variety of names, like “audience response system”, “personal response system”, “electronic voting system”, and “student response system”, RT nomenclature has generally referred back to the hardware: clickers (Caldwell, 2007; Kay & Lesage, 2009). However, with the proliferation of smartphones and improvement of the technological infrastructure in schools, most RTs are no longer dependent on specifically designed hardware such as clickers (Hunsu et al., 2016; Eyre, 2017). Most RT providers use web-based communication, operating with software exclusively (like iLike, Kahoot, Acadly, and Poll Everywhere²), or with software and the option to buy compatible hardware (like TurningPoint³). Because of this, this paper avoids hardware connotations of “clickers” and instead examines and discusses “RT”.

The affordances of technology consist not only of the technological affordances, which refer to the immediate actions technology makes possible (Hutchby, 2001), but also of the forms of teaching made possible by performing these actions⁴. Hutchby's positivist technological affordances would include the possibility to choose one alternative or more in RT multiple-choice functionality and have the body of responses represented as a histogram (Stav, Nielsen,

² HiST iLike homepage. (n.d.). Retrieved October 16, 2018, from <http://www.histproject.no/node/725>; Kahoot homepage. (n.d.). Retrieved October 16, 2018, from <https://kahoot.com/>; Acadly homepage. (April 10, 2017). Retrieved October 16, 2018, from <https://blog.acadly.com/student-response-system-comparison-the-definitive-feature-list-d25f38be5727>;

Polleverywhere homepage. (n.d.). Retrieved October 16, 2018, from <https://www.polleverywhere.com>

³ TurningPoint homepage. (n.d.). Retrieved October 16, 2018, from <https://www.turningtechnologies.com>

⁴ See Mishra and Koehler's (2006) TPACK framework for technology implementation in teaching, and Kalantzis and Cope's (2017) “seven affordances” of e-learning.

Hansen-Nygård, & Thorseth, 2010). The more constructivist didactic affordances against which Hutchby reacted would include the investment made in the learning process by the responding student (Beatty et al., 2006), the diagnostic properties of the histogram (Egelandsdal & Krumsvik, 2015; Caldwell, 2007), the potential for exploring the subject targeted by the question by reading and discussing the response distribution in class (Blasco-Arcas, Buil, Hernández-Ortega, & Sese, 2013; Ludvigsen, Krumsvik, & Furnes, 2015), and the basis this provides for further exercises (Einum, 2019). The didactic affordances of RT, therefore, to a larger extent than technological affordances take the professional and social context of applied RT into account.

2.1.1. Text response

RT text response functionality and its technical affordances stem from a variety of predecessors. A number of case studies report on the application of short messaging service (SMS)- based systems (Scornavacca & Marshall, 2007; Jain & Farley, 2012; Nesbit, O’Steen, Bell, & Martin, 2016), and various online messaging services such as Twitter, IMMAP, and LINE (Liu et al., 2017; Gan & Balakrishnan, 2016; Chen & Chen, 2017). Other systems, such as the IML system and AICHe Concept Warehouse, have tended to suffer from the need for custom-made, complex hardware or fall under the category of online database or learning management system (LMS) (Wood, 2006; Koretsky, Falconer, Brooks, Gilbuena, Silverstein, Smith, & Miletic, 2014). At present, text functionality has been incorporated in approximately half of the currently available RT systems (Socialcompare.com; Polleverywhere.com; Acadly.com), likely due to the emergence and proliferation of privately owned smartphones and the economic sustainability of application development and adoption of these in the 2010s (Nesbit, 2017; Eyre, 2017). The extent of functionality varies considerably among providers in terms of maximum participants (100–unlimited, subject to plan), maximum characters per response possible (16–unlimited), and outcome display structure (word cloud, frequency list, message board).

Despite this, RT text response—and in particular its didactic affordances and the nature of the questions asked and the responses given—has not been the subject of much academic attention, with research and development having been traditionally directed towards multiple-choice functionality. This has also left what constitutes RT text response an unresolved issue, with various online, phone, and infrared writing solutions being considered likely candidates (Koretsky et al. 2014; Landrum, 2015). For the purposes of this article, a narrow definition of RT text response functionality is used: software designed explicitly to allow short segments of

text from handheld devices to be tallied, displayed, and subjected to external analysis. This excludes online collaborative writing software, LMS, and SMS social media and interpersonal communication apps.

The technical affordances of text response functionality in RT include text composition through an online or a software text editor, the submission or collection of responses, in general through the web, and the organisation of responses as word clouds, frequency lists, or discussion forum trees. Figure 1 illustrates a vote with text response in the RT iLike. The teacher initiates the vote and monitors students (1_T.) as they respond (1_S.). Then, after the teacher ends the vote, the teacher client displays the responses as a word cloud (2_{Ta}.) or frequency list (2_{Tb}.), which can be shared in class while the student client goes passive (2_S.).

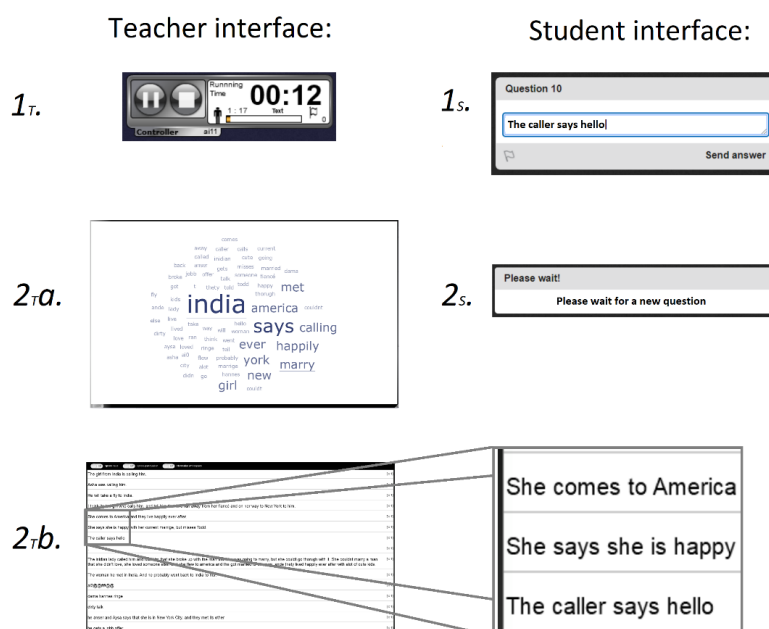


Figure1: A vote with RT text response functionality in the RT iLike.

2.1.2. Question and response types

When discussing the questions used and answers given with applied RT, the literature generally presents them in terms of their function or effect rather than their content. Because RT functionality generally has allowed only multiple-choice questions, the content of responses has been predefined by the teacher in the alternatives. Beatty et al. (2006) and Caldwell's (2007) taxonomies of question roles are symptomatic of the field in that these roles aim to make procedural and content knowledge explicit. Questions should target the

higher levels of Bloom's taxonomy and either retrospectively test students' understanding or provide the basis for further work (see also Hake, 1998; Kay & Lesage, 2009; Fitzpatrick, Finn, & Campisi, 2011). However, recent studies have questioned whether such goals are achievable within the current, multiple-choice-centred thinking, and suggest more open-ended forms of response to effectively communicate and develop student cognition (Hunsu et al., 2016; Liu, Chen, Chien, Liu, & Chou, 2017; Koretsky, Brooks, & Higgins, 2016).

The literature on applied RT therefore evidences a focus on what in this paper will be called formal questions, requesting application of formulae or procedural knowledge to relevant contexts, and content questions, targeting fact or content recall, conceptual understanding, or critical thinking. Bruff (2009) is less representative when he also includes personal/procedural questions, targeting the students' personal background, perspective, or opinions, or seeking their assessments or preferences for work processes. He suggests that, "As classroom response system technology becomes more sophisticated, [...] it is likely that more instructors will make use of free-response questions" for formal and content purposes and that teachers will find text response ("free-response") functionality relevant for personal/procedural questions. He suggests that, "As classroom response system technology becomes more sophisticated" (p. 98), teachers will find the text functionality this makes possible relevant for formal and content questions, but particularly for personal/procedural questions.

Furthermore, there is no discernible classification in the literature of the nature of students' responses to these questions, likely because their variety has been determined by their distribution across teacher-defined multiple-choice options. Analysis of RT responses is typically limited to analysis of response distributions with suggestions for appropriate teacher responses. For instance, an equal division between right and wrong answers suggests follow-up group or class-level discussion (Bjørkli & Arnesen, 2014; Bjørkli, 2015), and a skew towards wrong answers suggests peer discussion, information gathering, and revote (Nielsen, Hansen-Nygård, & Stav, 2012; Jääskeläinen & Lagerkvist, 2017). This requires a right/wrong dichotomy, which is well suited to formal and content questions, as well as to the multiple-choice format. However, personal/procedural questions are unlikely to provide such easy-to-read distributions. Studies comparing multiple-choice responses with text responses emphasise that the latter provides varied content that only partially overlaps with the expected content of comparable multiple-choice responses (Wilcox & Pollock, 2014; Hubbard, Potts, & Couch, 2017). It is worth noting that these studies have been able to compare only RT multiple-choice responses with text responses submitted in learning management and

assessment systems, and that no studies of the nature of RT text responses exist to date. Nevertheless, they argue that the RT text responses will differ from RT multiple-choice responses in their variety, and will therefore relate to formal, content, and personal/procedural questions differently than multiple-choice responses.

2.1.3. Participation with RT

Participation is here seen as distinct from “engagement”, a somewhat indefinite term used in various contexts to describe participation, involvement, and motivation (Astin, 1999; Fredrick, Blumenfeld, & Paris, 2004). While recognising the role of the emotive factors (motivation) and the democratic and social factors (involvement) in providing “engagement”, this article focuses on participation in line with Stowell and Nelson (2007), and Lodge’s (2005) definition as an observable effort towards the tasks and goals of the education. The observations of classroom activities, count of RT responses to teacher questions, and teacher and student interviews, as well as their analyses, is based on such a definition of participation.

In the literature, RT is generally considered to be conducive to participation, with technical arguments such as ease of use, anonymity, and private accountability being provided as relevant affordances (e.g., by Fies & Marshall, 2006; Caldwell, 2007; Hunsu et al., 2016). Students report that they find RT easy to use, which makes them participate, consider participating both with RT input and with evaluation of the resulting list of answers as conducive to learning, and see their participation with applied RT as a contrast to their passive role in traditional lectures (Heaslip et al., 2014; Bachman & Bachman, 2011; Habel & Stubbs, 2014). However, while students highlight the enabling aspect of RT for participation, those who do not like teaching that requires student participation see this enabling aspect as a threat, and have a negative attitude towards applied RT (Graham, Tripp, Seawright, & Joeckel, 2007). In fact, some studies report no gain in participation with applied RT (Carnaghan & Webb, 2007; Morling, McAuliffe, Cohen, & DiLorenzo, 2008; Stover, Heilmann, & Hubbard, 2018), and there is an emerging consensus that the perceived effects on participation are likely more a result of the way in which RT is applied rather than of RT itself (Anthis, 2011; Nielsen, Hansen-Nygård, & Stav, 2012; Ludvigsen & Krumsvik, 2012; Stewart & Stewart, 2013; Landrum, 2015). Finally, a review of 21 peer-reviewed articles published between 2000 and 2018 discussing RT and participation reveals that self-reported participation and participation observed in the classroom (and in particular post-vote discussions) figure prominently (n=11, n=7, both: n=3). However, quantitative measures of participation, e.g., average responses given per vote, are rare. Only two of the 21 articles

report on participation rates, of 85% and 97.7% respectively (Cutts, Kennedy, Mitchell, & Draper, 2004; Barr, 2017). At the time of writing, no literature on participation through RT text response is available. Because the software supports compilation, extraction, and quantification of text responses, this study is therefore able to provide a novel contribution to the research on RT participation by investigating both qualitative and quantitative expressions of participation with RT text response.

2.2. Online writing

The intersection of writing and technology has been framed in a variety of manners. Selber's (2004) system of composition studies and digital literacies with three categories provides a useful backdrop for understanding RT text functionality. In this system, user activity is understood in terms of functional literacy (being able to use the embedded functions of technology), critical literacy (being able to evaluate the appropriateness of using technology), and rhetorical literacy (applying technology to achieve communicative ends). Of these, the latter is considered the most nascent, and later research keeps grappling with this side of online writing as it is manifested in online platforms such as wikis, Google Docs, online discussion forums, etc. Traditional boundaries associated with writing seem to blur with the emergence of Web 3.0 interactive technologies⁵, and whether writing is private or public, for educational or social purposes, individual or collaborative, and in everyday oral, online, or formal vernacular changes depending on context, technology, didactic design, and even location (Leander 2008; Thorne, 2010; Ware et al., 2016). There is therefore a need to study new forms of composition, and adapt teaching methods and curricula to these (Yancey, 2009), and teachers and students engaging in online writing need to acquire and develop Selber's literacies, and, in particular, the rhetorical literacy to navigate novel forms of communication provided by technology such as RT.

The pursuit of rhetorical literacy is aided by the intersubjectivity that online writing can support. For instance, in a Norwegian study, Lund (2008) found that a "dynamically evolving wiki rests on the relations between participants as enacted in a collective ZPD [zone of proximal development]. Response, trust, and interdependency are the driving forces" (p. 50). Another Norwegian project found that online writing in secondary education opened new dialogic spaces for student interaction in which students could communicate and produce

⁵ In Web 1.0, the user can receive, but not edit online information. In Web 2.0, the user can interact with online information and other users, while in Web 3.0, the user is monitored by online pages so that an ubiquitous internet provides information tailored to the user (Cronje, 2018).

(Skaftun, Iglund, Husebø, Nome, & Nygard, 2017). Writing for and with teachers and peers has been suggested to make students more aware of their audience in their writing, both as collaborators in the writing process and as recipients of the final product (Warschauer, 2002; Ware, 2004). Similarly, readers' exposure to other students' writing has been found to familiarise them with the variety and complexity of composition and language (Lai & Zhao; 2006; Hyland & Hyland, 2006; Einum, 2019). The communication necessary for such productive intersubjectivity is supported by technology, which allow for asynchronous and synchronous feedback on form and content (Lund, 2008; Guth & Thomas, 2010; Ware & Warschauer, 2012; Zheng, Warschauer, & Lin, 2014). Furthermore, technology like RT represent a departure from the traditional text, not only because they allow several entrances to a text in production through the plethora of student responses (Kress, 2005), but also because purposeful application of such technology can potentially increase the involvement of students in text production (Anthis, 2011; Moore et al., 2016; Einum, 2019; in press; Green, 2019).

3. Method

The aims of the study—to map the extent of and motivations behind teachers' application of and students' participation with RT text response in upper-secondary language teaching—were pursued through a two-phase qualitative case study research design (Merriam 2009; Plano Clark & Creswell, 2015). An initial phase (Aug. 2016–June 2017) provided observation, interview, and RT response data regarding teachers' and students' use of RT in general, and RT text response in particular. The constant comparative analysis of data gathered and coded during this phase provided emerging categories, including patterns of participating in asking and responding with RT. In the following calibration phase (Aug. 2017–Dec. 2017), these emerging categories were compared to new, coded observation and interview data, and modified if necessary in a process known as analytic abduction, (Schurz, 2008; Fram, 2013). This process involves repeatedly returning to a previous level of analysis, such as codes for categories or data for codes, to evaluate findings and remove assumptions, using abductive logic to produce findings which accurately represent the object of study. Calibration-phase data was gathered through observations, interviews, and extraction of RT responses, and constant comparative analysis of this data entered into an abductive negotiation with the initial-phase categories to formulate theory.

3.1. Sampling and ethics

The study used a sample of 12 teacher participants and their language classes for the initial phase, and three teachers with their language classes for the calibration phase. The language classes ranged in size from 10 to 29 students ($M \approx 20$), and the students were between 16 and 19 years old. A total of 192 students produced RT multiple-choice and text responses for analysis. Teachers and students were sampled through purposeful and snowball sampling, and through maximum variation sampling (Plano Clark & Creswell, 2015). Teachers for initial observations and interviews were selected based on their access to and role in information-rich environments, willingness to participate, and skill in analysis and reflection (Patton, 2002; Bernard, 2002). Because informant interest was paramount for the data-gathering process, the plan for the study was presented to the complete body of teachers in an upper-secondary school with an invitation to join, to which interested teachers responded and were subjected to pilot observations and field interviews to determine their relevance. Initial phase teacher informants taught native language, ESL and FL, and they and their students all had prior experience with RT due to its availability and the comparative ubiquity of technical and digital resources in Norwegian schools (OECD, 2015; Hatlevik, Egeberg, Guðmundsdóttir, Loftsgarden, & Loi, 2013). Likewise, the three calibration-phase teacher-informants were chosen based on initial-phase performance, covering between them native, ESL and foreign languages, as well as both general and vocational study classes. Students were chosen through maximum variation sampling from the informant teachers' classes, including classes of general and vocational studies, and native-, second-, and third-language studies.

Participation in the study was voluntary. Participants were informed verbally and in writing prior to data collection, and their names replaced with pseudonyms in analysis. The data collection, storage, and analysis in the study were approved by the Norwegian Social Science Data Service (NSD) and complied with its ethical standards.

3.2. Data collection and analysis

Observations were performed with the researcher taking the role of "observer as participant" (Merriam, 2009; Creswell, 2014). This role was augmented as the novelty of the researcher's presence waned with time. Observation data like classroom occurrences, informant actions and reactions, and responses were recorded through descriptive and reflective field notes, and accompanied by analytic memo writing (Plano Clark & Creswell, 2015; Saldaña, 2009). In addition, the number of attending students was recorded, which was later compared with the number of RT responses to provide a quantitative expression of participation. Field notes

were then subjected to constant comparative analysis, in which they were coded with QSR NVivo 11 using the first cycle (initial) coding strategies attribute, descriptive (holistic and process), and simultaneous coding (Merriam, 2009; Fram, 2013; Saldaña, 2009). Figure 2 shows an the coding of an observation from Mr. Gregson’s Spanish class in QSR NVivo 11, providing the attribute codes “Observation” and “Spanish”. The codes on the right are represented by coloured and named bars, aligning with the data on the left, while the added notation below signify the coding strategy used to provide that code. Students attempted to translate “Now I am reading a book” into Spanish, providing a range of different answers. This observation was given two descriptive codes to describe its contents; the process code “Trying despite uncertainty” uses a gerund to denote action, while the holistic code “Non-target language” tries to describe the whole segment of the observation as showing the use of non-target language in translation using RT. Since two or more codes are applied to the same data, all codes exemplify a simultaneous coding strategy.

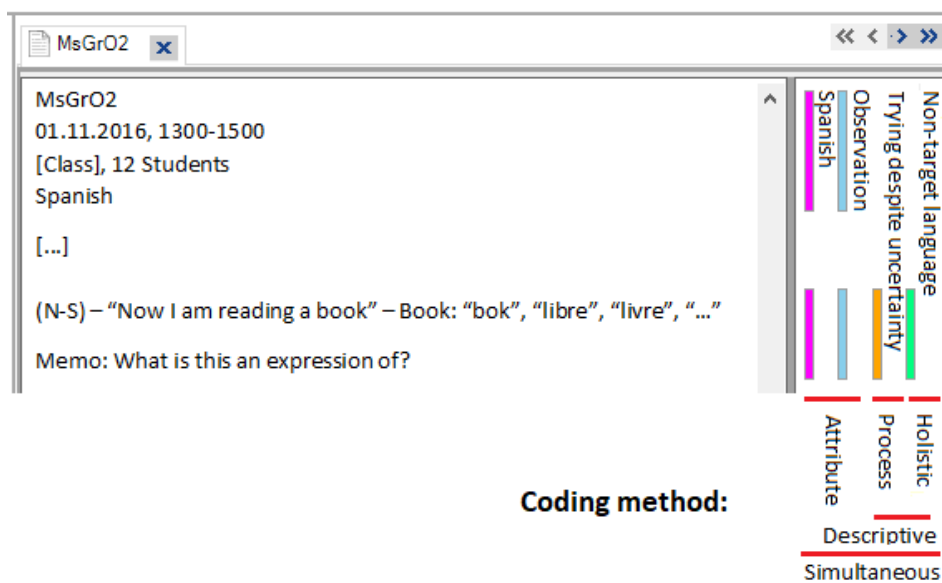


Figure 2: QSR NVivo 11 screenshot showing observation field notes and codes for the second observation in the language teacher Ms. Gregson’s classes (adapted for readability).

Responses submitted anonymously through the RT software were extracted through the informant teachers’ user accounts at the end of each data-gathering phase, rather than after each session, for the sake of efficiency. Both text responses and multiple-choice responses were extracted in order to determine their relation in use. Microsoft Excel was used to subject the responses and corresponding questions to content analysis (Holsti, 1969), in which they were coded with first cycle attribute and descriptive (holistic) simultaneous coding (Saldaña,

2009). Figure 3 shows how responses and the questions that precipitated them were registered and coded into a number of codes, as well as examples of analytic memos and notification of coding method applied. For instance, response 14.10.2 from the MsGrO2 observation (session 14) was attributively coded as a 19-character-long response to a divergent question, and was holistically coded as a genuine response containing Norwegian as non-target language. In addition to this, responses underwent rudimentary frequency counts in descriptive statistics in IBM SPSS 24, to provide insights about participation and the distribution of the characteristics identified in first cycle coding.

Session ID	Data ID	Teacher	Weekday	Date	Subject	Class	Students present
14	MsGrO2	Ms.Gregson	Tue.	01.11.2016	Spanish	[Class]	12

ID	Response							Question					Memo					
	ResponseID	VoteID	Content	Multiple choice	Numerical	# of characters	Genuine	Empty	Resistance	Meta	Non-target language	Content	Q: Divergent/convergent (1/2)	Formal	Content	Procedural	Personal/Noteworthy	Comments
14	10	2	Esta leyendo un bok	0	0	19	1	0	0	0	1	Translate "Now I am reading a book" into Norwegian	1	1	0	0	1	Norwegian
14	10	3	esta leyendo un livre	0	0	20	1	0	0	0	1	Translate "Now I am reading a book" into French	1	1	0	0	1	French
14	10	4	esta leyendo una libra	0	0	22	1	0	0	0	0	Translate "Now I am reading a book" into Spanish	1	1	0	0	1	un libro (m)

Simultaneous

Coding method

Figure 3: Microsoft Excel screenshot showing response and question coding of responses 14.20.2, 3 and 4 from the observation in Figure 2 (adapted for readability). Note that "Session ID" (14) corresponds to the general "Data ID" (MsGrO2), so the above context excerpt therefore also was subjected to attribute coding.

Initial- and calibration-phase interviews were conducted as either open-ended field interviews (n=34+20) or semi-structured interviews (n=5+5) (Silverman, 2014). The former were short dialogues with teacher informants, held in close proximity to observations as a form of member checking and additional situated data gathering (Creswell, 2014). The latter, predominantly focus groups, but also individual interviews of up to 2 hours, aimed to discuss procedures, outcomes (including responses), and attitudes related to RT text response. Both forms of interview followed Kvale and Brinkmann's (2015) seven stages of interviewing⁶.

⁶ 1. *Thematising*: Informant experiences of applied RT and RT text functionality.
 2. *Designing*: Individual, open-ended field interviews and individual/focus group semi-structured interviews with a reflexive, agile interviewer role.
 3. *Interviewing*: In accordance with interview guide, but following up on informant input, recorded.
 4. *Transcribing*: In source language, Norwegian, without dialect. Verbatim, with limited discourse analysis notation (Silverman, 2014; Poland, 2002)
 5. *Analysing*: See Figure 4.
 6. *Verifying*: Member checks, qualitative triangulation against observation and response data (Creswell, 2015).
 7. *Reporting*: In this article, in international conferences and local and regional seminars.

The interview guide provided the researcher with enough freedom to adaptively pursue issues perceived as central to the teacher and student informants. Interviews were recorded and/or transcribed, and coded in QSR NVivo 11 using first cycle coding methods like attribute and descriptive (holistic, in vivo, and process) simultaneous coding (Fig. 4) (Saldaña, 2009).

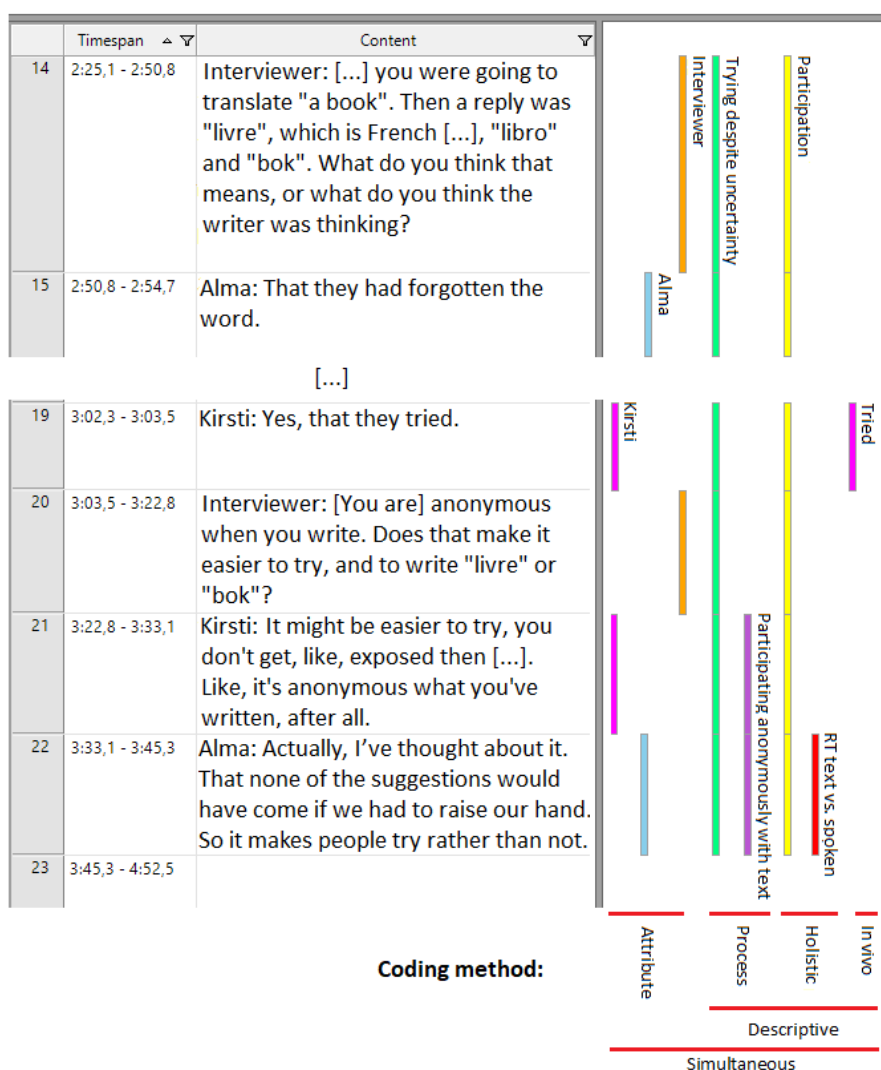


Figure 4: QSR NVivo 11 screenshot showing interview transcription and codes for the first focus group interview (07.03.2017) of Ms. Gregson's students (adapted for readability). The students Alma and Kirsti are interpreting the observation and response data presented in Figures 2 and 3.

Codes from the initial phase were collated to form categories through second cycle coding, which were tested by analytic abduction in the calibration phase (Schurz, 2008; Saldaña, 2009; Fram, 2013). This process is illustrated in Figure 5, in which the first cycle codes from

Figures 2-4 reappear as vertical staves and columns, while categories from second cycle coding appear as the blue nodes frequently used in QSR NVivo 11. Through focused coding, initial-phase first cycle codes were organised and reorganised into categories based on thematic or conceptual similarity, in accordance with constant comparative methodology (Merriam, 2009; Fram, 2013). When the categories could be considered empirically saturated enough, they provided a tentative theory. In the calibration phase, observation, response, and interview data were coded with the same first cycle coding as initial-phase data. The focus coding of calibration-phase first cycle codes, however, included initial-phase categories, effectively negotiating new data and existing categories through analytic abduction. This led to theoretical saturation of the categories and theory formulation (Merriam, 2009).

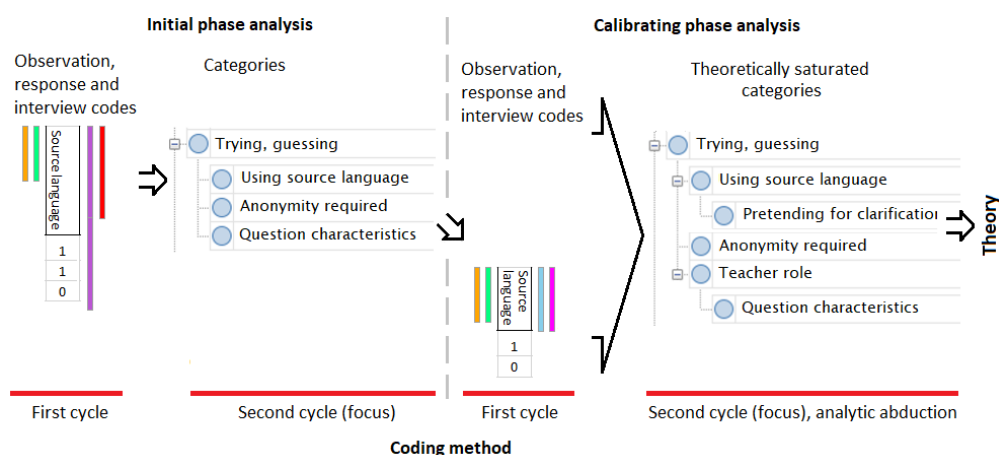


Figure 5: Analytic progress in the study from analysed data (see Figures 2–4) to theory. Categories and revised categories screenshot from QSR NVivo 11 (adapted for readability).

4. Results

Teacher informants' choice of functionality was relatively uniform across the data-gathering period. They were allowed to choose whichever RT functionality they found appropriate for the class and subject, and they predominantly chose text functionality over multiple-choice functionality, largely ignoring other options like sorting and structuring functionality. In a totality of 200 votes—i.e., a teacher request followed by student responses, spread across 38 lessons—teachers chose to use the text functionality in 88.5% (n=177) and multiple-choice functionality in 11.5% (n=23) of the votes. The skew in favour of text functionality include the 3.5% (n=7) of votes where numerical answers were requested, typically translations of numbers provided in third languages. This distribution is reflected in the response data

(n=2902), which consists of 86.2% text responses (n=2501, of which 70 are numerical) and 23.8% (n=401) multiple-choice responses.

Of the 38 lessons observed, 27 used the text response functionality exclusively, only one used multiple-choice functionality exclusively, and the remaining 10 lessons used both. In the latter, hybrid lessons, text response functionality was applied in 2/3 of the votes. Figure 6 shows the distribution of lessons among votes: e.g., three lessons—one using only text functionality, one using only multiple-choice functionality, and one using both—had six votes with RT. As is further illustrated by Figure 6, no discernible pattern regarding the number of votes used in each type of lesson can be found—hybrid lessons were, for instance, not typically the ones with many or few votes—though the majority of lessons used <9 votes, with a median of 5 votes per lesson. With the extent of RT application thus established by descriptive statistics, further qualitative research into the characteristics of applied RT text response appeared scientifically justified.

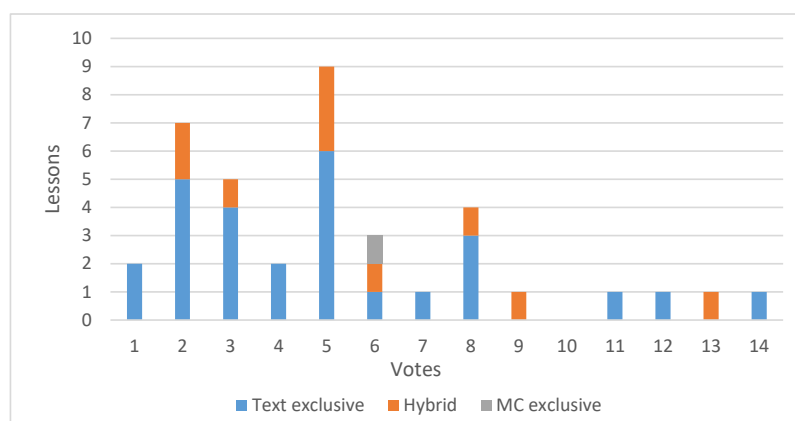


Figure 6: Distribution of lessons among votes.

4.1. Motivations guiding text response application

Students, who also had experiences from use of competitive, timed multiple-choice functionality in the RT Kahoot⁷, had a tendency to object to the rigidity of multiple-choice alternatives. In interviews, they highlighted professional and personal relevance, flexibility, and potential to perform and display more complex cognition, and therefore achieve higher grades, as the strengths of text functionality as opposed to multiple choice:

⁷ Kahoot homepage. (n.d.). Retrieved October 16, 2018, from <https://kahoot.com/>

Anton: I like it better when we can write, myself, because if the alternatives the teacher has chosen isn't what I think about the question, then it's better to write myself.

Adrian and Isabella, two other language students participating in a calibration-phase focus group interview, argued that text give funnier answers and a more varied lesson, something multiple-choice does not cater for, in their opinion. Adrian further pointed out that responding through multiple-choice is essentially repetition, while writing requires you to think and remember; his classmate Elin chimed in:

You can show more what you know and more in depth. That is what separates a [medium] grade from a [high] grade – to explain why, and you can't do that when you have four alternatives.

Teachers, who expressed a desire for active, participating students, pointed to the transfer of activity and production to the student as the most important affordance of the text response functionality. Furthermore, they echoed students like Anton by expressing a desire to “give the students a voice”, i.e., to provide them with an alternative means of communication to oral activity in class. According to language teachers Ms. Glossop and Ms. Travers, this would also allow the teacher to get access to the students' thinking through their text responses, and thus to a greater variety of responses than those afforded by multiple-choice functionality. Another language teacher, Ms. Gregson, summed up her stance like this:

Ms. Gregson: My goal is to make them succeed, and can they show me [that] in this platform? Yes, okay, then I choose that. I am just the support, and they are the ones who have to work.

Finally, observation data argue that, although secondary to text functionality, multiple-choice functionality was seen as a useful support tool for follow-up of text responses, e.g., for evaluating and organising. For instance, in Ms. Travers' English lesson late in the calibration phase, suggestions for protagonists in a short story were formulated as multiple-choice alternatives and then voted on based on likelihood. In another hybrid lesson, Ms. Glossop's Norwegian students submitted arguments for a cause as text responses, which were ranked by their appeal through a multiple-choice vote. Here, students were encouraged to evaluate their text responses through multiple choice, and in the ensuing discussion analyse conflicting evaluations.

4.2. Asking questions for text response

The analysis of observation data and text responses showed that teachers used RT text functionality to get responses to three categories of questions: formal questions, content questions, and personal/procedural questions (see example questions and responses in Table 1). Formal questions targeted language form: translations, conjugations, orthography, lexicology, and syntax, asking, e.g., for translations or different ways of expressing something. Content questions sought literary, contextual, rhetorical, or semiotic analysis by asking, e.g., for classification of an argument, for suggestions for setting in a short story, or why a part of the US is called “the rust belt”. Personal/procedural questions sought to elicit the students’ background or situation, or to plan or evaluate a procedure. These were often found to coincide with one another, when the former information was generally sought for the purpose of informing the latter, as in Ms. Travers’ “Which country would you like to write about?”

Question category	Example question (Data ID/ Session ID)	Example responses (Response ID)
Formal	How do you translate “I have a brother who is 18 years old.” into Spanish? (MsGrO9/2)	Me niño seis 18 (2.7.1) Mi hermano tiene diece ocho anos. (2.7.2) Tengo uno hermano y tengo 18 anos (2.7.8)
Content	What are the features of a short story? (MsTrO8/19)	I do not know iam tierd of training (19.1.5) The story starts in medias res (19.1.12) short few characters short period of time (19.1.25)
Personal/ procedural	How are you doing with the project? (MsTrO6/31)	It’s going very good. But the frames for the presentation is a little unclear (31.1.5) Not Good, We need longer time (31.1.6) good, but i need more time aaah Nikko (31.1.17)

Table 1: Example questions and responses from the three question categories.

Teachers explained that their choice of question category was dependent on which learning goals they were trying to achieve and their diagnosis of student needs. With RT text function, they preferred to ask formal or content questions, but a significant proportion of questions also fell into the personal/procedural category (see vote distribution in Fig. 7). In 14 of the votes, teachers aimed to bridge the students’ personal backgrounds with the content to be taught in the lesson, by asking questions fitting into both categories, like Ms. Gregson’s, “What are you curious to learn from this film about Queen Elizabeth?” Similarly, these dual-category questions could also visualise students’ pre-existing content knowledge of the class and provide a baseline for the further procedure, as was the case with the same teacher’s,

“What do you know about Ireland?”⁸ By comparison, multiple-choice questions included no dual-category questions and were relatively evenly distributed among the three question categories ($n_F=9$, $n_C=6$, $n_{P/P}=8$).

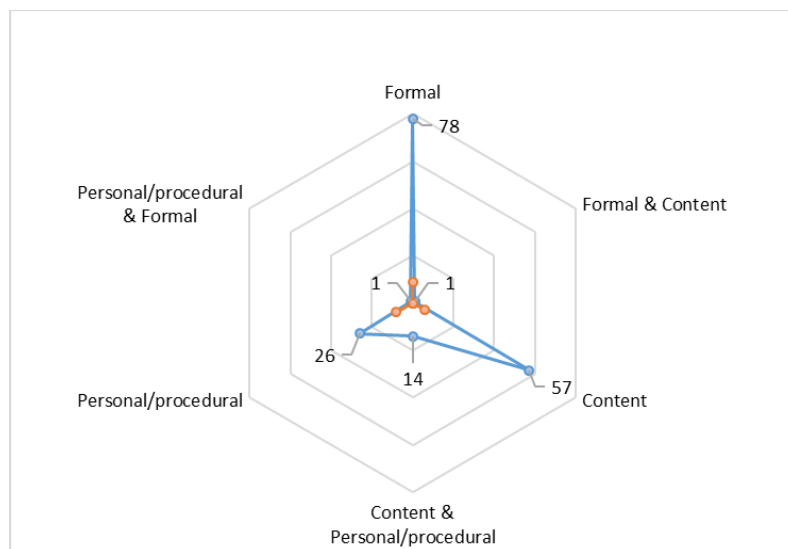


Figure 7: Distribution of questions requesting text responses (blue) and multiple-choice responses (red).

4.3. Responding with text response

Students’ text responses fit into four categories: genuine responses, empty responses, resistance responses, and meta comments (see response distribution in Fig. 8). Genuine responses were those exhibiting a discernible effort to answer the teacher’s request, and empty responses were those where the student had written something, then deleted it prior to the end of the vote. Resistance responses represented the students’ opposition to the procedure or situation in general, either entirely or partially, while meta comments were metacognitive comments on the student’s own learning process. Meta comments differed from resistance responses in their purpose and situatedness. Whereas a resistance response seeks to divert attention from the lack of a genuine response, like, “Wassup peaps”, in response to the request, “Write something you like in French”, a meta comment like, “I do not know im tierd of training”, in response to the question, “What are the features of a short story?” (Table 1), accepts the question but attempts to communicate to the teacher why a genuine answer could not be submitted. In addition, a secondary category including responses that included non-

⁸ The formal and content question was, “Where do these words come from?”, focusing on both vocabulary and context, and the formal and personal/procedural question was, “Where do you encounter English in your daily lives?”, focusing on language tone/vocabulary and personal language learning habits.

target language words emerged—secondary because it almost entirely coincided with other categories. An example of this is the genuine response, “Me gusta dans”, including the Norwegian word for “dance” in a Spanish translation of, “I like to dance”⁹.

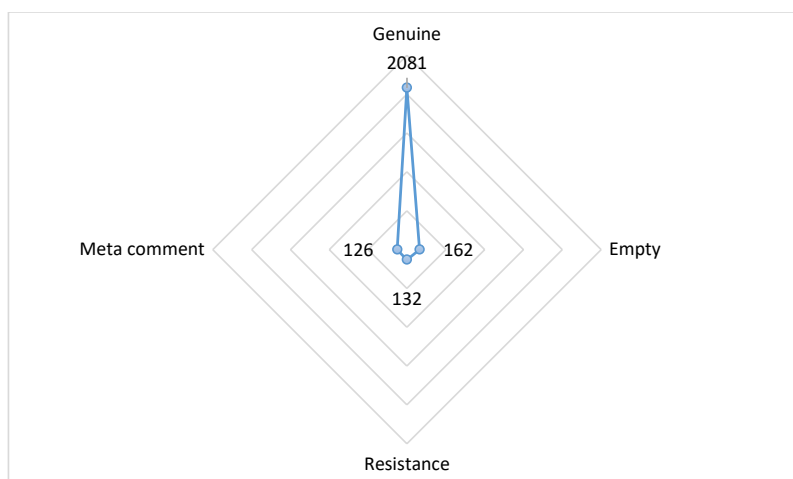


Figure 8: Distribution of text responses across the four major response categories.

Students, in general, attempted to provide a genuine response to the question. Genuine responses constituted 83% of all text responses, and they also included the majority of responses with non-target language words. The student Kirsti, when discussing responses where the students’ Spanish translations had included the Norwegian and French words for “book”, explained that

“It might be easier to try, you don’t get, like, exposed then [...]. Like, it’s anonymous what you’ve written, after all. [...] You can also see, in that iLike [an RT software], that other people are making mistakes, so you dare to try, yourself. You’re not alone”.

Teachers and students throughout interviews echoed this sentiment, and observation and interview data indicated that students saw the potential for learning, experimentation, and expression in the text functionality and therefore made genuine attempts to answer the question. Furthermore, apart from responses to language questions where spelling is central, genuine responses at times contained formulations typically found in spoken language (“The theme?? I guess the movie was about [...]”) or in informal writing settings (“i can see my homies”, emoticons). They were also typically short: 81.5% consisted of fewer than 51 characters, the average length of a text message (Battestini, Setlur & Sohn, 2010), suggesting that communicating with text responses in class has some similarities to communicating with

⁹ See more examples of responses incorporating non-target language in Figure 3 above.

text messaging outside. Finally, a small percentage of language (0.7%) and content (0.8%) responses were more genuine in purpose than in execution, showing clear signs of being arrived at through Google Translate or copied from the net. Though interesting, this eventuality was unexpected and hard to monitor within the framework of the study.

When students started writing, but then deleted their responses before the end of the vote, their empty responses were still registered in the software. Empty responses were thus similar to the genuine responses in that the students had produced a response, but rather than consider them fit for submission, they evaluated them as too faulty. More than half the empty responses were in response to content questions, and while observation data indicated that some of these responses were empty because students did not have time to reformulate their responses before the vote ended, the relative absence of partially completed answers indicates that empty responses tend to be a conscious choice by the student.

More than half of the resistance responses were submitted in response to content questions, and the informant teacher Ms. Travers' observation that the frequency of resistance responses increased as content knowledge decreased is supported by the data. Responses were either completely detached from the teacher's request, like the above, "Wassup peaps", or responding in part to the request, but incorporating elements not pertaining to the topic at hand, such as, "Colshaw, Desmond and head boss gollum", in response to "Who are the characters in this short story?"¹⁰ The deviant parts of resistance responses referenced cultural phenomena ("Harambe", "EA"), class members, or informal language with a degree of shock value. Students pointed to the list of responses as a common space for the class, in which social success could be attained by making the class laugh or individual classmates react by submitting resistance responses. Observation and interview data showed that teachers were uncomfortable with the first category of resistance responses, the one covering responses completely detached from the teacher request. However, it also showed that their concern was disproportionately high in relation to the occurrence of such responses (3.7% of responses), and also that their ability to handle such responses, mainly by denying them attention, increased during the two study phases. Finally, the repetition of similar or identical responses throughout or across lessons in the same class suggests few but prolific authors within this response category. For instance, the reference, "nikko", appeared in 12.9% of the resistance responses (10.6% as the first, completely detached variety). Such recurrences might also work

¹⁰ See also response 31.1.17 in Table 1.

as a pseudonym: although responses were anonymous, students and teachers ended up recognising the author’s signature, and with time and recurrence, Ms. Travers was able to discover the real identities of “nikko” and “gollum”.

Students provided meta comments on the procedure (“[...]this is silly”), their own understanding (“i don’t know”), or their own performance (“I forgot the question”)¹¹, and the responses in this category were evenly distributed across the three question categories. Like the resistance responses, meta comments were often submitted in combination with genuine responses. Students would make an attempt at answering, then indicate what they found problematic. Through meta comments, they could influence the process or indicate that they were still part of it, and the student Solveig said that it was important for them that the teacher knew how they related to the lesson. Another student, Egil, explained that anonymity was paramount in submitting meta comments, because if they otherwise were to say that “this is hard or this is boring, the teacher will get a bad impression of us”. However, observations showed and teachers explained that students who had submitted meta comments would often breach their anonymity and contact the teachers after the vote, to get help one on one.

4.4. Participation

When text responses were tallied and juxtaposed with observations, a quantitative expression of participation could supplement qualitative data (Table 2). An average of three students in four was found to participate in the RT text response votes. When participation in relation to the vote’s position in the sequence of votes in the session was studied (Fig. 6), average participation rates ranged from 62.0% (on the seventh vote) to 83.3% (on the 14th vote). However, the sample of responses decreases with the sequential situation of the vote (there are more 1st votes than 14th votes), and a small, but statistically significant negative correlation ($r=-.110$) between the number of votes per session and participation tempers the trend. Students tended to participate slightly more on formal questions than the other two categories of questions, and when compared with multiple-choice questions, there was no significant difference in participation.

	Vote	Formal	Content	Personal/procedural	Text response (MC)
Participation	76.4	83.1	71.0	72.8	76.4 (74.1)
Pearson’s r correlation to participation	-.110	.114	-.124	-.055	.019
Sig. p (2-tailed)	.000	.000	.000	.002	.247

Table 2: Summary of quantitative participation data.

¹¹ Another example of the latter is response 19.1.5 in Table 1.

Participation with RT text response is dependent on teacher recognition of responses (Einum, in press). Students said they were less likely to participate if the teacher did not follow up on their response, at times complaining orally in class or through written meta comments. At the same time, some students explained that they had a tendency to see the displayed text responses as disconnected from their originator;

Egil: I often forget what I have written myself.

Solveig: I kind of think as if it is [the teacher] who has written it.

Therefore, whether students' participation is contingent on the teacher following up each response or larger groups of responses, remains unclear in the data. Teachers themselves developed feedback strategies related to the various response categories. Genuine responses formed the basis for group or class discussions initiated and led by the teacher. Empty responses, while initially causing some confusion, were treated as indicators of uncertainty and thus influenced the teacher response to the body of genuine responses. Meta comments and resistance responses were met with articulated recognition and ignored, respectively, although in partial resistance responses, the non-resistance part tended to be treated like a genuine response.

Participation was thus observed to spill over into discussion, as teachers would agilely use the students' contributions as a background for discussion and ultimately further activities and votes (Einum, 2019). Students saw the relevance of their contributions and the discussion for future work, and saw their responses as a part of a larger procedure. This is also why they were comfortable discussing and having the teacher and peers discuss their contributions. The students Iselin and Egil explained that the written, anonymous response form freed them from the pressure to perform in front of peers and gave them time to think and prepare something to be discussed. This, in combination with the contextual distance to the anonymous, displayed representation of the text response in front of the class, was considered by both teachers and students to blur the line between textual and oral communication and participation.

5. Discussion

Previous research into applied RT has found that RT and its associated teaching methods promote participation (Kay & Lesage, 2009; Hunsu et al., 2016) and favours formal and content questions that test previous knowledge and provide a basis for further work (Beatty et al., 2006; Caldwell, 2007; Liu et al., 2017). However, this literature has to a very small extent studied the emerging text response functionality, focusing instead on multiple-choice functionality, in which response patterns are limited, being regulated by the provided

alternatives. Like previous studies, this study used interview and observation data to better understand the nature of applied RT. However, unlike previous studies, this study had a varied body of output from this application, due to the flexibility inherent in the text response functionality. Thus, this article attempts to expand the research field by examining the conditions guiding text functionality application in RT, the varied nature and background of its products, and measuring participation.

Teachers used RT text response for formal, content, and personal/procedural questions, eliciting largely genuine responses from students attempting to meet question requirements, but also meta comments, resistance responses, and empty responses. While participation rates were comparable to those on multiple-choice votes and those reported in the literature, more in-depth studies revealed a slight skew in favour of formal questions and a statistically significant, but small decrease in participation on subsequent votes within the same lesson. Finally, teachers' application was guided by a desire to enable and increase student participation by providing a dynamic communication channel, and students' participation was found to be motivated by anonymity and the teacher's follow-up of responses as well as by a desire for class-wide professional and social success and recognition.

The distribution of votes among question categories is in line with the literature's focus on formal and content questions, showing that teachers even with text response functionality tend to give attention to the product before the process. However, Bruff's (2009) prediction that the frequency of process/personal questions would increase with increased RT functionality seems to bear out. With this category of questions being largely absent from the literature, the 13% portion of the votes that fell into this category in this study does represent an increase. Findings suggest this might be related to text functionality affordances, the existence of meta comments in the body of answers, class culture, and teaching style.

In terms of online writing, teacher and student preference for text response functionality and their rationales behind their preferences situate RT text response within Selber's (2004) rhetorical literacy. The oral language on display in student responses indicates that users view this functionality as an alternative communication channel to the oral one in the classroom, one where virtual and real, spoken and written communication, as well as personal and collective identity, blend. The intersubjectivity of collaborative professional evaluation and reworking of their own and others' responses in conjunction with applied RT text functionality displays many of the same benefits for rhetorical literacy found by, e.g., Warschauer (2002), Hyland & Hyland (2006), Lund (2008), and Einum (2019). Furthermore,

Skaftun et al.'s (2017) conclusions from a similar context to this study that online writing opens up new dialogic spaces resonate in this study. RT text response provides an additional, anonymous communication channel to speaking in class, which likely explains both the sporadic similarity of spoken and RT text response language, and similarities to written communication also outside school. Findings therefore suggest that RT text functionality enters the academic discourse on online writing largely in terms of improved rhetorical literacy.

The set of response categories provided by content analysis and constant comparative analysis of text responses has no real equivalent in the literature, due to the focus of this literature on multiple-choice answers, which in general are formulated by the teacher. The classification of student responses into genuine, resistance, and empty responses, as well as meta comments, therefore constitutes the most novel contribution of this study, as this provides a proposed framework for understanding student activity through RT text functionality. Understanding student responses in terms of their direct and indirect messages, and the students' pursuit of professional and social success, allows the teacher to use RT as a tool to engage the students in active, student-centred learning. Genuine responses communicate both potential and limitations, as well as student engagement. Resistance responses provide a direct affront, but can indirectly be seen as social insurance against professional failure, and the proportion of resistance responses to genuine ones can indicate lack of content knowledge, as observed by Ms. Travers. Meta comments directly comment on the students' situation, but indirectly seek interaction and attention from the teacher. Even empty answers can be read as indirect messages. Therefore, the value of this study lies in the support it can provide for didactical flexibility and agile teaching, where teachers can more easily recognise the properties and functions of student responses and adapt their teaching accordingly. A twin study on discursive implementation of such text responses in a cyclical procedure showed that RT text responses have the potential to provide tailored, student-centred education to a productive student body (Einum, 2019). Therefore, testing and refinement of RT text response question and response categories from this study, as well as implementation of teaching practices including them, is likely to increase this potential.

Participation rates were roughly equivalent to the few reported in the literature, and while no experimental comparison to control classes using, e.g., hand raising was made, both teachers and students reported surprisingly high participation in their interviews. Quantitative and qualitative expressions of participation indicate that many of the aspects conducive to

participation reported in the RT literature also can be found in applied RT text response, such as perceived anonymity, learning facilitation, private accountability, and process involvement (Bachman & Bachman, 2011; Habel & Stubbs, 2014; Hunsu et al., 2016). In fact, in the setting, there was no significant quantitative difference between multiple-choice and text response participation. However, there is an area where text response seems to make a difference in relation to multiple choice in terms of participation: this appears to be in students' motivation for participating and the wider impact of their participation, both stemming from the variety and complexity of text responses. Students cited the potential for divergent cognition in text responses, in contrast with the convergent thinking of multiple-choice responses, as their main motivation for participating. They also highlighted the value of seeing all varieties of correct and incorrect responses and the teacher's and their own processing of these after the vote as conducive to participation. Arguably, they claimed, seeing and dealing with completely and partially erroneous answers reduces the fear of participating when there is uncertainty involved, a claim supported by observation and textual data. These claims support the conclusions of, e.g., Anthis (2011), Stewart and Stewart (2013), and Landrum (2015) that the way RT is applied matters more than RT functionality itself. RT text response functionality provides potential for participation, but this potential requires appropriate application by the teacher to engender student participation. Therefore, while participation remains high, like that reported in the literature, the main contribution of RT text response stems from its affordances and the accompanying teaching methods, providing variety and complexity to the nature of this participation.

6. Conclusions

This article has presented an overview of teacher questions and student responses as they were generated in the application of RT text response functionality. By doing so, it has contributed to the discussion of a nascent area of research within RT in particular, and classroom communication in general. The results suggest that new affordances in RT have the potential to significantly broaden and diversify the communication in the classroom, as well as support student-centred instruction and student participation. By opening an alternative communication channel, the teacher can allow oral and written composition and communication to blend, and provide a variety of responses that accurately represents student cognition. This initial generation of text provides an investment from the student upon which further participation and text generation can be based.

RT text response functionality therefore represents a medium through which learning processes and text generation can be facilitated. This led to its widespread adoption over multiple-choice functionality by teachers in this study, and a considerable participation rate by students, who not only saw its potential for learning facilitation, but also for the communication of procedural remarks such as meta comments, resistance responses, and empty responses. Continued participation, then, in terms of further composition or oral activity, seems contingent on teacher follow-up of student responses and the provision of a professional and social classroom setting where responses can be adequately handled. This means that teachers can promote and guide students' writing by using RT's text functionality to both generate text which can be continuously evaluated and compiled, and to discuss content and process. For instance, the teacher can request a topic sentence in support of the thesis statement of an argumentative essay through RT, discuss submitted sentences with the class, and then ask students to describe the characteristics of one of the sentences or to submit a follow-up sentence. Such a dialogic and interactive approach to composition echoes established thinking and current research on digital text production (Kress, 2005; Yancey, 2009; Moore et al., 2016; Green, 2019), as well as current research on student-centring of education with RT (Hunsu et al., 2016; Liu et al., 2017; Einum, 2019).

These findings and some limitations of this study, invite further research. The demand effect between students and teachers, where students write what they expect to be the teacher's favoured response, was not considered because of the impossibility of individual reward due to anonymity. While the role of this anonymity in the generation and processing of RT text responses was frequently connected to participation in the interviews of this study, it has not been studied in depth, and further research should therefore examine the role of anonymity in participating through RT text response whilst accounting for the demand effect on student responses. Also, data gathering was limited to one specific educational setting, rendering the findings valid for upper-secondary language education. However, because the text response functionality is context unspecific, there is reason to stipulate that the findings might be valid also in other contexts. I have presented the study context, research design, and methods as transparently as possible to accommodate further research, which should aim to test and expand on the findings of this study in other subjects and education levels. Finally, this and related studies (see Einum, 2019; in press) have identified an association between written composition with RT and individual, collaborative and oral ways of working. The research field of Networked Learning studies such connections between people and information across

different forms of communication and contexts (Siemens, 2004; Haythornthwaite; 2019). While this study explored the application of the RT text affordance with an attention to text composition, there is reason to believe that approaching RT text from a Networked Learning angle can provide significant knowledge for education. Such research might suggest directions for further development of the RT text functionality, for instance towards randomised exchange of responses for peer feedback, and would likely be highly applicable to writing- and general education contexts.

7. References

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Appendices

1. NSD project approval



Even Einum
Institutt for allmennfag NTNU

7491 TRONDHEIM

Vår dato: 07.02.2017

Vår ref: 52049 / 3 / ASF

Deres dato:

Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 10.01.2017. Meldingen gjelder prosjektet:

52049 *Responsteknologi og elevsentrerte tilnærminger i språkopplæring*
Behandlingsansvarlig *NTNU, ved institusjonens øverste leder*
Daglig ansvarlig *Even Einum*

Personvernombudet har vurdert prosjektet og finner at behandlingen av personopplysninger er meldepliktig i henhold til personopplysningsloven § 31. Behandlingen tilfredsstiller kravene i personopplysningsloven.

Personvernombudets vurdering forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt melde skjemaet, korrespondanse med ombudet, ombudets kommentarer samt personopplysningsloven og helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, <http://www.nsd.uib.no/personvern/meldeplikt/skjema.html>. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, <http://pvo.nsd.no/prosjekt>.

Personvernombudet vil ved prosjektets avslutning, 31.07.2019, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Kjersti Haugstvedt

Amalie Statland Fantoft

Kontaktperson: Amalie Statland Fantoft tlf. 55 58 36 41

Vedlegg: Prosjektvurdering

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

Personvernombudet for forskning



Prosjektvurdering - Kommentar

Prosjektnr: 52049

INFORMASJON OG SAMTYKKE

I følge meldeskjemaet skal deltakerne i studien informeres skriftlig og muntlig om prosjektet og samtykke til deltakelse. Informasjonsskrivet mottatt 06.02.2017, er godt utformet.

Deler av utvalget er elever på videregående skoler og er mellom 16 og 17 år. Personvernombudet er enig i at 16- og 17-åringene kan samtykke selv i dette prosjektet. Vi har lagt vekt på at det er nødvendig for prosjektets formål å innhente opplysningene fra ungdommene selv. Videre har vi lagt vekt på at det ikke samles inn sensitive opplysninger og at prosjektet har kort varighet.

METODE

Det innhentes personopplysninger gjennom observasjon, intervju og papirbaserte spørreundersøkelser. Sistnevnte metode er anonym og omfattes ikke av meldeplikten. Stipendiaten bekrefter på e-post mottatt 27.01.2017, at det ikke vil innhentes opplysninger som direkte eller indirekte kan identifisere informantene.

INFORMASJONSSIKKERHET

Personvernombudet legger til grunn at dere behandler alle data og personopplysninger i tråd med NTNU sine retningslinjer for innsamling og videre behandling av forskningsdata og personopplysninger.

PROSJEKTLUTT OG ANONYMISERING

I informasjonsskrivet har dere informert om at forventet prosjektlutt er 31.07.2019. Ifølge prosjektmeldingen skal dere da anonymisere innsamlede opplysninger. Anonymisering innebærer at dere bearbeider datamaterialet slik at ingen enkeltpersoner kan gjenkjennes. Det gjør dere ved å slette direkte personopplysninger, slette eller omskrive indirekte personopplysninger og slette digitale lydopptak.

2. Student consent form



SØR-TRØNDELAG FYLKESKOMMUNE



NTNU

Kunnskap for en bedre verden

Informasjonsskjema om datainnsamling i prosjektet «Responsteknologi og elevsentrerte tilnærminger i språkopplæringen»

Prosjektet «Responsteknologi og elevsentrerte tilnærminger i språkopplæring» vil kartlegge og tolke tilnærminger til språkopplæringen som benytter responsteknologi ved Charlottenlund Videregående Skole i perioden 2016-2019. Prosjektet er et treårig doktorgradsprosjekt gjennomført av stipendiat Even Einum som en del av Universitetskolesamarbeidet mellom NTNU, Sør-Trøndelag Fylkeskommune og Trondheim Kommune.

I løpet av skoleåret 2016-2017 og høsten 2017 vil det bli gjennomført større og mindre lærer- og elevintervjuer rettet mot holdninger, erfaringer og ideer tilknyttet responsteknologi og bruken av den. Målet er å kartlegge fenomenet og benytte resultatene til å finne og studere undervisningstilnærminger som kan bidra til inkluderende og målrettet, elevsentrert undervisning.

Jeg ber derfor om ditt samtykke til å benytte notater og opptak fra disse intervjuene i denne forskningen. Det er frivillig å delta og du kan når som helst trekke deg fra prosjektet og få dataene anonymisert. All informasjon blir behandlet konfidensielt og datamaterialet vil bli anonymisert ved prosjektslutt, senest juli 2019. Etter at alle personopplysninger slettes, ønsker jeg å bruke resultatene videre i doktorgradsprosjektet, presentere dem på konferanser, i tidsskrift og i min doktorgradsoppgave, men de vil bli presentert slik at ingen enkeltperson kan gjenkjennes. Dataene som samles inn vil kun være tilgjengelig for meg og mine veiledere, Lise Vikan Sandvik og Fredrik Mørk Røkenes (PLU, NTNU), og vi er alle underlagt taushetsplikt. Prosjektet er således i tråd med gjeldende etiske retningslinjer innenfor forskning.

Prosjektet er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste (NSD). Hvis det er noe du lurer på kan du ta kontakt med Even Einum via e-post: even.einum@stfk.no.

Med vennlig hilsen,

Even Einum

Stipendiat

PLU, NTNU, STFK

Samtykke

Angående datainnsamling i prosjektet «Responsteknologi og elevsentrerte tilnæringer i språkopplæring».

Jeg har mottatt og forstått den skriftlige informasjonen og er villig til å delta.

(Bruk blokkbokstaver)

NAVN: _____ DATO: _____

Jeg samtykker i at **anonymisert informasjon** fra intervjuer kan benyttes i prosjektet

3. Teacher consent form



SØR-TRØNDELAG FYLKESKOMMUNE



NTNU

Kunnskap for en bedre verden

Informasjonsskjema om datainnsamling i prosjektet «Responsteknologi og elevsentrerte tilnærminger i språkopplæringen»

Prosjektet «Responsteknologi og elevsentrerte tilnærminger i språkopplæring» vil kartlegge og tolke tilnærminger til språkopplæringen som benytter responsteknologi ved Charlottenlund Videregående Skole i perioden 2016-2019. Prosjektet er et treårig doktorgradsprosjekt gjennomført av stipendiat Even Einum som en del av Universitetsskolesamarbeidet mellom NTNU, Sør-Trøndelag Fylkeskommune og Trondheim Kommune.

I løpet av skoleåret 2016-2017 og høsten 2017 vil det bli gjennomført større og mindre lærer- og elevintervjuer rettet mot holdninger, erfaringer og ideer tilknyttet responsteknologi og bruken av den. Videre vil det bli gjennomført observasjoner, samt en anonym spørreundersøkelse med samme fokus og målgruppe. Målet er å kartlegge fenomenet og benytte resultatene til å finne og studere undervisningstilnærminger som kan bidra til inkluderende og målrettet, elevsentrert undervisning.

Jeg ber derfor om ditt samtykke til å benytte notater og opptak fra disse intervjuene og observasjonene, samt dataene fra spørreundersøkelsen i denne forskningen. Det er frivillig å delta og du kan når som helst trekke deg fra prosjektet og få dataene anonymisert. All informasjon blir behandlet konfidensielt og datamaterialet vil bli anonymisert ved prosjektslutt, senest juli 2019. Etter at alle personopplysninger slettes, ønsker jeg å bruke resultatene videre i doktorgradsprosjektet, presentere dem på konferanser, i tidsskrift og i min doktorgradsoppgave, men de vil bli presentert slik at ingen enkeltperson kan gjenkjennes. Dataene som samles inn vil kun være tilgjengelig for meg og mine veiledere, Lise Vikan Sandvik og Fredrik Mørk Røkenes (PLU, NTNU), og vi er alle underlagt taushetsplikt. Prosjektet er således i tråd med gjeldende etiske retningslinjer innenfor forskning.

Prosjektet er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste (NSD). Hvis det er noe du lurer på kan du ta kontakt med Even Einum via e-post: even.einum@stfk.no.

Med vennlig hilsen,

Even Einum

Stipendiat

PLU, NTNU, STFK

Samtykke

Angående datainnsamling i prosjektet «Responsteknologi og elevsentrerte tilnæringer i språkopplæring».

Jeg har mottatt og forstått den skriftlige informasjonen og er villig til å delta.

(Bruk blokkbokstaver)

NAVN: _____ DATO: _____

- Jeg samtykker i at **anonymisert informasjon** fra mine intervjuer kan benyttes i prosjektet
- Jeg samtykker i at **anonymiserte observasjoner** fra undervisningen kan benyttes
- Jeg samtykker i at **anonyme data** fra spørreundersøkelsen kan benyttes

4. Student survey

RESPONSTEKNOLOGI I SPRÅKOPPLÆRINGEN

Formålet med denne spørreundersøkelsen er å få innblikk i hvordan du som elev opplever, eller har opplevd, responsteknologi i språkopplæringen. Responsteknologi er teknologi der elevene kan kommunisere med læreren (svare / stemme / skrive inn) gjennom mobiler, nettbrett eller PC'er, og eksempler på slik teknologi kan være Kahoot, iLike, Socrative o.l. Prosjektet, som er del av undertegnede doktorgradsprosjekt, kartlegger og tolker tilnæringer til språkopplæringen som benytter responsteknologi ved Charlottenlund videregående skole. Resultatene fra undersøkelsen vil bli brukt i min doktorgradsoppgave ved Norges teknisk-naturvitenskapelige universitet (NTNU), på konferanser og i tidsskrift.

Det er frivillig å svare på spørsmålene, og alle som deltar er anonyme - ingen kan vite hva akkurat du har svart. Du samtykker i å delta i undersøkelsen ved å besvare skjemaet og levere det inn. Når skjemaet er levert, er det ikke lenger mulig å trekke seg fra undersøkelsen, fordi vi ikke vet hvem som har levert hvilket skjema. Resultatene vil bli presentert slik at ingen enkeltpersoner kan gjenkjennes.

Takk for at du er villig til å delta!



Even Einum, doktorgradstipendiat

LES DETTE FØR DU STARTER!	Skjemaet skal leses maskinelt. Følg derfor disse reglene: <ul style="list-style-type: none">• Bruk svart eller blå kulepenn. Skriv tydelig, og ikke utenfor feltene. Kryss av slik: <input checked="" type="checkbox"/>• Feilkryssing kan strykes ved å fylle hele feltet. Sett så kryss i rett felt.• Sett bare ett kryss på hvert spørsmål om ikke annet er oppgitt.
--	---

A. LITT OM DEG

1. Kjønn:

Kvinne ₁
Mann ₂

2. Alder:

Under 16 år ... ₁ 17 år ₂ 19 år ₃
16 år ₄ 18 år ₅ 20 år el. eldre .. ₆

3. Hvilket nivå er du på? ⇒ VG1 ₁ VG2 ... ₂ VG3 / Opplæring i bedrift ... ₃

4. Hvilket studieprogram følger du?

Medier og kommunikasjon <input type="checkbox"/> ₁	Service og samferdsel <input type="checkbox"/> ₆
Musikk, dans og drama <input type="checkbox"/> ₂	Kunst, design og arkitektur <input type="checkbox"/> ₇
Bygg- og anleggsteknikk <input type="checkbox"/> ₃	Studiespesialisering <input type="checkbox"/> ₈
Teknikk og industriell produksjon <input type="checkbox"/> ₄	YF og generell studiekompetanse ... <input type="checkbox"/> ₉
Design og håndverk <input type="checkbox"/> ₅	Toppidrett - fotball <input type="checkbox"/> ₁₀
	Annet <input type="checkbox"/> ₁₁

KS-17
5-3

1

Undersøkelser gjennomføres
nettsikkert på NTNU

Før du fortsetter: Kontroller at du ikke
har glemt noe på denne sida.

5. Hvilke språk fag har du hatt i løpet av videregående?

NB: Kryss av for alt som stemmer!

- | | | | | | |
|-----------------------|--------------------------|-----------------|--------------------------|--------------------------|--------------------------|
| 1. Norsk | <input type="checkbox"/> | 3. Engelsk..... | <input type="checkbox"/> | 6. Spansk..... | <input type="checkbox"/> |
| 2. Annet morsmål..... | <input type="checkbox"/> | 4. Tysk..... | <input type="checkbox"/> | 7. Russisk..... | <input type="checkbox"/> |
| | | 5. Fransk..... | <input type="checkbox"/> | 8. Annet fremmedspråk .. | <input type="checkbox"/> |

B. BRUK AV RESPONSTEKNOLOGI

1. Hvor ofte har du brukt responsteknologi i opplæringen på videregående? ⇒

NB: Regn med alle fag!

- | | | | | | | | |
|-------------------------------------|--------------------------|--------------------------|--------------------------------|--------------------------|-----------------------------------|--------------------------|--------------------------|
| Mer enn
én gang
pr. time
1 | Én gang
pr. time
2 | Én gang
pr. dag
3 | Et par
ganger
i uka
4 | Én gang
i uka
5 | Et par
ganger
pr. mnd.
6 | Én gang
pr. mnd.
7 | Sjeldnere
8 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2. Hvor ofte har du brukt responsteknologi i disse språkfagene på videregående?

- | | | | | | | | | | | |
|-----------------------------|--------------------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------------|--------------------------|-----------------------------------|--------------------------|--------------------------|--------------------------|
| | Har ikke
hatt dette
faget
9 | Mer enn
én gang
pr. time
1 | Én gang
pr. time
2 | Én gang
pr. dag
3 | Et par
ganger
i uka
4 | Én gang
i uka
5 | Et par
ganger
pr. mnd.
6 | Én gang
pr. mnd.
7 | Sjeldnere
8 | Aldri
9 |
| 1. Norsk..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Annet morsmål..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Engelsk | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Tysk | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Fransk | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Spansk..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Russisk | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Annet fremmedspråk | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

C. DELTAKELSE

Dette avsnittet handler om å være aktiv i timene. Hvor enig eller uenig er du i hvert av disse utsagnene?

- | | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | Svært
uenig
1 | Delvis
uenig
2 | Både
/og
3 | Delvis
enig
4 | Svært
enig
5 |
| 1. For meg er det lettere å delta og være aktiv i språkopplæringen når vi bruker responsteknologi enn når vi ikke gjør det..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. At jeg er anonym (ingen vet hvem jeg er) er viktig for at jeg skal svare når vi bruker responsteknologi..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Hvis vi får muligheten til å velge hvordan vi vil arbeide med et tema ved bruk av responsteknologi, deler jeg min mening..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- | | Svært uenig
1 | Delvis uenig
2 | Både /og
3 | Delvis enig
4 | Svært enig
5 |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 4. Hvis vi får muligheten til å velge hvilke tema vi skal fokusere på ved bruk av responsteknologi, deler jeg min mening..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Det er større sjanse for at jeg svarer på avstemmingen når jeg vet at vi vil få en ny sjanse hvis vi tar feil..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Hvis læreren ber oss stemme på eller skrive hva vi synes er vanskelig, og vi kan være anonyme, gjør jeg det..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

D. MOTIVASJON

Dette avsnittet handler om hvor villig du er til å lære, forstå og mestre språk.

- | | Svært uenig
1 | Delvis uenig
2 | Både /og
3 | Delvis enig
4 | Svært enig
5 |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. Bruk av responsteknologi kan gjøre at jeg får mer lyst til å jobbe med språkopplæringen..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Responsteknologi kan endre arbeidsmetodene slik at jeg får mer lyst til å lære språk..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Jeg liker at læreren bruker svarene vi har gitt med responsteknologi til å lage nye oppgaver..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

E. MEDVIRKNING

Dette avsnittet handler om å være med på å bestemme innhold og arbeidsmåter.

- | | Svært uenig
1 | Delvis uenig
2 | Både /og
3 | Delvis enig
4 | Svært enig
5 |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. For meg er det viktig å kunne påvirke innhold og arbeidsmåter i timene..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

I språkundervisning tror jeg responsteknologi kan gjøre det lettere ...

- | | Svært uenig
1 | Delvis uenig
2 | Både /og
3 | Delvis enig
4 | Svært enig
5 |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 2. ... å fortelle læreren om hva jeg synes er vanskelig, f.eks. gjennom avstemminger..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. ... for læreren å få vite hva jeg trenger å jobbe med..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. ... for meg å fortelle læreren hvordan jeg vil jobbe..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. ... for meg å fortelle læreren hva jeg har lyst til å jobbe med..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. ... for meg å fortelle læreren om hvordan jeg reagerer følelsesmessig på undervisningen..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

F. LÆRING

Dette avsnittet handler om hvordan responsteknologi påvirker læringen din.

- | | Helt uenig | Delvis uenig | Både /og | Delvis enig | Helt enig |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. Språk kan være vanskelig å lære hvis jeg ikke kan knytte det til min hverdag | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Responsteknologi kan gjøre at jeg får bedre kontakt med læreren | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Avstemminger med responsteknologi kan distrahere meg, slik at det blir vanskeligere å jobbe | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Hvis jeg må svare på spørsmål gjennom responsteknologi om det jeg jobber med, kan det bli klarere for meg hva jeg trenger å jobbe med | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Lærersens tilbakemelding etter spørsmål som besvares med responsteknologi kan hjelpe meg med det jeg jobber med..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Det er lettere for meg å bruke språket når jeg har hatt en eller flere avstemminger først, og vet hva jeg kan snakke/skrive om | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

G. KOMMENTARER

Er det noe annet om språk og responsteknologi du har lyst til å nevne? Skriv det her!®
NB: Ikke skriv noe som kan identifisere enkeltpersoner, verken deg selv eller andre.

5. Teacher survey, diverging questions (see Chapter 3.2.3)

RESPONSTEKNOLOGI I SPRÅKOPPLÆRINGEN

Formålet med denne spørreundersøkelsen er å få innblikk i hvordan du som lærer opplever, eller har opplevd, responsteknologi i språkopplæringen. Responsteknologi er teknologi der elevene kan kommunisere med læreren (svare/stemme/skrive inn) gjennom mobiler, nettbrett eller pc'er, og eksempler på slik teknologi kan være Kahoot, iLike, Socrative o.l. Prosjektet, som er stipendiat Even Einums doktorgradsprosjekt, kartlegger og tolker tilnærminger til språkopplæringen som benytter responsteknologi ved Charlottenlund Videregående Skole. Resultatene fra undersøkelsen vil bli brukt i min doktorgradsoppgave ved Norges teknisk-naturvitenskapelige universitet (NTNU), på konferanser og i tidsskrift.

Det er frivillig å svare på spørsmålene, og alle som deltar er anonyme – ingen kan vite hva akkurat du har svart. Du samtykker i å delta i undersøkelsen ved å besvare skjemaet og levere det inn. Når skjemaet er levert, er det ikke lenger mulig å trekke seg fra undersøkelsen, fordi vi ikke vet hvem som har levert hvilket skjema. Resultatene vil bli presentert slik at ingen enkeltpersoner kan gjenkjennes.

Takk for at du er villig til å delta!

Even Einum, doktorgradstipendiat



LES DETTE FØR DU STARTER!	Skjemaet skal leses maskinelt. Følg derfor disse reglene: <ul style="list-style-type: none">• <i>Bruk svart eller blå kulepenn. Skriv tydelig, og ikke utenfor feltene. Kryss av slik: <input checked="" type="checkbox"/></i>• <i>Feilkryssing kan strykes ved å fylle hele feltet. Sett så kryss i rett felt.</i>• <i>Sett bare ett kryss på hvert spørsmål om ikke annet er oppgitt.</i>
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A. LITT OM DEG

1. **Kjønn:** Kvinne ₁
Mann ₂
2. **Alder:** 20 – 34 år ₁ 50+ år ₂
35 – 49 år ₂

3. På hvilke studieprogram underviser du?

NB: Kryss av for alt som stemmer!

- | | |
|---|---|
| 1. Medier og kommunikasjon <input type="checkbox"/> | 8. Service og samferdsel <input type="checkbox"/> ₈ |
| 2. Musikk, dans og drama <input type="checkbox"/> | 9. Kunst, design og arkitektur <input type="checkbox"/> ₇ |
| 3. Bygg- og anleggsteknikk <input type="checkbox"/> | 10. Studiespesialisering <input type="checkbox"/> ₅ |
| 4. Teknikk og industriell produksjon <input type="checkbox"/> | 11. YF og generell studiekompetanse <input type="checkbox"/> ₉ |
| 5. Design og håndverk <input type="checkbox"/> | 12. Toppidrett - fotball <input type="checkbox"/> ₁₀ |
| | 13. Annet <input type="checkbox"/> ₁₁ |

5. Hvilke språkfag underviser du?

NB: Kryss av for alt som stemmer!

- | | | |
|---|---|--|
| 1. Norsk <input type="checkbox"/> | 3. Engelsk <input type="checkbox"/> | 6. Spansk <input type="checkbox"/> |
| 2. Annet morsmål <input type="checkbox"/> | 4. Tysk <input type="checkbox"/> | 7. Russisk <input type="checkbox"/> |
| | 5. Fransk <input type="checkbox"/> | 8. Annet fremmedspråk <input type="checkbox"/> |

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Undersøkelser@ersonforos
nettside@ntnu.no

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Før du fortsetter: Kontroller at du ikke har glemt noe på denne sida.

B. BRUK AV RESPONSTEKNOLOGI

1. Hvor ofte har du brukt responsteknologi i undervisningen din generelt på videregående? ⇨

NB: Regn med alle fag!

Mer enn én gang pr. time 1	Én gang pr. time 2	Én gang pr. dag 3	Et par ganger i uka 4	Én gang i uka 5	Et par ganger pr. mnd. 6	Én gang pr. mnd. 7	Sjeldnere 8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Hvor ofte har du brukt responsteknologi i undervisningen i disse språkfagene på videregående?

	Har ikke undervist i faget 6	Mer enn én gang pr. time 1	Én gang pr. time 2	Én gang pr. dag 3	Et par ganger i uka 4	Én gang i uka 5	Et par ganger pr. mnd. 6	Én gang pr. mnd. 7	Sjeldnere 8	Allri 9
1. Norsk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Annet morsmål.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Engelsk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Tysk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Fransk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Spansk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Russisk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Annet fremmedspråk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C. DELTAKELSE

Dette avsnittet handler om hvor aktive elevene er i timene. Hvor enig eller uenig er du i hvert av disse utsagnene?

	Svært uenig 1	Delvis uenig 2	Både /og 3	Delvis enig 4	Svært enig 5
1. Det er lettere for elevene å delta og være aktive i språkopplæringen når de bruker responsteknologi enn når de ikke gjør det.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. At elevene er anonyme er viktig for at de skal svare når vi bruker responsteknologi.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Hvis elevene får muligheten til å velge hvordan de vil arbeide med et tema ved bruk av responsteknologi, deler de sin mening.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. S1 interview guide, teachers

Intervjuguide: S1(ab) Lærere

Tid	Februar 2017	Mars 2017	Mai 2017
Objekter	Videregående lærere fra utprøvende klasser, n=12 (også ikke-språklærere. Medfører et fagdidaktisk snarere enn et språkdidaktisk fokus)	Språklærere ved videregående skole, fra prosjektklasser, n=8	Språklærere ved videregående skole, fra prosjektklasser, n=8
Intervjuform	Semi-strukturert fokusgruppe	Semi-strukturert fokusgruppe	Semi-strukturert individuelt
Bakgrunn	Klasseromsobservasjoner/-erfaringer, ustrukturerte lærerintervju	Klasseromsobservasjoner/-erfaringer, lærerintervju.	Klasseromsobservasjoner/-erfaringer, lærerintervju, elevintervju, spørreundersøkelse
Etiske rammer	Samtykkeskjema/informasjonskriv. Kjørerregler, mål og rettigheter gjentas i introduksjonen til intervjuet.		
Vitenskapsteoretisk bakgrunn	Fenomenologisk, pragmatisk		
Metodologisk rammeverk	Kvale & Brinkmann (2015), 7-stage interview inquiry.		
Intervjuers rolle	Åpen, responsiv, oppdagende, fleksibel.		
Notis:	Spørsmålene, og bruken av dem, vil informeres av data fra annen datainnsamling (observasjoner, lærerintervjuer, spørreundersøkelser (H2016/V2017)). I løpet av intervjuene vurderer intervjuer også fortløpende å forkaste eller følge opp punktene i intervjuguiden på bakgrunn av objektenes bidrag.		

1. Introduksjon

Først vil jeg si tusen takk for at dere stiller opp til intervju. Jeg kommer til å gi litt praktisk informasjon før vi setter i gang med intervjuet. Hensikten med dette intervjuet er å dele erfaringer fra bruken av responsteknologi i språkundervisningen, og også å utforske særtrekk og særbehov for fag der anvendt responsteknologi kan spille en rolle for elevene i undervisningen, samt å utvikle noen tanker om hva som kan være lurt å gjøre. I tillegg er jeg interessert i hva dere tenker om samspillet med elevene, og dem imellom, og hvordan dette kan påvirkes av digitale hjelpemidler/responsteknologi.

1.1 Tid:

- Ikke fastlagt tid, men kan ta opptil 2 timer.
- Hvis dere vil ha en pause er det bare å si ifra.

1.2 Tema:

Bakgrunnen for intervjuet er bruken av responsteknologi i fagene deres.

1.3 Etiske regler:

Jeg kommer til å ta lydopptak under intervjuet. Dataene fra intervjuet vil bli behandlet konfidensielt av meg og mine veiledere, det vil si at ingen får vite hvem dere er og hva dere har svart. Det er helt frivillig å delta på intervjuet. Dere svarer på det dere har lyst til å svare på, og dere har lov til å avslutte intervjuet når dere vil, men jeg håper at dere sitter til vi er ferdige.

- Høres dette greit ut?

1.4 Bakgrunnsinformasjon (mai)

- Hvilken utdanning har du og hvor lenge har du undervist språk?
- Hva synes du er mest interessant innenfor språkundervisning?
- Hva synes du er minst interessant?

- Kan du beskrive ditt forhold til digitale hjelpemidler i språkopplæring?
 - Hvilke muligheter/utfordringer ser du i denne forbindelse?
2. Bakgrunn: Språkopplæring og digitale hjelpemidler i klasserommet

- 2.1 Hva synes du er mest arbeidskrevende som språklærer?
- Før, under eller etter undervisningen?
 - Eksempler?
 - Har du teknikker for å gjøre dette lettere?
 - Kan du beskrive disse?
- 2.2 Hvilke arbeidsformer gjør at elevene lærer mest språk?
- Er det tema som passer bedre med spesifikke arbeidsformer enn andre?
- 2.3 Hva slags oppgaver tenker du ligger på læreren?
- i planlegging av arbeidsformer og innhold?
 - i gjennomføringen av slike arbeidsformer og innhold?
 - Hvorfor?
- 2.4 Hva slags oppgaver tenker du ligger på eleven(e)?
- i planlegging av arbeidsformer og innhold?
 - i gjennomføringen av slike arbeidsformer og innhold?
 - Hvorfor?
- 2.5 Hvilken rolle spiller digitale hjelpemidler i språkopplæring?
- Hva er digitale hjelpemidler?
 - Eksempler?
 - Husker du en gang det fungerte dårlig?
 - o Hvorfor fungerte det dårlig?
 - Husker du en gang det fungerte bra?
 - o Hvorfor fungerte det bra?
- 2.6 Tror du det er forskjell på hvordan lærere og elever forholder seg til digitale hjelpemidler/teknologi i språkopplæring?
- Kan du utdype?
- 2.7 Hva er kriteriene for at du skal velge å bruke en type digitale hjelpemidler i undervisningen din?
- Kriteriene for å fortsette å bruke dem?
 - Hva får deg til å forkaste dem?
3. Førsteintrykk i forhold til bruk av responsteknologi

Vi begynner litt generelt, så retter vi oss inn på de ulike temaene etter hvert. Dere har brukt responsteknologi i timene en stund nå. For å begynne helt på begynnelsen:

- 3.1 Assosiasjoner
- Hva er det første dere tenker på når dere hører «responsteknologi»?
- 3.2 Hvordan har dere opplevd disse oppleggene?
- Hva synes dere om at Kahoot, iLike etc, er brukt i undervisningen deres?
 - Var det noe dere opplevde som positivt?
 - o Lærerikt?
 - o Nytt?
 - o Brukervennlig?
 - Var det noe dere opplevde som negativt?
 - o Hvis ja: Hva kunne vært annerledes?
 - o Tekniske problemer?
 - o Ønsker om nye funksjoner/endret funksjonalitet?
- 3.3 Hyppighet
- Hvor ofte har dere brukt responsteknologi?

- Er dette for lite/for mye?
 - o Hvorfor?
4. Bruk av responsteknologi og de ulike metodene

Jeg har fått observere noe av bruken og snakket med en del av dere, men jeg er veldig interessert i å høre litt nærmere hva dere tenker rundt undervisningsopplegg og hvordan dere opplevde dem.

4.1 Først, husker dere en time der dere ikke benyttet responsteknologi, men der elevene jobbet bra og likte opplegget?

- Hva gjorde at de jobbet bra?
- Hva gjorde at de likte opplegget?

4.2 Husker dere også en time der som var motsatt?

- Hva gjorde at de ikke jobbet bra?
- Hva gjorde at de ikke likte opplegget?

4.3 Har dere hatt noen lignende erfaringer med responsteknologi?

- Eksempler?
- Hva gjorde at de (ikke) jobbet bra?
- Hva gjorde at de (ikke) likte opplegget?

4.4 Kan dere beskrive hvordan bruken av responsteknologi foregikk?

- Hva skjedde før dere tok i bruk teknologien?
 - o I hvilke situasjoner passet det godt inn/dårlig inn?
 - o Var det tema dere syntes var mer egnet enn andre?
 - o Hvorfor fungerer det bra/dårlig?
- Hvordan ble avstemmingen gjennomført?
 - o Hva gjorde at dere valgte denne formen for avstemming?
 - o Hva synes dere om denne formen for avstemming?
- Hva skjedde etter at elevene deltok via telefonene/pc'ene/tablet'ene deres?
- Hvordan foregikk gjennomgangen av resultatene?
 - o Hva gjorde at dere valgte denne måten å gjennomgå på?
 - o Hva synes dere om denne måten å gjøre gjennomgangen på?
- Hvordan ble resultatene fulgt opp?
 - o Fikk elevene for eksempel nye oppgaver?

Nå har vi snakket litt generelt om hvordan dere opplevde undervisningssituasjonen, og skal nå gå over til de ulike metodene som ble brukt.

4.5 Kan dere huske en metode som fungerte bedre eller dårligere enn andre?

- Hva var årsaken til dette?

4.6 Hvordan kan responsteknologi gjøre det lettere å lære emner og ferdigheter?

4.6.1. *Er det emner eller ferdigheter dere tenker er godt egnet til å læres ved hjelp av responsteknologi?*

- Eksempelvis: Kultur, litteratur, grammatikk, lesing, skriving, lytting, snakking, samtale, regning, digitale ferdigheter.
- Fakta/konsepser/prosesser?
- Kan dere huske timer der dere fikk inntrykk av at elevene lærte emner eller ferdigheter godt da dere anvendte responsteknologi? Hva ga dere dette inntrykket?
- På hvilken måte/hva er det som gjør disse emnene/ferdighetene egnet?
- Hvis man snur spørsmålet på hodet; er det funksjoner ved responsteknologien og opplegg/arbeidsformer som er mer egnet for noen emner/ferdigheter enn andre?

4.6.2. *Er det emner eller ferdigheter dere tenker er dårlig egnet til å læres ved hjelp av responsteknologi?*

- Eksempelvis: Kultur, litteratur, grammatikk, lesing, skriving, lytting, snakking, samtale, regning, digitale ferdigheter.
- Fakta/konsepser/prosesser?
- Kan dere huske timer der dere fikk inntrykk av at elevene lærte emner eller ferdigheter dårligere da dere brukte responsteknologi? Hva ga dere dette inntrykket?
- På hvilken måte/hva er det som gjør disse emnene/ferdighetene uegnet?
- Hvis man snur spørsmålet på hodet; er det funksjoner ved responsteknologien og opplegg/arbeidsformer som er mindre egnet for noen emner/ferdigheter enn andre?

4.7 (Dere nevnte/ofte nevnes) hastigheten på kommunikasjonen med responsteknologi. Hvordan spiller dette en rolle i språkundervisning?

- Hvordan har dette gitt seg uttrykk i din undervisning? Eksempler?
- Spiller det noen rolle for kommunikasjonen når i løpet av undervisningen anvendelsen av responsteknologien finner sted?
- Endres kommunikasjonsmønstrene?
 - o Hvordan?

4.8 Et aspekt ved responsteknologien er muligheten for å kunne gi umiddelbar tilbakemelding.

4.8.1. *Hva er nyttig med en umiddelbar tilbakemelding?*

- Hva er dine erfaringer med dette?
- Hvordan er det nyttig for deg å kunne gi umiddelbar tilbakemelding?
 - o Å få tilbakemelding på egne bidrag?
- Hvordan kan det være nyttig for eleven(e) å få en umiddelbar tilbakemelding på egne prestasjoner?
 - o Husker hva de har svart?
 - o Husker hvorfor de har svart slik? Altså begrunnelsen for svaret?
 - o Det er da læringsvinduet er åpent?

4.8.2. *Hva er mindre nyttig med en umiddelbar tilbakemelding?*

- Erfaringer?
- Når er det mindre nyttig med umiddelbar tilbakemelding på elevenes prestasjoner?
 - o For eleven(e)?
 - o For dere?
 - o Når elevene vet hva som mangler?
 - o Når elevene vil klare å finne svaret selv?

Når vi nå har snakket litt generelt om metoder, oppstart og gjennomføring, har jeg lyst til å høre litt mer med dere om hva dere gjør etter selve avstemningen.

4.9 Hvordan følger dere opp forskjellige utfall?

- Elevene gir uventede svar.
- Elevene svarer for det meste feil.
- Elevene svarer for det meste rett.
- Elevene har mange forskjellige svar.
- Elevene faller i få, men store kategorier.

- Hvorfor? Eksempler?

4.10 (Mulig oppfølging) Lærerstyrt forklaring:

- *Hvordan har dere inntrykk av at elevene forholder seg til faglærers gjennomgang og forklaring av oppgaven?*
- Føler dere at dere får gitt en god nok forklaring på hvorfor alternativene viste seg å være riktig eller feil?
 - o Er elevene tilfreds med forklaringene?
- Foretrekker dere å gi fullstendig forklaring eller ledetråder?
- Hva foretrekker elevene?

4.11 (Mulig oppfølging) Elevene diskuterer med medelever, etterfulgt av ny-sjanse avstemming:

- Hva synes dere om å la elevene diskutere med hverandre?
 - o Det er mulig å legge opp til diskusjoner før ny avstemming. Hvordan vil dere vurdere dette?
 - Diskuterer de?
 - Hva skjer i diskusjonene?
 - Står du på sine argumenter?
- Hvordan tror du elevene opplever disse diskusjonene?
- Hva trenger de før de kan gå inn i slike diskusjoner?
- Hva har de igjen faglig sett for å delta i diskusjonene?
- Er det forskjell på par-/gruppe- og klassesdiskusjoner?
- Burde det ha vært flere/færre diskusjoner?

4.12 (Mulig oppfølging) Ny sjanse

- Hvordan opplever dere det å la elevene svare på et bestemt spørsmål en gang til?
- Hvordan opplever elevene det?
 - o Hvilket utbytte kan eleven ha?
 - Enten lære av egne feil, eller få bekreftet det de allerede vet?

4.12.1 Hvis responsteknologien brukes i vurdering, burde denne avstemmingen være tellende for testresultatet/karakteren?

- Hvorfor/hvorfor ikke?
- Hva er mest rettferdig?
- Hvis noen har svart rett første gangen, men svarer feil andre gangen. Burde første eller andre gang være mest tellende?
 - o Hvorfor/hvorfor ikke?
- Er det rettferdig at alle får en sjanse til å rette opp feil som man har gjort?
 - o Hvorfor/hvorfor ikke?

4.12.2 Hva har dere best erfaringer med? Et nytt spørsmål som dekker samme problemstilling, eller samme spørsmål på nytt?

- Hvorfor foretrekker dere dette?
- Hva foretrekker elevene? Hvorfor?

4.13 (Mulig oppfølging) Andre?

4.14 Samlet sett, hvilken type gjennomgang virker det som elevene foretrekker?

- Gjennomgang på tavla?
- Diskusjon med medelever, etterfulgt av ny avstemming?
- Hint, etterfulgt av ny avstemming?
- Variasjon?

4.14.1 Hva vil dere si påvirker elevenes engasjement under oppfølgingen av den opprinnelige avstemmingen?

4.15 Når elevene får nye oppgaver, hvordan bør disse se ut?

- Samme tema som forrige, men annen vinkling?
- Vanskeligere tema, som bygger på forrige?
- Undervisning imellom?
- Når passer de forskjellige?

4.16 Ved tester, hva foretrekker dere å vise under gjennomgangen av testresultatene; prosentfordelingen eller svarfordelingen?

- Hvorfor?
- Hva foretrekker elevene?
- Sammenligne seg selv med andre i klassen?
- Ser hvordan de ligger an i forhold til resten?

4.17 Annet?

5. Deltakelse, inkludering, motivasjon og tilrettelegging for læring

5.1 Først, har dere noen triks for å nå elevene i språkopplæringen

- i forhold til fag, ferdigheter og motivasjon?
- Er dette noe du må organisere/legge til rette for, eller elevene?
- Hvordan gjør du/de dette?
- Hva kjennetegner disse triksene?
- Er det noe du bør passe deg for, for å unngå å miste kontakten med elevene?

5.2 Hvordan kan IKT påvirke måten elevene jobber med faget?

5.3 Hvordan kan responsteknologi påvirke måten elevene jobber med faget?

- Hvordan vil det at elevene kan være anonyme og kommunisere påvirke timen og arbeidet?

5.4 Blir måten elevene deltar i undervisningen på annerledes?

- Deltar elevene vanligvis i undervisningen? Svarer de på spørsmålene?
 - o Når unnlater de å delta?
- Hva bestemmer hvor mye de deltar i undervisningen?
- Ser dere noen måter responsteknologi får dere til å delta mer eller mindre i undervisningen på?
- Hvordan?
- Eksempler?
- Deltar elevene mer når undervisningen er basert på deres bidrag? Hvorfor/hvorfor ikke?

5.5 Hvordan opplever dere elevenes mulighet til å påvirke arbeidsformene og det som undervises?

- Er det forskjell når dere bruker responsteknologi i undervisningen?
- **Med responsteknologi:** Hvordan kan dere la elevene påvirke måten ting blir gjort på?
- Når er det ønskelig at elevene skal ha mulighet til å påvirke arbeidsformene?
- Når er det ønskelig at elevene skal ha mulighet til å påvirke innholdet?
- Eksempler?
- Hvilke arbeidsformer foretrekker elevene å benytte generelt?
- Ser dere noen forskjell i påvirkningskraften de har med eller uten responsteknologi?

5.6 Inntrykk av motivasjon

5.6.1 Hva motiverer elever for språk?

- Hvorfor?

5.6.2 Hva gjør elever demotiverte for språk?

- Hvorfor?

5.7 Hvordan påvirker responsteknologien elevenes motivasjon i undervisningen?

5.7.1 Husker du en episode der du fikk inntrykk av at responsteknologien gjorde timen mer motiverende for elevene?

- Hvordan? Hva var forskjellig fra vanlig undervisning?
- Hva gjorde du? Hva gjorde elevene?

5.7.2. Husker du en episode der du fikk inntrykk av at responsteknologien gjorde time mindre motiverende for elevene?

- Hvordan? Hva var forskjellig fra vanlig undervisning?
- Hva gjorde du? Hva gjorde elevene?

5.8 Tror dere oppfatningen av responsteknologioppleggene er avhengig av hvordan man ligger an faglig sett?

- *Mener dere at det er en forskjell mellom hvordan svake og sterke elever opplever dette?*
- Hva tror dere svake elever mener om bruken av responsteknologi?
 - o Tror dere de synes det er unødvendig?
 - o Opplever de en nytteverdi?
 - o Læring av gruppediskusjoner?
 - o Forskjell på de forskjellige oppleggene?
 - o Tror dere at det hjelper svake elever med å bli bedre?

- Hvorfor/hvorfor ikke?
- Hva tror dere sterke elever mener om bruken av responsteknologi?
 - Tror dere de synes det er unødvendig?
 - Opplever de en nytteverdi?
 - Læring av gruppediskusjoner?
 - Forskjell på de forskjellige oppleggene?
 - Tror dere at det hjelper sterke elever med å bli bedre?
 - Hvorfor/hvorfor ikke?

6. Roller

6.1 Hva synes dere faglærer bør være flink til for at undervisning med responsteknologi skal fungere for elevene?

- Være komfortabel?
- Være forberedt?
- Være fleksibel?
- Reaksjon på ting som går dårlig eller bra?
- Annet?

6.2 Hvordan synes dere han/hun bør forholde seg til elevene og deres bidrag for at undervisningen med responsteknologi skal fungere for dem?

- Hvorfor?
- Hvordan påvirker faglærer elevenes holdning/engasjement til bruken av responsteknologi?
- Har dere ellers noen kommentarer i forhold til rollen faglærer bør fylle i denne konteksten?

6.3 Hva synes dere elever bør være flinke til for at undervisning med responsteknologi skal fungere for dem?

- Være komfortabel?
- Være forberedt?
- Være fleksibel?
- Reaksjon på ting som går dårlig eller bra?
- Annet?

6.4 Hvordan synes dere elevene bør forholde dere til lærerens instruksjoner for at undervisningen med responsteknologi skal fungere for dem?

- Hvorfor?
- Hvordan kan elevene påvirke faglærers holdning/engasjement til bruken av responsteknologi?

6.5 Hvordan endrer innføringen av responsteknologi forhold og roller?

- I klasserommet?
 - Utenfor klasserommet?
- Elevrollen?
- Lærerrollen?

7. Oppsummering

Nå nærmer det seg slutten på intervjuet, så da er det på tide med en liten avrundning.

7.1 Kan dere oppsummere hvordan dere synes oppleggene med responsteknologi fungerte?

- Hva synes dere var bra/dårlig?
- Hvorfor?

7.2 Har dere innspill til hvordan ting bør gjøres annerledes i forbindelse med bruken av responsteknologi?

7.2.1 Har dere noen forslag til andre situasjoner/typer oppgaver der responsteknologi kan benyttes?

- Andre metoder?
- Noe dere savnet?

7.2.2 Har dere noen forslag til andre måter resultatene fra avstemningen kan behandles på?

- Andre metoder?
- Noe dere savnet?

7.2.3 Har dere noen forslag til andre måter responsteknologi kan benyttes på generelt?

- For eks. som trening til eksamen? Eller på eksamen?

7.3 Er det noe mer dere har lyst til å fortelle meg?

7.4 Har dere noen siste kommentarer før vi avslutter?

Da gjenstår det bare å si tusen takk for deltagelsen!

7. S1 interview guide, students

Intervjuguide: S1(ab) Elever

Tid	Mars 2017	Mai 2017
Objekter	Videregåendelever fra prosjektklasser, n=3x4	Videregåendelever fra prosjektklasser, n=6
Intervjuform	Semi-strukturert fokusgruppe	Semi-strukturert individuelt
Bakgrunn	Klasseromsobservasjoner/-erfaringer, lærerintervju	Klasseromsobservasjoner/-erfaringer, elevintervju, spørreundersøkelse, lærerintervju.
Etiske rammer	Samtykkeskjema/informasjonskriv. Kjøreregler, mål og rettigheter gjentas i introduksjonen til intervjuet.	
Vitenskapsteoretisk bakgrunn	Fenomenologisk, pragmatisk	
Metodologisk rammeverk	Kvale & Brinkmann (2015), 7-stage interview inquiry.	
Intervjuers rolle	Åpen, responsiv, oppdagende, fleksibel.	
Notis:	Spørsmålene vil kunne informeres av data fra annen datainnsamling (observasjoner, lærerintervjuer, spørreundersøkelser (H2016/V2017)). I løpet av intervjuene vurderer intervjuer også fortløpende å forkaste eller følge opp punktene i intervjuguiden på bakgrunn av objektenes bidrag.	

1. Introduksjon

Først vil jeg si tusen takk for at dere stiller opp til intervju. Jeg kommer til å gi litt praktisk informasjon før vi setter i gang med intervjuet. Hensikten med dette intervjuet er å få fram hva dere som elever synes om bruken av responsteknologi i fagene deres med tanke på opplegg, deltakelse, motivasjon og muligheter for læring. Jeg vil bruke dette i doktorgradsarbeidet

1.1 Tid:

- Ikke fastlagt tid, men kan ta opptil 2 timer.
- Hvis dere vil ha en pause er det bare å si ifra.

1.2 Tema:

Bakgrunnen for intervjuet er bruken av responsteknologi i fagene deres.

1.3 Etiske regler:

Jeg kommer til å ta lydopptak under intervjuet. Dataene fra intervjuet vil bli behandlet konfidensielt av meg og mine veiledere, det vil si at ingen får vite hvem dere er og hva dere har svart. Det er helt frivillig å delta på intervjuet. Dere svarer på det dere har lyst til å svare på, og dere har lov til å avslutte intervjuet når dere vil, men jeg håper at dere sitter til vi er ferdige.

- Høres dette greit ut?

1.4 Bakgrunnsinformasjon:

Kanskje vi kan begynne med en liten presentasjonsrunde av dere? Hvis alle kan presentere seg selv:

- Navn, alder og studiebakgrunn?
- Hva er framtidsplanene deres?
- Trives dere?

2. Førsteintrykk i forhold til bruk av responsteknologi

Vi begynner litt generelt, så retter vi oss inn på de ulike temaene etter hvert. Dere har brukt responsteknologi i timene en lang stund nå. Ofte har det fulgt mønsteret avstemming, en reaksjon fra læreren og eventuelt videre oppgaver. For å begynne helt på begynnelsen:

2.1 Assosiasjoner

- Hva er det første dere tenker på når dere hører «responsteknologi»?

2.2 Hvordan har dere opplevd disse oppleggene?

- Hva synes dere om at Kahoot, iLike etc, er brukt i undervisningen deres?
- Var det noe dere opplevde som positivt?
 - o Lærerikt?
 - o Nytt?
 - o Brukervennlig?
- Var det noe dere opplevde som negativt?
 - o Hvis ja: Hva kunne vært annerledes?
 - o Tekniske problemer?
 - o Ønsker om nye funksjoner/endret funksjonalitet?

2.3 Hyppighet

- Hvor ofte har dere brukt responsteknologi?
- Er dette for lite/for mye?
 - o Hvorfor?

3. Deltakelse, inkludering, motivasjon og tilrettelegging for læring

3.1 Hvordan kan IKT påvirke måten dere jobber med faget?

3.2 Hvordan kan responsteknologi påvirke måten dere jobber med faget?

- Hvordan vil det at dere kan være anonyme og kommunisere påvirke timen og arbeidet?

3.3 Blir måten dere deltar i undervisningen på annerledes?

- Deltar dere vanligvis i undervisningen? Svarer dere på spørsmålene?
 - o Når unnlater dere å delta?
- Hva bestemmer hvor mye dere deltar i undervisningen?
- Ser dere noen måter responsteknologi får dere til å delta mer eller mindre i undervisningen på?
- Hvordan?
- Eksempler?
- Deltar dere mer når undervisningen er basert på deres bidrag? Hvorfor?

3.4 Hvordan opplever dere muligheten til å påvirke arbeidsformene og det som undervises?

- Er det forskjell når dere bruker responsteknologi i undervisningen?
- **Med responsteknologi:** Hvordan kan dere påvirke måten ting blir gjort på? Har dere mulighet til å påvirke arbeidsformene?
- Hvordan kan dere påvirke det som blir undervist?
 - o Tema og materiale
- Eksempler?
- Hvilke arbeidsformer foretrekker dere å benytte generelt?
- Ser dere noen forskjell i påvirkningskraften dere har med eller uten responsteknologi?

3.5 Hvordan påvirker responsteknologien motivasjonen din i undervisningen?

3.5.1. Husker du en episode der du syntes at responsteknologien gjorde time mer motiverende?

- Hvordan? Hva var forskjellig fra vanlig undervisning?
- Hva gjorde du? Hva gjorde læreren?

3.5.2. Husker du en episode der du syntes at responsteknologien gjorde time mindre motiverende?

- Hvordan? Hva var forskjellig fra vanlig undervisning?
- Hva gjorde du? Hva gjorde læreren?

3.6 Hvordan kan responsteknologi gjøre det lettere å lære emner og ferdigheter?

3.6.1. Er det emner eller ferdigheter dere tenker er godt egnet til å læres med hjelp av responsteknologi?

- Eksempelvis: Kultur, litteratur, grammatikk, lesing, skriving, lytting, snakking, samtale, regning, digitale ferdigheter.

- Fakta/konsepter/prosesser?
- På hvilken måte/hva er det som gjør disse egnet?
 - o I emnet?
 - o I bruken av teknologien?

3.6.2. Er det emner eller ferdigheter dere tenker er dårlig egnet til å læres med hjelp av responsteknologi?

- Eksempelvis: Kultur, litteratur, grammatikk, lesing, skriving, lytting, snakking, samtale, regning, digitale ferdigheter.
- Fakta/konsepter/prosesser?
- På hvilken måte/hva er det som gjør disse lite egnet?
 - o I emnet?
 - o I bruken av teknologien?

3.7 Tror dere oppfatningen av responsteknologioppleggene er avhengig av man ligger an faglig sett?

- *Mener dere at det er en forskjell mellom hvordan svake og sterke studenter opplever dette?*
- Hva tror dere svake elever mener om bruken av responsteknologi?
 - o Tror dere de synes det er unødvendig?
 - o Opplever de en nytteverdi?
 - o Læring av gruppediskusjoner?
 - o Forskjell på de forskjellige oppleggene?
 - o Tror dere at det hjelper svake elever med å bli bedre?
 - o Hvorfor/hvorfor ikke?
- Hva tror dere sterke elever mener om bruken av responsteknologi?
 - o Tror dere de synes det er unødvendig?
 - o Opplever de en nytteverdi?
 - o Læring av gruppediskusjoner?
 - o Forskjell på de forskjellige oppleggene?
 - o Tror dere at det hjelper sterke elever med å bli bedre?
 - o Hvorfor/hvorfor ikke?

4. Roller:

4.1 Hva synes dere faglærer bør være flink til for at undervisning med responsteknologi skal fungere for deg?

- Være komfortabel?
- Være forberedt?
- Være fleksibel?
- Reaksjon på ting som går dårlig eller bra?
- Annet?

4.2 Hvordan synes dere han/hun bør forholde seg til dere og deres bidrag for at undervisningen med responsteknologi skal fungere for deg?

- Hvorfor?
- Hvordan påvirker faglærer deres holdning/engasjement til bruken av responsteknologi?
- Har dere ellers noen kommentarer i forhold til måten faglærer brukte systemet?

4.3 Hva synes dere elever bør være flink til for at undervisning med responsteknologi skal fungere for deg?

4.3.1. Andre elever?

- Være komfortabel?
- Være forberedt?
- Være fleksibel?
- Reaksjon på ting som går dårlig eller bra?
- Annet?

4.3.1. Deg?

- Være komfortabel?
- Være forberedt?
- Være fleksibel?
- Reaksjon på ting som går dårlig eller bra?
- Annet?

4.4 Hvordan synes dere dere som elever bør forholde dere til lærerens instruksjoner for at undervisningen med responsteknologi skal fungere for deg?

- Hvorfor?
- Hvordan tror du dere kan påvirke faglærers holdning/engasjement til bruken av responsteknologi?

4.5 Hvordan endrer innføringen av responsteknologi forhold og roller?

- Klasserommet?
 - o Utenfor klasserommet?
- Elevrollen?
- Lærerrollen?

5. Bruk av responsteknologi og de ulike metodene

Jeg har fått observere noe av bruken og har fått litt oppdateringer av lærerne, men jeg er veldig interessert i å høre hvordan dere opplevde oppleggene.

5.1 Kan dere beskrive hvordan bruken av responsteknologi foregikk?

- Hva skjedde før dere tok i bruk teknologien?
 - o I hvilke situasjoner passet det godt inn/dårlig inn?
 - o Var det tema dere syntes var mer egnet enn andre?
 - o Hvorfor fungerer det bra/dårlig?
- Hvordan ble avstemmingen gjennomført?
- Hva skjedde etter at dere deltok via telefonene/pc'ene/tablet'ene deres?
- Hvordan foregikk gjennomgangen av resultatene?
 - o Hva synes dere om denne måten å gjøre gjennomgangen på?
- Hvordan ble resultatene fulgt opp?
 - o Fikk dere for eksempel nye oppgaver?

Nå har vi snakket litt generelt om hvordan dere opplevde undervisningssituasjonen, og skal nå gå over til de ulike metodene som ble brukt.

5.2 Kan dere huske en metode som fungerte bedre eller dårligere enn andre?

- Hva var årsaken til dette?

5.3 Hva er nyttig med en umiddelbar tilbakemelding?

- Hvorfor er det nyttig å få en umiddelbar tilbakemelding på egne prestasjoner?
 - o Husker hva dere har svart?
 - o Husker hvorfor dere har svart slik? Altså begrunnelsen for svaret?
 - o Det er da læringsvinduet er åpent?

5.4 Hva er mindre nyttig med en umiddelbar tilbakemelding?

- Når er det mindre nyttig å få en umiddelbar tilbakemelding på egne prestasjoner?
 - o Når dere vet hva som mangler?
 - o Når dere vil klare å finne svaret selv?

Under gjennomgangen, valgte faglærer å bruke ulike metoder?

- Lærer gjennomgår oppgaven på tavla?
- Hint fra lærer, etterfulgt av ny sjanse-avstemming?
- Diskusjon med medstudenter, etterfulgt av ny sjanse-avstemming?
- Nye oppgaver?
- Annet?

Jeg tenkte vi skulle gå gjennom disse metodene, og diskutere litt rundt dem:

5.5 Lærerstyrt forklaring:

- *Hva synes dere om at faglærer går gjennom oppgaven på tavla og forklarer?*
- Følte dere at dere fikk en god nok forklaring på hvorfor alternativene viste seg å være riktig eller feil?
 - o Egen læring?
- Foretrekker dere fullstendig forklaring fra læreren eller ledetråder?

5.6 Diskusjon med medstudenter, etterfulgt av ny-sjanse avstemming:

- *Hva synes dere om å diskutere med andre studenter?*
 - o Det legges ofte opp til diskusjoner før ny avstemming. Hvordan vil dere vurdere dette i forhold til egen forståelse og læring?
 - Diskuterer dere?
 - Hva skjedde i diskusjonene?
 - Sto du på ditt argument?
- Hva trenger dere før dere går inn i slike diskusjoner?
- Hva har dere igjen faglig sett for å delta i diskusjonene?
- Er det forskjell på par-/gruppe- og klassediskusjoner?
- Burde det ha vært flere/færre diskusjoner?

5.7 Ny sjanse

- *Hvordan opplevde dere det å svare på et bestemt spørsmål en gang til?*
 - o Læringsutbytte?
 - Enten lære av egne feil, eller få bekreftet det du allerede visste?
 - o Ønsker dere mer eller mindre av dette?

5.7.1 Hvordan vil dere vurdere egen deltagelse ved disse anledningene?

- Deltok dere: Svarte dere på spørsmålene?
 - o Har dere noen ganger unnlatt å svare på et spørsmål?
 - o Hvorfor?

5.7.2 Hvis responsteknologien brukes i vurdering, burde denne avstemmingen være tellende for testresultatet/karakteren?

- Hvorfor/hvorfor ikke?
- Hva er mest rettferdig?
- *Hvis noen har svart rett første gangen, men svarer feil andre gangen. Burde første eller andre gang være mest tellende?*
 - o Hvorfor/hvorfor ikke?
- *Er det rettferdig at alle får en sjanse til å rette opp feil som man har gjort?*
 - o Hvorfor/hvorfor ikke?

5.7.3 Hva liker dere best: Et nytt spørsmål som dekker samme problemstilling, eller samme spørsmål på nytt?

- Hvorfor foretrekker dere dette?

5.8 Når dere får nye oppgaver, hvordan bør disse se ut?

- Samme tema som forrige, men annen vinkling?
- Vanskeligere tema, som bygger på forrige?
- Undervisning imellom?
- Når passer de forskjellige?

5.9 Samlet sett, hva foretrakk dere at faglærer gjorde?

- Gjennomgang på tavla?
- Diskusjon med medstudenter, etterfulgt av ny avstemming?
- Hint, etterfulgt av ny avstemming?
 - o Variasjon?
 - o *Hvordan opplevde dere de ulike metodene i forhold til egen læring?*

5.9.1 Hvordan vil dere vurdere eget engasjement under oppfølgingen av den opprinnelige avstemmingen?

- Spent og interessert?

- Deltagende?

5.10 Ved tester, hva foretrekker dere å se under gjennomgangen av testresultatene; prosentfordelingen eller svarfordelingen?

- Hvorfor?
- Sammenligne seg selv med andre i klassen?
- Ser hvordan dere ligger an i forhold til resten?

5.11 Annet?

6. Oppsummering

Nå nærmer det seg slutten på intervjuet, så da er det på tide med en liten avrundning.

6.1 Kan dere oppsummere hvordan dere synes oppleggene med responsteknologi fungerte?

- Hva synes dere var bra/dårlig?
- Hvorfor?

6.2 Har dere innspill til hvordan ting bør gjøres annerledes i forbindelse med bruken av responsteknologi?

6.2.1 *Har dere noen forslag til andre situasjoner/typer oppgaver der responsteknologi kan benyttes?*

- Andre metoder?
- Noe dere savnet?

6.2.1 *Har dere noen forslag til andre måter resultatene fra avstemmingen kan behandles på?*

- Andre metoder?
- Noe dere savnet?

6.2.2 *Har dere noen forslag til andre måter responsteknologi kan benyttes på generelt?*

- For eks. som trening til eksamen? Eller på eksamen?

Er det noe mer dere har lyst til å fortelle meg?

Har dere noen siste kommentarer før vi avslutter?

Da gjenstår det bare å si tusen takk for deltagelsen!