Han Han

Flipped Classroom in Teacher Education

Perceptions from English language teacher educators and student teachers in Norway

Doctoral thesis

NTNU
Norwegian University of
Science and Technology

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Norwegian University of Science and Technology
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This doctoral thesis was written between February 2019 and June 2023 in the Department of Teacher Education (ILU), Faculty of Social and Educational Sciences (SU) at the Norwegian University of Science and Technology (NTNU). During this period, I was supervised by Associate Professor Fredrik Mørk Røkenes at NTNU and Professor Rune Johan Krumsvik at the University of Bergen (UiB). From January 2020 to June 2020, I was a visiting scholar at the National Center for Research on Evaluation, Standards, and Student Testing (CRESST), School of Education and Information Studies at the University of California Los Angeles (UCLA).

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commitment to intellectual rigor, has made me explore deeper into the subject matter, refine my methodology, and strengthen the overall coherence of this thesis.

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Abstract

This doctoral thesis addresses the use of the Flipped Classroom (FC) teaching approach in teacher education and its influence on the education of student teachers, with a special focus on English language teacher education in Norway. The thesis examines how the FC teaching approach is applied in teacher education and how both teacher educators and student teachers in Norway perceive this approach. The overall research question explored in this thesis is: *How is Flipped Classroom used in English language teacher education and in what ways can Flipped Classroom influence English language student teachers' learning?* This article-based thesis consists of four independent but interrelated research articles and a synopsis. The synopsis includes a discussion of the research on the use of FC in teacher education; an overview of the thesis' theoretical background; a description of the research design and the methodology used in the data collection and analysis; and a discussion of the findings of the four research articles. The synopsis ends with a discussion of the practical implications of implementing the FC teaching approach in teacher education, the limitations of the study, and suggestions for further research.

Article I is a scoping review focusing on the FC teaching approach in teacher education, which examines this approach from a researchers' perspective. This study follows several strict inclusion and exclusion criteria and presents a scoping literature review of 33 studies published between 2014 and 2019. The primary findings of this study indicate that FC studies in teacher education have mainly been conducted in the US, that the FC teaching approach is being increasingly implemented in European and Asian countries, and that this approach has primarily been adopted in the disciplines of pedagogy, science, and language arts. Moreover, most FC studies in teacher education have employed mixed methods with surveys, the most commonly used instrument to collect data. Two main research foci were identified across the reviewed studies—student perceptions and academic performance. Based on the synthesis, current trends and future development in the research field are discussed in this study, the pedagogical value of the FC teaching approach is added to teacher education, and potential knowledge gaps in the research literature are identified.

Article II is an empirical study exploring teacher educators' perceptions regarding the use of the FC teaching approach and its impact on student teachers in the field of English language teaching in Norway. This case study, focusing on teacher educators' aspect, employs a mixed methods design and collects both quantitative and qualitative data to investigate English

language teacher educators' experience with and perceptions of the FC teaching approach. Through an online survey and in-depth interviews conducted in Norway, teacher educators' experiences with FC are examined, and their perceptions of FC with three pairs of advantages and challenges are investigated. Last, implications and suggestions for teacher educators regarding the implementation of the FC teaching approach are provided.

Article III is an empirical study on student teachers' thoughts regarding the FC teaching approach with the aim of helping teacher educators make informed decisions. This case study, concentrating on student teachers' side, employs a mixed methods design, and the insights of student teachers in the field of English language teaching in Norway constitute the primary research data. A survey and focus group interviews are the main data collection instruments used. The advantages and challenges of the FC teaching approach perceived by student teachers are reported, and the possibility of student teachers becoming future flippers is explored. Last, student teachers provide some practical suggestions on implementing the FC teaching approach.

Article IV is an empirical study focusing on the perspective of student teachers to examine the effectiveness of the FC teaching approach in terms of motivation and engagement. This study employs an explanatory sequential mixed methods approach, with self-reported survey data regarding motivation and engagement and focus group interviews with student teachers in the field of English language teaching in Norway constituting the main data. In Phase 1, a quasi-experimental design was adopted, and quantitative data from the control group (the non-flipped group) and the experimental group (the FC group) was collected via a paper-based survey. In Phase 2, qualitative data from the FC group was collected via focus group interviews. The findings of these two phases revealed that there is no statistically significant difference between the two groups regarding the impact of the FC teaching approach on student teachers' motivation and engagement. However, the FC group stated that the FC teaching approach stimulates their motivation and engagement more compared to the lecture-based approach.

The main contribution of this doctoral thesis is increased knowledge about the FC teaching approach in teacher education by exploring the overall research question: *How is Flipped Classroom used in English language teacher education and in what ways can Flipped Classroom influence English language student teachers' learning?* This thesis investigates the FC teaching approach in teacher education from three perspectives—those of researchers,

teacher educators, and student teachers—with the goal of providing a holistic picture of how this approach is enacted in teacher education. The findings from this thesis show that despite the disadvantages of the FC teaching approach, both teacher educators and student teachers in English language teacher education in Norway believe the advantages make this teaching approach a promising one. Furthermore, taking the suggestions of teacher educators and student teachers into consideration, it is expected that the FC teaching approach can be well integrated into teacher education. The results of this thesis imply that more FC courses can be introduced in teacher education and that the FC teaching approach can potentially be an effective solution in pandemic situations, such as the recent global Covid-19 pandemic.

Sammendrag (abstract in Norwegian)

Denne doktorgradsavhandlingen tar for seg bruken av omvendt undervisning (Flipped Classroom, FC) som undervisningstilnærming i lærerutdanningen og FCs innflytelse på utdanningen av lærerstudenter, med spesielt fokus på engelskspråklig lærerutdanning i Norge. Avhandlingen undersøker hvordan FC brukes i lærerutdanningen, samt hvordan både lærerutdannere og lærerstudenter i Norge oppfatter denne tilnærmingen. Det overordnede forskningsspørsmålet for avhandlingen er: *Hvordan brukes Flipped Classroom i engelskspråklig lærerutdanning, og på hvilke måter kan Flipped Classroom påvirke engelskspråklige lærerstudenters læring?* Denne artikkelbaserte doktorgradsavhandlingen består av fire uavhengige, men sammenhengende forskningsartikler og en kappetekst. Kappen inneholder en diskusjon av forskning om bruk av FC i lærerutdanningen, en oversikt over avhandlingens teoretiske bakgrunn, en beskrivelse av det overordnede forskningsdesignet og anvendt metodikk, metoder for datainnsamling og dataanalyse, samt en integrert diskusjon av funnene fra de fire forskningsartiklene. Til slutt avsluttes kappen med en diskusjon av de praktiske implikasjonene av å implementere FC i lærerutdanningen, sammen med studiebegrensninger og potensielle forslag til videre forskning.

Artikkel I er en omfattende forskningsgjennomgang av forskingslitteraturen med fokus på FC i lærerutdanning, hvor forskernes perspektiver ble undersøkt. Denne studien følger strenge inkluderings- og eksklusjonskriterier og presenterer en omfattende litteraturgjennomgang av 33 studier publisert mellom 2014 og 2019. De primære funnene fra denne studien viser at FC-studier i lærerutdanning hovedsakelig ble utført i USA, med økende implementering i europeiske og asiatiske land, og med hovedvekt på fagene pedagogikk, vitenskap og språkkunst. Videre viste flertallet av FC-studiene i lærerutdanningen bruk av blandede metoder, der spørreundersøkelser var det mest brukte datainnsamlingsverktøyet. To hovedfokusområder ble identifisert på tvers av de gjennomgåtte studiene: elevoppfatninger og akademiske prestasjoner. Basert på denne syntesen diskuteres nåværende trender og fremtidig utvikling i forskningsfeltet, FCs pedagogiske verdi for lærerutdanningen, samt identifisering av potensielle kunnskapshull i forskningslitteraturen.

Artikkel II er en empirisk studie med formål å utforske lærerutdanneres oppfatninger om bruken av FC og effekten av FC på lærerstudenter innenfor engelsk språk i Norge. Denne casestudien fokuserer på lærerutdannernes perspektiv og følger et design med blandede (mixed) metoder. Både kvantitative og kvalitative data samles inn for å undersøke

engelskspråklige lærerutdanneres erfaring og oppfatning av FC som undervisningstilnærming. Gjennom en nettbasert spørreundersøkelse og dybdeintervju gjennomført i Norge undersøkes lærerutdannernes oppfatning av FC ved å identifisere tre par med fordeler og utfordringer. Til slutt presenteres implikasjoner og forslag til lærerutdannere om å ta i bruk FC.

Artikkel III er en annen empirisk studie som har som mål å gi bevis på lærerstudenters perspektiver om FC og hjelpe lærerutdannere med å ta informerte beslutninger. Denne casestudien fokuserer på lærerstudenters synspunkt og følger en forskningstilnærming med blandede metoder, hvor innsikt fra lærerstudenter innen engelsk språk i Norge utgjør de primære forskningsdataene. Undersøkelser og fokusgruppeintervjuer er hovedinstrumentene som brukes til å samle inn data i denne studien. Studien tar for seg lærerstudentenes oppfatninger av fordeler og utfordringer knyttet til FC, og undersøker også muligheten for at lærerstudenter kan bli fremtidige tilhengere av FC-tilnærmingen. Til slutt presenterer lærerstudentene praktiske forslag til implementering av FC som undervisningstilnærming.

Artikkel IV er også en empirisk studie som fokuserer på lærerstudenters perspektiv for å undersøke effektiviteten av FC når det gjelder motivasjon og engasjement. Hoveddataene består av egenrapporterte spørreundersøkelser om motivasjon og engasjement, samt fokusgruppeintervjuer med lærerstudenter innen engelsk språk i Norge. Undersøkelser og fokusgruppeintervjuer er de viktigste instrumentene for datainnsamling. Studien følger en forklarende sekvensiell forskningstilnærming med blandede metoder. I fase 1 brukte studien et kvasi-eksperimentelt design, og kvantitative data ble samlet inn fra både en kontrollgruppe (den ikke-flippede gruppen) og en eksperimentell gruppe (den flippede gruppen) gjennom en papirbasert undersøkelse. I fase 2 ble kvalitative data samlet inn fra den flippede gruppen gjennom fokusgruppeintervjuer. Basert på funnene fra disse to fasene i studien, ble det konkludert at det ikke var noen statistisk signifikant forskjell mellom de to gruppene når det gjaldt FCs innvirkning på lærerstudenters motivasjon og engasjement. Imidlertid uttrykte den flippede gruppen i fokusgruppeintervjuene at FC-undervisningstilnærmingen fremmet deres motivasjon og engasjement i større grad sammenlignet med den forelesningsbaserte tilnærmingen.

Hovedbidraget til denne doktorgradsavhandlingen er økt kunnskap om bruken av FC i lærerutdanningen ved å utforske det overordnede forskningsspørsmålet: *Hvordan brukes Flipper Classroom i engelskspråklig lærerutdanning, og på hvilke måter kan Flipped*

Classroom påvirke engelskspråklige lærerstudenters læring? Gjennom forskning fra tre perspektiver - forskere, lærerutdannere og lærerstudenter - gir avhandlingen et helhetlig bilde av hvordan FC kan implementeres i lærerutdanningen. Funnene fra avhandlingen viser at både lærerutdannere og lærerstudenter i engelskspråklig lærerutdanning i Norge ser på FC-undervisningstilnærmingen som lovende, til tross for fordeler og ulemper knyttet til tilnærmingen. Basert på forslag fra både lærerutdannere og lærerstudenter, anbefales det å implementere FC på en hensiktsmessig måte i lærerutdanningen. Resultatene tyder på at flere FC-kurs kan introduseres i lærerutdanningen, og at FC-undervisningstilnærmingen kan være en effektiv løsning, spesielt i situasjoner som den globale Covid-19-pandemien som rammet Norge våren 2020.

List of publications

Article I

Han, H., & Røkenes, F. M. (2020). Flipped Classroom in teacher education: A scoping review. *Frontiers in Education, 5*(221), 1–20. https://doi.org/10.3389/feduc.2020.601593

Article II

Han, H., & Røkenes, F. M. (in press). Teacher educators' perceptions of Flipped Classroom in teacher education: Insights from EFL teacher educators in Norway. *Nordic Journal of Digital Literacy.*

Article III

Han, H., Røkenes, F. M., & Krumsvik, R. J. (2023). Student teachers' perceptions of Flipped Classroom in EFL teacher education. *Education and Information Technologies*. https://doi.org/10.1007/s10639-023-11839-w

Article IV

Han, H., Røkenes, F. M., & Krumsvik, R. J. (under review). Flipped Classroom's impact on students' motivation and engagement. Manuscript submitted for publication in *British Journal of Educational Technology*.

List of abbreviations

CALL – Computer-Assisted Language Learning

EFL – English as a Foreign Language

ELL – English Language Learning

ESL – English as a Second Language

FC – Flipped Classroom

ICT – Information and Communication Technology

LMS – Learning Management System

MALL – Mobile-Assisted Language Learning

MES-UC – Motivation and Engagement Scale- University/College

MMR – Mixed Methods Research

MOOC – Massive Open Online Course

PDC – Professional Digital Competence

RALL – Robot-Assisted Language Learning

SDT – Self-Determination Theory

ZAD – Zone of Achieved Development

ZPD – Zone of Proximal Development

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Part I: Synopsis

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1. Introduction

This introductory chapter begins with a presentation of my doctoral project. Then, this chapter outlines the research aims of the thesis and discusses Flipped Classroom (FC) from the perspective of teacher education. Subsequently, the research positionality is identified by stating my personal background and philosophical stance. This chapter concludes with an outline of the thesis and a brief overview of each chapter.

1.1 My doctoral project

> *Our verdict—the flipped classroom worked!* (Bergmann & Sams, 2012, p. 105)

This quote comes from two American teachers, Jonathan Bergmann and Aaron Sams, who started teaching chemistry at Woodland Park High School in Woodland Park, Colorado in 2006. Bergmann and Sams noticed that many students missed a great deal of school because of sports or other activities, and therefore in the spring of 2007 they began recording their live lessons using screen capture software and posting the lectures online to accommodate the students who missed classes. Bergmann and Sams found that their students loved the recorded lectures. Absent students were able to catch up by watching the recorded lectures; some students who were in class and heard the live lessons began to rewatch the recordings; and some students watched the recordings to review for exams. At the same time, the teachers loved the recorded lectures because they did not have to spend much time helping their students catch up (Bergmann & Sams, 2012, p. 4). Bergmann and Sams (2012, pp. 20–33) concluded that the FC teaching approach succeeded, stating that FC helps students of all abilities to excel and that it speaks the language of today's students. Their experience inspired me to investigate the FC teaching approach in my doctoral project.

When stakeholders in education, such as teachers and administrators, speak about the FC, they are comparing it with a traditional teacher-centered classroom where students receive "traditional face to face (F2F) instruction in class" (O'Flaherty et al., 2015, p. 85) by "quietly taking notes and copying down the homework assignment" (Ahmed, 2016, p. 417). This kind of traditional teacher-centered lecture is often characterized as a passive and transmissive teaching approach, which is "discredited as stifling of" (Yough et al., 2017, p. 411) students' motivation and engagement and as ineffective in improving students' learning (Ahmed, 2016; Turan & Akdag-Cimen, 2020). In contrast, the conceptual foundations of the FC teaching approach are based on not delivering teacher-centered lectures in a classroom environment but on student-centered learning theories (Piaget, 1968; Vygotsky et al., 1978; see Section 2.1

Flipped Classroom's theoretical framework). The FC teaching approach inverts a traditional teacher-centered classroom by assigning students lecture materials or presentations to be viewed at home or outside the classroom and prioritizing student-centered learning activities inside the classroom (Bergmann & Sams, 2012; Lage et al., 2000; Turan & Akdag-Cimen, 2020). Figure 1 provides a visual representation of typical activities found in a traditional teacher-centered classroom and in an FC. In using this inversion technique, researchers and teachers embrace the task presented by Bloom (1984)—to "find methods of group instruction as effective as one-to-one tutoring" (p. 15).
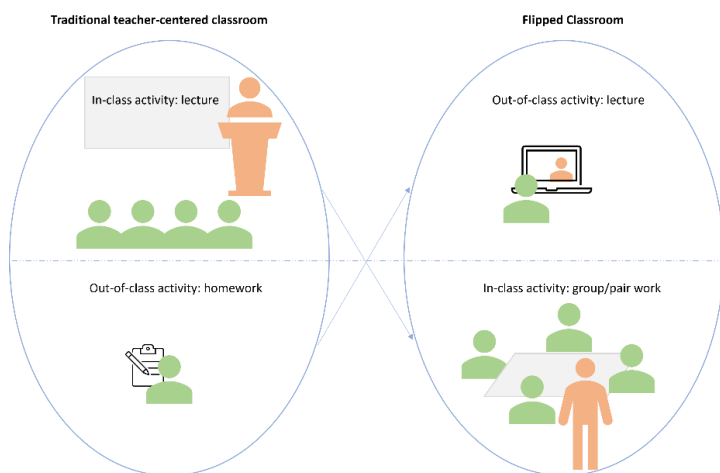
Figure 1 *Traditional teacher-centered classroom and Flipped Classroom*

Researchers such as Bishop and Verleger (2013) and Abeysekera and Dawson (2015) further argue that with the FC teaching approach, activities outside the classroom are often assisted by computers or digital technologies, and activities inside the classroom are normally interactive to promote students' active learning. Despite being around since the 2000s (Baker, 2000; Lage et al., 2000), the FC teaching approach has gained popularity in education and has attracted the attention of various stakeholders, particularly due to the pioneering work of Bergmann and Sams (Bergmann & Sams, 2009, 2012) and the rapid growth of video lecture sites, such as Khan Academy[1] and TED-Ed[2]. Recent findings of researchers in education generally seem to support Bergmann and Sams' conclusion that the FC teaching approach is successful in achieving its intended educational goals.

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[1] https://www.khanacademy.org/
[2] https://ed.ted.com/

In my doctoral project, I focus on examining the FC teaching approach in teacher education. My doctoral thesis consists of four independent but interrelated research articles and a synopsis (Figure 2). These four articles investigate the FC teaching approach in teacher education from three distinct perspectives. Article I examines FC from the perspective of researchers, Article II examines it from the perspective of teacher educators, and Articles III and IV examine it from the perspective of student teachers. In examining the FC teaching approach from these different angles, my doctoral project aims to provide a comprehensive understanding of the application of FC in teacher education.
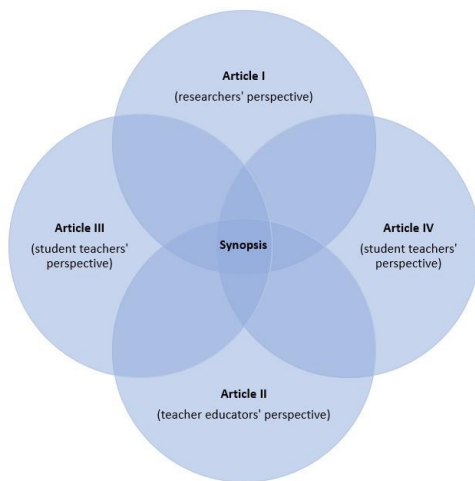
Figure 2 *The overall structure of this doctoral project*

Figure 3 illustrates the interdependence of the four articles within the interconnected structure of my doctoral project. Article I serves as the foundation, informing the research scope for Article II and influencing the research designs for Articles III and IV. Article II provides teacher educators' perceptions of the FC teaching approach to enrich the information presented in Article I. Similarly, Articles III and IV provide student teachers' perceptions of FC to further enhance the knowledge base established in Article I. Articles III and IV are mutually complementary with Article II.

Article I
(researchers' perspective)

inform research design   provide STs' perceptions   provide STs' perceptions   inform research design

Article III
(student teachers' perspective)

inform research scope   provide TEs' perceptions

Article IV
(student teachers' perspective)

complementary   complementary

Article II
(teacher educators' perspective)
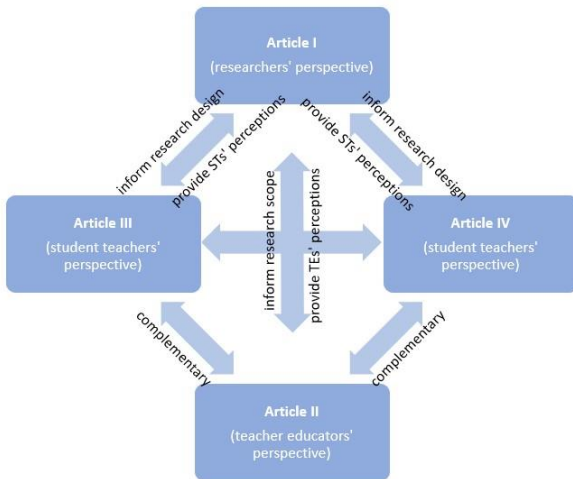
Figure 3 *The interrelation between the four articles in this doctoral project*

The interconnectedness between the four articles results in a comprehensive and holistic examination of the FC teaching approach in teacher education, with each article building upon and augmenting the others. Article I, a scoping review study, serves as a foundation that lays the groundwork and establishes a baseline for the entire thesis. Article I provides a broad overview of FC in teacher education, offers key insights, and sets the scope of the subsequent research. Building upon the foundation of Article I, the three empirical articles in this thesis —Article II, Article III, and Article IV—dig deeper into the subject from different perspectives. Each of these articles contributes a unique perspective, shedding light on specific aspects of the FC teaching approach in teacher education. Thus, a more comprehensive and multi-faceted understanding emerges. Together, these four articles collectively paint a rich picture of the FC teaching approach in teacher education and form a comprehensive body of knowledge that provides valuable insights for researchers, educators, and policymakers alike.

1.2 Research aims

According to Nygaard and Solli (2021), the introductory chapter of a synopsis "plays a crucial role" (p. 122), having two essential functions—"zooming in" and "zooming out" (p. 123). In the following "zooming in", I will introduce the research aims of my doctoral project and present the overall research question this thesis seeks to address. In the subsequent "zooming out" (see Section 1.3 Flipped Classroom from a teacher education perspective), I

will contextualize the thesis within the broader landscape of FC research in teacher education to present how my research relates to that of other researchers.

Since Bergmann and Sams started employing the FC teaching approach in their chemistry class in 2007 (Bergmann & Sams, 2009, 2012), FC has attracted significant attention from researchers across educational levels, from primary education (Aidinopoulou & Sampson, 2017; D'Addato & Miller, 2016; Sezer, 2017) to secondary education (Abdelrahman et al., 2017; Kostaris et al., 2017; Ng et al., 2022; Ölmefors & Scheffel, 2021) to higher education (Brewer & Movahedazarhouligh, 2018; Lundin et al., 2018; O'Flaherty et al., 2015). Although research on FC in upper secondary school contexts is more prevalent compared to primary and lower secondary school contexts (Satparam & Apps, 2022), it is important to note that the FC teaching approach has its roots in higher education (Talbert, 2017) and has been extensively and globally adopted in that environment (Lin & Hwang, 2019; Senali et al., 2022). In higher education, FC studies have been conducted across various subject disciplines, such as medical education (Hew & Lo, 2018; Lin & Hwang, 2019), engineering education (Karabulut-Ilgu et al., 2018), and business and entrepreneurship education (Senali et al., 2022). Research on the FC teaching approach in higher education has identified some benefits. For instance, FC can help improve students' learning outcomes, motivation, engagement (Khanova et al., 2015), confidence (Schneider & Blikstein, 2016), and attendance (Chen et al., 2014), and students generally perceive this approach positively (Bishop & Verleger, 2013). However, researchers have also highlighted some drawbacks. For instance, the FC teaching approach increases the workload of both teachers and students (Critz & Knight, 2013; Hall & DuFrene, 2016), and more supervision is required during in-class time (Hoffman, 2014).

Although there is extensive research on the FC teaching approach in higher education, there is a research gap. For instance, more research on FC from Europe is desirable (O'Flaherty et al., 2015), and further research on implementing FC in the subject discipline of English in different countries is necessary (Turan & Akdag-Cimen, 2020). The scoping review study by O'Flaherty et al. (2015) reflected the increased use of FC in higher education and provided a comprehensive overview of the relevant research. The authors found "there was a notable absence of literature from Europe" (O'Flaherty et al., 2015, p. 87) in the context of higher education, including teacher education. Turan and Akdag-Cimen (2020) systematically reviewed 43 articles focusing on use of the FC teaching approach in English language teaching and found that five studies (12%) were conducted in Europe, all in Turkey.

Therefore, it would be extremely valuable for researchers to conduct "more studies on the use of flipped classroom method in EFL courses in countries with different cultures and educational trends" (Turan & Akdag-Cimen, 2020, p. 600). Moreover, the FC teaching approach is usually explored from a single perspective, such as that of students (Adnan, 2017; Dove & Dove, 2017b; González-Gómez et al., 2022) or teachers (Ford, 2015; Tomas et al., 2019). For instance, González-Gómez et al. (2022) concentrated on science student teachers' self-efficacy and attitudes vis-à-vis the FC teaching approach, while Ford (2015) used a teacher's perspective in sharing her experience of teaching mathematics with the FC teaching approach. Due to the space constraints of studies, it is understandable that a single study cannot examine use of the FC teaching approach from multiple perspectives. However, a doctoral thesis has an advantage in this regard. In addressing the research gaps and limitations, the primary research aim of this thesis is to explore the use and influence of the FC teaching approach on the education of student teachers from different perspectives, with a special focus on English language teacher education. The overall research question addressed in this thesis is:

> *How is Flipped Classroom used in English language teacher education and in what ways can Flipped Classroom influence[3] English language student teachers' learning?*

To best address this overall research question, this doctoral research project is divided into four empirical research articles that contribute insights from different perspectives (see Figure 2), thus providing a comprehensive examination of the use and influence of the FC teaching approach in teacher education. Table 1 provides an overview of this thesis and the four empirical articles.

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[3] In the context of this research question, influence refers to the affect the FC teaching approach has on the learning of English language student teachers, which suggests how this approach can shape or change student teachers' learning experiences. Different from causality, which refers to a specific cause-and-effect relationship between variables, examining the influence of the FC teaching approach on English language student teachers' learning in this doctoral thesis involves exploring how this approach influences student teachers' learning experiences and perceptions. This thesis does not establish a direct causal relationship between the FC teaching approach and student teachers' learning but rather advances understanding of the potential impact this approach may have.

Table 1 *Overview of thesis and research articles (adapted from Røkenes, 2016, p. 7)*

Research aim	To explore the use and influence of Flipped Classroom on the education of student teachers from different perspectives, with a special focus on English language teacher education.			
Overall research question	*How is Flipped Classroom used in English language teacher education and in what ways can Flipped Classroom influence English language student teachers' learning?*			
	Article I	**Article II**	**Article III**	**Article IV**
Title	Flipped Classroom in Teacher Education: A Scoping Review	Teacher Educators' Perceptions of Flipped Classroom in Teacher Education: Insights from EFL Teacher Educators in Norway	Student Teachers' Perceptions of Flipped Classroom in EFL Teacher Education	Flipped Classroom's Impact on Students' Motivation and Engagement
Sub-research questions	*1. What are the trends in FC in teacher education? 2. What are the research foci and findings of the presented studies on FC in teacher education?*	*1. What experiences with the FC approach do teacher educators report? 2. How do teacher educators perceive the FC in teacher education?*	*1. What are student teachers' perceptions of FC regarding advantages and disadvantages? 2. To what extent do student teachers prefer FC, and what are their suggestions for its future implementation?*	*1. What is FC's impact on students' motivation and engagement? 2. How do students perceive their motivation and engagement in a course taught with the FC approach?*
Design	Scoping review	Mixed methods case study research	Mixed methods case study research	Mixed methods case study research
Sample	Published peer-reviewed articles (N=33)	English language teacher educators in Norway (N_{Survey}=25) ($N_{Interview}$=10)	English language student teachers in Norway (N_{Survey}=34) ($N_{Interview}$=19) ($N_{Exit\ ticket}$=143)	English language student teachers in Norway (N_{Survey}=78) ($N_{Interview}$=19)
Data	· Database searches · Keywords · In/exclusion criteria · Manual searches	· Surveys · In-depth interviews	· Surveys · Focus group interviews · Exit tickets	· Surveys · Focus group interviews
Analysis	Statistical analysis Qualitative analysis	Statistical analysis Thematic analysis	Statistical analysis Thematic analysis	Statistical analysis Qualitative analysis

These four research articles examine how the FC teaching approach has been used in teacher education (Article I); how this approach is used in English language teacher education (Articles II, III, and IV), focusing on the perspectives of teacher educators and student teachers; the advantages and challenges of this approach (Articles I, II, III, and IV); and the impact of this approach on motivation and engagement (Articles I and IV). The articles collectively contribute to a more comprehensive understanding of the FC teaching approach in teacher education, by studying its use in English language teacher education and the perceptions of researchers, teacher educators, and student teachers.

1.3 Flipped Classroom from a teacher education perspective

Research on a teaching approach in teacher education differs slightly from that in other fields of education. On one hand, student teachers in teacher education are teachers-to-be, and they are potential implementers of this teaching approach (Graziano, 2017). On the other hand, student teachers' perspectives and conceptions of teaching are based on their previous formal educational experiences (Levin, 2015). To put it simply, teachers usually teach the way they were taught (Lortie, 1975). Therefore, it is crucial to assess the effectiveness and influence of the FC teaching approach within the context of teacher education programs in order to improve instructional quality and better prepare student teachers for their teaching careers. Considering these factors, there is an ongoing need to investigate the FC teaching approach within teacher education (Adnan, 2017; Cabi, 2018; Debbağ & Yildiz, 2021; Ford, 2015; Fraga & Harmon, 2014; González-Gómez et al., 2022; Lee & Martin, 2020).

In addition, within the educational landscape of Norway, it is essential to highlight the competence goals students are expected to have achieved by the time they complete their lower secondary school education, as outlined in the national curriculum. One specific competence goal for the teaching of the English language is for students to "utilize various digital resources and other supplementary tools in language learning, text creation and interactive communication" (Ministry of Education and Research, 2019, p. 72, my translation). Therefore, to help students become proficient in this regard, it is necessary to have digitally competent teachers. These teachers can serve as mentors, providing essential support and guidance to help students achieve this competence goal. This is advantageous for both students and schools. Considering this context, it is valuable to conduct research on the implementation of the FC teaching approach within teacher education, as this approach is closely intertwined with digital competence (see Section 2.2.2 Flipped Classroom and digital competence).

The research findings in teacher education appear to echo the conclusion reached by Bergmann and Sams. The FC teaching approach seems to improve student teachers' learning outcomes (González-Gómez et al., 2016; Kurt, 2017), positively influence student teachers' motivation and engagement (Helgevold & Moen, 2015; Tomas et al., 2019), enhance student teachers' self-efficacy beliefs and self-regulated learning (González-Gómez et al., 2022; Lee & Bonk, 2019), decrease student teachers' anxiety (Dove & Dove, 2017a, 2017b), and provide student teachers a positive and interactive learning environment (Adnan, 2017; Kurt, 2017). Generally speaking, both student teachers (González-Gómez et al., 2016; Ng, 2018) and teacher educators (Ford, 2015; Tomas et al., 2019) appear to have positive attitudes toward FC.

However, there are some conflicting findings in the teacher education research. For instance, Şengel (2014) concluded that the FC teaching approach had a similar but not better effect on student teachers' learning outcomes compared to the traditional teacher-centered approach. Graziano (2017) argued that student teachers must take more responsibility with the FC teaching approach. Furthermore, some student teachers are not motivated by this approach because they do not "want to put an effort on it" (Cabi, 2018, p. 214). The controversy regarding the FC teaching approach in teacher education indicates the need for further research within this field (Debbağ & Yildiz, 2021; Goodwin & Miller, 2013) and will continue "until researchers are able to provide reliable data" (Graziano, 2017, p. 129).

This doctoral thesis aims to provide diverse research data and empirical evidence regarding the FC teaching approach from researchers in teacher education, teacher educators, and student teachers. The necessity to "synthesize research evidence has been recognized for well over two centuries" (Grant & Booth, 2009, p. 92), and review studies are a means to gather research within a particular domain (Grant & Booth, 2009). To date, there has been a lack of review studies which systematically organize empirical studies on FC in teacher education. Through a scoping review study (Article I), this doctoral thesis revealed the limited number of studies on teacher educators' perceptions of FC. However, the available studies highlighted teacher educators' positive experiences and desire to continue using the FC teaching approach. For instance, Ford (2015) shared her teaching experience with implementing FC and concluded that she desired "to continue using this teaching model" (p. 378). Tomas et al. (2019) provided a narrative account of their experiences of teaching first-year student teachers using the FC teaching approach and suggested "a flipped learning continuum" (p. 17) for student teachers to transition from a traditional teacher-centered

classroom to an FC. Due to the lack of research on teacher educators' perspectives, this doctoral project seeks to investigate teacher educators' experiences and perceptions of FC of more teacher educators and aims to collect their common opinions. Compared with limited research on the perspective of teacher educators, more studies focusing on student teachers' perceptions of FC have been conducted, and generally speaking, student teachers have favorable attitudes (González-Gómez et al., 2016; Jeong et al., 2018; Ng, 2018) due to "the time flexibility" (Fraga & Harmon, 2014, p. 22), "better learning" (Kurt, 2017, p. 216), and "creative abilities" (García-Sánchez & Santos-Espino, 2017, p. 178). However, there are some variable opinions. One student teacher in the study by Graziano (2017) stated that with the FC teaching approach, they had to "take responsibility for not only our own learning, but for our classmates as well" (p. 124). Another student teacher stated that the responsibility of learning in an FC was "completely on the students" (Dove & Dove, 2017b, p. 138). Besides responsibility, Fraga and Harmon (2014) discovered that the reasons student teachers had unfavorable attitudes toward the FC teaching approach "fell into two categories—issues of time management and confusion" (p. 22). Due to the varied research findings, this doctoral project seeks to explore student teachers' perceptions of the FC teaching approach and to provide research data from an English language teacher education program.

This doctoral project was conducted within teacher education programs in Norway and has teacher educators and student teachers in English language teacher education as participants. Therefore, this project represents an important opportunity to advance understanding of the FC teaching approach in teacher education by bridging the knowledge gap, and, as of the time of writing it is the only study investigating the FC teaching approach in an English language teacher education context from multiple perspectives.

1.4 Research positionality

Researchers are not neutral and bring their own worldviews, values, scientific beliefs, and biases to their research. "Researchers' own personal training and experiences" (Creswell & Creswell, 2018, p. 20) influence their research in a number of ways, such as how they approach a study, interpret findings, and draw conclusions (Maxwell, 2013; Merriam & Tisdell, 2015; Savin-Baden & Major, 2013). Therefore, it is essential to reflect on researchers' positionalities and note the biases they might bring to a study (Creswell & Creswell, 2018; Nygaard & Solli, 2021). Furthermore, researchers' reflexivity is considered "a core characteristic" (Creswell & Creswell, 2018, p. 200) of research and involves being aware of one's own assumptions, values, and potential biases and actively considering how

these may impact the research design, data collection, analysis, and interpretation. By practicing reflexivity, researchers can strive for transparency and rigor in their research.

My background for conducting this doctoral project is partly related to my personal teaching experience as a language teacher. I hold a master's degree in education, with a major in teaching Chinese as a second language. I was an assistant professor at Beijing Language and Culture University in Beijing, China for over 10 years and taught Chinese to students from all over the world. In my classroom, I utilized a combination of lectures and interactive tasks. Outside my classroom, my students still had an immersive Chinese learning environment. For instance, my students had to speak Chinese when they were shopping and needed to read Chinese characters while using public transportation. Thus, my students had many opportunities to practice the target language outside my classroom. Before I started my doctoral project, I had been teaching Chinese at an upper secondary school for three years in a small city in Norway. During this time, I realized that my classroom was the only place where my students could practice Chinese, and our class time was the sole opportunity for them to use the language. I deeply desired that my students in Norway could have more time and opportunities to communicate in Chinese. However, a significant portion of our class time was inevitably dedicated to lecturing about Chinese tones, pronunciation, grammar, and other essential elements. The dilemma of how I could use our class time to the greatest advantage reminded me of my own experience as an English learner. As an undergraduate studying English, I sought additional opportunities to practice the language outside the classroom. Therefore, I acquired a native English speaker as a language partner, and with this interaction, I noticed a marked improvement in my English proficiency. Regrettably, in the small Norwegian city where I taught, I was the only Chinese native speaker. Therefore, I became interested in the FC teaching approach, as one of its advantages is moving lecturing time out of class and thus freeing up class time for active learning (Onchwari et al., 2014) and collaborative learning (Udvari-Solner, 2012). Consequently, the FC teaching approach could potentially provide my students with more opportunities to communicate in Chinese, either with me or their classmates, within the classroom setting. Motivated by this possibility, I was inspired to conduct research on the FC teaching approach in language education.

In addition to researchers' personal backgrounds, it is also necessary to look at their philosophical stances as "a view of reality and knowledge that in turn informs researcher perspectives, approaches and methods" (Savin-Baden & Major, 2013, p. 54). Creswell and

Creswell (2018) emphasized the value of addressing researchers' "worldviews", "paradigms" or "epistemologies and ontologies" (p. 5):

> Although philosophical ideas remain largely hidden in research (Slife & Williams, 1995), they still influence the practice of research and need to be identified. We suggest that individuals preparing a research proposal or plan make explicit the larger philosophical ideas they espouse. This information will help explain why they chose qualitative, quantitative, or mixed methods approaches for their research. (Creswell & Creswell, 2018, p. 5)

Johnson and Christensen (2017) summarized Guba's questions characterizing research paradigms in the dialogue on the worldwide paradigm during the 1980s and 1990s and used insightful quotes from Guba (1990). For the sake of better understanding, I have included Table 2 that presents these quotes along with my own interpretations of these profound philosophical questions.

Table 2 *Questions characterizing research paradigms from Guba (Johnson & Christensen, 2017, p. 31) and my interpretations*

	Guba's questions	My interpretations
Ontology	"What is the nature of the knowable? Or what is the nature of reality?"	There is an external world independent of our minds and multiple realities that vary by power and privilege (Dewey, 1958).
Epistemology	"What is the relationship between the knower (the inquirer) and the know (or knowable)?"	Knowledge is deeply rooted in human experience and is constantly evolving based on our practical interactions with the world (James, 2010).
Methodology	"How should the inquirer go about finding out knowledge?"	Both quantitative and qualitative data can be used in research to provide the best understanding of a research problem and help researchers answer a research question (Dewey, 1938; Peirce, 2009).

These questions serve as thought-provoking guides, inviting critical reflection and prompting meaningful discussions about the nature of research, the role of a researcher, and the broader epistemological and ontological considerations that shape a researcher's investigations. By offering my interpretations, I aim to put my own spin on these questions. Based on my interpretations in Table 2 and considering the three major educational research paradigms

(quantitative research, qualitative research, and mixed methods research) (Creswell & Creswell, 2018; Johnson & Christensen, 2017; Teddlie & Tashakkori, 2009), I position myself within the mixed methods research (MMR) paradigm. The MMR paradigm is primarily associated with pragmatism in terms of ontology, epistemology, and methodology (Creswell & Creswell, 2018; Johnson & Christensen, 2017; Johnson et al., 2017; Johnson et al., 2007; Tashakkori et al., 2020). Therefore, in using a mixed methods design in my doctoral thesis and four empirical articles, I have a pragmatist stance as my research positionality.

Johnson and Onwuegbuzie (2004) listed 22 distinct principles of pragmatism and made the following point about pragmatism:

> The project of pragmatism has been to find a middle ground between philosophical dogmatisms and skepticism and to find a workable solution … to many longstanding philosophical dualisms about which agreement has not been historically forthcoming. (Johnson & Onwuegbuzie, 2004, p. 18)

Tashakkori et al. (2020) regarded this specific point as "classical pragmatism" (p. 62), which is "what most writers have in mind when they refer to 'pragmatism'" (p. 62). The above point aligns with my own perspective as a pragmatist in the context of my doctoral research project. Greene (2007, pp. 83–84) summarized the characteristics of pragmatism, including practical and problem-solving orientation, and Datta (1997) emphasized that being practical is one of "the essential criteria for making design decisions" (p. 38) for pragmatists.

According to Datta (1997, p. 38), being practical "implies a basis in one's experience of what does and does not work". In my doctoral project, I aim to explore the use and influence of Flipped Classroom on the education of student teachers from different perspectives, with a particular focus on English language teacher education. In my doctoral, the term "practical" relates to the usefulness of the FC teaching approach. In addition, by investigating researchers', teacher educators', and student teachers' perceptions of the FC teaching approach, my doctoral project has "practical" applications in terms of improving educational practices. By understanding these perceptions, teachers can better understand how to incorporate FC into their teaching practices and can provide better support to their students. Additionally, gathering researchers' insights by using a scoping review design and collecting teacher educators' and student teachers' perceptions using MMR and a case study approach is "practical" for me, as these techniques allow me to systematically identify and analyze a

large body of literature and collect data from multiple sources and perspectives. In embracing pragmatism as my philosophical stance, I adopt a practical and flexible approach that emphasizes the significance of real-world applications and the contextual nature of knowledge construction. By adopting this pragmatist perspective, I can ensure that my doctoral project is grounded in practicality and makes meaningful contributions to educational practices.

For pragmatists, "what is ultimately important and justified or 'valid' is what solves our problems and what works in particular situations in practice and what promotes social justice" (Johnson & Christensen, 2017, p. 32). Therefore, in alignment with this perspective, the exploration of ontology and epistemology will not be extensively dealt with in this thesis. While these philosophical concepts hold significance in shaping research paradigms and the understanding of knowledge, the primary focus of this thesis centers around the methodology employed in the research process (see Chapter 4 Methodology). In prioritizing the methodology, this thesis emphasizes the practical aspects of conducting research and seeks to contribute to the existing body of knowledge by offering insights into the research design and methods. By providing a comprehensive account of the methodology, I aim to equip my readers with a clear understanding of how my research was conducted, thereby enabling them to assess the credibility of the findings of this thesis.

1.5 Thesis structure

This doctoral thesis is organized into two parts, Part I: Synopsis and Part II: Articles. Part I consists of six chapters that provide essential background and context for the research conducted in this thesis.

Chapter 1 introduces this doctoral project, research aims, Flipped Classroom in teacher education, and researcher's personal background and philosophical stance.

Chapter 2 provides the theoretical and conceptual framework of this thesis. First, it clarifies Flipped Classroom's theoretical framework from the social constructivist view. Then, it explains the concept of Flipped Classroom and the connection between Flipped Classroom and digital competence. Last, it describes the relationship between computer-assisted language learning and English language learning.

Chapter 3 outlines the current state of research on Flipped Classroom, including research in teacher education, in English language teacher education, and in the Nordic region.

Chapter 4 explains the methodological framework behind this thesis and describes how the findings of this thesis were achieved through an account of the research design and methods, instruments for data collection, and analysis of the empirical data. It concludes with a discussion of research credibility, including ethical considerations and researcher bias.

Chapter 5 gives a summary of the four research articles in this thesis and presents the main findings.

Chapter 6 discusses the empirical, theoretical, and methodological implications and contributions of this thesis, as well as its limitations. It ends with some concluding remarks before the four research articles in Part II.

2. Theoretical and conceptual framework

In this chapter, the theoretical framework, concept, and development of Flipped Classroom (FC) and its connection to digital competence are presented. Subsequently, computer-assisted language learning and English language learning are described.

2.1 Flipped Classroom's theoretical framework

Different from a traditional teacher-centered classroom, the in-class time in an FC is not used for teachers to deliver lectures but for students to apply their knowledge to solve problems or complete tasks. The fundamental focus of the FC teaching approach is on student-centered learning, which has its roots in social constructivism theory (Ahmed, 2016; Bishop & Verleger, 2013). Furthermore, the FC concept aligns with Vygotsky's zone of proximal development (Erbil, 2020). In addition, self-determination theory offers valuable insights when examining the motivational aspects of implementing the FC teaching approach and the impact of FCs on student engagement and learning outcomes (Abeysekera & Dawson, 2015). Some researchers closely associate the FC teaching approach with Bloom's taxonomy (Anderson & Krathwohl, 2001; Bloom, 1956) because this approach enables teachers to design learning activities that promote students' higher-order thinking skills by incorporating the taxonomy's levels of cognitive skills (Conner et al., 2014; García-Sánchez & Santos-Espino, 2017). Additionally, a number of scholars consider cognitive load theory (Clark et al., 2006; Miller, 1956) to be relevant to FC. The FC teaching approach helps in managing cognitive load by allowing students to review and process information at their own pace. FC reduces students' cognitive overload through in-class activities that support deeper understanding and application (Abeysekera & Dawson, 2015; Turan & Göktaş, 2016). However, for the purposes of this doctoral thesis, the focus is on social constructivism theory, the framework of zone of proximal development, and self-determination theory, so other theoretical approaches to FC will not be pursued further.

2.1.1 Social constructivism theory

Developed by psychologist Lev Semenovič Vygotsky, social constructivism theory (Vygotsky et al., 1978) forms the basis of the understanding that knowledge is not a photocopy of an objective reality but rather a product of the mind's selection, interpretation, and reconstruction of experiences. According to Vygotsky et al. (1978) and Vygotsky and Kozulin (1986), knowledge develops from the interactions people have with their social and cultural environments. Therefore, knowledge is the outcome of the interplay between

subjective and environmental factors. Social constructivism emphasizes the role of social interaction, collaboration, and the construction of knowledge through meaningful experiences. Social constructivists argue that learning occurs through social interaction and the help of others, including peers and teachers. According to social constructivism theory, the process of acquiring new knowledge involves three distinct steps:

Step 1: Construction. During this initial step, people actively build up and understand a new concept by engaging in mental processes that adapt to the new information.

Step 2: Storage. Following the construction step, people store the newly constructed concept in their memory for future reference and retrieval.

Step 3: Retrieval. In this final step, people access the information stored in their memory in order to use it effectively.

These cognitive steps highlight the dynamic nature of knowledge construction and the crucial role of social interaction in the learning process.

When social constructivism theory is introduced into a classroom, it demands a shift in the teacher's role, from being the "sage" or the primary source of knowledge to being a facilitator or "guide". Social constructivism theory encourages students to actively collaborate with both their peers and teachers in the process of constructing, understanding, and applying knowledge. The principles of active learning, collaborative learning, and cooperative learning[4] advocated by social constructivism theory are aligned with the FC teaching approach (Bishop & Verleger, 2013; Erbil, 2020; Karabulut‑Ilgu et al., 2018; Lage et al., 2000; Onchwari et al., 2014). With the FC teaching approach, students engage in out-of-class activities, such as watching video lectures, to construct and store new knowledge. When they come to the classroom, they retrieve, apply, and reconstruct their knowledge by working on collaborative learning tasks with their peers under the guidance of the teacher. Thus, social constructivism as the underlying theoretical framework aligns with the principles, practices, and benefits of the FC teaching approach (Bishop & Verleger, 2013).

In this doctoral thesis, the implementation of the FC teaching approach involves a pre-class phase where student teachers independently engage with instructional content, such as video

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[4] In this doctoral thesis, active learning means that students actively participate in the learning process, as opposed to sitting quietly and listening; collaborative learning means there are opportunities for students "to learn from more competent peers" (Udvari-Solner, 2012, p. 632); and cooperative learning as a specific kind of collaborative learning means that students work together in small groups.

lectures or reading materials. This phase provides student teachers the opportunity for individual knowledge construction and storage. The subsequent in-class phase of the FC teaching approach offers an ideal setting for the application of social constructivist principles. During this in-class phase, student teachers actively participate in group or pair activities, thus fostering a rich environment where social constructivism theory can come into play. By sharing their perspectives, exchanging ideas, and negotiating meaning, student teachers collaboratively retrieve and construct knowledge. They draw on their own experiences while building upon the insights of their peers. As social constructivism recognizes the importance of scaffolding and support from both teachers and peers (Bruner, 1990; Wood et al., 1976), teacher educators play a crucial role during the in-class phase of an FC. Teacher educators provide guidance, facilitate discussions, ask thought-provoking questions, and offer feedback to support student teachers' learning process. Peers also contribute to each other's learning by providing assistance, sharing resources, and offering constructive feedback.

Furthermore, social constructivism highlights the creation of a community of learners, where student teachers feel comfortable sharing their ideas, asking questions, and collaborating with others. With its emphasis on active learning and interaction, the FC teaching approach fosters a sense of community within the classroom. Student teachers develop a collective responsibility for their learning and benefit from the diverse perspectives and experiences of their peers. By incorporating social constructivism in the design of an FC, teacher educators can create an environment that encourages student teachers' active participation, collaboration, and reconstruction of knowledge through meaningful social interactions. The combination of independent learning during the pre-class phase and collaborative learning during the in-class phase aligns with social constructivism theory and promotes deeper understanding and engagement among student teachers.

2.1.2 Vygotsky's zone of proximal development

The concept of the zone of proximal development (ZPD) was also introduced by Vygotsky and is defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers" (Vygotsky et al., 1978, p. 86). The concept was further developed by Vygotsky's followers (e.g., Daniels et al., 2007), who pointed out that students can proceed to the next zone of their proximal development with the help of more knowledgeable individuals, such as peers and teachers. The principle of the ZPD is based on the difference between what students can do

on their own and what they can do with the help or encouragement of their peers or teachers. According to Vygotsky et al. (1978), the learning process is enhanced through interactions with peers or teachers who are more knowledgeable. These knowledgeable others provide guidance, scaffolding, and assistance to students, helping them bridge the gap between their current abilities and their potential for further development. By engaging in collaborative activities within their ZPD, students are challenged to extend their learning and acquire new skills and knowledge. Vygotsky's ZPD framework recognizes the importance of social interaction and the role of more capable others in fostering effective learning experiences.

Vygotsky's ZPD is highly relevant and valuable vis-à-vis the implementation of the FC teaching approach. The concept aligns with the principles of the FC teaching approach, which emphasize active learning, collaborative learning, and cooperative learning, with the teacher acting as facilitator rather than the sole provider of knowledge. With the FC teaching approach, students first watch video lectures prepared by teachers who possess more knowledge of the subject matter. Students then come to class and participate in higher-level cognitive activities, such as completing learning tasks or solving problems, in collaboration with their peers and teachers. During the in-class time, the students interact with both knowledgeable teachers and peers who may better understand the content of the video lectures. In particular, students with lower levels of achievement work together with more knowledgeable peers, fostering collaborative learning experiences. By engaging in collaborative activities and problem-solving exercises during the in-class phase, students build upon the pre-existing knowledge gained from the out-of-class activities. Acting as a guide and facilitator, the teacher can assess each student's ZPD by observing their level of understanding and providing targeted support and challenges accordingly. As a personalized teaching method, the FC teaching approach encourages students to step out of their comfort zones and push their cognitive boundaries, enabling them to make significant progress in their learning. Thus, students can benefit from the FC teaching approach within the ZPD context (Erbil, 2020).

In addition, the combination of the FC teaching approach and ZPD empowers students to take ownership of their learning. By engaging with the content independently in out-of-class activities, students become active participants in the learning process rather than passive recipients of knowledge. This shift toward self-directed learning promotes autonomy, responsibility, and metacognitive skills, as students develop strategies for managing their time, setting goals, and reflecting on their learning progress. As they navigate their ZPDs

with the FC teaching approach, students become more aware of their strengths, weaknesses, and areas for improvement. They become more adapted to their individual learning needs and preferences. This self-awareness allows students to tailor their learning experiences to suit their specific requirements and optimize their learning potential.

2.1.3 Self-determination theory

Formally introduced and developed by psychologists Edward Lewis Deci and Richard M. Ryan, self-determination theory (SDT) is a psychological framework focusing on human motivation and well-being (Deci & Ryan, 1985). It is important to highlight that SDT is primarily employed in Article IV of this doctoral thesis. However, the extent to which it is explored in that article is limited due to the word constraints imposed by the publication. Therefore, I take advantage of this opportunity to elaborate on it in this section.

According to Ryan and Deci (2017), at its core SDT proposes that individuals have natural psychological needs for autonomy, competence, and relatedness. Autonomy refers to the need to experience a sense of decision making and choice in one's actions; competence relates to the need to feel capable and effective in achieving desired outcomes; and relatedness pertains to the need for meaningful connections and social interactions with others. According to SDT, when these psychological needs are met, individuals are more likely to be intrinsically motivated, experience greater well-being, and engage in activities with a sense of enjoyment and satisfaction. In contrast, when these needs are unfulfilled, individuals may experience diminished motivation and well-being and might potentially engage in behaviors driven by external pressures or obligations. SDT emphasizes the importance of supporting individuals' autonomy, competence, and relatedness in various contexts, such as education and work. By creating environments that foster individuals' autonomy and provide opportunities for skill development and meaningful social interactions, SDT suggests that motivation and well-being can be enhanced. While a significant amount of literature addresses SDT and its related concepts (Koestner & Holding, 2021; Vansteenkiste et al., 2010), the purpose of this section is to provide a brief overview of the conceptual elements comprising my theoretical framework for FC. Therefore, this section specifically concentrates on the application of SDT within the context of the FC.

By applying SDT to the FC teaching approach, teachers can design and implement instructional strategies that foster students' intrinsic motivation, the satisfaction of psychological needs, and overall well-being. Considering autonomy, competence, and

relatedness within the FC context can help in creating a positive and engaging learning environment, promoting students' active participation, and enhancing students' learning outcomes. With the FC teaching approach, students often have more control over their learning process, as they can access instructional materials and resources independently. This autonomy gives students a sense of choice, ownership, and control over their learning, which aligns with the autonomy need outlined in SDT. In addition, SDT highlights the significance of competence in fostering motivation and engagement. The FC teaching approach can facilitate the development of students' competence by providing opportunities for active learning, skill development, and self-assessment. Students engage with instructional content before class, allowing them to come to class prepared and actively participate in class activities, discussions, and collaborative projects. This active engagement can enhance students' perceived competence and sense of mastery. Furthermore, teachers can foster a supportive and inclusive classroom environment with the FC teaching approach that promotes collaboration, peer interaction, and meaningful teacher–student relationships. By incorporating social and collaborative activities within the FC framework, students' need for relatedness can be addressed, thus improving their motivation and overall engagement.

For these reasons, integrating the principles of SDT can provide a valuable lens to understand the motivational aspects of implementing the FC teaching approach and the impact of FCs on students' learning experiences. SDT offers insights into how FCs create an environment that supports students' intrinsic motivation, autonomy, and social connections, ultimately leading to improved engagement and learning outcomes.

2.2 Flipped Classroom's conceptual framework

2.2.1 Flipped Classroom

The FC is a pedagogical approach that has existed for no more than a few decades, and researchers and practitioners have proposed various definitions to capture its essence. One early definition was that of Lage et al. (2000), although they did not propose the term "Flipped Classroom". Lage et al. (2000) described the inverted (or flipped) classroom, stating that "Inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa" (Lage et al., 2000, p. 32). Lage et al. (2000) introduced the method of inverting the classroom when teaching introductory economics at Miami University in the US. In their inverted classroom, students could access videotaped lectures, PowerPoint lectures with sound, and reading materials in advance, and they "were expected to come to class prepare to discuss the relevant material"

(Lage et al., 2000, p. 33). The authors found that both students and teachers had positive perceptions of the course with the inverted classroom approach and concluded that this approach "can appeal to *all* types of learners" (Lage et al., 2000, p. 32, italics in original). In the same year, Baker (2000) applied web course management tools in his class at Cedarville College (now Cedarville University) in the US. In this class, Baker offered three online components (lectures, threaded discussions, and quizzes) for students to engage in as out-of-class activities. The in-class time was then utilized for active learning, which Baker (2000) described using with four verbs—"clarify, expand, apply, and practice" (pp. 13–14). Baker (2000) used the term "classroom flip" (p. 9), which might be the first published mention of the word "flip" associated with this approach to teaching and learning.

Bergmann and Sams, often recognized as the pioneers of the FC teaching approach (see Section 1.1 My doctoral project), adopted the definition of Lage et al. (2000) to define the FC and stated that the basic concept of the FC was "that which is traditionally done in class is now done at home, and that which is traditionally done as homework is now completed in class" (Bergmann & Sams, 2012, p. 13). Expanding on earlier definitions, Bishop and Verleger (2013) conducted a research survey to refine FC activities and highlighted two aspects—"interactive group learning activities inside the classroom" (p. 5) and "direct computer-based individual instruction outside the classroom" (p. 5). This distinction emphasizes the importance of collaborative and engaging activities during in-class time, while individual instruction using technology takes place outside the classroom. Similarly, Abeysekera and Dawson (2015) provided "a catch-all definition" (p. 1) of the FC and emphasized that with the FC teaching approach, "learning activities that are active and social" (p. 3) occur inside the classroom and "most information-transmission teaching" (p. 3) occurs outside the classroom. This definition highlights the shift in focus from passive information delivery to active and interactive learning experiences within the classroom setting.

The Flipped Learning Network (FLN) has attempted to explicitly distinguish between the FC and flipped learning. The FLN emphasizes that having students watch supplemental videos outside a class and not engaging in flipped learning is just to flip a class, stating that "Flipping a class can, but does not necessarily, lead to Flipped Learning" (FLN, 2014, p. 1). In this distinction, the FLN acknowledges that flipping a class is a subset of flipped learning. However, it is worth noting that the FLN's definition of the FC appears to be quite broad. They stated that "Many teachers may already flip their classes by having students read text

outside of class, watch supplemental videos, or solve additional problems" (FLN, 2014, p. 1). While the FLN emphasizes that flipped learning goes beyond merely flipping a class, the distinction between the two terms is somewhat blurred. The broader definition of the FC provided by the FLN seems to encompass many elements that are considered part of flipped learning.

The FC has evolved and taken many forms, ranging from being entirely in a physical classroom to being a fully online environment (Bates, 2015). In this thesis, I propose the following as a working definition of FC:

> A Flipped Classroom teaching approach is an instructional model that reverses the traditional teacher-centered teaching and learning surroundings and settings by providing teaching content outside classrooms and collaboratively completing learning tasks with applying knowledge inside classrooms. Moreover, a classroom does not necessarily need to be a room in a physical sense; instead, a classroom can be extended to other learning spaces, such as online spaces.

This working definition draws on the definitions of both Lage et al. (2000) and Bergmann and Sams (2012) and means that students need to study primary teaching content outside of classrooms and be prepared with the knowledge for in-class activities before coming to class to apply their knowledge and complete different learning tasks. Furthermore, the FC teaching approach can be implemented in either a physical classroom or an online classroom. For instance, in the context of a literature class using the FC teaching approach, students may be assigned several book chapters to read in advance. The students would then come to class to engage in group discussions and analysis of these chapters with their peers under the guidance of the teacher. Alternatively, with the development of technology, the teacher may prepare these chapters in audio or video format for students to review in advance before meeting on an online platform such as Zoom, where students can join breakout rooms to discuss and analyze the material with their peers and receive guidance from the teacher.

2.2.2 Flipped Classroom and digital competence

As Bishop and Verleger (2013) pointed out, FC activities involve "direct computer-based individual instruction outside the classroom" (p. 5). Thus, there is a close association between the FC teaching approach and the use of information and communication technology (ICT) for teaching and learning and consequently digital competence (Gómez-García et al., 2020), which is mandatory for both teachers and students. Digital competence refers to the ability to

confidently, critically, and responsibly use and engage with digital technologies for learning, work, and participation in society (European Commission, 2019). Being digital competent has become crucial for 21st-century citizens, as emphasized by the European Commission (European Commission, 2019), and digital competence is strongly connected to 21st-century education (Erstad et al., 2021). Digital competence and the FC teaching approach are closely intertwined and have a mutually beneficial relationship.

The digital competence of both teachers and students enables implementation of the FC teaching approach. In the case of courses designed using the FC teaching approach, teachers often prepare video lectures, which may include "talking head" lectures, voice-over PowerPoint presentations, interactive video lectures with embedded quiz sections, and podcasts. Teachers also need to design learning activities for students to work on the subject discipline during the in-class time, with or without ICT. Therefore, implementing FC requires that teachers possess pedagogical or professional digital competence (PDC) (Amhag et al., 2018). This refers to teachers' "proficiency in using ICT in a professional context with good pedagogic–didactic judgment and his or her awareness of its implications for learning strategies and the digital Bildung of pupils and students" (Krumsvik, 2011, pp. 44–45). Teacher's PDC involves a deep understanding of digital technologies in teaching and learning beyond technical proficiency (Lund et al., 2014). Similarly, when taking a course taught with the FC teaching approach, students need digital competence that includes basic digital skills, such as the ability to use learning management systems (LMS), digital devices, and interactive learning tools (Røkenes & Krumsvik, 2016). Students' digital competence refers to the "skills, knowledge, creativity, and attitudes required to use digital media for learning and comprehension in a knowledge society" (Røkenes & Krumsvik, 2016, p. 2), translating from the original work of Erstad et al. (2005, p. 7). Lower levels of digital competence are considered to limit students' learning experience with the FC teaching approach (Awidi & Paynter, 2019). For instance, such students may have trouble downloading or streaming video lectures, accessing online readings, or understanding how to use the necessary LMS. As a result, they may miss important content prepared by their teachers and may fall behind their peers. Therefore, digital competence in both teachers and students is a prerequisite for effectively implementing FC.

The FC teaching approach is effective in promoting both teachers' and students' digital competence (Gómez-García et al., 2020; Sevillano-Monje et al., 2022; Yoon et al., 2020). By creating video lectures, podcasts, or other digital learning resources for out-of-class activities,

teachers become more proficient in using ICT for teaching purposes (Gómez-García et al., 2020). This improves teachers' understanding of different digital tools and resources, making it easier for teachers to incorporate them into teaching practice. The FC teaching approach provides teachers with opportunities to reflect on their pedagogical practices and teaching methods and helps them develop a deeper understanding of how to use ICT effectively in their classrooms. Furthermore, FC promotes a culture of continuous learning and development among teachers. With the FC teaching approach, teachers learn alongside their students and explore new digital tools and resources together. Meanwhile, FC encourages active, collaborative, and cooperative learning, which enhances students' digital competence by fostering communication, collaboration, and problem-solving skills in digital environments (Sevillano-Monje et al., 2022). With the FC teaching approach, teachers create digital content to engage students in self-directed learning and help them develop digital skills by having them practice using digital tools and resources to acquire knowledge and collaborate with their peers (Gómez-García et al., 2020). By working in pairs or groups and engaging in discussions, students learn to use digital tools for communication, research, and presentation purposes. Moreover, the FC teaching approach promotes students' digital competence by providing them with a safe and controlled environment to explore and experiment with ICT and helps them develop the confidence and ability to use digital tools for learning, working, and participating in society.

2.3 Computer-assisted language learning and English language learning

Using the FC teaching approach in language teaching and language education typically involves computer-assisted language learning (CALL), which is broadly defined as "the search for and study of applications of the computer in language teaching and learning" (Levy, 1997, p. 1). CALL has a rich history that can be traced back to 1954 and Burrhus Frederic Skinner, who "advocated the use of teaching machines" (Levy, 1997, p. 14). Since then, CALL has developed rapidly (Chapelle, 2001; Chapelle & Sauro, 2017; Levy, 1997).

Early developers of CALL suggested that computers could be used to teach languages through programmed instruction and recognized that using computers is beneficial to practice the forms of language, particularly grammar and vocabulary (Ahmad et al., 1985). The advent of the Internet in the 1990s accelerated the development of web-based CALL programs, enabling language learners with an Internet connection to access learning materials and resources from anywhere. In the 2000s, the development of new technologies, such as mobile devices, led to the emergence of mobile-assisted language learning (MALL), which

provided new opportunities for language learners to practice and engage with language materials and resources. In CALL, technology is used to provide language learners with additional resources and tools to support their language learning. At present, CALL continues to evolve with new technologies and approaches to language teaching and learning, such as robot-assisted language learning (RALL), chatbots, and artificial intelligence (AI). Language educators and researchers continue to explore the potential of CALL to provide language learners with new opportunities to engage with language materials and resources.

CALL plays a significant role in the context of FC, as it provides additional resources and tools to support language learners. Teachers using the FC teaching approach often prepare video lectures, which are uploaded to LMS for students to review before coming to class. This integration of technology in the FC improves students' access to language materials and allows them to engage with content prior to class, thereby optimizing in-class time for interactive and collaborative language learning activities. FC and CALL are complementary approaches that can be used together to support language learning in a variety of contexts (Ghufron & Nurdianingsih, 2021). The integration of CALL and FC offers language learners the benefits of both approaches—the flexibility and accessibility of digital resources through CALL and the active and interactive learning experiences facilitated by the FC.

English language learning (ELL) refers to the process of acquiring and developing proficiency in the English language. There are many approaches to ELL, including classroom-based instruction, online courses, self-study programs, and immersion experiences. In recent years, technology has played an increasingly important role in ELL, with CALL and MALL becoming popular tools for learners to improve their English language skills (Richards & Rodgers, 2014). Integrating technology into ELL has proven to be effective and beneficial. Research has shown that effective ELL programs should incorporate a variety of pedagogical methods and that successful ELL programs should endeavor to promote learners' autonomy, providing learners with the tools and resources they need to take control of their own learning and to develop their language skills independently (Celce-Murcia et al., 2014; Ellis, 1985). In the Norwegian context, there is a strong emphasis on integrating technology into ELL (Brevik et al., 2020), which reflects the recognition of the potential benefits technology can bring to ELL.

When discussing research on English language teaching in schools and higher education in Norway, the terms English as a Second Language (ESL) and English as a Foreign Language

(EFL) are often used interchangeably (Lund, 2003; Røkenes, 2016). The term EFL is used in Articles II, III, and IV in this doctoral thesis because EFL is commonly used in international publications. However, the notion of EFL may not satisfactorily characterize the status of English in Norway (Jakobsen, 2022). According to Brevik (2015, p. 4), "Norway has traditionally, but somewhat inaccurately, been included among the countries where English is considered a foreign language". In various aspects of Norwegian life, English is often seen as a second language rather than a foreign one, due to widespread exposure and the resulting advanced proficiency (Crystal, 2012; Jakobsen, 2022; Rindal, 2014). In addition, English holds a unique position in Norway. English is a compulsory subject starting in the first grade and has its own national curriculum, thus distinguishing the position of English from that of other foreign languages, such as French and Spanish, in Norwegian schools (Ministry of Education and Research, 2019). This recognition of English as a subject discipline further supports the notion that English is more than just a foreign language in the Norwegian education system. The term ESL is usually employed in countries where English is an official language (Dahl, 2014), which is not the case in Norway where Norwegian and Sámi are the official languages. To address the dilemma of the terms, ELL and English language are used in the synopsis of this doctoral thesis to address the complexity and nuances of English language instruction in Norway.

The FC teaching approach has been applied in ELL since 2014 and has gained popularity among researchers (Turan & Akdag-Cimen, 2020). The review study by Turan and Akdag-Cimen (2020) examined the trends and main findings regarding the FC teaching approach in the context of ELL. One of the key advantages is its potential to enhance the learning experience. By allowing learners to engage with language content at their own pace, the FC teaching approach accommodates individual learning needs. The approach can be particularly helpful for English language learners who may need more time to process and understand new information. FC also provides more opportunities for active, collaborative, and cooperative learning activities, such as pair and group work. These interactive tasks are essential for developing English language skills. Furthermore, the FC teaching approach enables a more personalized and individualized approach to learning, as teachers can provide more targeted support and feedback to students during in-class activities. This personalized attention from teachers can greatly contribute to improving students' English language proficiency.

3. Current state of research on Flipped Classroom

This chapter discusses the current state of research on Flipped Classroom (FC). The process of identifying and selecting studies for this chapter is briefly outlined. This is followed by a comprehensive overview of the research on the use of FC, including in teacher education, in English language teacher education, and in the Nordic region.

This chapter—particularly Section 3.2 Flipped Classroom in teacher education—differs from Article I (*Flipped Classroom in teacher education: A scoping review*) in this doctoral thesis in several aspects, including the aim, scope, criteria, methods, and reporting. As indicated by the title, Article I is a scoping review study that primarily focuses on the FC teaching approach in teacher education and that explores FC from the perspective of researchers. The aim of Article I is to identify the extent, range, and nature of available research on FC in teacher education and to identify gaps in the existing evidence. The studies included in Article I are peer-reviewed articles published before January 1, 2020. The findings are presented in a tabular format, providing an overview of the included studies (see Table 3 in Article I). However, the current chapter presents a traditional or narrative literature review (Grant & Booth, 2009; Hart, 2018) with the primary purpose of providing a comprehensive and interpretive summary of the existing literature on the FC teaching approach. The aim is to identify key themes, concepts, theories, and gaps in the study of FC. The studies included in this chapter were selected based on their relevance to the topic of this doctoral thesis and their contribution to the understanding of the topics. They have a longer time frame and a broader range of sources and include peer-reviewed empirical studies, books, book chapters, and doctoral theses, allowing for a comprehensive synthesis of the literature. The findings of the narrative literature review are presented in a narrative format and are organized thematically to create a comprehensive overview of the existing literature.

The FC has been a popular pedagogical approach for nearly two decades in education, both K-12 education (Bergmann & Sams, 2012; Satparam & Apps, 2022) and higher education (O'Flaherty et al., 2015; Talbert, 2017). The FC teaching approach has also been of interest to scholars for about 10 years in teacher education (Debbağ & Yildiz, 2021; González-Gómez et al., 2016; Jong, 2023), in English language teacher education (Cabi, 2018; Kurt, 2017; Lee & Martin, 2020) and in the Nordic region (Helgevold & Moen, 2015; Hultén & Larsson, 2018). By highlighting these studies, it becomes evident that the FC teaching approach has attracted the attention of scholars across virtually all educational contexts.

3.1 Process of identifying and selecting research

The overall research question addressed in this thesis is *How is Flipped Classroom used in English language teacher education and in what ways can Flipped Classroom influence English language student teachers' learning?* Therefore, it is important to identify research on the FC teaching approach in teacher education and then specify research focusing on FC in English language teacher education. Given that this thesis is positioned in a Norwegian and Nordic teacher education context, it is relevant to explore research on the FC teaching approach in the Nordic region. First, exploring research on the FC teaching approach in teacher education can provide a broader understanding of how it is utilized in the preparation of teachers across various subjects and disciplines. Second, narrowing down the focus to FC in English language teacher education is essential to understand the specific application and implications of the FC teaching approach in the context of preparing English language teachers. Last, considering the Nordic region aligns with the specific context of this doctoral thesis, and this regional focus can contribute to understanding the unique characteristics and considerations related to FC implementation within the Nordic teacher education context. To a certain extent, this literature review might overlap somewhat with the content discussed in the four articles in this thesis. However, it differs from them due to the distinctive focus of this thesis, which centers around the overall research question and involves a broader scope.

A systematic and comprehensive search strategy was employed in conducting this narrative literature review to identify relevant studies related to the topic of interest. The following steps were taken to ensure a rigorous and inclusive review process. First, multiple electronic databases were searched, including Education Resources Information Center (ERIC), Web of Science, JSTOR, Scopus, and Google Scholar, to retrieve relevant articles. These databases were chosen based on their extensive coverage of literature concerning education and language teaching. Second, a combination of keywords was used to construct search queries. The search terms included variations of "flipped classroom", "teacher education", "English language", "Nordic", and related terms. Boolean operators (e.g., AND, OR) were employed to refine the search and capture relevant studies. Third, studies were included if they met at least one of the following criteria: (a) focus on the FC teaching approach in teacher education, (b) specifically address FC in English language teaching or learning, and (c) center on FC in the Nordic region and written in English. Studies that did not meet these criteria were excluded. Next, titles and abstracts of the retrieved studies were screened to determine their relevance to the overall research question of this thesis, and full-text studies were

assessed for eligibility based on the inclusion and exclusion criteria. Subsequently, relevant data from the selected studies were extracted and organized into thematic categories, and a narrative synthesis approach was adopted to analyze and summarize the findings of the included studies. Last, the findings are presented in a narrative format, highlighting common themes, results, and variations. Relevant quotes from the literature have been incorporated to support the discussion and provide illustrative examples.

By following these systematic procedures, a comprehensive narrative review of the literature on the FC teaching approach in teacher education, in English language teacher education, and in the Nordic region was conducted with the aim of providing valuable insights and identifying knowledge gaps. It is worth noting that in the introductory chapter of this thesis (see Section 1.3 Flipped Classroom from a teacher education perspective), I provide a brief overview of the relevant literature and set the stage for the main topic of my research, thus providing the general context for this thesis. However, the current review chapter builds upon the foundation laid by the mini review by examining the literature in more depth, thus providing a comprehensive analysis and synthesis of the relevant studies and research findings and allowing a more detailed understanding of the research topic.

3.2 Flipped Classroom in teacher education

The FC teaching approach has its roots in higher education (Talbert, 2017) and has been extensively and globally applied at that level (Brewer & Movahedazarhouligh, 2018; Lundin et al., 2018; O'Flaherty & Phillips, 2015). Scholars in teacher education, a study area within higher education (Zgaga, 2013), have been showing a growing interest in the FC teaching approach across various subject disciplines, such as science (González-Gómez et al., 2016; Sammel et al., 2018; Schwichow et al., 2022), language (Cabi, 2018; García-Sánchez & Santos-Espino, 2017), mathematics (Dove & Dove, 2017a; Ford, 2015), and special education (Massey et al., 2022).

Researchers in teacher education are interested in the effect of FC on student teachers' learning outcomes. Some studies have found that the FC teaching approach significantly improved student teachers' learning outcomes (Choi & Lee, 2018; Debbağ & Yildiz, 2021; González-Gómez et al., 2016; Jeong et al., 2018). However, a few studies had contrasting findings in that they found no significant differences in learning outcomes between an FC and a traditional teacher-centered classroom (Cabi, 2018; Fraga & Harmon, 2014).

Researchers in teacher education also pay attention to the impact of FC on student teachers' motivation and engagement in learning. Some studies have found that the FC teaching approach enhanced student teachers' motivation to learn (Debbağ & Yildiz, 2021; Şengel, 2014; Tomas et al., 2019; Turan & Göktaş, 2018) and stimulated their engagement in learning, both in class and outside class (Helgevold & Moen, 2015; Lee & Bonk, 2019; Tomas et al., 2019). Yet, other studies have not found a positive effect of the FC teaching approach on student teachers' motivation (Cabi, 2018; Yough et al., 2017) and engagement (Ford, 2015).

Researchers in teacher education also pay attention to student teachers' perceptions of the FC teaching approach. Many studies found that student teachers generally had positive opinions about the FC teaching approach (Aslan, 2022; García-Sánchez & Santos-Espino, 2017; González-Gómez et al., 2016; Kurt, 2017; Ng, 2018) because it stimulated better learning outcomes (Kurt, 2017), allowed more flexibility (Fraga & Harmon, 2014; Ng, 2018), allowed more creativity (García-Sánchez & Santos-Espino, 2017; Ng, 2018), and was more fun (Aslan, 2022). The FC teaching approach also promoted active learning and classroom interaction (Van Wyk, 2018) and improved confidence in teaching (Dickenson, 2014). Nevertheless, some student teachers dislike the FC teaching approach due to increased responsibility (Dove & Dove, 2017b; Graziano, 2017), an increased need for time management, and increased confusion (Fraga & Harmon, 2014).

Compared to more attention to student teachers' perceptions of FC, fewer researchers have focused on the perspectives of teacher educators (Aidoo et al., 2022; Ford, 2015; Tomas et al., 2019). Ford (2015) shared her own experience with the FC teaching approach and expressed a desire to continue using it. Tomas et al. (2019) examined how to best support first-year student teachers with the FC teaching approach and advised that appropriate teacher-led instruction is helpful for students' transition to learning in higher education. Aidoo et al. (2022) interviewed three teacher educators who adopted the FC teaching approach and examined its advantages and disadvantages.

After the Covid-19 outbreak, researchers in teacher education began focusing on the FC teaching approach in a synchronous online context (Aidoo et al., 2022; Lee et al., 2022). The Covid-19 pandemic forced a rapid shift to online education, as schools and educational institutions worldwide were closed. This transition highlighted the need to explore effective communication strategies in an online setting. The findings of Lee et al. (2022) showed that

student teachers favored a synchronous online FC and that the FC teaching approach positively enhanced student teachers' self-directed learning.

While there are a number of review studies of the literature on the FC teaching approach in K-12 education and higher education (Brewer & Movahedazarhouligh, 2018; Lin & Hwang, 2019; Lundin et al., 2018; O'Flaherty et al., 2015; Satparam & Apps, 2022; Senali et al., 2022), review studies on FC in teacher education did not exist at the time work on this thesis started.

3.3 Flipped Classroom in English language teacher education

Not limited to the context of teacher education, Arslan (2020) conducted a systematic review of 78 studies on the FC teaching approach in teaching English. This review study revealed that the FC teaching approach has positive effects on improving students' English language skills, such as writing and speaking, and concluded that the FC teaching approach is a "promising pedagogy for teaching EFL/ESL better" (p. 787). Lee and Davis (2018) reviewed research on FC in EFL and ESL contexts and in teacher education in the US. They found that the FC teaching approach provides "many advantages" (p. 689) in English language education and suggested that teacher educators create more courses with the FC teaching approach in English language teacher education. Egbert et al. (2015) tried to design an FC course in English language teacher education by following "the ideas in the literature as closely as possible" (p. 18) but found it did not fit the student teachers or the context of English language teacher education very well. This might be because "teacher education is a complex, open-ended field in which there are no exact answers, formulas, or strategies, and static lectures which many flipped experiences center on" (Egbert et al., 2015, p. 18). This might also be because student teachers were "conditioned to learn from lecture" (Egbert et al., 2015, p. 16) and were not used to the innovative FC teaching approach.

Some researchers in teacher education have focused on FC in the field of English language teaching methodology (Adnan, 2017; Cabi, 2018; García-Sánchez & Santos-Espino, 2017; Karaaslan & Çelebi, 2017; Köroğlu & Çakır, 2017; Kurt, 2017; Lee & Martin, 2020). Köroğlu and Çakır (2017) employed a quasi-experimental design with 48 first-year English language student teachers in Turkey. Twenty-three of the participating student teachers learned with the FC teaching approach, and 25 learned with a traditional pedagogical approach. This study found that there was a statistically significant difference in learning outcomes between the FC group and the non-flipped group in favor of the FC group and that

the FC teaching approach was "remarkably effective to develop pre-service English language teachers' speaking skills" (p. 52). This study also found that the FC group developed significantly in terms of fluency, coherence, lexical resources, grammar, pronunciation, and accuracy. In Turkey, Kurt (2017) achieved a similar result with 62 sophomores, finding a statistically significant difference in final exam scores between an FC group of 32 student teachers and a non-flipped group of 30 student teachers in favor of the FC group. Student teachers' self-efficacy was significantly different between the FC group and the non-flipped group in favor of the FC group.

Adnan (2017) conducted an action research study in Turkey with 70 senior-year student teachers taking the same course of Materials Development and Evaluation in ELL. Thirty-one of the participating student teachers were in an FC group and 39 were in a non-flipped group. This study found that there was no significant difference between mean scores for the FC group and the non-flipped group regarding midterms and final e-portfolios, but the participants in the FC group received significantly higher essay scores compared to the non-flipped group. Cabi (2018) conducted a study in Turkey with 59 student teachers (28 in an FC group and 31 in a non-flipped group). The findings echoed those of Adnan (2017) in that there was no statistically significant difference between the two groups in terms of the student teachers' academic achievement.

The study of García-Sánchez and Santos-Espino (2017) involved 90 student teachers in Spain working toward a master's degree. The authors found that the participants had a positive attitude toward the FC teaching approach and preferred video lectures combining teacher educators' faces and voices. Karaaslan and Çelebi (2017)'s study in Turkey had a similar conclusion in that 29 participating student teachers generally had a positive attitude toward FC. A study by Lee and Martin (2020) in the US involved 15 student teachers and used a survey and semi-structured interviews to determine what encourages them or hinders them from implementing the FC teaching approach. Thus, they identified three benefits and four challenges of the FC teaching approach. Garcia-Ponce and Mora-Pablo (2020) conducted focus group interviews with 19 student teachers in Mexico and found that they perceived the FC teaching approach as innovative and beneficial for learning. However, their lack of familiarity with the FC teaching approach was challenging for them.

Yaşar and Polat (2021) investigated the FC teaching approach in a fully online context in Turkey, where 27 participants from an English language teaching program took a four-week

online FC course based on a Massive Open Online Course (MOOC). They reported that the FC teaching approach had a significant effect on student teachers' academic achievement and that student teachers had a positive view of the MOOC-based FC course. The study of Al-Naabi et al. (2022) in Oman also investigated FC in a fully online context due to the outbreak of the Covid-19 pandemic and focused on English language teacher educators' perspectives. Al-Naabi et al. (2022) found that teacher educators shared the opinion that the FC teaching approach was beneficial during Covid-19, that this approach provided student teachers "with better exposure to the language" (p. 419), and that FC was associated with better motivation and engagement of student teachers.

Regarding previous research on FC in English language teaching, Turan and Akdag-Cimen (2020) found that fewer than half of the reviewed studies provided empirical data relating to the effect of the FC teaching approach and that the least commonly used method in research on FC in English language teaching was the qualitative method. Therefore, Turan and Akdag-Cimen (2020) suggested that both "experimental studies on the effect of the flipped classroom method on EFL education" (p. 602) and "qualitative studies" (p. 602) are essential. The systematic literature review of Kernagaran and Abdullah (2022) that aimed to identify gaps in the existing literature echoed the findings of Turan and Akdag-Cimen (2020). Kernagaran and Abdullah (2022) also noticed a lack of empirical data on the effect of the FC teaching approach, as only 25% of the included studies provided such data. In addition, Kernagaran and Abdullah (2022) found that studies on student perceptions and teacher reflections were limited, and "only two studies were conducted on teacher education" (p. 803). Therefore, Kernagaran and Abdullah (2022) suggested that future research on FC in the context of English language teaching should focus on "educator and learner perception" (p. 806) and should be conducted in the field of teacher education.

3.4 Flipped Classroom in the Nordic region

This doctoral thesis is situated in a Norwegian and Nordic teacher education context. Therefore, it is natural to explore research on FC in the Nordic region as well. The Nordic region consists of Denmark, Norway, Sweden, Finland, and Iceland, as well as the Faroe Islands, Greenland, and Åland. Researchers in the Nordic region have shown interest in the FC teaching approach and have published related studies in the Nordic languages (e.g., Barker, 2013; Hachmann & Holmboe, 2014; Sointu et al., 2018; Stormats, 2019; Worum et al., 2022) and in English. In this section, selected studies conducted in the Nordic region and published in English are discussed.

In Denmark, Triantafyllou and Timcenko (2015) introduced the FC teaching approach to university students in a statistics course and a mathematics workshop and found that out-of-class activities with the FC teaching approach enhanced students' learning and engagement. However, the authors also noticed that students missed just-in-time explanations while working on out-of-class activities. According to Kristensen et al. (2020), university students in medialogy in Denmark self-reported different evaluation ratings of their learning outcomes, workload, and the difficulty of courses with the FC teaching approach. A possible reason for the differences was found to be the teachers' ability to successfully perform a scaffolded teaching practice.

In Sweden, Hultén and Larsson (2018) interviewed teachers working in primary and lower secondary schools who had implemented the FC teaching approach and found that the FC met three objectives from the participating teachers' viewpoints—student activity in class, educational change, and being part of a digital learning community. Ölmefors and Scheffel (2021) focused on students' perspectives by interviewing upper secondary school students and discussed issues that needed to be addressed to offer students equal opportunities for learning with the FC teaching approach.

In Finland, Antonova et al. (2017) focused on higher education teachers' perceptions of the FC teaching approach and identified some barriers to its implementation, such as lack of time, support, and assistance. Hyppönen et al. (2019) investigated university students' self-regulation in relation to their academic achievement in FCs and found that the students' self-regulation profile was related to academic achievement in FC courses. Väisänen and Hirsto (2020) interviewed higher education teachers, and the results of analyzing the collected qualitative data indicated that teachers identified collaboration, communication, and information literacy brought by the FC teaching approach as facilitating the development of students' working life skills. Toivola et al. (2022) interviewed four Finnish teachers who had implemented the FC teaching approach in teaching mathematics for several years at primary and secondary schools and found three main pedagogical rationales in the accounts of teachers—"individualizing learning, fostering self-regulated learning, and fostering engagement" (p. 6). Sointu et al. (2023) investigated factors affecting university students' satisfaction with an FC course and found that FC demanded "effort in outlining the aims of the flipped approach clearly for the students, using clear and comprehensive instructions throughout the course, and designing and delivering content that allows students to focus on the key points of the course within a safe environment" (p. 516).

In Iceland, Ingason and Gudmundsson (2018) examined whether the FC teaching approach was suitable for use in teaching project management. By interviewing both university students and teachers, the authors found that FC was fruitful and relevant for teaching and learning project management and that the university students were more positive about the FC teaching approach than the teachers.

In Norway, Bergfjord and Heggernes (2016) evaluated the FC teaching approach based on university students' evaluations. They concluded that FC "worked fairly well" (p. 10) and that FC was "better viewed as a continuous process, than as an on/off switch" (p. 10). Steen-Utheim and Foldnes (2018) focused on university students' engagement and found that the affective dimension of student engagement was particularly prominent when students reflected upon learning with the FC teaching approach. Isaksen and Johansen (2020) provided an overview of the concept of FC and discussed the advantages, disadvantages, risks, and common misunderstandings related to it. Østerlie (2020) investigated the FC teaching approach in physical education in Norwegian secondary schools and found that this approach promoted deep learning. Nielsen (2023) explored university students' experiences with the FC teaching approach in an engineering mathematics course and searched for possible reasons this approach could be a source of frustration for some students. Students participating in the study of Nielsen (2023) expressed that it was difficult for them to adjust their study habits to the FC teaching approach and that it was hard for them to find the motivation to complete out-of-class activities, such as watching the required learning videos.

In teacher education, Helgevold and Moen (2015) introduced FC into the Philosophy of Science and Research Methods course in a Norwegian teacher education program with the aim of stimulating student teachers' participation and engagement. The participants in this study reported that the FC teaching approach stimulated greater involvement in learning. Østerlie and Bjerke (2023) interviewed Norwegian student teachers studying physical education to understand their perceptions of the use of the FC teaching approach and found that the participants had a positive perception. The study of Østerlie and Bjerke (2023) also found that the FC teaching approach improved student teachers' motivation and deep learning and argued that the experience with the FC teaching approach helped student teachers to use this approach in future teaching.

While some research has been carried out on FC in the Nordic region, few studies published in English have attempted to investigate the FC teaching approach in teacher education.

Although FC has gained attention in education research globally, the specific context of teacher education in the Nordic region has not been extensively explored in English language studies. This suggests a gap in the literature regarding the application and effectiveness of the FC teaching approach in Nordic teacher education programs. Consequently, there is a need for further research in this area to provide insights into the implementation of FC in the Nordic context and to determine its implications for teacher education practices.

4. Methodology

This chapter discusses the methodology employed throughout the doctoral project. This chapter starts by detailing the main research design, the methods of this thesis, and the methodology employed in the four research articles. This chapter then describes the process of collecting research data for the four article and the approaches used in analyzing the collected data, including quantitative data and qualitative data. Last, this chapter concludes by discussing the research credibility of this doctoral thesis.

It is necessary to point out that ontology, epistemology, and methodology constitute a comprehensive framework of interconnected practices and perspectives that shape the essence of research. Ontology focuses on the study and understanding of the natural world, and epistemology is the study and explanation of what knowledge is and the logic behind the knowledge. In this context, ontology defines my research framework, while epistemology determines the research questions to be examined in my research. Both ontology and epistemology are addressed in the section on clarifying my philosophical stance (see Section 1.4 Research positionality). Therefore, this chapter focuses on the methodology employed in this thesis.

4.1 Research design and methods

The overarching research methodology and design employed in this thesis consist of a mixed methods research (MMR) approach, as this thesis involves the collection of both quantitative and qualitative data and a combination of quantitative and qualitative methods (Creswell & Creswell, 2018; Johnson & Christensen, 2017; Tashakkori et al., 2020). In their work, Johnson et al. (2007) analyzed 19 definitions of MMR and offered the following general definition:

> Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration. (Johnson et al., 2007, p. 123)

Figure 4 visualizes the overarching research design of this thesis. Each of the four articles "combines elements of qualitative and quantitative research approaches" (Johnson et al., 2007, p. 123) and is described in the synopsis of this thesis.
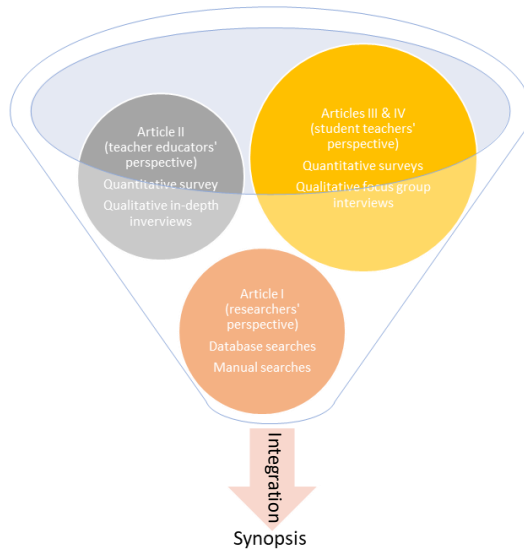
Figure 4 *The overarching research design of this thesis*

In this thesis, Article I explores researchers' perceptions of Flipped Classroom (FC) in teacher education by analyzing data obtained via database searches and manual searches. Article II investigates the implementation of the FC teaching approach from a teacher educators' perspective by collecting quantitative data via an online survey and qualitative data via in-depth interviews. Articles III and IV employ two paper-based quantitative surveys and qualitative focus group interviews to examine student teachers' perceptions of the FC teaching approach and its impact on motivation and engagement.

Articles II, III, and IV follow an explanatory sequential MMR approach, which includes two distinct phases—a quantitative phase and then a qualitative phase. The first phase involves collecting and analyzing quantitative data from surveys, and the findings from this phase provide an initial understanding of the research problems. The second phase involves collecting and analyzing qualitative data from interviews. By integrating the quantitative and qualitative findings, these articles aim to provide a more comprehensive and nuanced understanding of the research questions.

4.1.1 Mixed methods research

Different from a mere quantitative or a mere qualitative research approach, MMR combines both quantitative and qualitative approaches to help researchers gain a more complete understanding of their research questions (Johnson & Christensen, 2017; Johnson et al., 2007;

Tashakkori et al., 2020; Tashakkori & Teddlie, 2010) and to "improve the overall quality of research" (Johnson & Christensen, 2017, p. 468). With MMR, qualitative data in the form of words or narratives can enrich numerical data, and quantitative data can add precision and enhance the interpretation of qualitative information (Johnson & Christensen, 2017). Although MMR has great potential to improve research quality, it is important to acknowledge that MMR also has limitations. Johnson and Christensen (2017, p. 488) identified four drawbacks of MMR: it tends to "require more time and resources", it demands expertise in both qualitative and quantitative research, it may "yield contradictory findings" from qualitative and quantitative research, and "little is known about the relative merits of the different types" of MMR.

In this thesis, a combination of quantitative and qualitative data was employed to provide a comprehensive understanding of the implementation of the FC teaching approach in teacher education. Quantitative data, such as the percentage of participating teacher educators and student teachers, was employed to precisely represent the extent of shared opinions within this thesis. By including these numerical figures, this thesis was able to provide a more precise representation of the overall trends. Moreover, numerical data was used to investigate the impact of FC on student teachers' motivation and engagement. In addition, words and sentences from researchers in the field of teacher education, teacher educators, and student teachers were collected via surveys, interviews, and documents to enrich the interpretation of numerical data.

This doctoral thesis investigates the FC teaching approach in teacher education from three perspectives—those of researchers, teacher educators, and student teachers—"to develop a *better understanding*" (Greene, 2007, p. 98, italics in original) of how FC is enacted in teacher education. By incorporating various voices from these three perspectives, this thesis endeavors to provide "a more complete and comprehensive understanding" (Greene, 2007, p. 101) of the implementation of the FC teaching approach in teacher education. The adoption of MMR in this thesis is in line with the concept of "for purposes of complementarity" (Greene, 2007, p. 101). MMR is employed to take advantage of the strengths of both qualitative and quantitative approaches, thereby enhancing the overall understanding of the FC teaching approach in teacher education.

Teddlie and Tashakkori (2009) illustrated a continuum between qualitative, mixed methods, and quantitative paradigms called the QUAL-MM-QUAN continuum. This continuum shows

the three paradigms with three overlapping circles from pure qualitative (A) to pure quantitative (E). Figure 5 (Teddlie & Tashakkori, 2009, p. 28) visually represents this continuum. In this figure, (B) represents qualitative-dominant mixed methods, (D) represents quantitative-dominant mixed methods, and (C) represents totally integrated mixed methods. Researchers can "move across the continuum in the optimal way to further answer the initial and evolving research questions" (Teddlie & Tashakkori, 2009, p. 29). Moreover, mixed methods researchers can move "across the continuum seamlessly (and without impediment from the false dichotomies of the incompatibility thesis) to pursue answers to research questions" (Teddlie & Tashakkori, 2009, p. 29) with the "potential complementary strengths" (Johnson & Christensen, 2017, p. 51).
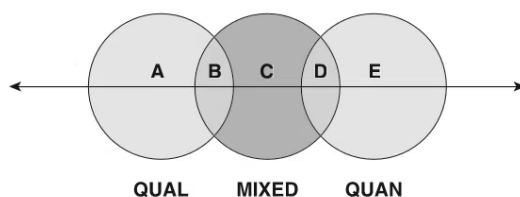
Figure 5 *The QUAL-MM-QUAN continuum (Teddlie & Tashakkori, 2009, p. 28)*

In this thesis, a comprehensive examination of the FC teaching approach in teacher education is conducted by integrating of quantitative and qualitative data from researchers, teacher educators, and student teachers. In doing this, this thesis positions itself within the zone of (C) in Figure 5. Article I examines researchers' perspective (Figure 4) and analyzes the collected quantitative data from previous studies to identify trends in the implementation of the FC teaching approach in teacher education. Quantitative and qualitative data are combined to analyze the research foci and the findings presented in these studies. Article II examines teacher educators' perspective (Figure 4) and uses quantitative survey data to provide an overview of teacher educators' insights and experiences with FC. Furthermore, qualitative data obtained from in-depth interviews is synthesized to offer a deeper understanding of teacher educators' perceptions of FC. Article III examines student teachers' perspective (Figure 4) and uses quantitative data from surveys and documents to establish a general understanding of student teachers' perceptions of FC. Qualitative data from surveys and focus group interviews are analyzed to understand student teachers' thoughts about the FC teaching approach. Article IV also examines student teachers' perspective (Figure 4) and the impact of FC on motivation and engagement by comparing quantitative data from surveys

of an FC group and a non-flipped group and qualitative data from focus group interviews. This synopsis synthesizes both the quantitative data and the qualitative data from the four studies, providing a comprehensive view of the FC teaching approach in teacher education.

4.1.2 Scoping review

Scoping reviews are also known as scoping studies (Anderson et al., 2008; Arksey & O'Malley, 2005; Levac et al., 2010; Sutton et al., 2019). Grant and Booth (2009) listed 14 review types and described scoping reviews as those that "provides preliminary assessment of the potential size and scope of available research literature" (p. 101) with the purpose of identifying "the nature and extent of research evidence" (p. 101). More recently, after significant modification and extensive discussion by a group researching the scoping review methodology, Munn et al. (2022) provided a formal and explicit definition of scoping reviews:

> Scoping reviews are a type of evidence synthesis that aims to systematically identify and map the breadth of evidence available on a particular topic, field, concept, or issue, often irrespective of source (i.e., primary research, reviews, non-empirical evidence) within or across particular contexts. Scoping reviews can clarify key concepts/definitions in the literature and identify key characteristics or factors related to a concept, including those related to methodological research. (Munn et al., 2022, p. 950)

While having the potential ability to "inform policymakers as to whether a full systematic review is needed" (p. 101), Grant and Booth (2009) have argued that the weakness of scoping reviews is that they are limited in terms of "rigor" and "duration" (p. 101). Rigor refers to the thoroughness and precision of a review study, and duration refers to the amount of time required to conduct the review process. Scoping reviews have certain limitations when it comes to rigor compared to other types of systematic reviews, such as meta-analyses. Furthermore, scoping reviews typically involve a less time-intensive process, which may limit the depth of analysis and the level of detail provided. However, despite these limitations, the scoping review approach has gained popularity among researchers due to its ability to integrate research data (Daudt et al., 2013; Davis et al., 2009; Daza et al., 2021). This popularity is also attributed to the ability of scoping reviews to help researchers achieve the following four goals (Arksey & O'Malley, 2005, p. 21): to examine the extent, range and nature of research activity; to determine the value of undertaking a full systematic review; to

summarize and disseminate research findings; and to identify research gaps in the existing literature.

In this doctoral project, the decision to conduct a scoping review instead of a full systematic review was based on that the main research aim of a scoping review, which is "to describe and map a body of literature" (Peters et al., 2022, p. 954). Munn et al. (2018) provided valuable insights for researchers to determine whether a full systematic review or a scoping review is most appropriate. According to Munn et al. (2018), when researchers have a question concerning "the feasibility, appropriateness, meaningfulness, or effectiveness" (p. 3) of a specific treatment or practice, a systematic review could be considered the most valid approach. Conversely, if researchers are primarily interested in identifying specific characteristics or concepts in research and in "mapping, reporting, or discussing" (p. 3) these characteristics or concepts, a scoping review would be a better choice. This thesis sought to capture the voices of researchers in teacher education and to synthesize research data on the FC teaching approach in teacher education. With the purpose of detailing the latest experiences, developments, and knowledge about FC in teacher education, Article I in this doctoral thesis employed the scoping review approach and explored FC in teacher education from the perspective of researchers. The scoping review approach facilitated a comprehensive examination of the topic, allowing for the identification of research gaps and areas that require further investigation within the scope of this thesis. The scoping review approach proved beneficial in exploring the FC teaching approach in teacher education from the perspective of researchers and provided a solid foundation for subsequent stages of the research process of this doctoral project.

The field of scoping review studies was significantly shaped by the work of Arksey and O'Malley (2005), who published the first methodological framework for conducting a scoping review study and laid the foundation in this field. Their framework provided a systematic approach to exploring and mapping the existing literature on a specific topic and offered researchers a clear structure to follow during the scoping review process. Subsequently, Levac et al. (2010), based on their experiences of conducting scoping review studies, made some recommendations to make the scoping review approach more robust and effective. Table 3 gives an overview of the Arksey and O'Malley (2005) methodological framework and includes the insightful recommendations of Levac et al. (2010).

Table 3 The framework for conducting a scoping review

Arksey and O'Malley Framework	Levac et al. Recommendations for clarification or additional steps
Stage 1: Identifying the research question	1. Clearly articulate the research question that will guide the scope of inquiry. Consider the concept, target population, and health outcomes of interest to clarify the focus of the scoping study and establish an effective search strategy. 2. Mutually consider the purpose of the scoping study with the research question. Envision the intended outcome (e.g., framework, list of recommendations) to help determine the purpose of the study. 3. Consider rationale for conducting the scoping study to help clarify the purpose.
Stage 2: Identifying relevant studies	1a. Research question and purpose should guide decision-making around the scope of the study. 1b. Assemble a suitable team with content and methodological expertise that will ensure successful completion of the study. 1c. When limiting scope is unavoidable, justify decisions and acknowledge the potential limitations to the study.
Stage 3: Study selection	1. This stage should be considered an iterative process involving searching the literature, refining the search strategy, and reviewing articles for study inclusion. 2a. At the beginning of the process, the team should meet to discuss decisions surrounding study inclusion and exclusion. At least two reviewers should independently review abstracts for inclusion. 2b. Reviewers should meet at the beginning, midpoint and final stages of the abstract review process to discuss challenges and uncertainties related to study selection and to go back and refine the search strategy if needed. 2c. Two researchers should independently review full articles for inclusion. 2d. When disagreements on study inclusion occur, a third reviewer can determine final inclusion.
Stage 4: Charting the data	1a. The research team should collectively develop the data-charting form and determine which variables to extract in order to answer the research question. 1b. Charting should be considered an iterative process in which researchers continually extract data and update the data-charting form. 1c. Two authors should independently extract data from the first five to ten included studies using the data-charting form and meet to determine whether their approach to data extraction is consistent with the research question and purpose. 2. Process-oriented data may require extra planning for analysis. A qualitative content analysis approach is suggested.
Stage 5: Collating, summarizing, and reporting the results	Researchers should break this stage into three distinct steps: 1a. Analysis (including descriptive numerical summary analysis and qualitative thematic analysis), 1b. Reporting the results and producing the outcome that refers to the overall purpose or research question, 1c. Consider the meaning of the findings as they relate to the overall study purpose; discuss implications for future research, practice and policy.

Through the integration of a foundational framework (Arksey & O'Malley, 2005) and supplementary recommendations (Levac et al., 2010), researchers can improve their efficiency in navigating the scoping review process while ensuring the overall quality of their study. Therefore, Article I in this thesis followed the Arksey and O'Malley (2005) framework and adopted Levac et al. (2010)'s recommendations (Table 3). First, I and the co-author of Article I identified and clearly proposed two research questions to guide this scoping review study. Second, we identified relevant studies, developed search terms and a set of inclusion and exclusion criteria, and chose two electronic databases to search. Third, we selected studies by searching databases, searching manually, screening titles and abstracts, screening full texts, and selecting eligible articles for inclusion. Thus, we selected 33 studies for inclusion. Next, during the data charting stage, we determined appropriate variables to extract in order to answer the research questions, such as year of publication, country location, research design, and methodology. We then analyzed the included studies and used the strategy of coding and categorization (Saldaña, 2016). Last, we summarized, reported on, and discussed the findings of the 33 included studies. During this final stage, we included both a descriptive numerical summary analysis regarding the general characteristics and research methods of the included studies and research foci and a qualitative analysis regarding student perceptions, attitude, motivation, and emotions. Moreover, we reported the results and discussed the findings, referring to the overall research purpose or research questions.

4.1.3 Case study research

Case study research (Creswell & Poth, 2018; Merriam & Tisdell, 2015; Stake, 1995; Yin, 2014), which has a long and notable history across many subject disciplines (Creswell & Poth, 2018), was also employed in this thesis. Stake (1995) established procedures for conducting case study research, and Creswell and Poth (2018) provided a comprehensive definition of case study research, as follows:

> Case study research is defined as a qualitative approach in which the investigator explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information (e.g., observations, interviews, audiovisual material, and documents and reports), and reports a case description and case themes. The unit of analysis in the case study might be multiple cases (a multisite study) or a single case (a within-site study). (Creswell & Poth, 2018, pp. 96–97)

According to this definition, it is the bounded system(s) that can define the case(s); therefore, case study research may be combined with other methodological approaches, such as MMR (Merriam & Tisdell, 2015). Guetterman and Fetters (2018) argued that case study research can be well integrated with MMR. They identified two methodological approaches to such integration and characterized "mixed methods–case study designs" as mixed methods studies with a nested case study and "case study–mixed methods designs" as case studies with nested mixed methods. The three empirical MMR studies in this thesis, Articles II, III, and IV, employed case study research in the research design, with the cases being English language teacher educators and student teachers in Norway. While case study research is often seen as broader than MMR and my research primarily involves English language teacher educators and students in Norway, the overall research design of this thesis could be characterized as a case study. However, it is important to emphasize that the scoping review study conducted in this thesis is distinct from a case study. Based on Guetterman and Fetters (2018), the integration of mixed methods and a case study within the context of my thesis falls under the category of "mixed methods–case study designs". Therefore, I identify the overarching research methodology and design of this thesis as MMR instead of a case study.

According to Creswell and Poth (2018, p. 96), "the entire culture-sharing group in ethnography" can be studied as a case. Therefore, case study research means the study of one case or cases within a real-life setting (Yin, 2014). Furthermore, the case or cases may be at a concrete level, such as an individual or group level, or at a less concrete level, such as a relationship or a specific project (Creswell & Poth, 2018; Yin, 2014). It may therefore be challenging for researchers to "identify the case" (Creswell & Poth, 2018, p. 102), to study "a single case or multiple cases" (Creswell & Poth, 2018, p. 102), and to provide enough basis for generalization (Crowe et al., 2011). When using multiple cases in research, Creswell and Poth (2018) suggested that researchers consider "resource limitations, case selection, and cross-case analysis" (p. 102).

Cases in this doctoral thesis are groups—teacher educators and student teachers in English language teacher education programs in Norway. In Article II, the case is a group of 25 English language teacher educators in Norwegian primary and lower secondary school teacher education programs. This group of teacher educators from 14 higher education institutions with English language teacher education programs in Norway had the experience of implementing FC in their teaching and participated in an online survey for Article II. Of this group, 10 teacher educators working at six different universities in Norway came from

four countries (Norway, two other European countries, and the US) and participated in in-depth interviews. In Articles III and IV, the case is a group of English language student teachers qualifying to teach grades 1–7 and grades 5–10[5] from a teacher education program at a Norwegian university. There are two sub-groups: the FC group and the non-flipped group. The FC group is the case in Article III, while both the FC group and the non-flipped group are the cases in Article IV.

English language teacher educators and student teachers in Norway were chosen as cases in this doctoral thesis because this thesis investigates the FC teaching approach in teacher education programs in Norway. The prerequisite for English language teacher educators taken as the case in Article II was that they had implemented FC in their teaching because the aim of this article was to explore teacher educators' shared insights and experiences with FC. Two sub-groups of English language student teachers were selected as the case in Articles III and IV. The FC group was chosen as the case in Article III because this article aimed to investigate student teachers' perceptions of FC. The FC group and the non-flipped group, both from the same course taught by the same teacher educator, were chosen as the cases in Article IV because this teacher educator is interested in the FC teaching approach and would like to implement FC. Article IV aimed to explore the impact of FC on student teachers' learning motivation and engagement. With the same teacher educator teaching the same course, it aimed to "control for confounding variables" (Johnson & Christensen, 2017, p. 355) and compare the learning motivation and engagement of the two sub-groups of student teachers.

4.1.4 Sampling

Sampling is the procedure of "drawing a sample from a population" (Johnson & Christensen, 2017, p. 252). When researchers aim to understand the characteristics of a population, they select a sample from the population and study the characteristics of the sample. Because a sample is normally much smaller in size than a population, this can save researchers' time. After researchers study the characteristics of a sample, they attempt to generalize from the sample to the whole population, which means that researchers make statements about the population based on the sample data (Johnson & Christensen, 2017, p. 252).

In this thesis, the sampling in the scoping review study (Article I) was guided by a set of inclusion/exclusion criteria (Pham et al., 2014; Tricco et al., 2016). Meanwhile, the three

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[5] In Norway, elementary schools consist of grades 1–7 and lower secondary schools consist of grades 8–10.

empirical case studies (Articles II, III, and IV) in this thesis employed both purposive sampling and convenience sampling strategies when recruiting and selecting participants (Creswell & Creswell, 2018; Johnson & Christensen, 2017; Maxwell, 2013; Patton, 2015; Tashakkori et al., 2020). According to Johnson and Christensen (2017), in purposive sampling a researcher first specifies "the characteristics of a population of interest and then tries to locate individuals who have those characteristics" (p. 268). In convenience sampling, researchers "include in their sample people who are available or volunteer or can be easily recruited and are willing to participate" (p. 267). "Using a convenience sample can be both time- and cost-effective" (Given, 2008, p. 125). Purposive sampling "is a strategy in which particular settings, persons, or activities are selected deliberately in order to provide information that can't be gotten as well from other choices " (Maxwell, 2013, p. 97). According to Patton (2015):

> [the] power of purposeful sampling lies in selecting *information-rich* cases for in depth study. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the inquiry, thus the term *purposeful* sampling. (Patton, 2015, p. 264, italics in original)

The precise sample size needed for a study is "related to many factors that vary across studies" (Tashakkori et al., 2020, p. 165). In this thesis, the sample in Article I consisted of 33 peer-reviewed studies on the FC teaching approach in teacher education published between 2014 and 2019 (N=33); the sample in Article II consisted of 25 English language teacher educators in Norwegian primary and lower secondary school teacher education programs (N=25); the sample in Article III consisted of 34 English language student teachers from a teacher education program at a Norwegian university (N=34); and the sample in Article IV consisted of two cohorts of English language student teachers (N=78), including an FC group (N=34) and a non-flipped group (N=44) from the same course taught by the same teacher educator. The 25 English language teacher educators with experience of implementing FC in their teaching were purposefully sampled to explore their shared experiences and their insights regarding the FC teaching approach. The FC group and the non-flipped group were purposefully sampled to examine the impact of FC on student teachers' learning motivation and engagement. In addition, of the 25 English language teacher educators, 10 were voluntarily recruited to participate in in-depth interviews as a convenience sample. Meanwhile, the participating English language student teachers were

also voluntarily recruited to participate in survey and focus group interviews and to complete exit tickets (see Section 4.2.4 Documents) for each session.

4.2 Data collection

This doctoral thesis collected data from databases and manual searches, surveys, interviews, and documents. Specifically, this thesis collected data from database searches and manual searches for Article I, from an online survey and in-depth interviews for Article II, from a paper-based survey, focus group interviews, and documents for Article III, and from a paper-based survey and focus group interviews for Article IV. In this section, I discuss the instruments and procedures for collecting data for this thesis. Data collection was not limited to a single instance but was an ongoing process from 2019 to 2021. Using this cumulative approach, I was able to gather diverse data from a wide array of sources. These sources include primary and secondary sources, surveys, interviews, and documents. This approach allows for a more robust and nuanced analysis, enabling a deeper exploration of the subject matter.

4.2.1 Database and manual searches

Database searches were conducted to collect relevant peer-reviewed articles as data for the scoping review study (Article I). Peer review, "an external seal of approval" (Gannon, 2001, p. 743), is a process to approve a scientific work as valid. Generally, an academic community does not accept a scientific hypothesis or statement unless it has been peer reviewed (e.g., Gannon, 2001; Mulligan, 2005). Even though the peer review is not flawless, its benefits are real (Gannon, 2001), including filtering poor research, upholding the quality of published works, and supporting editors' decisions (Gannon, 2001; Mulligan, 2005). Thus, only published peer-reviewed articles were collected for Article I.

The search terms in Article I were developed and categorized based on two dimensions. One dimension was related to the FC teaching approach (i.e., the activity examined), while the other dimension was related to student teachers and teacher educators (i.e., the participants in the activity examined) to narrow the search within the field of teacher education. Each search term was separated by the Boolean operator OR, and each dimension was separated by the Boolean operator AND. Following the set of inclusion and exclusion criteria, two electronic databases were searched—ERIC and Web of Science. As the time frame for included studies in Article I was 2000–2019, the last database search was conducted on January 1, 2020. Moreover, a manual search was conducted to "locate relevant studies missing in the database

searches" (Røkenes & Krumsvik, 2014, p. 255). Manual searches or hand searches "nicely supplement database searches" (Vassar et al., 2016, p. 304) and "identify additional primary studies" (Vassar et al., 2016, p. 302). Eventually, 33 peer-reviewed articles were included in Article I, 22 from ERIC, nine from Web of Science, and two found via the manual search.

Both database and manual searches play important roles in a scoping review study, but they also have limitations. While database searches constitute a systematic and comprehensive approach to retrieving information, relying on this approach alone may result in the exclusion of potentially valuable studies. Databases can have limitations in terms of coverage, indexing inconsistencies, and publication biases, which can impact the completeness and representativeness of the retrieved literature (Boeker et al., 2013). Therefore, researchers suggest manual searches to supplement database searches in order to identify additional primary studies (Røkenes & Krumsvik, 2014; Vassar et al., 2016). Although manual searches help to make up for the limitations of database searches, they are time consuming and may introduce selection biases based on the researcher's knowledge and expertise (Vassar et al., 2016). To minimize these potential biases, I followed the advice of Vassar et al. (2016) and conducted manual searches routinely. This hybrid approach of combining database and manual searches ensures a broader coverage of relevant literature and enhances the validity and reliability of the findings (Levac et al., 2010).

4.2.2 Surveys

Surveys can help researchers answer "descriptive questions" (Creswell & Creswell, 2018, p. 147) by providing a quantitative description of trends or opinions of a population by studying a sample of that population. A paper-based survey involves distributing physical questionnaires to participants and collecting responses manually, while an online survey involves collecting data via Internet-based platforms. Paper-based surveys have been widely used in the past, yet they have some limitations. For instance, the process of data collection is time-consuming and resource-intensive, particularly when dealing with large sample sizes. In addition, paper-based surveys are subject to issues such as non-response bias, data entry errors, and difficulties in data analysis and management (Dillman et al., 2009). In contrast, online surveys have several advantages, including cost-effectiveness, convenience, and the ability to reach a wide and diverse group of participants. However, online surveys also have limitations, such as the potential for self-selection bias, data validity concerns due to the lack of control over participant environments, and challenges in ensuring data security and privacy (James & Busher, 2015). To address these limitations, researchers are advised to employ a

hybrid approach that combines both paper-based surveys and online surveys, which allows for greater flexibility and wider participant reach and improves the generalizability of the findings (Creswell & Creswell, 2018; Creswell & Plano Clark, 2017).

Three surveys—one online survey and two paper-based surveys—were employed to collect data in this thesis. First, an online survey consisting of 26 questions with five multiple-choice questions, 19 questions using a 5-point Likert scale, and two open-ended questions, was developed and used in Article II to examine English language teacher educators' experiences with and perceptions of FC. Participating teacher educators completed this survey in January and February of 2021. Second, a survey on perceptions of FC was used in Article III to investigate student teachers' insights regarding the FC teaching approach. This paper-based survey consisted of 19 questions using a five-point Likert scale and six open-ended questions. The FC group completed this survey right after they completed the survey on motivation and engagement in November 2021. Last, a survey on motivation and engagement (i.e., the Motivation and Engagement Scale- University/College (MES-UC) developed by the Lifelong Achievement Group[6]) was employed in Article IV to examine whether there were differences regarding student teachers' motivation and engagement between the FC group and the non-flipped group. This paper-based survey is a self-report questionnaire designed to assess motivation and engagement among university and college students and aims to capture various dimensions of motivation and engagement that are relevant to academic settings. Martin (2001, 2002, 2007) discussed the underlying theories of this survey, including self-efficacy, self-regulation, self-determination, and motivation orientation, and argued that this survey provides a comprehensive framework for understanding the multifaceted nature of students' motivation and engagement. This paper-based survey consisted of 44 questions using a seven-point Likert scale and is organized under four themes (positive motivation, positive engagement, negative motivation, and negative engagement). Both the non-flipped group and the FC group in this thesis completed this survey right after they completed the last session of the obligatory course in November 2019 and 2020, respectively.

4.2.3 Interviews
Qualitative interviews (Brinkmann & Kvale, 2014) can be used to collect detailed information regarding interviewees' experiences and can yield "rich and meaningful data" (Knox & Burkard, 2009, p. 566). This allows for in-depth exploration and understanding of

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[6] https://lifelongachievement.com/

interviewees' perspectives and meanings. However, there are some potential limitations and challenges associated with qualitative interview research. Interview research is inherently subjective, as it relies on the interaction between the interviewer and interviewee. On one hand, the interviewer's biases, preconceptions, and interpretations can influence the data collected and subsequent analysis. On the other hand, interviewees may provide responses that are socially desirable or that conform to perceived expectations rather than express their true thoughts or experiences. To address these potential limitations, this doctoral thesis employs established interview protocols and member checking to enhance validity and reliability (Seidman, 2019).
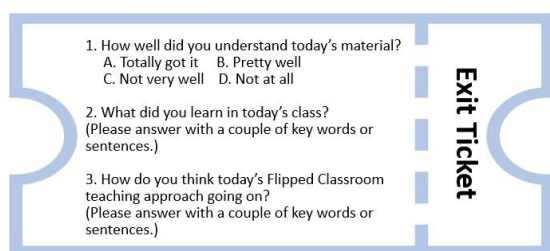
Two interviews were conducted in this thesis to collect data regarding teacher educators' and student teachers' thoughts. In Article II, in-depth interviews (Creswell & Poth, 2018) with teacher educators were used to collect qualitative data regarding teacher educators' perceptions of FC. First, based on a descriptive statistical analysis of the collected survey data in Article II, an interview protocol was developed and piloted. Second, a finalized interview guide was created to help explain and interpret the survey results. The interview guide consisted of six main questions and 15 follow-up questions covering teacher educators' experiences of implementing the FC teaching approach and their perceptions. Last, using this interview guide, 10 in-depth interviews were conducted in English and online in spring 2021 using the virtual meeting platform Zoom, and each interview lasted 30–60 minutes. The in-depth interviews were video recorded with the consent of the participants. Zoom interviews save cost (Archibald et al., 2019) and widen researchers' reach to "secure a geographically diverse sample inclusive of some participants who may not have been able (or willing) to meet in-person" (Oliffe et al., 2021, p. 6), especially during the pandemic period when health authorities advise against unnecessary travel. Furthermore, as Oliffe et al. (2021) suggested, hosting individual interviews on Zoom is "a relatively lighter weighted methods concession" (p. 7) than hosting focus group interviews on Zoom. However, Zoom interviews are not without criticism; for instance, Zoom interviews raise ethical concerns, including ensuring participant privacy and confidentiality in online environments (see Section 4.4.2 Ethical considerations). In Articles III and IV, 19 student teachers who took the course with the FC teaching approach in the autumn of 2020 participated in focus group interviews (Creswell & Poth, 2018) to explore their perceptions of FC. The focus group interviews were conducted after the participating student teachers completed the course but before they took the exam. Each focus group interview with five to seven participants was conducted in English in

person and audio recorded with the consent of the participants. The interviews lasted 45–60 minutes. In total, there were three focus group interviews. Focus group interviews are "relatively inexpensive" and "individuals are more likely to provide candid responses" (Leung & Savithiri, 2009, p. 218).

4.2.4 Documents

The use of documents can provide researchers with a deeper understanding of social phenomena, historical contexts, and individual experiences, which are valuable sources of data (Merriam & Tisdell, 2015). However, documents are often created for specific purposes, and their availability and selection can be influenced by various factors, such as organizational interests. In addition, the accuracy of the information contained in documents may be uncertain, so researchers need critically evaluate the credibility of the sources. Merriam and Tisdell (2015) further emphasized that documents are not limited to written materials but encompass various forms of recorded information, such as reports, memos, letters, diaries, photographs, audio recordings, videos, and digital media.

Exit tickets (Fowler et al., 2019), as a form of a document, were employed in this thesis to collect relevant data. Exit tickets, also called tickets to leave, are short response tasks for students to complete before ending a class and serve several purposes, including providing student feedback (Fowler et al., 2019). In Article III, to obtain student teachers' immediate feedback on and perceptions of FC, all English language student teachers in the FC group were invited to voluntarily answer a three-question exit ticket after each teaching session. Altogether, 143 exit tickets were collected using the digital quiz software Socrative[7]. Three questions on each exit ticket (Figure 6) concerned how student teachers understood session materials, what they learned from sessions, and what they thought about the FC teaching approach.

1. How well did you understand today's material?
   A. Totally got it   B. Pretty well
   C. Not very well   D. Not at all

2. What did you learn in today's class?
(Please answer with a couple of key words or sentences.)

3. How do you think today's Flipped Classroom teaching approach going on?
(Please answer with a couple of key words or sentences.)

Exit Ticket

Figure 6 *Exit ticket*

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[7] https://www.socrative.com/

The use of exit tickets in this thesis allowed for the collection of real-time feedback from student teachers, providing a snapshot of their immediate perceptions and reflections. The three questions posed on the exit tickets were designed to obtain specific information related to the FC teaching approach and thus gain a deeper understanding of student teachers' experiences and perceptions. This thesis benefits by employing exit tickets as a data collection method; the benefits include brevity, ease of administration, and the ability to gather timely feedback. The collected exit tickets contribute to the empirical evidence regarding student teachers' perceptions of FC, providing information on their understanding of the materials, the knowledge acquired from the sessions, and their overall impressions of the FC teaching approach.

4.3 Data analysis

This mixed methods thesis consists of four studies—one scoping review study (Article I) and three empirical case studies (Articles II, III, and IV). Descriptive statistics were used to analyze the quantitative data, and qualitative analysis—including thematic analysis—was used to study the qualitative data in this doctoral thesis. The integration of statistical and thematic data analysis techniques aligns with the principles of MMR. According to Tashakkori et al. (2020, p. 9, italics in original), "*Mixed methods data analysis* involves the integration of statistical and thematic data analytic techniques", and mixed methods researchers need to go back and forth seamlessly between statistical and thematic analysis (Tashakkori et al., 2020; Tashakkori & Teddlie, 2003). By adopting this integrated approach, this thesis leverages the strengths of both quantitative and qualitative methods, thus providing a more vigorous and nuanced understanding of the FC teaching approach in teacher education.

4.3.1 Statistical analysis

Descriptive statistics "focus on describing, summarizing, or explaining data" (Johnson & Christensen, 2017, p. 498) and were employed in this thesis to scrutinize the quantitative data. In the scoping review study (Article I), descriptive statistics were used to analyze the included 33 articles to examine the research trends relating to FC in teacher education, including general characteristics, research methods, and research foci of the included articles. Descriptive statistics were also employed to examine the survey responses, to describe the most frequent answers, and to display the distribution of different replies. In Article II, the statistical results provided simple summaries of the participating teacher educators' experiences and perceptions of FC. In Article III, the statistical results provided a general

overview of the participating student teachers' perceptions of the FC teaching approach. In Article IV, following the Motivation and Engagement Scale-University/College (MES-UC) Test User Manual (19th Edition), descriptive statistics were used to analyze the responses to the survey on motivation and engagement.

Inferential statistics "infer the characteristics of populations based on samples" (Johnson & Christensen, 2017, p. 498) and were utilized in this doctoral thesis to investigate and analyze the differences in motivation and engagement between the FC group and the non-flipped group. In Article IV, data on motivation and engagement levels from these two cohorts were first collected via the paper-based survey MES-UC, and then inferential statistical analysis was used to draw conclusions about the larger population from which these groups were sampled. Specifically, T-test was used to compare the motivation and engagement levels between the FC group and the non-flipped group. This allowed Article IV to go beyond simply describing the characteristics of the two cohorts and enabled this study to determine whether the differences in motivation and engagement were statistically significant or merely due to chance.

4.3.2 Qualitative analysis

Qualitative analysis is a research method used to understand and interpret social phenomena by examining non-numerical data (Creswell & Poth, 2018). Unlike quantitative analysis, which relies on numerical data and statistical techniques, qualitative analysis aims to provide rich and in-depth insights into the complexities of human behavior, attitudes, and interactions. This thesis employed qualitative analysis to examine researchers' focus on FC in teacher education and to explore student teachers' perceptions regarding their motivation and engagement with the FC teaching approach. In Article I, qualitative analysis was used to determine the specific categories or researchers' foci of including studies and to organize them into meaningful categories, such as student perceptions, attitudes, motivation, and emotions. Thus, Article I provided a comprehensive understanding of the range and diversity of researchers' interest in the FC teaching approach in teacher education. Article IV used qualitative analysis to explore student teachers' insights as expressed in focus group interviews and to determine the impact of FC on student teachers' motivation and engagement.

4.3.3 Thematic analysis

As a method of qualitative data analysis, thematic analysis is used "for identifying, analysing and reporting patterns (themes) with data" (Braun & Clarke, 2006, p. 79) and "involves systematic processes of data coding to develop themes—themes are your ultimate analytic *purpose*" (Braun & Clarke, 2022, p. 4, italics in original). In this thesis, thematic analysis was employed to analyze the qualitative data collected from various sources, such as interviews and open-ended survey responses. The aim was to uncover the underlying themes and patterns that are present within the data, thus providing valuable insights into the experiences, perspectives, and perceptions of the participants regarding the FC teaching approach in teacher education.

Braun and Clarke (2006) provided an overview guide for conducting thematic analysis that serves as a foundational framework for the analysis process. Figure 7 shows the key steps involved in thematic analysis. These steps help researchers navigate the analysis process systematically, ensuring rigor and consistency in the identification and interpretation of themes. Expanding upon this guide, Braun and Clarke (2022)'s more recent publication gives a detailed explanation of conducting thematic analysis: doing familiarisation (phase one); doing coding (phase two); developing themes (phases three to five), which includes generating initial themes (phase three), developing and reviewing themes (phase four), refining, defining and naming themes (phase five); and writing the report (phase six). By following this guide (Braun & Clarke, 2006, 2022), researchers can ensure a systematic and rigorous exploration of the qualitative data and provide a structured and transparent process for identifying and interpreting the underlying themes within the data, thus enhancing the validity and reliability of the findings.
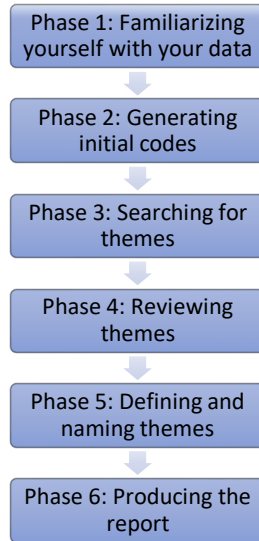
Figure 7 *A step-by-step guide for doing thematic analysis (Braun & Clarke, 2006)*

The thematic analysis approach can be used to "explore the context of teaching and learning at a level of depth" (Castleberry & Nolen, 2018, p. 808). This approach was employed in both Articles II and III, following the step-by-step guide shown in Figure 7 to explore the collected qualitative interview data. In Article II, the qualitative data from in-depth interviews with teacher educators were analyzed using thematic analysis to investigate teacher educators' experiences with and perceptions of FC. In Article III, thematic analysis approach was used to analyze the qualitative data from focus group interviews with student teachers to examine their perceptions of FC and suggestions for implementing FC. The qualitative data collected for Articles II and III were imported into NVivo 12, a qualitative data analysis program designed to assist researchers in organizing, analyzing, and gaining insights from qualitative data. Thematic analysis was then conducted by closely following the step-by-step guide proposed by Braun and Clarke (2006, 2022).

First, I and the co-author(s) of Articles II and III familiarized ourselves with the data by thoroughly examining the interview transcripts and recordings. Second, we created initial codes by systematically coding the dataset in NVivo 12. Our coding process was guided by our research questions and aims. Third, we examined the list of codes to identify overarching themes. This involved sorting, organizing, and refining the analysis of codes to construct broader themes. We looked for similarities or connections between codes and grouped related codes. Fourth, we reviewed and refined the themes by merging overlapping themes and

eliminating those lacking sufficient data. For instance, in Article II the codes related to not coming to class because of not reviewing video lectures and no need to come to class due to having learned from video lectures were merged to form the theme risk of poor attendance. Fifth, we further refined the names and definitions of the themes to capture their essence accurately. Last, we reported the themes in relation to our research questions and provided an in-depth analysis of each theme. In Article III, for instance, flexibility and efficiency in out-of-class activities is one of the themes that participating student teachers perceived as an advantage of FCs. We interpreted that student teachers appreciated the freedom to work at their own speed and convenience to complete out-of-class tasks They also noted that video lectures prepared by teacher educators focused on essential points and core elements of specific topics.

4.4 Research credibility

This section addresses the research credibility of this thesis. This section starts by discussing research validity, reliability, and generalizability. Ethical considerations in this doctoral thesis are then discussed. Last, researcher bias and dilemmas are examined.

4.4.1 Validity, reliability, and generalizability

Quantitative research, qualitative research, and MMR uses different terminology to discuss and assess research credibility (Creswell & Creswell, 2018; Johnson & Christensen, 2017; Miles et al., 2020; Onwuegbuzie & Johnson, 2006; Tashakkori & Teddlie, 2010). In quantitative research, internal validity, external validity, ecological validity (Gehrke, 2018) or generalizability, and reliability are often examined. In qualitative research, credibility, transferability, and dependability are often examined. Although the terminology is fairly equivalent, according to Yilmaz (2013) there is no one-to-one relationship between them because of the fundamental differences between quantitative and qualitative research. MMR involves the use of both quantitative and qualitative research, so all of the approaches entailed in quantitative and qualitative research to ensure research quality are important when conducting MMR (Tashakkori et al., 2020). Moreover, it is essential that MMR has strong quantitative and qualitative credibility (Johnson & Christensen, 2017). In this thesis, quantitative terms such as validity, reliability, and generalizability are used to elaborate on research quality due to the lack of uniform mixed methods terminology and for the sake of coherence and clarity.

Research validity and reliability are important considerations in research and are critical aspects of a doctoral thesis. The research validity of a study refers to how accurate the inferences are and how well the findings obtained from the study participants (sample) represent true findings among similar individuals outside the study (population) (Johnson & Christensen, 2017). The research reliability of a study refers to "the degree to which the finding is independent of accidental circumstances of the research" (Kirk & Miller, 1986, p. 20). To put it simply, if the study were replicated, the same results would be obtained. Ensuring research validity and reliability requires careful attention to various aspects of research design, data collection, and data analysis. I have used a number of steps to minimize the threat to the validity and reliability of this doctoral thesis.

One key aspect of research validity and reliability is the use of appropriate research designs, and researchers need to carefully select and justify a research design that aligns with their research questions and purpose (Creswell & Creswell, 2018). The overall research design for this thesis is based on MMR, which is visualized in Figure 4 (see Section 4.1 Research design and methods). Mixed methods sequential explanatory designs were used in the three empirical studies of this thesis (Articles II, III, and IV), where one method was used to inform or build on another and could enhance the validity and reliability of the research findings. The research designs of the three studies consisted of two distinct phases: a quantitative phase followed by a qualitative phase (Creswell & Creswell, 2018). The quantitative phase provided "baseline information" and allowed me to explore the FC teaching approach in teacher education in depth by avoiding "elite bias" (Johnson et al., 2007, p. 115). The qualitative phase provided a deep understanding of participants' beliefs and allowed me to construct a holistic picture to explore the research questions this doctoral thesis tried to address (Creswell & Poth, 2018).

During the processes of collecting and analyzing data for this thesis, measures such as pilot testing, interview guidelines, convenience and purposive sampling, and member checking, were taken to minimize potential biases or threats to the validity and reliability of this thesis. Pilot testing a survey is important to establish the validity of the instrument, to provide a preliminary evaluation of the reliability of survey items, and to improve the survey format and questions (Creswell & Creswell, 2018, p. 154). Pilot testing was used in Articles II and III of this thesis. In Article II, a pilot survey of three educators in higher education was conducted to help plan and modify the final version of the survey. In Article III, a paper-based survey was developed and piloted with five English language graduates. The survey in

Article IV, MES-UC, was not pilot tested because the validity and reliability of MES-UC have already been assessed in published research articles, such as those by Martin (2009) and Martin et al. (2015). The interview guide approach (Johnson & Christensen, 2017) was used in this thesis and was implemented in in-depth interviews with teacher educators in Article II and in focus group interviews with student teachers in Articles III and IV. Based on the descriptive statistical analysis of the collected survey data in Articles II and III, interview protocols were developed and applied in pilot interviews with six English language graduates. After the pilot interviews, finalized interview guides were created to better explain and interpret the survey results. The interview guide approach assures that "the same general topics and questions [are used] with all the interviewees" (Johnson & Christensen, 2017, p. 237), thus improving the reliability of interview findings.

Convenience sampling and purposive sampling strategies were used in Articles II, III, and IV of this thesis (see Section 4.1.4 Sampling). According to Johnson and Christensen (2017, p. 267), convenience samples "are not the optimal way to go, especially when the researcher wants to generalize to a population based on a single study. Nonetheless, researchers are forced to use convenience samples because of practical constraints". Therefore, when a convenience sampling strategy is used, "it is especially important that researchers describe the characteristics of the people participating in their research studies" (Johnson & Christensen, 2017, p. 267). A detailed introduction of the participants in this thesis was included (see Section 4.1.3 Case study research and Section 4.1.4 Sampling) under the premise of considering participant ethics. The limitation of purposive sampling relates to generalizing from a sample to a whole population. Johnson and Christensen (2017) proposed an optional solution for researchers, which is to "specify the criteria that potential participants must meet to be included in a research study but then attempt to obtain a random sample of these people" (p. 268). However, Johnson and Christensen (2017) admitted that this solution "is not always possible or practical" (p. 268). This thesis specified that the prerequisite for recruiting teacher educators in Article II was the experience of implementing the FC teaching approach. Nevertheless, due to the limited number of teacher educators recruited, it was not feasible to choose a random sample from them. Furthermore, member checking helps validate research findings (Creswell & Poth, 2018) and was used in this thesis to establish the credibility and increase the rigor of the research. Each of the transcribed interview texts in Article II was returned to the corresponding participating teacher educator for member checking to validate the trustworthiness of the research findings.

Generalizability with case study research has been much discussed among scholars (e.g., Donmoyer, 2009; Giddens, 1984; Lincoln & Guba, 1985). Flyvbjerg (2006) argued that "it is incorrect to conclude that one cannot generalize from a single case" (p.225), but "it depends on the case one is speaking of and how it is chosen" (p. 225). In this thesis, the generalizability of findings depends on the rich and thick description of the contexts of case studies and the participating samples and on the transparency of the methodology employed (Lincoln & Guba, 1985). Although all participating teacher educators in Article II worked in English language teacher education programs in Norway, they taught at different universities and came from different countries (see Section 4.1.3 Case study research). Therefore, the findings of this thesis can potentially be valuable for researchers, teacher educators, student teachers, and other stakeholders located not only in Norway but also in other countries.

4.4.2 Ethical considerations

The Norwegian Centre for Research Data (NSD[8]) granted ethical permission after this doctoral research started (see Appendix I). The NSD viewed and approved both the online survey for teacher educators in Article II and the paper-based survey on perceptions of FC for student teachers in Article III. The NSD also viewed and approved the interview guidelines for teacher educators in Article II and the interview guidelines for student teachers in Articles III and IV. The survey on motivation and engagement used in Article IV was MES-UC (Liem & Martin, 2012; Martin, 2003), developed by the Lifelong Achievement Group. As a commercial research product, the NSD reviewed the construction of MES-UC rather than all 44 questions and approved the survey.

Research data containing personal information were processed according to the General Data Protection Regulation (GDPR) and the Norwegian University of Science and Technology (NTNU) guidelines. The participants in Article II were recruited by sending out emails (see Appendix II) to English teacher educators in Norway through a national professional list, and 25 teacher educators volunteered to participate. All 10 teacher educators participating in the interviews were notified about the interview format and gave informed consent (see Appendix III) before being interviewed. I interviewed each participant once and transcribed the 10 in-depth interviews. The participants in Articles III and IV were recruited by inviting them in person during the first session of the course and sending out emails before the last session. All participating student teachers were notified about the formats of data-collecting

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[8] On January 1, 2022, NSD became a part of Sikt, the Norwegian Agency for Shared Services in Education and Research.

instruments and gave informed consent (see Appendix IV) before participating. I participated in the three focus group interviews and transcribed the interviews. Furthermore, I was the only person who could access both the interview data with the participants' real names, as all participants were anonymized with a participant number when interview transcripts were analyzed and research findings were presented. All research data in this doctoral thesis, including video and audio recorded interview data, were stored in an encrypted NTNU-administered computer.

Zoom interviews were used in this thesis to collect data regarding teacher educators' experiences with and perceptions of FC. There are a number of articles about the video-conferencing platform Zoom that discuss perceived privacy or security issues (e.g., Chen & Zou, 2023; Dassel & Klein, 2023; Mohanty et al., 2022); however, "the reality is that it is difficult to guarantee the security of any online communication platform" (McMaster University, n.d.). At NTNU, Zoom and Blackboard Collaborate are the only two approved tools for streaming, live, webinar, and synchronous teaching; however, to date there are no university guidelines for using Zoom to conduct research interviews. The Research Ethics Board of McMaster University (n.d.) highlighted three key concerns about Zoom, which were encryption, storage, and "Zoom bombings" (which means that if security settings for Zoom meetings are not properly configured, it is possible for uninvited guests to join meetings). McMaster University (n.d.) emphasized that "it is up to individual researchers to weigh the benefits and risks and determine whether it [Zoom] is an appropriate platform for a study". As mentioned above, all research data in this doctoral thesis, including video and audio recorded Zoom interview data, were stored in an encrypted NTNU-administered computer. In addition, each of the 10 participating teacher educators received a separate Zoom link for the interviews, and the waiting room feature was enabled for all Zoom interviews; therefore, there were no "Zoom bombings" during the interviews.

4.4.3 Researcher bias and dilemmas

Researcher bias means that a researcher finds what he or she wants to find, which is a threat to research credibility (Johnson & Christensen, 2017, p. 299). According to Becker (1967), research can never be free of researcher bias because research is inevitably conducted from the researcher's perspective. Savin-Baden and Major (2013) advised researchers to engage their own biases by mentioning personal standpoints. Johnson and Christensen (2017) suggested reflexivity as the key strategy, "which means that the researcher actively engages in critical self-reflection about his or her potential biases and predispositions" (p. 300). In the

introductory chapter of this thesis, the researcher's personal perspective was explicitly elaborated through the practice of reflexivity. Due to my previous educational background and teaching experience (see Chapter 1 Introduction), part of the research context of this thesis was familiar to me (teacher education, language teaching, and learning). However, most of the research context of was unfamiliar to me (teacher education in Norway, English language teaching and learning in Norway), and the participants were strangers (teacher educators, student teachers). Therefore, I see myself as predominately having the position of "outsider" and sometimes the position of "insider" (Johnson & Christensen, 2017, p. 306).

This doctoral project was conducted between 2019 and 2023 and was affected by the outbreak of Covid-19. Besides examining the impact of FC on learning motivation and engagement, the original plan for Article IV also included exploring the impact of FC on student teachers' learning achievement using a quasi-experimental design. Therefore, I collected pre-test data on student teachers' English knowledge on the first day of the course from the control group (the non-flipped group) in 2019 and the experimental group (the FC group) in 2020. I also collected both groups' final exam grades as post-test data. The intention was to explore whether the experimental group's learning achievement differed from that of the control group's. However, due to the Norwegian Covid-19 situation, the experimental group had to take their final exam digitally, which was different from the paper-based written exam that the control group had taken. Therefore, this doctoral thesis did not explore the impact of the FC teaching approach on student teachers' learning achievement.

5. Presentation of articles

The overall research question explored in this doctoral thesis is: *How is Flipped Classroom used in English language teacher education and in what ways can Flipped Classroom influence English language student teachers' learning?* This chapter provides a summary of the four research articles in this thesis, including individual research questions (RQ), aims, contexts within the doctoral project, research methods, and main findings. A more detailed exposition of the findings can be found in the respective articles (see Part II: The studies).

There is a clear division between the four individual articles: Article I examines the overall research question from the researchers' perspective, Article II investigates this research question from the teacher educators' perspective, and Articles III and IV scrutinize this research question from the student teachers' perspective. Therefore, the combined findings from the four separate articles aim to explore the overall research question from a comprehensive perspective by integrating the perceptions of the three stakeholders (researchers, teacher educators, and student teachers). Nevertheless, these four articles have clear interconnectivity. Article I, as the foundation for this thesis, informs the research scope for Article II and the research designs for Articles III and IV; Article II offers teacher educators' perceptions of Flipped Classroom (FC) to add more information to Article I; Articles III and IV present student teachers' perceptions of FC to add more knowledge to Article I; and Articles III and IV are mutually complementary to Article II (see Figure 3 in Chapter 1 Introduction).

5.1 Article I

Han, H., & Røkenes, F. M. (2020). Flipped Classroom in teacher education: A scoping review. *Frontiers in Education, 5*(221), 1–20. https://doi.org/10.3389/feduc.2020.601593

RQ 1: *What are the trends in Flipped Classroom in teacher education?*

RQ 2: *What are the research foci and findings of the presented studies on Flipped Classroom in teacher education?*

Article I of this thesis is a scoping review study that focuses on FC in teacher education, with the purpose of examining the use of FC in teacher education and the impact of FC on the education of student teachers from the researchers' perspective. A strict set of inclusion and exclusion criteria was adopted in the database searches, and 33 peer-reviewed articles published between 2014 and 2019 were included for analysis in the final scoping review. The

main findings from Article I include the general characteristics and research methods of published research articles about FC in teacher education and the researchers' research foci regarding FC in teacher education. The results from Article I reveal that the first studies about FC in teacher education were published in 2014, and since then, FC research in teacher education has been increasing steadily. The results from Article I also reveal that FC studies in teacher education were mainly conducted in the US, with increased implementation in European and Asian countries. Moreover, the findings from Article I show that FC studies in teacher education were primarily conducted in the disciplines of pedagogy, science, and language arts. With respect to research methods adopted by researchers in teacher education, a majority of FC studies employed mixed methods and engaged participating student teachers with FC teaching approach experience. Surveys were the most commonly used instrument to collect data. Two main research foci were identified in Article I: student perceptions and academic performance.

Article I provided an overview of FC research conducted in the domain of teacher education and the main findings from Article I responded to the two research questions. Importantly, the findings from Article I reveal a gap in the literature: fewer researchers have focused on teacher educators' perceptions. This gap helped inform the research scope of Article II. The findings from Article I regarding research methods also helped inform the research design in Articles III and IV.

5.2 Article II

Han, H., & Røkenes, F. M. (in press). Teacher educators' perceptions of Flipped Classroom in teacher education: Insights from EFL teacher educators in Norway. *Nordic Journal of Digital Literacy.*

RQ 1: *What experiences with the Flipped Classroom approach do teacher educators report?*

RQ 2: *How do teacher educators perceive the Flipped Classroom in teacher education?*

Article II of this thesis is an empirical article with the intention of exploring teacher educators' perceptions regarding the use of FC and the impact of FC on student teachers in the field of English language teaching in Norway. This case study attempts to fill the research gap revealed by Article I, that most research on FC in teacher education seems to focus more on the perceptions of FC from student teachers than from teacher educators. Article II identified out-of-class and in-class activities and courses used with the FC teaching approach

in English language classrooms. Furthermore, Article II reported prevailing opinions and generated themes regarding teacher educators' experiences with FC and their perceptions of FC's advantages and challenges.

Article II aims to comprehensively understand teacher educators' perceptions of FC. Article I identified only two studies in the literature focusing on teacher educators' perspectives as both researchers and implementers of FC; however, the authors of these two studies provided firsthand data about their own perceptions of FC. Thus, the findings from Article II provide common thoughts shared by more teacher educators to understand their perceptions. Article II addressed the first research question by outlining four aspects of teacher educators' experiences, including new opportunities for teaching and learning, out-of-class activities in FC, in-class activities in FC, and student teachers' feedback. Article II examined the second research question and identified three advantages (flexible preparations for student teachers, efficient time for active learning, and possibility of reusing materials) and three challenges (limited preparations from student teachers, risk of poor attendance, and time-consuming). Last, Article II provides practical suggestions for teacher educators on implementing FC. Article II focused on teacher educators' perceptions in an attempt to fill the research gap revealed by Article I. Furthermore, Article II provided general thoughts of FC shared by teacher educators and complemented Articles III and IV, which centered on student teachers' perspectives.

5.3 Article III

Han, H., Røkenes, F. M., & Krumsvik, R. J. (2023). Student teachers' perceptions of Flipped Classroom in EFL teacher education. *Education and Information Technologies*. https://doi.org/10.1007/s10639-023-11839-w

RQ 1: *What are student teachers' perceptions of Flipped Classroom regarding advantages and disadvantages?*

RQ 2: *To what extent do student teachers prefer Flipped Classroom, and what are their suggestions for its future implementation?*

Article III of this thesis is an empirical study that aimed to provide evidence of student teachers' thoughts on FC and help teacher educators make informed decisions. Insights from English language student teachers in Norway are the main data for Article III. Based on research methodology informed by Article I, Article III is a mixed methods study that

included an FC group as participants to explore student teachers' perceptions of FC regarding advantages and disadvantages and the possibility of student teachers becoming future flippers. Surveys and focus group interviews were the major instruments used to collect the data in the study. Article III reported student teachers' general view on FC's advantages and challenges, and generated themes on FC's advantages and challenges. Article III explored the possibility of student teachers becoming future flippers and provided some practical suggestions for implementing the FC teaching approach in teacher education.

Article III addressed the first research question by highlighting five advantages (flexibility and efficiency in out-of-class activities, repeatable usage of video lectures, deep and collaborative learning in in-class activities, engaged teacher educators in in-class activities, and effective solution in Covid-19 pandemic) and challenges (accountability for student teachers' preparation, different student teachers' preparation, questions not answered immediately, increasing student teachers' workload, and high demanding for teacher educators). Article III also responded to the second research question of the study, indicating that student teachers would prefer to take a course taught with the FC teaching approach rather than to implement FC in their own teaching. Last, Article III provided practical suggestions for teacher educators on implementing FC, which, combined with suggestions from teacher educators in Article II, offered comprehensive and helpful ideas for teacher educators to enact the FC teaching approach.

5.4 Article IV

Han, H., Røkenes, F. M., & Krumsvik, R. J. (under review). Flipped Classroom's impact on students' motivation and engagement. Manuscript submitted for publication in *British Journal of Educational Technology*.

RQ 1: *What is Flipped Classroom's impact on students' motivation and engagement?*

RQ 2: *How do students perceive their motivation and engagement in a course taught with the Flipped Classroom approach?*

Article IV of this thesis is also an empirical study that investigated FC's impact on students' motivation and engagement. Self-reported survey data regarding motivation and engagement and focus group interviews with student teachers in the field of the English language in Norway are the main data for Article IV. Based on the research methodology informed by Article I, Article IV is an explanatory sequential mixed methods study that included an FC

group and a non-flipped group as participants to explore FC's impact on students' motivation and engagement. Surveys and focus group interviews were the major instruments used to collect the data in the study. In Phase 1, a quasi-experimental design was adopted in Article IV, and quantitative data from the control group (the non-flipped group) and the experimental group (the FC group) were collected through a paper-based survey. In Phase 2 of Article IV, qualitative data from the FC group were collected through focus group interviews.

Based on the findings of these two phases, Article IV explored the impact of FC on students' motivation and engagement and found that there was no statistically significant difference between the FC group and the non-flipped group regarding motivation and engagement. However, in Article IV, the FC group expressed in the focus group interviews that the FC teaching approach promoted their motivation and engagement compared to the lecture-based approach. Furthermore, Article IV, together with Article III, provided a wider understanding of the FC teaching approach from the student teachers' perspectives.

6. Discussion and conclusion

This chapter starts with a discussion of the overall implications of this doctoral project in relation to implementing Flipped Classroom (FC) in teacher education, including empirical, theoretical, and methodological contributions. This chapter then discusses the limitations encountered during this project and proivdes valuable insights for future research. This chapter ends with the conclusion of this doctoral thesis.
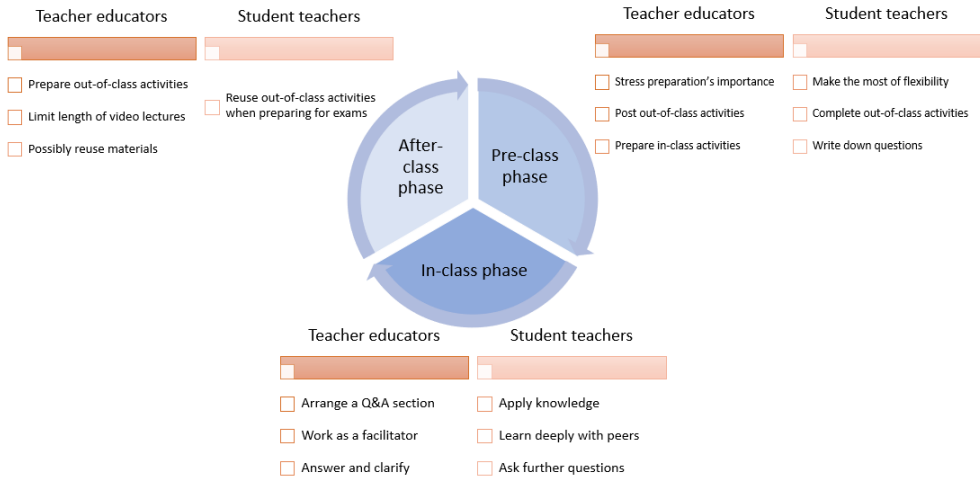
6.1 Discussion

This doctoral thesis aims to provide diverse research data and empirical evidence regarding the FC teaching approach from different perspectives—those of researchers in teacher education, teacher educators, and student teachers. In the pursuit of examining the overall research question, the findings of this thesis provide implications regarding the existing knowledge about FC in teacher education. This section elaborates on the findings of this thesis in terms of their empirical, theoretical, and methodological contributions. Subsequently, the limitations encountered during the research process are discussed, which provides valuable insights about the boundaries and constraints of this thesis. Following that, suggestions for future research are proposed with the aim of advancing understanding of the FC teaching approach in teacher education and addressing the identified research gaps. These suggestions give valuable directions for researchers to explore to enhance the effectiveness and implementation of the FC teaching approach in educational settings.

6.1.1 Empirical contributions

The principal empirical contribution of this thesis lies in its practical recommendations for teacher educators and student teachers regarding the implementation of FC in teacher education. Teacher educators and student teachers are "users" of the FC teaching approach, and therefore teacher educators who have implemented FC and student teachers who have been taught with the FC teaching approach can provide empirical recommendations based on "user experience". In this thesis, Article II collected such suggestions from English language teacher educators in Norway, and Articles III and IV gathered relevant ideas from English language student teachers in Norway. Article I provided opinions from researchers in teacher education. By integrating viewpoints from the three perspectives, an all-around "user guide" for enacting the FC teaching approach was developed. This "user guide" model is based on the empirical work in this doctoral thesis, on consulting previous research, and on conducting empirical investigations in teacher education. Figure 8 illustrates this model with two "users"

of the FC teaching approach, teacher educators and student teachers, during three phases. Even though the research context of this thesis is English language teaching in teacher education in Norway, the findings can be transferred and applied to disciplines other than English and other contexts in higher education.

Teacher educators
- Prepare out-of-class activities
- Limit length of video lectures
- Possibly reuse materials

Student teachers
- Reuse out-of-class activities when preparing for exams

After-class phase

Pre-class phase

Teacher educators
- Stress preparation's importance
- Post out-of-class activities
- Prepare in-class activities

Student teachers
- Make the most of flexibility
- Complete out-of-class activities
- Write down questions

In-class phase

Teacher educators
- Arrange a Q&A section
- Work as a facilitator
- Answer and clarify

Student teachers
- Apply knowledge
- Learn deeply with peers
- Ask further questions

Figure 8 *Recommendations for teacher educators and student teachers in Flipped Classroom*

As Figure 8 shows, a lesson taught with the FC teaching approach consists of three phases. First, in the pre-class phase or pre-class preparation, teacher educators should "discuss in advance" with student teachers about this approach, "make 'clear expectations'" of student teachers, and "stress the importance of completing out-of-class activities before coming to class" to student teachers (Article II). This practice echoes the study by Graziano (2017) in that student teachers take more responsibility in FC. Teacher educators are expected to prepare "different types of presentations" because "to have variation is always good" (Article III). Article II finds that video lectures are "the most popular", and other possible activities include "reading materials, digital slide shows, and quizzes" in the pre-class phase. At the same time, teacher educators need to post these out-of-class activities for student teachers ahead of time. In addition, teacher educators should prepare "various in-class activities when implementing FC physically or digitally, typically group or pair activities and discussions" (Article II) that can improve student teachers' "deep and collaborative learning" (Article III). In this phase, student teachers "have the freedom to manage their out-of-class time" and can "choose when, where, and how to work on the out-of-class activities" (Article II), which confirms the flexibility of the FC teaching approach mentioned in other studies (Fraga & Harmon, 2014; Ng, 2018). Therefore, student teachers should make the most of the flexibility

"to get prepared and learn efficiently in the classroom" (Article III), as they "already know a bit of the subject" (Article IV). In addition, student teachers should realize that "adequate and proper preparation demand their endeavors" (Article II), which promotes "their deep learning in class" (Article III). Student teachers complete out-of-class activities without teacher educators' presence, so student teachers' questions cannot "be answered immediately" (Article III). It is necessary and helpful for student teachers to write down their questions and bring them to class. With the FC teaching approach, teacher educators have "more time to answer their [student teachers'] questions and clarify issues" (Article III).

Second, in the in-class phase or in-class activities, teacher educators should arrange a question and answer (Q&A) session at the beginning of each lesson because in Article III student teachers propose that one of the challenges of the FC teaching approach is that their questions cannot "be answered immediately". During Q&A sessions, teacher educators can answer student teachers' questions and resolve their confusion. Thus, Q&A sessions facilitate student teachers' participation in the in-class activities. Article II finds that group or pair activities are the prior in-class activities organized by teacher educators. While student teachers work on these activities, the role of teacher educators should be that of a facilitator (Articles I, II, III, and IV). With the FC teaching approach, student teachers observe "engaged teacher educators in in-class activities" (Article III), which echoes the finding of Van Wyk (2018), who found there is more classroom interaction with the FC teaching approach. As a facilitator in a classroom, teacher educators should "be ready for harder questions" (Article III) that student teachers come up with during the process of active, collaborative, cooperative, and deep learning with their peers. Student teachers should come to class prepared (Articles II, III, and IV) "with some basic knowledge" (Article III) and apply the knowledge to participate in the in-class activities. With their preparation work, student teachers are ready and have a willingness to "learn efficiently in the classroom" (Article III), and they think "it's more fun to learn more" (Article IV) with the FC teaching approach. Student teachers learn deeply through active and collaborative group or pair activities or discussions with peers (Articles II, III, and IV). Meanwhile, with the idea that "the in-class time was for getting help" (Article III), student teachers can get more time to ask further questions when teacher educators in their role as facilitators visit and support each group.

Last, in the after-class phase or post-class reflection, teacher educators need to prepare out-of-class activities for upcoming teaching sessions with the FC teaching approach. As

mentioned in the pre-class phase, out-of-class activities include "different types of presentations" (Article III). When preparing these activities, such as video lectures, teacher educators should "disregard this feeling of perfectionism" (Article II) and limit the length of video lectures (Articles II and III). It is preferable for both teacher educators and student teachers that the length of a video lecture is 10–15 minutes. Several shorter video lectures are better than a very long one (Articles II and III). Furthermore, both teacher educators and student teachers can reuse video lectures. It saves teacher educators' time and energy "in the long run" (Article II) if they can reuse prepared activities. It is advisable for teacher educators to "avoid mentioning a date or a timeline" (Article II) for the sake of reusing materials. Student teachers can reuse or rewatch video lectures, as it is "beneficial to repeatedly watch video lectures, especially when preparing for the exam" (Article III).

According to O'Flaherty et al. (2015), teachers "may not fully understand the pedagogy of how to effectively translate the flipped class into practice" (p. 94). The abovementioned practical recommendations, as shown in Figure 8, help teacher educators put the FC teaching approach into practice and help student teachers in courses taught using the FC teaching approach.

Along with practical recommendations for teacher educators and student teachers, this thesis contributes to developing learning resources for FC. On one hand, teacher educators notice that preparing activities for an FC is both time and energy consuming, especially during their first time trying the FC teaching approach (Article II). On the other hand, student teachers remark that the FC teaching approach demands more from teacher educators compared to traditional lecture teaching (Article III). Findings from other researchers also indicate that the FC teaching approach increases teacher educators' workload (Critz & Knight, 2013). Therefore, learning resource developers may design and create learning resources that are suitable for teacher educators to use in FCs, such as video or audio lectures. The findings of Articles II and III suggest that the length of a video lecture be 10–15 minutes and that a pause function be added to video lectures to allow student teachers to think and reflect.

Another important empirical contribution of this thesis is that it adds to the body of knowledge about the FC teaching approach in Norwegian teacher education. Relatively few studies have been conducted on FC in a Norwegian educational context. Therefore, this thesis is valuable in terms of filling the research gap and improving understanding of how FCs function in the context of Norwegian teacher education. Furthermore, this thesis is unique in

its contextualization of the FC teaching approach within English language teacher education in Norway. While there may be a few studies on FC in teacher education and higher education in Norway and some studies in Norwegian schools, a specific focus on FC in the Norwegian teacher education setting, particularly in English language teaching, is lacking. By contributing to the understanding of the FC teaching approach in Norwegian teacher education and contextualizing it within English language teaching, this thesis can inform educational policies, teacher training programs, and instructional practices in Norway. This thesis can also serve as a foundation for future research in this area, thus promoting a deeper understanding of the impact of the FC teaching approach on student teachers' learning in the Norwegian educational system.

6.1.2 Theoretical contributions

One theoretical contribution of this doctoral thesis relates to the development of the theoretical framework for FCs. On one hand, social constructivism theory emphasizes the importance of social interactions in the construction of knowledge because this theory recognizes that knowledge is not simply transmitted from the teacher to the learner but is constructed through active engagement with the materials and with others (Vygotsky et al., 1978). Social interactions can take many forms, including discussions, group activities, and collaborative projects. The FC teaching approach utilizes in-class time for higher-order thinking activities, such as pair or group discussions, and promotes peer-to-peer interaction (Articles I, III, and IV) and student-to-teacher interaction (Articles I, II, and III). With the FC teaching approach, student teachers' learning occurs through social interactions and the help of others, including peers and teachers (Articles I, II, and III), and student teachers' learning motivation and engagement are enhanced through such social interactions (Articles I and IV).

On the other hand, the FC teaching approach improves and deepens student teachers' learning through collaborative activities that fall in the ZPD (Daniels et al., 2007; Vygotsky et al., 1978). The FC teaching approach supports the advancement from the zone of achieved development (ZAD) to ZPD (Daniels et al., 2007). This thesis captures the key components of FCs in different phases. The preparation in the pre-class phase in FCs impacts student teachers' learning in the in-class phase, where student teachers benefit from the FC teaching approach within the context of ZPD (Erbil, 2020). If student teachers do not prepare well in the pre-class phase, they achieve less in the in-class phase (Articles II and III); therefore, they do not advance from ZAD to ZPD. Such development of the framework guides teacher educators to emphasize the importance of pre-class preparation (Article II) and to advise

student teachers to take responsibility for learning with the FC teaching approach (Article III).

In addition, the FC teaching approach aligns with the principles of SDT by supporting students' autonomy, competence, and relatedness. In an FC, student teachers have the autonomy to engage with the pre-recorded lectures or materials at their own pace, in their own place, and in their own time. This autonomy allows them to take responsibility for their learning and adapt their experience according to their individual needs and preferences (Articles I, II, III, and IV). Furthermore, active participation in in-class time with the FC teaching approach fosters a sense of competence, as student teachers see themselves mastering the material and becoming more proficient in their learning (Articles II, III, and IV). The FC teaching approach can also facilitate a sense of relatedness among student teachers and between student teachers and teacher educators. Teacher educators act as facilitators or guides in an FC, fostering positive relationships and providing individualized support, which also contributes to a sense of relatedness (Articles II, III, and IV).

Another theoretical contribution of this thesis relates to exploring the potential of the FC teaching approach in the subject discipline of English language and advancing understanding of FC in teacher education from the perspectives of researchers, teacher educators, and student teachers. The study by Arslan (2020) found that "only a limited number of studies have touched on the use of flipped learning in various disciplines from different perspectives" (p. 777). This doctoral thesis aims to fill this research gap and reveals that both teacher educators and student teachers in English language teacher education in Norway believe the FC teaching approach is a promising one (Articles II, III, and IV). By embracing the integration of FCs into teacher education programs, English language student teachers will be equipped with a broader range of digital knowledge and skills. This will enable them to become digitally confident teachers who can effectively help their students achieve the competence goals set by the national curriculum.

This thesis provides a comprehensive review of the existing literature on the FC teaching approach in teacher education (Article I and Section 3.2 Flipped Classroom in teacher education in the synopsis). The literature review covers a wide range of scholarly works, including research studies, theoretical frameworks, and practical implementations of FCs in teacher education. By systematically examining and synthesizing the literature, this thesis provides an in-depth understanding of the current state of knowledge regarding the FC

teaching approach in teacher education. This thesis acknowledges and builds upon previous reviews that have explored FC in various educational contexts. This thesis also identifies commonalities and differences between these reviews. Furthermore, this thesis goes beyond existing reviews by incorporating new empirical evidence and extending the scope of inquiry, which ensures a more holistic understanding of the implementation of FCs in the specific context of teacher education. Thus, this thesis contributes expanded and deepened knowledge to the research on the FC teaching approach in teacher education.

6.1.3 Methodological contributions

The use of scoping review (Arksey & O'Malley, 2005; Levac et al., 2010) and case study research (Creswell & Poth, 2018; Merriam & Tisdell, 2015; Stake, 1995) with MMR (Johnson & Christensen, 2017; Tashakkori et al., 2020) in this doctoral thesis can be considered a methodological contribution. An MMR approach is suitable for exploring research questions, as it provides a more complete picture (Johnson & Christensen, 2017; Johnson et al., 2007; Tashakkori et al., 2020; Tashakkori & Teddlie, 2010). Following the manipulation of research designs advised in the literature on MMR, scoping review and case study research helped inform the four studies in this thesis. Consistent with the literature (Johnson & Christensen, 2017), the words or narratives from interviews in this thesis, including in-depth interviews with teacher educators in Article II and focus group interviews with student teachers in Articles III and IV, add meaning to the statistical numbers obtained from surveys in Articles II, III, and IV. Meanwhile, the statistical numbers add precision to the words and narratives in this thesis. The richness of both quantitative and qualitative data in this doctoral thesis was essential in exploring the FC teaching approach in teacher education. Furthermore, the different kinds of data collected from researchers, teacher educators, and student teachers helped in drawing a complete picture of implementing FC in teacher education and provided a nuanced and deep understanding of the FC teaching approach.

Another methodological contribution of this thesis relates to the validation of existing research methods in the study of the FC teaching approach in teacher education. Specifically, this thesis identified prevalent research methods used in the field and then validated their effectiveness. In Article I, prevalent research methods used in this field were identified. For instance, MMR was commonly used, and the participants involved in the research were mainly student teachers, including FC groups and non-flipped groups. Surveys were also commonly used to explore participants' perceptions. Interviews were often adopted to collect

qualitative data, and focus-group interviews were used more frequently than one-to-one interviews. Subsequently, these commonly used research methods were employed in Articles II, III, and IV, where the reliability and validity of these methods were further examined to ensure their effectiveness in generating meaningful results. By doing so, this thesis aimed to improve the quality of research on the FC teaching approach in teacher education and to contribute to its advancement. This doctoral thesis provides a comprehensive analysis of the research methods commonly used to investigate the FC teaching approach in teacher education and contributes to their validation (Johnson & Christensen, 2017). This, in turn, improves the quality of research in the field and helps advance the understanding and knowledge of the FC teaching approach in teacher education.

Last, the transparency of the research process in this doctoral thesis methodologically contributes to the research field. Throughout this synopsis and the four research articles in this thesis, the processes of identifying research problems, reviewing the literature, selecting research designs, deciding samples, collecting research data, and analyzing the collected data were thoroughly described. For instance, a rich and thick description of the contexts of case studies was presented in Articles II, III, and IV, which is helpful for improving the transparency of the adopted methodology and generalizing the findings. Doing so is consistent with Lincoln and Guba (1985), who emphasized the importance of providing a comprehensive description of the research process to ensure credibility, transferability, dependability, and confirmability. In addition, inclusion and exclusion criteria, search terms in database searches, article hits, and study selection were well-documented in Article I. This documentation enhances the transparency of the research process and enables other researchers to replicate the study, which is essential for building and advancing knowledge in any field of research. In summary, this thesis contributes to the research field by providing a transparent and comprehensive description of the research process. This level of transparency enhances the research's credibility and contributes to the advancement of knowledge regarding the FC teaching approach in teacher education.

6.1.4 Limitations and future research

Despite the abovementioned findings and contributions of this doctoral thesis, it is not without limitations. Researcher bias (see Section 4.4.3 Researcher bias and dilemmas) is discussed, and the limitations of the four articles are addressed in each of them. Therefore, the limitations of this thesis as a whole will be considered as follows. Furthermore, by

identifying the constraints and limitations of this thesis, new areas in need of research are revealed.

One potential limitation of this thesis is the use of purposive and convenience sampling strategies (Johnson & Christensen, 2017). While a detailed introduction of the participants in this thesis was included, these sampling strategies may still limit the generalizability of the findings. This is because purposive sampling involves selecting participants based on specific criteria, which may not be representative of the entire population. Convenience sampling involves selecting participants based on their availability, which may not be representative of the entire population either. Moreover, the sample size of this thesis may limit the generalizability of the findings. However, it is important to note that the use of purposive sampling allowed for the selection of participants with relevant characteristics, such as prior experience with the FC teaching approach. This approach enabled me to gather more in-depth and detailed information about the participants' perceptions of and experiences with the FC teaching approach.

Another potential limitation of this thesis is the lack of a pre-test on student teachers' motivation and engagement in Article IV. Without a pre-test, it is difficult to determine whether any changes in motivation and engagement observed in the study were a result of the FC teaching approach intervention or other factors. A pre-test would have provided a baseline measurement of student teachers' motivation and engagement before the intervention, making it easier to evaluate the effectiveness of the FC teaching approach. Nevertheless, in the context of this thesis, if the same survey had been administered as both a pre-test and a post-test, student teachers' exposure to the survey questions during the pre-test could have influenced their subsequent responses in the post-test. This could result in inflated or deflated scores on motivation and engagement measures, leading to misleading interpretations of the effects of the FC teaching approach.

In addition, this doctoral project was conducted before and during the Covid-19 pandemic, which might be another limitation. The pandemic brought about significant disruptions and changes to educational practices worldwide, including the rapid adoption of online and remote teaching modalities. The unforeseen circumstances and sudden transition to remote learning during the pandemic may have impacted the implementation and effectiveness of the FC teaching approach in ways that differ from a non-pandemic context. Therefore, the findings of this thesis may reflect the unique circumstances and challenges brought about by

the pandemic, potentially limiting their applicability to more typical educational settings. Furthermore, these contextual and temporal factors may have affected the amount of time it takes to publish articles. Article I in this thesis was published in 2020; however, Article III was published in 2023, and Article II will be published in 2023. This three-year gap might delay the dissemination of the research findings to the wider academic community and to practitioners.

Despite these limitations, this doctoral thesis still provides valuable insights into the use of FCs in teacher education. By identifying prevalent research methods in the field and validating their effectiveness, this thesis contributes to the advancement of knowledge in this field. The thorough description of the research process also enhances the credibility of this thesis.

Overall, it is important to recognize the limitations of this doctoral thesis and acknowledge the impact they may have on the generalizability of the findings. However, these limitations do not negate the value of this thesis's contributions to the research on the FC teaching approach in teacher education. Future research can build on this doctoral thesis by addressing some of the limitations identified, such as by using more representative sampling strategies and conducting pre-tests to establish baseline measurements.

Several areas for future research related to the FC teaching approach in teacher education are suggested. One suggestion is to explore the perceptions of teacher educators who may be resistant to implementing the FC teaching approach. Understanding their perspectives can provide insights into potential barriers and challenges in implementing the FC teaching approach and can help inform strategies to address these issues. Another suggestion is to examine the perceptions of student teachers who have taken several courses with the FC teaching approach or consecutive FC courses. This can help provide a more comprehensive understanding of the long-term impact of FCs on student teachers' learning outcomes and experiences. There is a significant demand for further empirical studies investigating the impact of the FC teaching approach on student teachers' learning achievement, motivation, and engagement. While Articles III and IV in this thesis focused on student teachers' perceptions and their motivation and engagement, measuring the actual impact of the FC teaching approach on student teachers' learning outcomes can provide more concrete evidence of its effectiveness in improving learning.

Additionally, future research can explore the potential impact of the FC teaching approach on other aspects of teacher education, such as the development of student teachers' pedagogical skills and instructional strategies and their PDC. Examining the role of technology in supporting the implementation of FCs is another suggested topic for future research. To advance understanding in this field, it is also essential to conduct more longitudinal research that explores whether student teachers exposed to the FC teaching approach during their teacher education programs continue to implement FC in their future teaching practices. By examining the extent to which student teachers incorporate FC strategies, materials, and pedagogical approaches in their own classrooms, researchers can shed light on the transferability and lasting impact of the FC teaching approach in the professional practices of student teachers.

Furthermore, it is important to investigate the relationship between teacher educators' and student teachers' PDC and their beliefs regarding technology and the implementation of FCs. Understanding this relationship can inform the design and implementation of effective teacher education programs that foster the development of technology-enhanced teaching practices and support the successful integration of the FC teaching approach.

The abovementioned suggestions for future research highlight the need for a more comprehensive understanding of the impact of FC in teacher education. Such studies can provide a more nuanced understanding of the strengths and limitations of the FC teaching approach and help inform decisions about its implementation in different contexts. These areas of research can also help address some of the limitations identified in this doctoral thesis and can help advance knowledge in this research field.

6.2 Conclusion

The Flipped Classroom (FC) teaching approach has become increasingly popular in various fields of education, including teacher education. This doctoral thesis aimed to investigate the use of FC in English language teacher education in Norway and its impact on student teachers' learning from three different perspectives—those of researchers, teacher educators, and student teachers. The overall research question of this thesis was to examine how FC is used in English language teacher education and how it can influence student teachers' learning. This thesis has provided valuable insights into the use of the FC teaching approach in teacher education, and the findings suggest that FC is a promising model for English language teacher education in Norway.

The four independent but interrelated research articles and the synopsis of this thesis provided a comprehensive picture of the FC teaching approach in teacher education. The scoping review study, Article I, showed that FC studies in teacher education were mainly conducted in the US, that there is increased implementation of this approach in European and Asian countries, and that adoption of this approach occurs primarily in the disciplines of pedagogy, science, and language arts. Article I also identified two main research foci across the reviewed studies—student perceptions and academic performance. Based on the synthesis, current trends and future development in the research field were discussed, and the pedagogical value of the FC teaching approach was added to teacher education. Article II focused on teacher educators' perceptions regarding the use of the FC teaching approach and its influence on student teachers in the field of English language teaching in Norway. This study revealed that teacher educators had positive experiences with FC and identified several advantages and challenges associated with using the FC teaching approach. Implications and suggestions for teacher educators regarding implementing the FC teaching approach were provided, which may help teacher educators make informed decisions about using the FC teaching approach in their teaching. Article III investigated student teachers' thoughts on FC in the field of English language teaching in Norway. This study found that student teachers perceived several advantages and challenges of using the FC teaching approach in their learning, and student teachers provided practical suggestions on implementing FC in teacher education. The possibility of student teachers becoming future flippers was also explored in this study. Article IV focused on the impact of FC on student teachers' motivation and engagement. The study found that there was no statistically significant difference between an FC group and a non-flipped group in terms of the effect of the FC teaching approach on student teachers' motivation and engagement. However, in the focus group interviews the FC group expressed that the FC teaching approach increased their motivation and engagement compared to the traditional lecture-based approach.

This doctoral thesis suggests several practical implications of implementing FC in teacher education. First, teacher educators need to be aware of the advantages and challenges of using the FC teaching approach and must make informed decisions about implementing FC in their teaching. Second, student teachers need to be informed about the FC teaching approach and its benefits and challenges. Third, teacher educators and student teachers need to work collaboratively to implement the FC teaching approach in teacher education. Fourth, the

implementation of FC in teacher education requires appropriate technological support, infrastructure, and resources.

This thesis has some limitations that must be acknowledged. The studies in this thesis were limited to English language teacher education in Norway, and the findings may not be generalizable to other contexts. In addition, the studies were limited to certain aspects of the FC teaching approach, and therefore further research is needed to investigate other aspects, such as its impact on student teachers' academic achievement. This thesis highlights the need for further research on the use of the FC teaching approach in teacher education, particularly in the context of English language education. The research findings of this doctoral thesis have identified knowledge gaps in the literature, and the suggestions provided by teacher educators and student teachers can be used as a starting point for future research.

In conclusion, this doctoral thesis contributes to the existing literature on FC in teacher education and provides insights into the use of the FC teaching approach in English language teacher education in Norway. The findings suggest that the FC teaching approach is a promising one for teacher education and that its implementation requires the collaborative efforts of teacher educators and student teachers. The FC teaching approach has the potential to enhance student teachers' learning outcomes, to improve student teachers' motivation and engagement, and to be an effective solution, particularly in the context of situations such as the Covid-19 pandemic. Meanwhile, teacher educators can benefit from the advantages of the FC teaching approach. Based on the suggestions of teacher educators and student teachers, it is expected that the FC teaching approach can be implemented in a favorable manner in teacher education.

6.2.1 Final remarks

This doctoral thesis has contributed to the understanding of the FC teaching approach in teacher education by examining the perceptions of English language teacher educators and student teachers in Norway. The empirical, theoretical, and methodological insights gained from this research provide a solid foundation for future studies in this field. By embracing the implications, addressing the limitations, and building upon the findings of this thesis, the educational community can continue to enhance instructional practices and improve teacher education programs, ultimately benefiting both teacher educators and student teachers in the pursuit of effective and innovative teaching approaches.

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Part II: The studies

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Article I

Flipped Classroom in Teacher Education: A Scoping Review

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Although flipped classroom (FC) has been popular in education since the 2000s, there is a lack of reviews on how the teaching approach has been applied and what has been gained in the field of teacher education. Most reviews focus either on implementation and learning outcomes with students in higher education and disciplines other than education or on the latter approaches with primary and secondary school pupils. This article presents a scoping literature review of 33 studies published between 2014 until 2019 on flipped classroom (FC) in teacher education. Our analysis points out that studies were mainly conducted in the United States, with an increased implementation in European and Asian countries, and with adoption primarily in the disciplines pedagogy, science, and language arts. Moreover, a majority of studies employed mixed methods with surveys being the most commonly used instrument to collect data. Two main foci were identified across the reviewed studies: *student perceptions* and *academic performance*. The analysis of the former revealed six outcomes (1. *Attitude, motivation, and emotion*; 2. *Content delivery*; 3. *Learning environment*; 4. *Learning experience*; 5. *Instructor and student presence*; 6. *Engagement*). Based on our synthesis, we discuss current trends and future development in the research field, FC's pedagogical value added in teacher education, and potential knowledge gaps in the research literature.

Keywords: flipped classroom, teacher education, higher education, pre-service teacher, scoping review

INTRODUCTION

Recent improvements in and access to digital technologies have paved the way for flipped classroom (FC) as an appealing, innovative, and motivating pedagogical teaching approach (Abeysekera and Dawson, 2015). Compared to traditional lectures often characterized by passive and transmissive modes of teaching, FC can be viewed as a "student-centered approach to teaching and learning that emphasizes student engagement and active learning" (Steen-Utheim and Foldnes, 2018, p. 308). Despite being around since the 2000s (cf. Baker, 2000; Lage et al., 2000), FC gained popularity with Bergmann and Sams (Bergmann and Sams, 2009, Bergmann and Sams, 2012) who were concerned about high school students missing end-of-day classes.

Bergmann and Sams (Bergmann and Sams, 2012, p. 13) state that the basic concept of FC is "that which is traditionally done in class is now done at home, and that which is traditionally done as homework is now completed in class." Building on the former definition, Bishop and Verleger (2013, p. 5) underline two aspects of FC: (1) "interactive group learning activities inside the classroom" and (2) "direct computer-based individual instruction outside the classroom." Similarly, Abeysekera and Dawson (2015, p. 3) note that in FC, "learning activities that are active and social" occur inside the classroom while "most information-transmission teaching" occurs outside the classroom.

The consequent enthusiasm among practitioners and researchers has resulted in increased interest in FC as an educational research area, in turn resulting in several literature reviews and meta-analyses (O'Flaherty et al., 2015; Betihavas et al., 2016; DeLozier and Rhodes, 2017; Akçayir and Akçayir, 2018; Hew and Lo, 2018; Turan and Akdag-Cimen, 2019). However, reviews on FC rarely focus on teacher education with study populations including teacher educators, pre-service teachers, or mentor teachers. O'Flaherty et al. (2015), for example, investigated FC in higher education. Their review included studies with empirical evidence from across subject disciplines (e.g., nursing, business management, social science) and found indirect evidence for FC improving academic performance, and student and staff satisfaction. However, most of the included studies were not related to teacher education and thus the review has limited utilization to the field. In addition, Hew and Lo (2018) conducted a meta-analysis on FC and student learning in health profession education, while Turan and Akdag-Cimen (2019) focused on FC and English language teaching.

Although there is a growing interest in the field, little is known about the use of FC in teacher education, where there is currently a lack of reviews systematically organizing empirical studies in the research field. Therefore, it is necessary to conduct a scoping review of FC in teacher education to inform researchers and practitioners about the latest developments, knowledge, experiences, and research foci in the field. The scoping review approach has become growingly popular among researchers for synthesizing research data (Davis et al., 2009; Daudt et al., 2013) because a scoping review can, according to Arksey and O'Malley (2005, p. 21) help meet four goals: "(1) To examine the extent, range and nature of research activity; (2) To determine the value of undertaking a full systematic review; (3) To summarize and disseminate research findings; (4) To identify research gaps in the existing literature." Thus, the current study adopts the scoping review approach and seeks to obtain both quantitative and qualitative data which will help to address the abovementioned information for researchers and practitioners. In the next sections of the article, we introduce the review method, followed by a presentation of results and discussion of findings.

METHOD

The current study was conducted as a scoping review (Arksey and O'Malley, 2005; Levac et al., 2010). According to Grant and Booth (2009, p. 101), a scoping review:

> provides a preliminary assessment of the potential size and scope of available research literature. It aims to identify the nature and extent of research evidence (usually including ongoing research). […] Scoping reviews are able to inform policymakers as to whether a full systematic review is needed. They share several characteristics of the systematic review in attempting to be systematic, transparent and replicable.

The present study adopted the five-stage framework of Arksey and O'Malley (2005, p. 22): (1) identifying the research

TABLE 1 | Key search terms.

Search terms	
AND	"flipped approach" OR "flipped class" OR "flipped classroom" OR "flipped instruction" OR "flipped learning" OR "flipped methods" OR "flipped model" OR "flipped teaching" OR "flipping classroom" OR "inverted classroom" OR "inverting classroom" OR "peer instruction"
	"aspiring teacher" OR "future teacher" OR "novice teacher" OR "pre-service teacher" OR "prospective teacher" OR "student teacher" OR "teacher education" OR "teacher educator"

question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results.

Identifying the Research Questions
The following two research questions (RQs) guided the review:

1. What are the trends in FC in teacher education?
2. What are the research foci and findings of the presented studies on FC in teacher education?

The first question aims to provide an overview and a map of trends in FC in teacher education by providing details about variables including author details, year of publication, country location, subject disciplines, research methodology, study design, and participants. The second research question aims to summarize and disseminate the different approaches to and outcomes of FC in teacher education.

Identifying Relevant Studies
The search terms were developed and categorized based on two dimensions according to the purpose of the review. One dimension was related to FC (i.e., the activity examined), while the other dimension was related to pre-service teachers (i.e., the participants in the activity examined) to narrow the search within the field of teacher education. Each search term was separated by the Boolean OR operator and each dimension was separated by the Boolean AND operator, which was outlined in **Table 1**.

A set of inclusion and exclusion criteria were developed to focus the scope of the review (**Table 2**). Based on previous research, FC has been observed in the research literature since the early 2000s (Lage et al., 2000), and so the last 20 years were set as the time period for the review. Other criteria include peer-reviewed articles, English and Norwegian languages, a focus on empirically driven studies, and with populations related to teacher education where the sample size is explicitly mentioned.

Two electronic databases were searched: Education Resources Information Center (ERIC) and Web of Science. Moreover, a manual search or "hand-searching" (Chapman et al., 2010, p. 23) reference lists was conducted after searching the databases to "locate relevant studies missing in the database searches" (Røkenes and Krumsvik, 2014, p. 255).

Study Selection
Based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement (Moher et al., 2009),

TABLE 2 | Inclusion and exclusion criteria.

Criterion	Included	Excluded
Databases	Eric, Web of Science	Other databases
Time frame	2000–2019	Articles published before January 1, 2000
Publication type	Online peer-reviewed articles	Books and book chapters, conference proceedings, short papers, gray literature (e.g., reports), editorials
Languages	English and Norwegian	Other languages
Focus	Empirical studies with a primary focus on the flipped classroom in the field of teacher education	Articles focusing on aspects other than the flipped classroom (e.g., the effects of an online course that has utilized the flipped classroom method in the implementation phase)
Participants	Articles focusing on pre-service teachers, student teachers, teacher educators, prospective teachers, future teachers, and aspiring teachers	Articles focusing on pupils and in-service teachers
Sample	Studies explicitly stating the number of study participants	Articles not explicitly mentioning the number of study participants (e.g., "a group of" or "more than 470")

Figure 1 shows the study selection process, including procedures for searching databases, searching manually, screening titles and abstracts, screening full texts, and selecting eligible articles for inclusion. The last database search was conducted on January 1, 2020; 92 articles were identified, from among which 17 duplicates were removed. All the potentially relevant articles went through a two-step screening process. The first step was to exclude irrelevant articles by screening titles and abstracts. The second step was to filter out unrelated articles by screening full texts. After the first step, 12 articles from ERIC and 19 from Web of Science were excluded because they were unrelated to FC or not conducted in the field of teacher education. After the second step, 11 articles from ERIC and two from Web of Science were removed mainly due to research focus and sampling, such as focusing on the effects of an online course instead of FC or the unclear number of study participants. Eventually, 33 articles were included for further analysis, 22 from ERIC, nine from Web of Science, and two found through a manual search. Full texts were obtained of the 33 studies, and each study was reviewed and confirmed as suitable for inclusion by the authors.

Data Charting and Collation

Summaries of each study were developed based on indicators including authors, year of publication, country location, research design, methodology, study population and sample size, and brief descriptions of outcomes (**Table 3**). In **Table 3**, EG (experimental group) has taken courses in FC and CG (control group) has taken courses in a traditional classroom. A detailed table with study title, discipline, research questions, and characteristics of participants can be found in the **Supplementary Material**). Next,

studies were analyzed using a coding and categorization strategy (Saldaña, 2016).

Summarizing and Reporting Findings

In accordance to the fifth stage of Arksey and O'Malley's (2005) framework for scoping reviews, the next sections summarize, report on, and discuss findings from the 33 included studies.

RESULTS AND DISCUSSION OF FINDINGS

The coding and analyzing system included three main categories (i.e., general characteristics, research methods, and research foci), each with several subcategories.

General Characteristics of Included Studies
Distribution by Year of Publication
The results from the database searches revealed that the first studies about FC in teacher education were published in 2014, while according to a previous review article the first study about FC was published in 2000 (Akçayir and Akçayir, 2018). Thus, FC research in teacher education started nearly 14 years after the first published study on FC. As shown in **Figure 2**, even though FC research in teacher education started late, according to Akçayir and Akçayir, this is still within the main tendency in the FC research: "After more than a decade, flipped classroom studies became popular among scholars; the numbers of such studies began to steadily increase after 2012" (2018, p. 337).

Distribution by Country
Figure 3 shows that nearly one third of the reviewed studies were conducted in the USA (10 of 33 articles), while seven were conducted in Turkey. Six studies were conducted in Spain; two were conducted in each of Australia, South Africa, and South Korea; and one was conducted in each of Canada, China, Kuwait, and Norway.
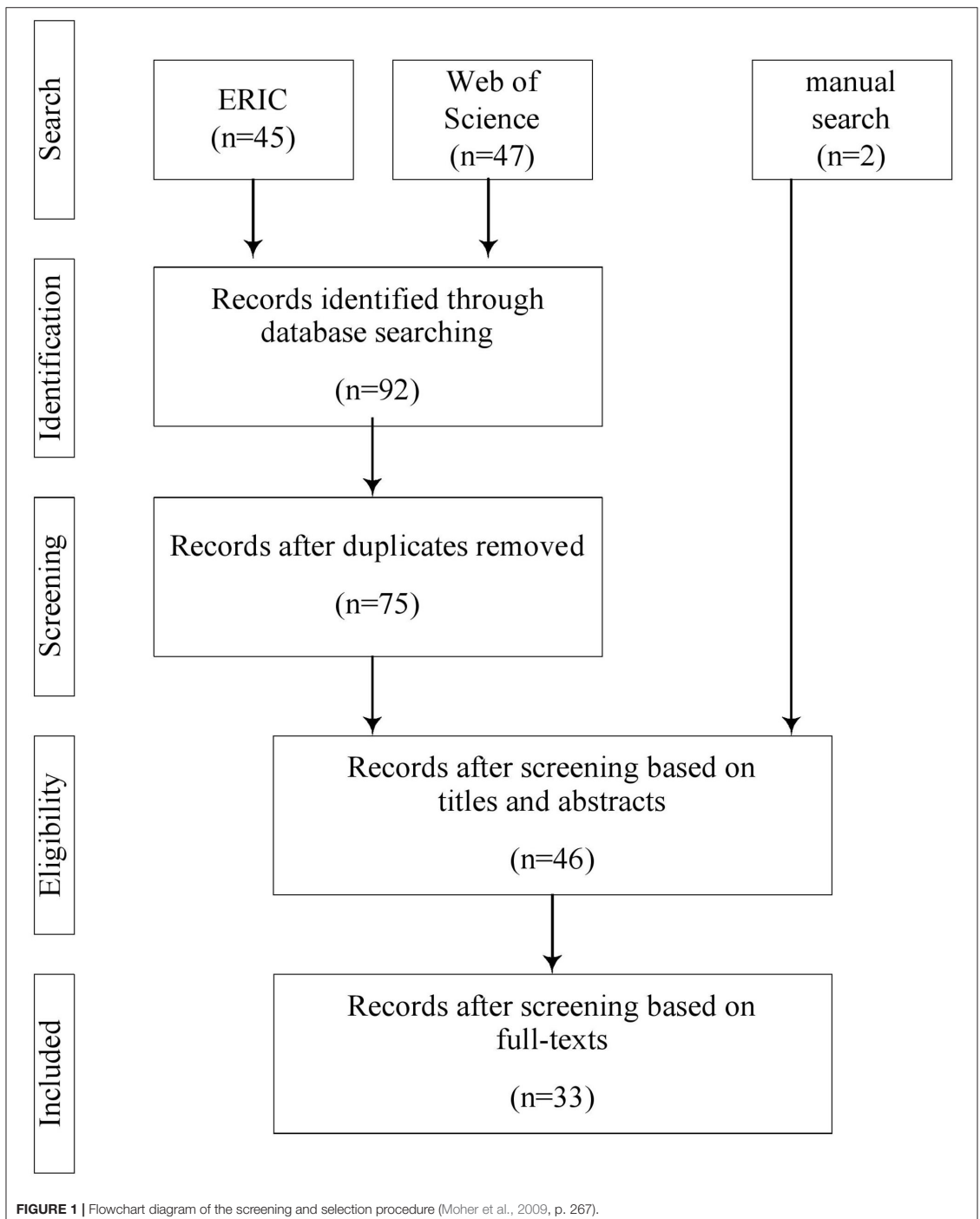
Distribution by Subject Discipline
Teacher education involves many subject disciplines, such as general education, mathematics, science, language, history, and health science. In this review, articles were categorized as "pedagogy" when courses were not aiming at a specific subject discipline or a certain group of student teachers, such as an introduction to educational psychology course, an instructional methods course, and an educational technology course. **Figure 4** shows that nearly one third of the reviewed studies (10 articles out of 33) were in pedagogy. When further subdividing the studies into different subject disciplines, studies on FC in teacher education were mainly in the science (six articles), language (five articles), and mathematics (three articles) disciplines.

Research Methods of Included Studies
Methodological Paradigm
Out of the 33 reviewed studies, more than half (17) did not explicitly identify their methodological paradigm. Therefore, we categorized the methodological paradigms in these articles based on the description in the method sections. **Figure 5** shows

Search

| ERIC (n=45) | Web of Science (n=47) | manual search (n=2) |

Identification

Records identified through database searching

(n=92)

Screening

Records after duplicates removed

(n=75)

Eligibility

Records after screening based on titles and abstracts

(n=46)

Included

Records after screening based on full-texts

(n=33)

FIGURE 1 | Flowchart diagram of the screening and selection procedure (Moher et al., 2009, p. 267).

TABLE 3 | Overview of included studies.

Study number/ authors	Year/ country location	Research design	Methodology/ study population and sample size	Outcomes
S1 Adnan, M.	2017 Turkey	Analyzing EG's final journal entry guided by open-ended questions. Comparing midterm/quiz, essay and final portfolio scores between EG and CG. Interviewing focus group. Recording weekly electronic journal entries of EG.	Mixed 70 in total, 31 in EG, 39 in CG	No significant difference between EG and CG on midterm/quizzes and final e-portfolio scores. EG received significantly higher essay scores. Both EG and CG had positive and negative perceptions on content delivery and student presence. EG had positive perceptions on learning environment and experience.
S2 Almodaires, A. A., Alayyar, G. M., Almsaud, T. O., Almutairi, F. M.	2019 Kuwait	Comparing scores from three exams between EG and CG. Survey.	Mixed 195 in total, 128 in EG, 67 in CG	Significant difference among the three exam results in favor of EG, but no significant difference on final grade. EG had favorable attitudes toward FC.
S3 Cabi, E.	2018 Turkey	Comparing pretest and posttest scores between EG and CG. Focus group.	Mixed 59 in total, 28 in EG, 31 in CG	No significant difference between EG and CG in academic performance. Coming to the class prepared and no assignments outside the class were positive aspects. Problems encountered were about motivation, content, and learning.
S4 Choi, J., Lee, Y.	2015 (South) Korea	Comparing pretest and posttest scores between EG and CG. Survey from EG.	Mixed 79 in total, 39 in EG, 49 in CG	Significant difference in favor of EG in academic achievement. FC was more effective for students to learn knowledge and skills for instructional material production, and the effects were more observable in a difficult task. EG had positive attitudes (out of a total 25 respondents, 18 preferred FC, 5 liked traditional, 2 were neutral).
S5 Conner, N. W., Rubenstein, E. D., DiBenedetto, C. A., Stripling, C. T., Roberts, T. G., Stedman, N. L. P.	2014a USA	A focus-group conversation.	Qualitative 32 in EG	EG had mixed perceptions of FC. Positive aspects of online lectures were simplicity and knowledge development, and negative aspects were technological issues. Positive aspect of classroom learning activities was knowledge development, and negative aspects were teaching assistant consistency and negative impact on knowledge development.
S6 Conner, N. W., Stripling, C. T., Blythe, J. M., Roberts, T. G., Stedman, N. L. P.	2014b USA	Focus group.	Qualitative 14 in EG	EG's perceptions of overall learning were that FC could help students learn and build confidence in teaching skills. EG had mixed perceptions of the quality and effectiveness of online video modules and online quizzes. EG suggested restructuring of in-class lecture time.
S7 Dove, A., Dove, E.	2017a USA	Pre-course and post-course survey.	Mixed 48 in total, 22 in EG (taking consecutive FC), 26 in CG	EG had significantly greater decreases for general mathematics anxiety CG. EG's mean score decreased on both survey scales, while CG's mean score increased. No significant difference between EG and CG in anxiety about teaching mathematics. Both EG and CG found flipped learning to be a worthwhile instructional practice for a mathematics course.
S8 Dove, A., Dove, E.	2017b USA	Pre-course and post-course survey. A whole class interview. Scrutinizing classroom observation (video-tape).	Mixed 114 in total, 75 in EG, 39 in CG	EG was able to incorporate more opportunities for interaction and communication within and between students and the instructor. EG (teacher flipped) was significantly better at decreasing students' general math anxiety than EG (Khan Academy flipped) and CG. EG (teacher flipped) was significantly better at decreasing students' anxiety about teaching mathematics than EG (Khan Academy flipped). EG had positive perceptions on the influence of the instructor, the classroom instructional methods, and the methods used for delivery of the content.
S9 Erdogan, E., Akbaba, B.	2018 Turkey	Focus group.	Qualitative 9 in CG	CG had a positive attitude toward FC. CG did not think that they were equipped enough to implement FC. CG wanted to use FC in the teaching process but that a certain experience had to be provided first.

(Continued)

TABLE 3 | Continued

| Study number/ authors	Year/ country location	Research design	Methodology/ study population and sample size	Outcomes
S10 Ford, P.	2015 USA	Examining strategies for creating lessons. Exploring the structure of the in-class sessions. Recording reflections from the instructor and pre-service students.	Mixed 30 in EG	Two formats of content delivery in FC, teaching to an imaginary classroom and creation of large slides or storyboards, were shared. The instructor gained higher scores on teaching evaluation.
S11 Fraga, L. M., Harmon, J.	2014 USA	Comparing exam scores between EG and CG. Recording reflections from the instructor. Pre-post survey.	Mixed 51 in total, 25 in EG, 26 in CG	No significant difference between EG and CG in exam scores. EG was on higher confidence level than CG in teaching particular aspects of word study.
S12 García-Sánchez, S., Santos-Espino, J. M.	2017 Spain	Documenting anonymous blog contributions. Recording the elaboration process of videos. Survey.	Mixed 90 in EG	EG's preferred video style was a lecture displayed as some variant of slideshow, mostly combined with narrator's face and voice. Simple record-and-publish software tools were favored over more sophisticated settings by EG. EG had positive attitude toward FC.
S13 González-Gómez, D., Jeong, J. S., Airado Rodríguez, D. A., Cañada-Cañada, F.	2016 Spain	Comparing assessment scores between EG and CG. Post-task survey.	Quantitative 103 in total, 52 in EG, 51 in CG	A statistically significant difference on all assessments in favor of EG performing higher on average. EG had a favorable perception about FC.
S14 González-Gómez, D., Jeong, J. S., Cañada-Cañada, F.	2019 Spain	Pre–post survey.	Quantitative 68 in EG	Significant differences in EG's self-efficacy before and after course completion. FC significantly increased EG's positive attitudes toward science and scientific contents.
S15 Graziano, K. J.	2017 USA	Conducting informal discussion. Exploring lesson plans. Post-survey. Scrutinizing classroom observation (field notes).	Mixed 24 in EG	EG were more productive and enthusiastic about class. Develop meaningful, engaging activities in FC was a challenge. Most EG were likely to implement FC when they became teachers.
S16 Hall, J. A.	2018 USA	Exploring pre–post course lesson plans. Pre–post survey.	Quantitative 23 in EG	EG gained statistically significant self-perceptions of pedagogical knowledge and application of technological pedagogical content knowledge. EG's gains in self-perceptions of technological knowledge and technological pedagogical knowledge were not statistically significant.
S17 Helgevold, N., Moen, V.	2015 Norway	Examining individually written texts. Focus group. Survey.	Mixed 81 surveys from EG, 107 written texts	FC stimulated greater involvement in the teaching and learning processes. Variation in modalities was highlighted among EG. EG pointed FC as relevant to their future teaching practices.
S18 Jeong, J. S., Cañada-Cañada, F., González-Gómez, D.	2018 Spain	Examining grades obtained from in-class activities, laboratory activities, final exam and passing rate. Post-task survey.	Quantitative 153 in EG	Significant difference on students' performance in favor of FC. EG had general positive perceptions toward FC. The overall scores were very high in positive emotions, women's group expressed generally higher values in negative emotions. Students' educational background has an effect on scores in the negative emotions.
S19 Jeong, J. S., González-Gómez, D., Cañada-Cañada, F.	2016 Spain	Survey.	Quantitative 65 in EG	EG had a general positive opinion about the flipped materials. The majority of EG were satisfied with the instruction methodology. Positive emotions were fun and enthusiasm, and negative emotion was concern.
S20 Jeong, J. S., González-Gómez, D., Cañada-Cañada, F.	2019 Spain	Survey.	Mixed 127 in total, 65 in EG, 62 in CG	EG had a valuable learning experience in general. FC fostered students' participation more effectively than traditional teaching formats. Positive emotions were highly scored by EG.

(Continued)

TABLE 3 | Continued

Study number/ authors	Year/ country location	Research design	Methodology/ study population and sample size	Outcomes
S21 Karaaslan H., Çelebi, H.	2017 Turkey	Focus group. Survey.	Mixed 29 in EG (25 participated in focus-group interview, 21 completed survey)	EG's views on flipped tasks were positive in most respects. EG's views on flipped learning and related constructs were generally have positive attitudes.
S22 Kurt, G.	2017 Turkey	Comparing final exam scores between EG and CG. Focus group. Survey.	Mixed 62 in total, 32 in EG, 30 in CG	Overall scale of self-efficacy was significantly different between EG and CG. Subscales (student engagement and classroom management) were significantly different between EG and CG. Subscale (instructional strategies) was not different at a significant level, but EG had higher gains than CG. Statistically significant difference in final exam scores in favor of EG.
S23 Lee, J., Bonk, C. J.	2019 (South) Korea	Pre–post survey.	Mixed 30 in EG (three pre-service teachers did not participate in the post-survey and were excluded for further data analysis.)	Significant difference in learning time between EG and CG, and EG spent more time learning. EG interacted with instructors more frequently. EG gained more frequent feedback from instructor and more noticeable differences with peers. EG had much more positive perceptions about all of the listed learning activities. There was statistically significant difference in the overall self-regulated learning ability and cognitive domain, but no significant differences in other domains.
S24 Montgomery, A. P., Mousavi, A., Carbonaro, M., Hayward, D. V., Dunn, W.	2019 Canada	Examining course scores. Recording log files.	Quantitative 157 in EG	Self-regulated learning behaviors had weak to moderate significant relationships with academic achievement. Access day-of-the-week and access frequency were taken as the strongest predictors for student success.
S25 Ng, E. M. W.	2018 China	Comparing pretest and posttest scores. Focus group. Scrutinizing class activities.	Mixed 73 in EG	EG was self-regulating and learning. EG was able to apply their acquired online knowledge in group projects. The advantages of FC included promoting self-learning, innovation, and flexibility.
S26 Sammel, A., Townend, G., Kanasa, H.	2018 Australia	Survey.	Mixed 79 in EG	EG's perceptions on enjoyment was a positive skew, and on degree or extent of science learning was a negative skew.
S27 Sayeski, K. L., Hamilton-Jones, B., Oh, S.	2015 USA	Examining pre–post test scores. Survey.	Mixed 115 in EG	Statistically significantly difference in Peer-Assisted Learning Strategies module, and no statistically significant differences in Classroom Management and Accommodations modules. EG was more confident in the degree to which the content was learned in FC. The most popular condition was the FC condition.
S28 Sengel, E.	2016 Turkey	Comparing final test scores between EG and CG. Survey.	Mixed 74 in total, 40 in EG, 34 in CG	EG had positive perceptions toward the practicality of FC model. No statistically significant difference between EG and CG. EG was willing to pay more toward physics course and they were more motivated to solve physics problems.
S29 Tomas, L., Evans, N., Doyle, T., Skamp, K.	2019 Australia	Exploring instructors' journal. Survey.	Mixed 171 in EG	EG had a positive perception toward FC. Additional teacher-led instruction, scaffolding and guidance were required in class.
S30 Turan, Z., Goktas, Y.	2018 Turkey	Focus group. Survey.	Mixed 116 in total, 58 in EG, 58 in CG	Attention, relevance, confidence, and satisfaction scores of EG are higher than CG. Leading positive motivational factor in EG was hands-on activities, and leading negative motivational factor in EG was difficulty.
S31 van Wyk, M. M.	2018a South Africa	Survey.	Quantitative 371 in EG	91% EG strongly agreed that FC is a student-centered approach which increased student active learning, promote, and increase classroom interaction.

(Continued)

TABLE 3 | Continued

Study number/ authors	Year/ country location	Research design	Methodology/ study population and sample size	Outcomes
				EG perceived that the teacher played an important role in FC. FC forced students to take responsibility for their own learning.
S32 van Wyk, M. M.	2018b South Africa	Comparing final exam scores between EG and CG. Exploring blog postings. Survey.	371 in total, 208 in EG, 162 in CG	EG outperformed CG in the final examination scores. EG had a positive lived experience. Teachers were important in deciding activities (out-of-class and in-class). FC forced students to take responsibility for their own learning.
S33 Yough, M., Merzdorf H. E., Fedesco, H. N. Cho, H. J.	2017 USA	Comparing test scores between EG and CG. Survey.	Quantitative 263 in total, 152 in EG, 111 in CG	CG had significantly higher scores on two of the motivation outcomes (intrinsic and identified regulation) than EG, but EG had significantly higher scores on several indices of objective learning outcomes.

FIGURE 2 | Number of articles published by year.
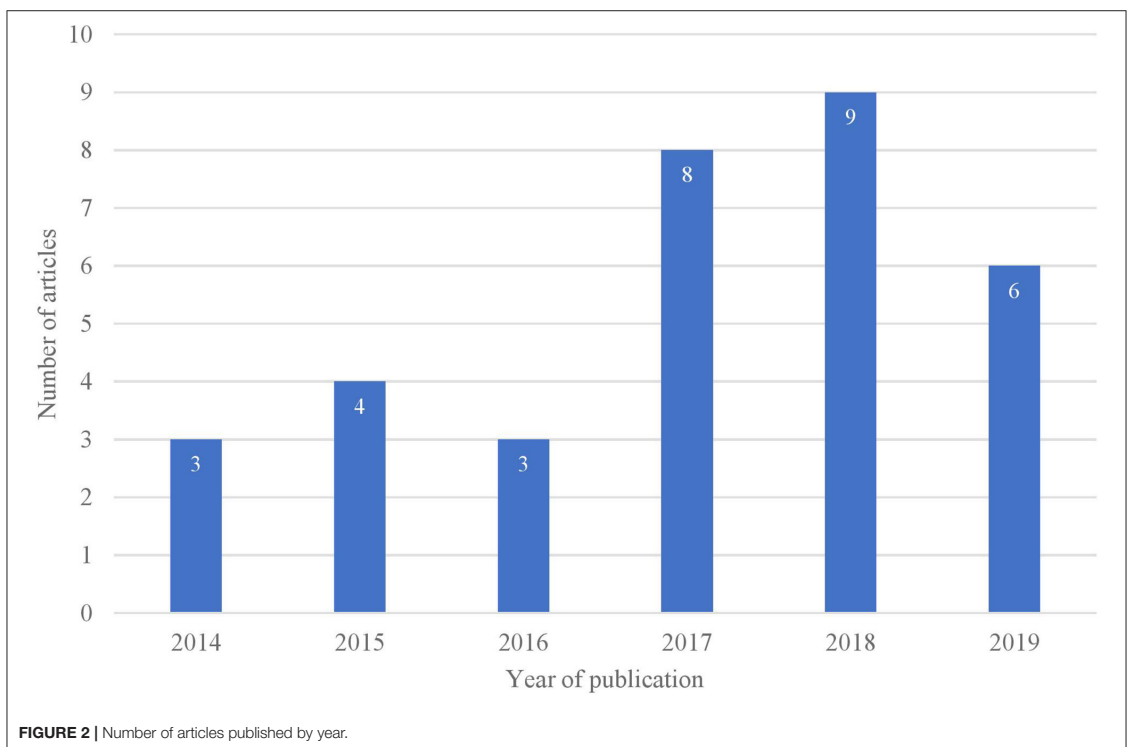
that 22 (67%) of the studies used mixed methods for data collection, 8 (24%) used quantitative methods, and 3 (9%) used qualitative methods.

Participants Involved in the Research

The current study focuses on the FC in teacher education; therefore, the authors were interested in the perceptions of pre-service teachers and the effects (e.g., academic, engagement, and emotional) on pre-service teachers that were explored in all the reviewed studies. **Figure 6** shows that participants who were taught using a FC approach were coded as the experimental group (EG), while those who were not were coded as the control group (CG). Of the 33 reviewed studies, 18 were conducted only with participants who had learned using an FC approach; 14 were conducted with participants who learned using both an FC and a traditional approach. Only one study (Erdogan and Akbaba, 2018) involved participants who had not taken any courses taught using the FC approach; this study investigated student teachers' opinions about whether the social studies classroom should be flipped.

FIGURE 3 | Distribution of articles conducted in various countries.
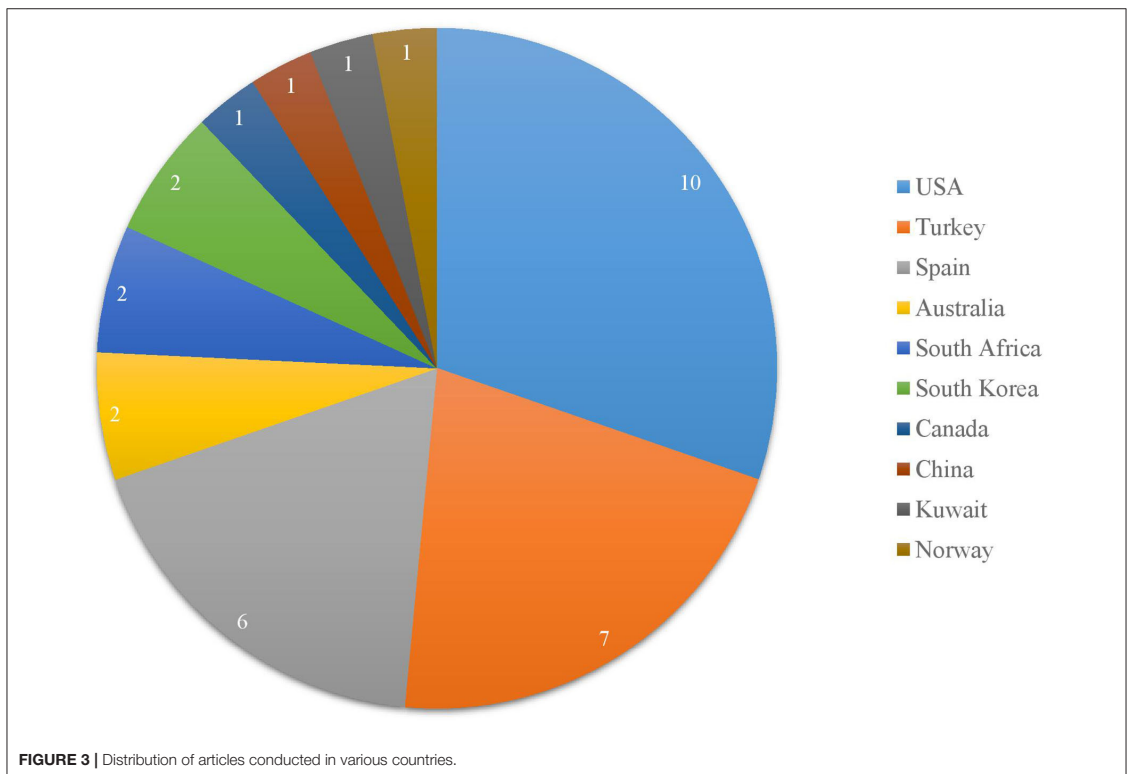
The number of EG members ranged from 14 to 371, while the number of CG members ranged from 9 to 162. The total number of participants across all 33 reviewed studies ranged from 9 to 371.

Instruments for Data Collection

Table 4 lists all instruments used for data collection in the reviewed studies; S + [number] represents the studies reviewed (e.g., S1 represents the first study in the reviewed list). Surveys, both paper-based and online, were the most commonly used tool (over two thirds) to explore participants' perceptions. Some studies applied both pre- and post-surveys (Fraga and Harmon, 2014; Dove and Dove, 2017a,b; Hall, 2018). Others conducted surveys after an FC intervention. Test scores were frequently used to collect data about students' academic performance, and scores could come from final exams, tests, or quizzes. Interviews were often used to collect qualitative data, and focus-group interviews were used more frequently than one-to-one interviews. Due to the characteristics of teacher education, lesson plans made by student teachers could also be considered an instrument. Classroom observation was conducted in FCs as well, with the observations in the form of both video-taped lessons and field notes. Student teachers' weekly journals, teacher educators' journals, and student teachers' feedback were all reflections of

participants in teaching and learning and could be generalized as self-report materials. Tasks completed by student teachers also served as a tool to collect data. As a teaching methodology or pedagogical instructional model closely related with information and communication technology (ICT), the FC is always linked with computers or the Internet. Therefore, a course blog and student teachers' log information could also be considered data. Furthermore, course assessments are often conducted at the end of a university-level course, and so that data can also be used to study the FC.

Research Foci of Included Studies

Most of the reviewed studies (27) seemed to be concerned with students' perceptions of the FC, and some (14) also explored whether the FC could improve students' academic performance (**Figure 7**). Other aspects examined were teacher educator's perceptions of the FC (two studies), students' self-regulated learning (SLR; two studies), students' anxiety (two studies), students' self-efficacy (two studies), and students' self-perceptions of pedagogical knowledge, technological knowledge, and technological pedagogical content knowledge (TPACK; one study).

FIGURE 4 | Distribution of studies conducted in different subject disciplines.
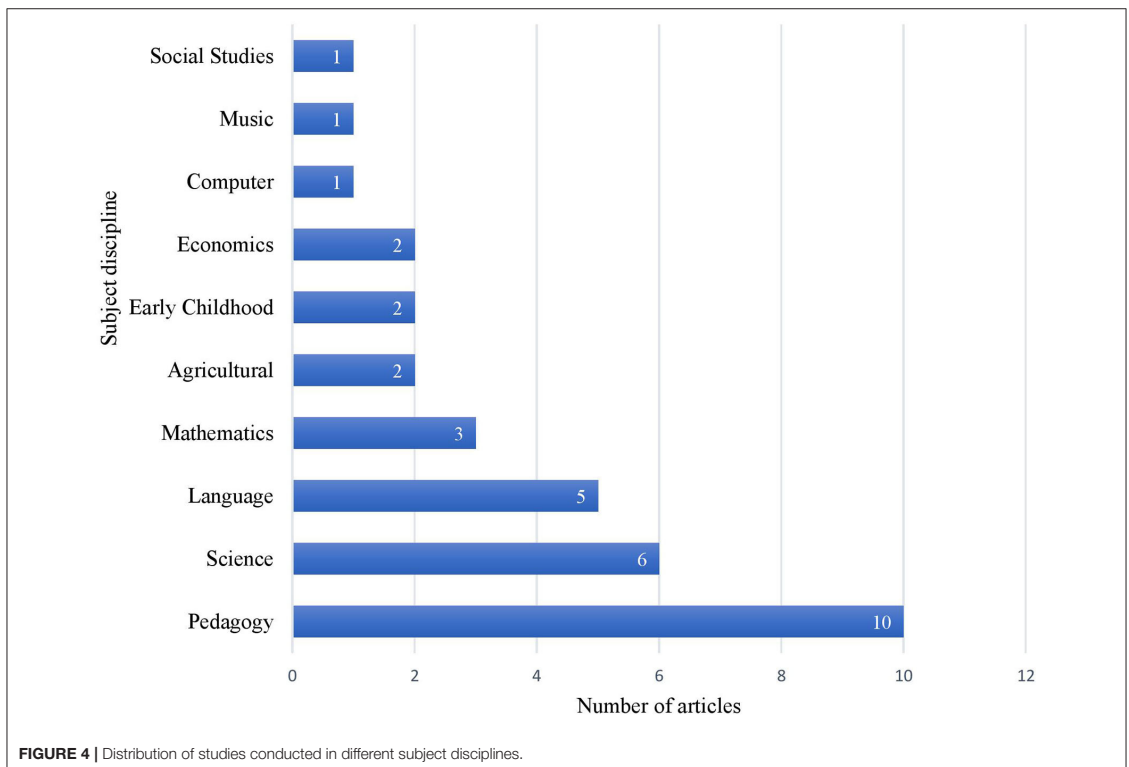
Student Perceptions of the Flipped Classroom

The top research focus reflected in 27 of the 33 articles is student perceptions of the FC teaching approach. **Figure 8** gives an overview of the aspects of student perceptions covered in those 27 studies.

Table 5 lists details about the different research foci and their representative articles. Each aspect will be elaborated in the following text.

Attitude, Motivation, and Emotion

The reviewed studies were categorized as examining attitude, motivation, and emotion when they explored student teachers' or teacher educators' attitudes, motivations, and emotions vis-à-vis the FC. Students had favorable attitudes and "a general positive opinion" (González-Gómez et al., 2016, p. 456, 458). For example, on flipped classes, students said "it was a really good class" (Conner et al., 2014b, p. 74) and "this class was by far the best class we have taken" (Conner et al., 2014b, p. 74, 75). Student participants in Fraga and Harmon (2014) stated they liked the FC model because of "the time flexibility" (p. 22, 24) and "being in control of their own individual learning" (p. 22, 24). Survey data from García-Sánchez and Santos-Espino (2017) showed that students were satisfied with the FC approach due to "remarkable facts that suggest participants were pleased with their creative abilities" (p. 178). Focus-group interview data from

Kurt (2017) indicated that all participants were "highly satisfied" (p. 216) because of "their perception of better learning and their enjoyment of the flipped class model" (p. 216). Sayeski et al. (2015) compared three instructional conditions (independent, facilitated, and flipped) and concluded from students' survey data that "the most popular condition was the flipped classroom condition" (p. 302). In Ng's study (2018), eight students attended the focus-group interview and "they all liked" (p. 72) the FC approach and its advantages of "promoting self-learning, innovation, and flexibility" (p. 72). FC was associated with "a general positive perception" (Jeong et al., 2018, p. 163) not only in the face-to-face learning environment but also in the online environment; 91% of participants in van Wyk's (2018a) study strongly agreed that FC was a student-centered approach that increased student active learning and promoted and increased classroom interaction.

However, students' attitudes toward the FC compared to the TC were sometimes "variable" (Tomas et al., 2019, p. 12). A student in Conner et al. (2014a) "felt the flipped classroom approach went well, but was challenging to keep up with if you forgot to watch the online videos prior to attending class" (p. 73). One student commented that in FCs students should "take responsibility for not only our own learning, but for our classmates as well" (Graziano, 2017, p. 124). A student in Dove and Dove (2017a) also said that the responsibility of learning was

FIGURE 5 | Distribution of articles conducted using three methodological paradigms.
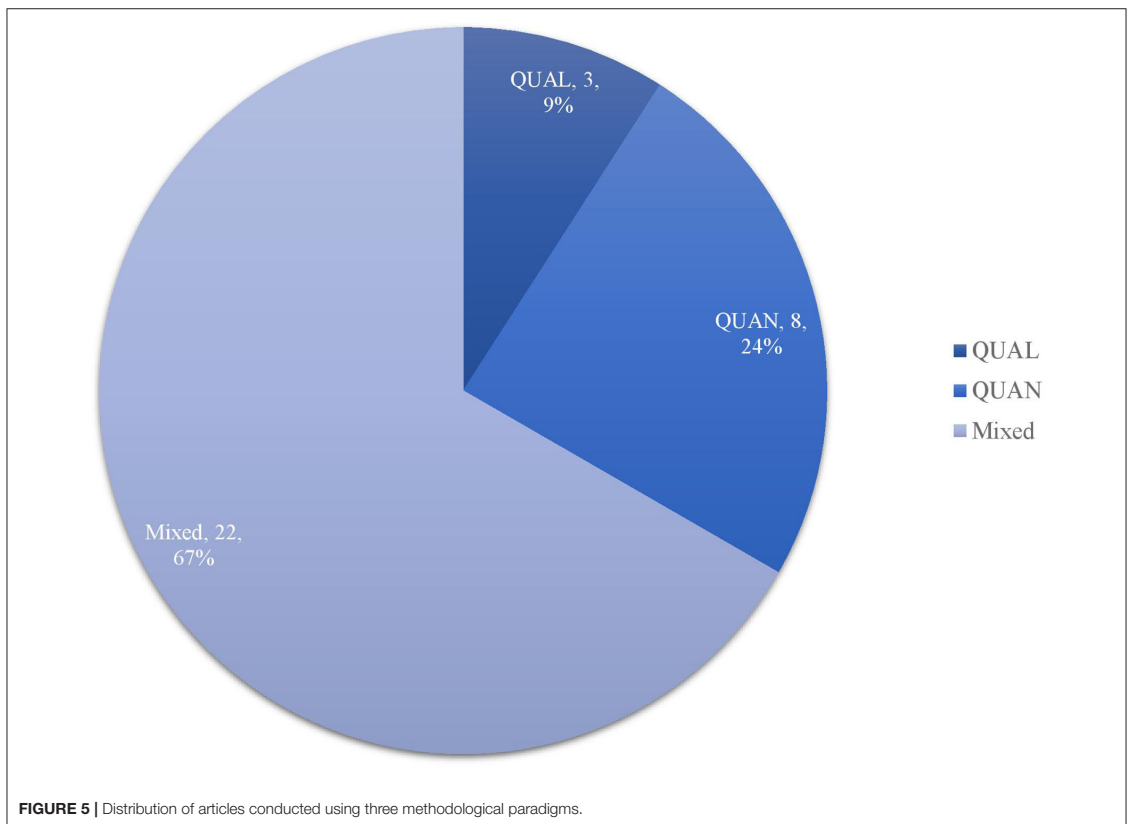
"completely on the students" (p. 138). Besides responsibility, the responses of students who disliked the FC model "fell into two categories—issues of time management and confusion" (Fraga and Harmon, 2014, p. 22). Tomas et al. (2019, p. 12) summarized students' attitudes toward FCs, stating "In spite of the variability in students' perceptions, the majority appeared to respond positively to the flipped classroom approach." Furthermore, student teachers seemed to favor having flipped classes in the future. Survey data from Jeong et al. (2016) showed that 94% of participants agreed or strongly agreed that they were "willing to have more courses flipped" (p. 753). In Kurt (2017), one student said, "I believe my future students will benefit from" (p. 217) flipping a language classroom. A participant in van Wyk (2018b) posted on the class blog that "I love flipping my class strategy and will definitely use it" (p. 19). There were other varying opinions as well. For example, survey data from Jeong et al. (2019a) revealed that students "agreed or strongly agreed to have more courses flipped" (p. 8) because the flipped course was "interactive" (p. 10) and "interesting" (p. 10). Survey data from Graziano (2017) also showed that "the majority of students said very likely or likely" (p. 125) in response to being asked about flipping their own classrooms in the future. One student teacher commented

in the informal discussion that "I will not have the time during my first few years of teaching to accurately gather or make videos on my own" (p. 124).

Several studies also explored students' motivation vis-à-vis FCs. Sengel (2016)'s survey data revealed that students in FCs "were willing to pay more" (p. 495) for the course and "were more motivated" (p. 495). Survey data from Tomas et al. (2019) indicated that "for a majority of students, the flipped approach enhanced their motivation to learn" (p. 12). Turan and Goktas (2018) focused their research on the impact of FCs on students' motivation; their survey data revealed that "the motivation for students in the experimental group was greater than that of the control group" (p. 142), which meant that students' motivation in FCs was greater than that in TCs. Turan and Goktas (2018) categorized motivation within the scope of ARCS theory, which identifies attention, relevance, confidence, and satisfaction as four critical components that affect motivation. They discovered that "the attention level of students [in the experimental group, our interpretation] toward the course was clearly high" (p. 142). In fact, all the ARCS scores in Turan and Goktas (2018) were higher for the EG than for the CG. Turan and Goktas (2018) also found that the leading positive motivational factor was hands-on

FIGURE 6 | Student participants involved in research.
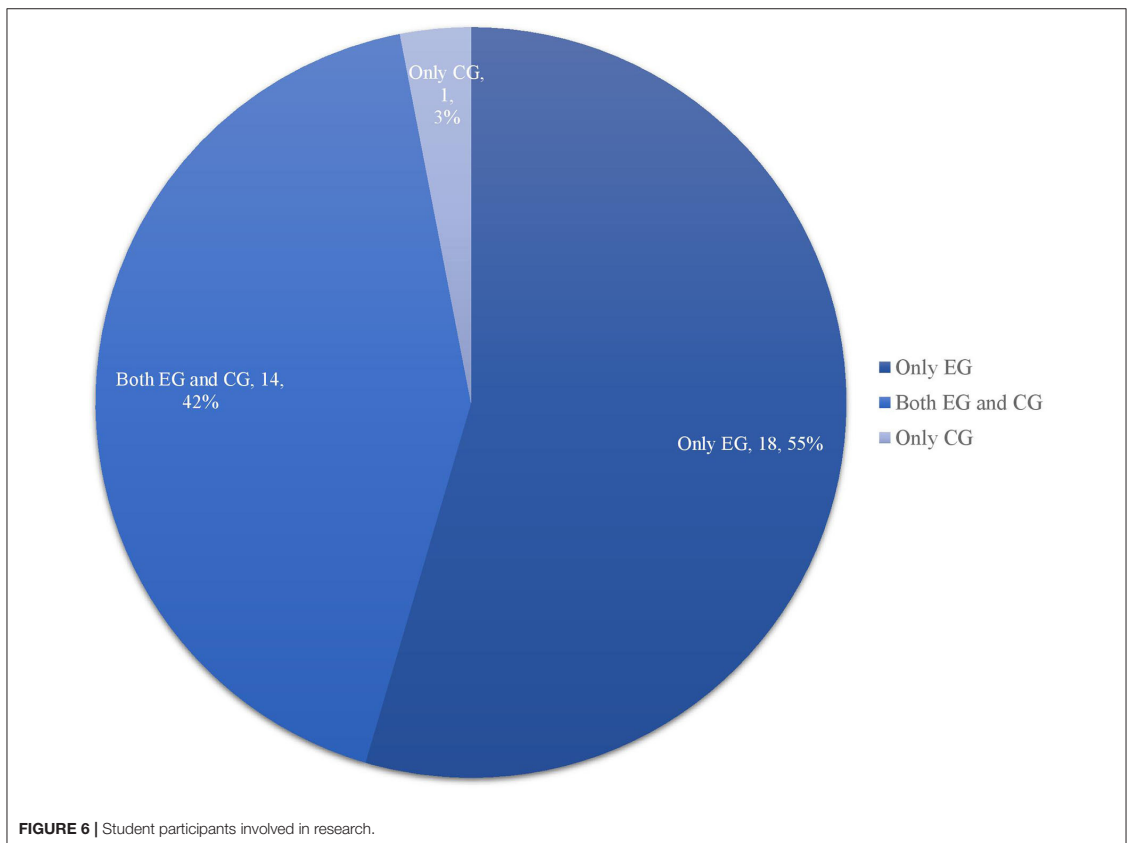
activities, while the leading negative motivational factor was difficulty in flipping. However, the survey data of Yough et al. (2017) revealed that "all analyses were non-significant with the exception of two motivation outcomes" (p. 6); even "preservice teachers in the traditional sections were more likely to report greater levels of intrinsic motivation [...] and identification [...] than those in flipped sections" (p. 6). Cabi (2018) also found that some students were not motivated because they "did not want to put an effort on it" (p. 214) and felt that "the topics were boring and unnecessary" (p. 214).

Jeong et al. (2016, 2018) explored students' emotions and self-evaluations after participating in FCs. Both studies had the same findings regarding positive and negative emotions: "the overall scores were very high in positive emotions" (2018, p. 7), with feelings of fun and enthusiasm having the highest score. Regarding negative emotions, boredom had the lowest score and concern had the highest. These findings indicated that many students agreed that the FC model was fun and that feelings of concern and nervousness had brought more negative emotions to them than boredom. In their recent study, Jeong et al. (2019a) concluded from survey data that "positive emotions were highly scored" (p. 11) by students in an FC compared to those in a TC.

Content Delivery

As one of the characteristics of FCs, content delivery differs from that in TCs where usually a lecturer presents his or her lecture during class time. In an FC, a lecturer normally records the lecture in advance and students access the content outside class time with different equipment. Sengel (2016) investigated equipment to access online videos and found that the most commonly used equipment was "laptop[s] (95%) and cellphone[s] (80%)" (p. 492), while "IPod[sic] touch (27%) and IPad[sic] (36%) were the equipment" least used (p. 492). In addition, many researchers explored students' perceptions of content delivery and found they had both positive and negative opinions.

Some students thought that content delivered before class, such as narrated presentations with "talking heads" and online lectures, were "convenient, effective and engaging" (Adnan, 2017, p. 215), "beneficial" (Conner et al., 2014b, p. 73), and "easy to watch and easy to follow" (Conner et al., 2014a, p. 71). Other benefits included having "the opportunity to pause" (Conner et al., 2014a, p. 71) and being able to "wait, stop, go back" (Dove and Dove, 2017b, p. 325) and to "stop and replay" (Tomas et al., 2019, p. 12). This approach also made students "come to the class

**TABLE 4 |** Instruments for data collection.

Instruments		Percentage of the 33 studies		Representative studies
Survey		23 (70%)		S4, S7, S8, S11, S12, S13, S14, S15, S16, S17, S18, S20, S21, S22, S23, S26, S27, S28, S29, S30, S31, S32, S33
Scores		13 (39%)		S1, S2, S3, S4, S11, S13, S18, S23, S24, S25, S28, S32, S33
Interview	Focus-group interview	12 (36%)	10 (30%)	S1, S3, S5, S6, S9, S17, S21, S22, S25, S30
	Whole class interview		1 (3%)	S8
	Informal discussion		1 (3%)	S15
Lesson plans		3 (9%)		S11, S15, S16
Classroom observation	Video-taped	2 (6%)	1 (3%)	S8
	Field notes		1 (3%)	S15
Self-report materials	Weekly journals	1 (3%)		S1
	Educators' journal	1 (3%)		S29
	Feedback questionnaire	1 (3%)		S2
	Reflections from the teacher and students	1 (3%)		S10
	Self-reported steps	1 (3%)		S25
Completed tasks	Artifacts for teaching	1 (3%)		S11
	Elaboration process	1 (3%)		S12
	Individually written texts	1 (3%)		S17
	Group and individual tasks	1 (3%)		S25
Course blog	Anonymous blog contributions	1 (3%)		S12
	Log file (log actions)	1 (3%)		S24
	Blog postings	1 (3%)		S32
Course assessment		1 (3%)		S1

prepared" (Cabi, 2018, pp. 213-214). A student teacher in Dove and Dove (2017b) stated that "PowerPoints [...] brings you step by step about what is happening" (p. 325). Survey data from Graziano (2017) revealed that students "enjoyed the flexibility in delivering course content" (p. 124). Students in Jeong et al. (2016) had "a general positive opinion" (p. 752) about utilizing video lectures, stating they were of "great help to achieve learning goals" (p. 752). This sentiment was echoed by participants in Kurt (2017) who stated that videos helped them "learn the

material better" and made the material "more enjoyable" (p. 216). According to Lee and Bonk (2019), 23 of 27 participants reported that "class preparation through online video lectures helped them pay attention to their f2f classes" (p. 16) and "encouraged them to participate more actively in the group discussions" (p. 16). Jeong et al. (2019a)'s survey data showed that "students agreed or strongly agreed that having video lectures or other "flipped" materials before class helped or help to achieve the learning goals and to complete the in-class activities more confidently or in an easier manner" (p. 7). The researchers noticed that "students attended class after revising the flipped materials and were more willing to participate in student-centered activities such as collaborative chores" (p. 7). Tomas et al. (2019) found that 98.8% of students believed that "viewing the flipped videos helped them to understand the key concepts" (p. 11) in their course. According to the survey data in Helgevold and Moen (2015)'s study, most participants "found the online lectures to be a useful learning arena" (p. 35) because they could control "time, placement and pace" (p. 35). Similarly, Kurt (2017)'s focus-group interview data showed that participants "all appreciated watching the lectures at any time they wanted and being able to decide on their own pacing. They paused, rewound and replayed the video lectures as they needed" (p. 217).

Meanwhile, some students encountered "technological issues" (Conner et al., 2014a, p. 72) and "lost their attention" (Adnan, 2017, p. 215) while watching the videos or narrated presentations. Some thought the content was "difficult" or "not sufficient" (Cabi, 2018, p. 214). In Conner et al. (2014b), one student teacher stated that "honestly they could have just given us the handouts and I would have gotten as much from it" (pp. 72-73). Students in the Graziano (2017) study acknowledged they were not "'tech savvy' or comfortable with technology" (p. 126); furthermore, making videos was "time consuming" (p. 124, 126) for teachers. In Ng's study (2018, pp. 72-73), student teachers mentioned difficulties they encountered when watching online videos: (1) "they did not have a teacher to ask when they could not understand the online video"; (2) "they had to wait until the following week to ask the teacher when they could not understand a concept"; and (3) "they might forget about asking the questions." These difficulties were also encountered by participants in Sengel's study (2016), where "70% of them indicated that they did not have chance to ask for these problems someone outside of the class time" (p. 493). Accordingly, Ng (2018) suggested that when utilizing an FC teaching approach, teacher educators could suggest student teachers email or contact their teacher educators "if they encounter any difficulties prior to the next lesson" (p. 73). Sammel et al. (2018) found that "the median number of online videos watched by the participants was only four out of eight" (p. 55), and students were not well-engaged even though they "knew that 50% of their final mark was derived from the video content" (p. 55). Sammel et al. (2018) also discovered that even though students highlighted convenience in terms of time management and repeatability, they still preferred face-to-face lectures and believed it was what they paid for as campus students.

One student in Conner et al. (2014b, p. 73) said "Don't just read me what is on the PowerPoint. We are in college, we can read." Other student teachers in Conner et al. (2014b,

FIGURE 7 | Research foci of included studies.
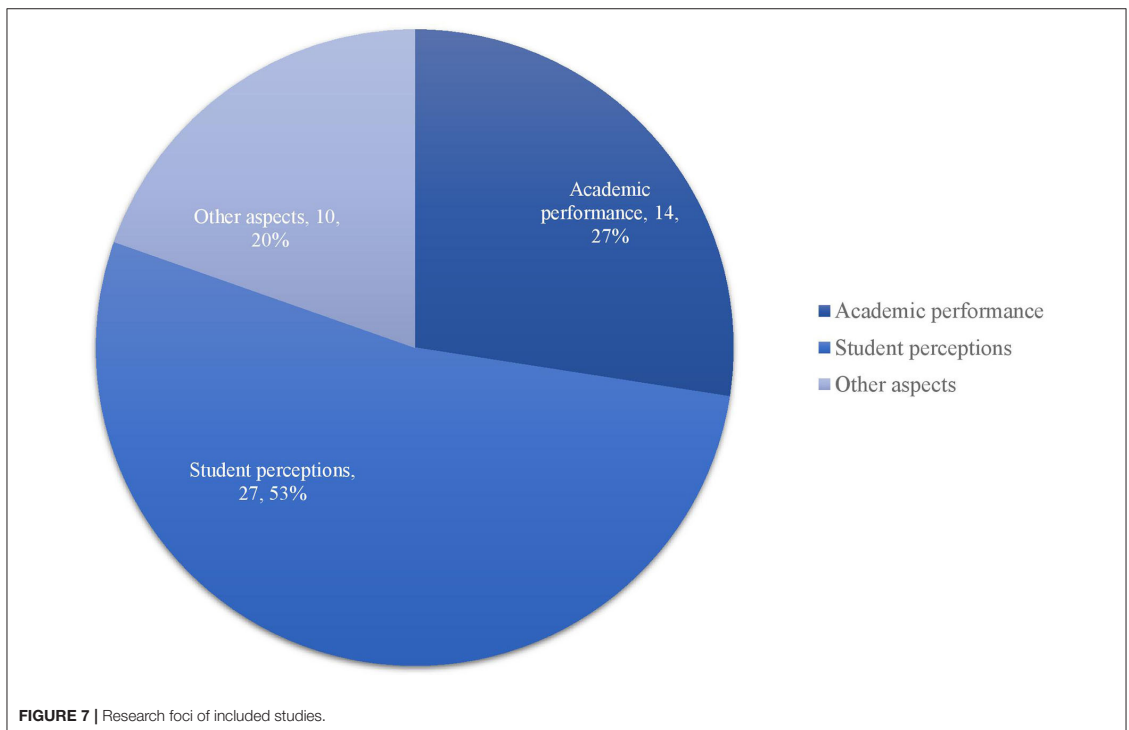
p. 73) suggested "providing a set of partially completed notes for future students because that would encourage the students to watch the online videos to 'fill in the blanks in your notes'". In Ford (2015), the teacher educator attempted to use two formats to record videos—teach an imaginary classroom and create large slides or storyboards. García-Sánchez and Santos-Espino (2017) found that student teachers preferred "a lecture displayed as some variant of slideshow, mostly combined with narrator's face and voice" (p. 176) and "simple record-and-publish software tools" (p. 176) rather than "more sophisticated settings" (p. 176) where instructors "used puppets and cartoons as characters" (p. 176). Furthermore, the length of a video lecture with the FC approach was explored in some of the reviewed studies. For example, Wagner et al. (2013) suggested not making videos longer than 10 min because very few college students (35.7%) reported enjoying watching long videos.

Some teachers provided online lectures and quizzes as out-of-class activities. For example, González-Gómez et al. (2016) provided two types of online quizzes, "multiple-choice online quizzes about the contents taught in the video lessons that students had to complete after watching or/and reading the proposed material" (p. 456) and "questionnaires inserted in the video lessons" (p. 456). In these cases, students had to provide the right answer to be able to watch the remaining part of the video. The point was to encourage the students to

watch the complete video lessons. Jeong et al. (2016) found that online quizzes were "useful to point out and overcome the most complex contents" (p. 753). In González-Gómez et al. (2016), 87 of 101 participants agreed or strongly agreed the online quizzes "provided together with the multimedia material had allowed them to achieve the learning objectives" (p. 457), and "nearly 90% of students were able to point out the most complex contents before the class and therefore to focus to overcome them after completing the online quizzes provided with the video lessons" (pp. 457-458). However, students in Conner et al. (2014b)'s study argued that online quizzes "were not very challenging and that being allowed to use notes during the quiz was pointless" (p. 73) and it was "very easy to forget" (p. 73).

Learning Environment

In the review, learning environment can be understood as focusing on psychosocial factors in the classroom. Here, the FC was regarded as "flexible," "stress free" (Adnan, 2017, p. 216), and potentially improving "the confidence" (Conner et al., 2014a, p. 72) of students. Karaaslan and Çelebi (2017)'s survey data indicated "the students generally had positive attitudes" (p. 652) regarding the learning environment. Participants in Kurt (2017)'s study also had "positive perceptions of their experiences in the flipped learning environment" (p. 216); they mentioned that the learning environment was "student-centered, more positive and less stressful" (p. 217). However, some students

FIGURE 8 | Aspects of student perceptions of FC.
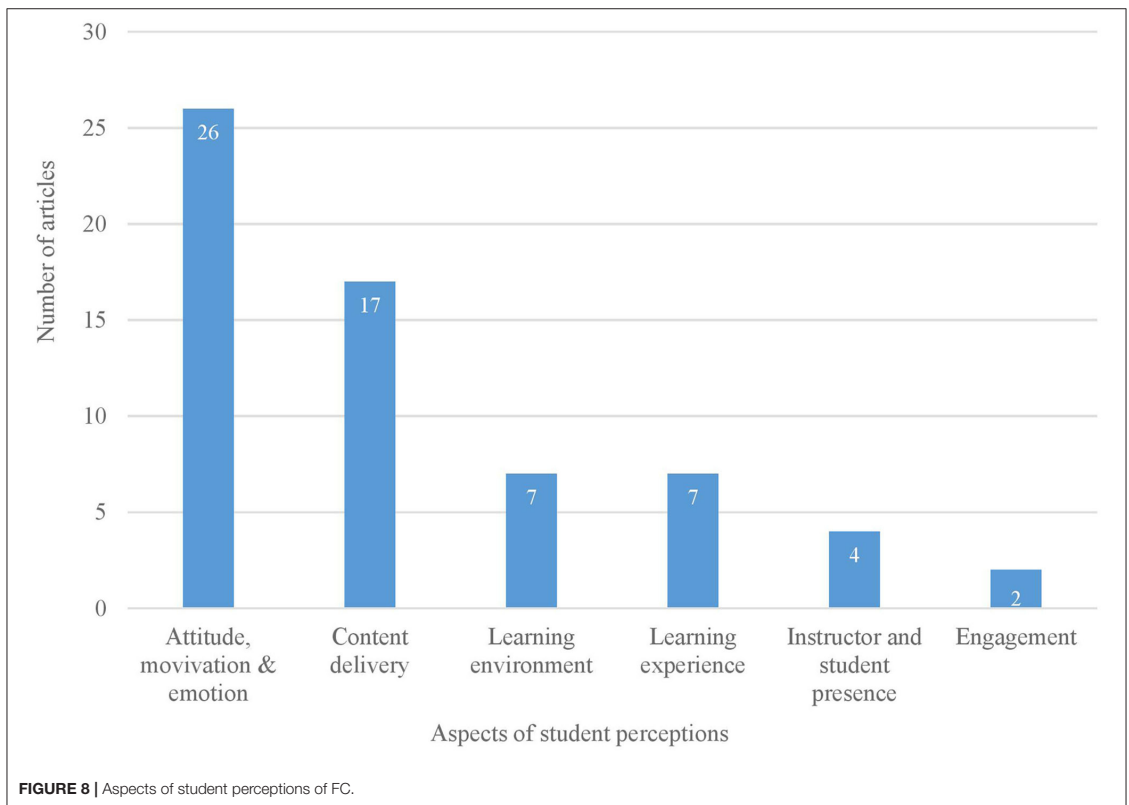
TABLE 5 | Different research foci on student perceptions and their representative articles.

Aspects focused on student perceptions	Number of articles	Representative articles
Attitude, motivation, and emotion	26	S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S15, S18, S19, S20, S21, S22, S25, S27, S28, S29, S30, S31, S32, S33
Content delivery	17	S1, S3, S5, S6, S8, S10, S12, S13, S15, S17, S19, S20, S21, S25, S26, S28, S29
Learning environment	7	S1, S5, S6, S15, S19, S21, S22,
Learning experience	7	S1, S10, S19, S20, S23, S31, S33
Instructor and student presence	4	S1, S8, S31, S32
Engagement	2	S15, S17

in Conner et al. (2014a)'s study had the opposite opinion, stating the FC was "a waste of time and did not contribute to learning" (p. 73).

Graziano (2017) found that the learning environment was more interactive; one student said, "there is more student–teacher interaction in a flipped class" (p. 124). According to Jeong et al. (2016), over 91% participants "thought that the course was more interactive than other courses taken in the same school" (p. 753). By analyzing video-taped classroom observations, Dove and Dove (2017b) found that FCs (flipped both with teacher's videos and lecture videos from Khan Academy) "were able to incorporate more opportunities for interaction and communication within and between students and the instructor" (p. 328). In van Wyk (2018b)'s study, a participant said on the blog that "The flipped method helps me to collaborate with my classmates on specific tasks and establish positive relationships with others" (p. 22).

Learning Experience

The reviewed articles were coded for learning experience if they explored participants' experiences with FC both inside and outside classrooms. Students in Adnan (2017)'s study talked about their learning experience with FC, saying they believe FC can enhance learning because it encourages "social classroom learning" (p. 218) and they can learn "from each other in the classroom" (p. 218). Students in Jeong et al. (2019a)'s

study considered the FC course "a valuable learning experience" (p. 10) and "significantly more interactive" (p. 7), saying it "provided a higher perception about the learning process for the same contents" (p. 7). Survey data in Lee and Bonk (2019)'s study revealed that the flipped class integrated with team-based learning can offer students "much higher and richer learning experiences" (p. 17). The findings of the reviewed articles revealed that students connected their learning experiences with their responsibility. For example, students in Dove and Dove (2017b) felt they were "encouraged" (p. 325) to take responsibility for their own learning, and they "positively reacted to the increased opportunities for structured small group activities" (p. 325). Similarly, student teachers in van Wyk (2018b)'s study stated that FC "created a positive lived experience" (p. 13) and forced them to "take responsibility for their own learning" (p. 13). According to van Wyk (2018a), 97% of student teachers agreed that FC pedagogy forced them to "take responsibility for their own learning" (p. 260). Lee and Bonk (2019) found that because students were forced to take responsibility, "there is a significant difference of learning time" (p. 16) in FCs compared to TCs and that students spent more time in FCs.

Instructor and Student Presence

Both instructors' classroom role and guiding role were emphasized in Adnan (2017), as instructors were in the classroom "interacting, answering questions and providing help" (p. 216). Dove and Dove (2017b)'s survey and interview data revealed that "students were overwhelmingly positive about the role of the instructor in their learning" (p. 324). In van Wyk's study (2018a), participants perceived that instructors played "an important role in creating a positive lived experience" (p. 263) in open-distance e-learning environments. Students in Lee and Bonk (2019)'s study reported they interacted "more frequently" (p. 18) with instructors in FCs and "received more frequent feedback on their learning" (p. 18) from instructors. In addition, relationships with instructors seemed more positive in FCs; for example, 81.4% of participants in Lee and Bonk (2019)'s study reported that instructors were "accessible and very helpful" (p. 18). The teacher educator in Ford (2015)'s study obtained a high rating on teaching evaluations. Not only were relationships with instructors improved but relationships with peers were "quite close and comfortable" (p. 19), as a student in the Lee and Bonk (2019) study stated. Participants in van Wyk (2018b)'s study agreed that "the teacher played an important role when it came to decision making about what out-of-class and in-class activities should be carefully integrated in order for students to understand the strategy and be motivated to prepare for the class" (p. 13). However, they "were less in agreement … concerning the role that teachers play in moving around and assisting students who are struggling while at the same time correcting misconceptions and providing one-on-one tutoring" (p. 13). In addition to instructor presence, Adnan (2017) examined student presence and found that "almost all students mentioned their adaptation to new roles/competencies" (p. 217) for the flipped course. The students had been educated in TCs since they started school, so

it would naturally take some time for them to adapt to the new teaching approach.

Engagement

Regarding students' engagement in learning, the reviewed studies had generally positive results and included only a few negative opinions. The survey findings of Tomas et al. (2019) painted "an encouraging picture of students' engagement with the flipped videos" (p. 9) and reflected that "the majority of students watched the flipped videos more than once, generally prior to attending class" (p. 9). However, the teacher educator in Ford (2015)'s study found through classroom observations that "not all students were watching the videos" (p. 375). Analyses of the empirical data in Helgevold and Moen (2015) showed that "this flipped classroom model, to some extent, seems to have stimulated students' participation and engagement" (p. 40). Students in Lee and Bonk (2019)'s study reported they were "immersed into learning in class time" (p. 20) and "never dozed at all" (p. 20) in FCs. By analyzing data from the Teachers' Sense of Efficacy Scale (TSES) developed by Tschannen-Moran and Hoy (2001), Kurt (2017) found "there was a significant difference between the experimental and control groups in their gain scores … and the subscales of student engagement and classroom management" (p. 215), indicating the differences in students' engagement in FCs compared to TCs were statistically significant in favor of FCs.

Academic Performance in a Flipped Classroom

Whether FCs can influence students' learning outcomes was one of the research foci in nearly half the reviewed studies (14 of 33) that examined students' academic performance in FCs. **Table 6** lists statistical results about students' academic performance in FCs and the representative articles.

Of the 14 studies, four (Choi and Lee, 2015; González-Gómez et al., 2016; Kurt, 2017; Jeong et al., 2018) found a significant difference between the EG and the CG in favor of the EG. Kurt (2017) found the EG "overperformed" (p. 216) during final exams compared to the CG and that "the difference was statistically significant" (p. 216). The statistical results from Jeong et al. (2018)'s study "demonstrated that the flipped-classroom model gave better outcomes than previous classes not applying the flipped-classroom model" (p. 8), as "significant differences at the

TABLE 6 | Students' academic performance in flipped classrooms.

Statistical results	Number of articles	Representative articles
Significant difference in favor of EG	4	S4, S13, S18, S22
No significant difference, but EG outperformed CG	3	S31, S32, S33
No significant difference; EG and CG performed similarly	3	S3, S11, S28
Partly significant difference, partly no significant difference	3	S1, S2, S27
Relationship between log file and data and academic performance	1	S24

95% significance level ($p < 0.05$) were observed" (p. 6) in favor of the FC. Choi and Lee (2015) found that the FC approach was more effective for students to learn knowledge and skills for instructional material production and that the effects were more observable for a difficult task.

Yough et al. (2017) and van Wyk (2018b) found no statistically significant differences in learning outcomes between the EG and the CG. However, these two studies had similar empirical findings to van Wyk (2018a) in that they found the FC teaching approach "enhanced" (van Wyk, 2018a, p. 262) students' academic achievement. Yough et al. (2017)'s statistical analysis revealed that "participants in the flipped sections had increased meaningful learning outcomes over participants in the traditional sections" (p. 6). "Preservice teachers in the flipped sections were more likely to score higher on items related to topics of information processing, development, and motivation compared with traditional section students" (Yough et al., 2017, p. 6). In comparing student teachers' pretest and posttest results, van Wyk (2018b) found that FC pedagogy is "a more effective digital pedagogical tool" (p. 12) and that the EG "outperformed the control group [...] in terms of the final examination score" (p. 12). Furthermore, one of the participants in van Wyk (2018b)'s study stated "the flipped class strategy made it easier for me to learn better [....] I am a visual learner. The videos help to better my understanding and increased my results in the course [...] I increased my examination final mark to distinction (83%)" (p. 21).

Contrary to the above studies, three studies (Fraga and Harmon, 2014; Sengel, 2016; Cabi, 2018) found no significant difference in learning outcomes between the EG and the CG. Based on a statistical analysis, Sengel (2016) found "the flipped classroom model and traditional model had almost similar positive effects on the achievement" (p. 494).

Findings from the other three studies (Sayeski et al., 2015; Adnan, 2017; Almodaires et al., 2019) were mixed. Adnan (2017)'s statistical results revealed no significant difference between the EG and the CG on midterm/quizzes and final e-portfolio scores; however, the EG achieved significantly higher essay scores. Almodaires et al. (2019) found a significant difference among the three exam results in favor of the EG but no significant difference in the final grade. Sayeski et al. (2015) found that students' learning outcomes were statistically significantly better in the flipped instructional condition than in the other two instructional conditions (homework and instructor facilitated) for a Peer-Assisted Learning Strategies (PALS) module (PALS is a reading strategy for Grades 2–6). However, there were no statistically significant differences for the Classroom Management and Accommodations modules.

Different from the abovementioned studies that examined academic performance through scores and explored the impact of FCs on students' learning outcomes, Montgomery et al. (2019) investigated the relationship between log file data and students' learning outcomes. They discovered that among all the log file data, "access day-of-the-week and access frequency" were "the strongest predictors for student success" (p. 114), while location of access had "a weak relationship" (p. 121) with academic performance.

Other Aspects of a Flipped Classroom Teaching Approach

Other aspects of FCs researched in the reviewed studies include teacher educator's perceptions (two studies), students' SLR (two studies), students' anxiety (two studies), students' self-efficacy beliefs (two studies), and students' self-perceptions of pedagogical knowledge, technological knowledge, and TPACK (one study).

Teacher Educator's Perceptions

Compared to 27 of 33 studies concerning student teachers' perceptions, there were fewer studies on teacher educators' perceptions. Only two studies, those by Ford (2015) and Tomas et al., 2019), investigated teacher educators' perceptions. The key finding of the latter study was that "additional teacher-led instruction, scaffolding and guidance were required in-class to review the concepts explored in the flipped videos, and to support students to complete the active learning tasks successfully" (p. 13). Ford (2015) shared her own experiences of teaching using the FC approach and her strategies for creating a flipped course, concluding that her experience strengthened her desire "to continue using this teaching model" (p. 378).

Students' Self-Regulated Learning

Different from Lee and Bonk (2019)'s study that investigated students' perceptions of their own SRL, Montgomery et al. (2019) utilized learning analytics (LA) to investigate students' use of SRL. They used pretests and posttests, group and individual tasks, and self-reported steps to examine whether the FC represented good pedagogy with reference to self-regulation principles. Montgomery et al. (2019)'s quantitative data about students' SRL were positive. Students were self-regulating and learning on their own by watching online lectures; students were able to acquire both content and procedure knowledge on their own from the online videos; students were able to apply their acquired online knowledge in group projects; individual students could apply the knowledge they acquired online in their own work; and students developed their self-regulation. These findings correspond with van Wyk (2018b)'s conclusion that FC pedagogy "indeed enhanced students' self-directed learning to support their learning significantly" (p. 13). According to Montgomery et al. (2019), "all six SRL behaviors [online access location, day-of-the-week, time-of-day, online frequency, online regularity and exam review patterns, our interpretation] were revealed to have weak to moderate significant relationships with academic achievement" (p. 114).

Students' Anxiety

Dove and Dove (2017a,b) were interested in students' anxiety about both learning and teaching mathematics. The Dove and Dove (2017a) found "significantly greater decreases for general mathematics anxiety" (p. 134) for the EG but no significant difference in anxiety about teaching mathematics between the EG and the CG. Dove and Dove (2017b) found that the FC with teacher videos was significantly better at decreasing students' general math anxiety than the FC with lecture videos from Khan Academy and TC. It was also significantly better at decreasing

students' anxiety about teaching mathematics than the FC with lecture videos from Khan Academy.

Students' Self-Efficacy Beliefs

Kurt (2017) found that students taught in FCs had "a higher level of self-efficacy beliefs" (p. 211) and that, with regard to teachers' sense of students' self-efficacy, "there was a significant difference between the experimental and control groups" (p. 215) in favor of the EG. Based on observed quantitative data, González-Gómez et al. (2019) concluded that the FC had "a significant positive impact in the science self-efficacy beliefs and attitudes toward science" (p. 9).

Students' Self-Perceptions of Pedagogical, Technological, and Technological Pedagogical Content Knowledge

Hall (2018)'s quantitative study revealed that after an FC intervention, students' self-perceptions of pedagogical knowledge and the application of TPACK were statistically significant. However, students' self-perceptions of technological knowledge and TPACK were not statistically significant.

CONCLUSION, STUDY LIMITATIONS, AND FUTURE RESEARCH

This scoping review examined 33 peer-reviewed studies on FCs in teacher education in terms of general characteristics, research methods, and research foci in the existing literature. The main findings from this review study revealed answers to aforementioned research questions. The trends in FC in teacher education are that there was a gradual and steady increase in publications on the use of FCs, most existing studies in English were conducted in the USA, Turkey, and Spain, and courses with FC within the disciplines of pedagogy and language were commonly researched. Additionally, mixed methods were more commonly used than a single quantitative or qualitative method, and surveys, test scores, and interviews were popular data collection instruments among researchers. With respect to the second research question, two main research foci were identified that researchers were primarily concerned with students' perceptions and their academic performance. The analysis of students' perceptions revealed six outcomes (1. Attitude, motivation, and emotion; 2. Content delivery; 3. Learning environment; 4. Learning experience; 5. Instructor and student presence; 6. Engagement). With regard to students' academic performance, though researchers reported dissimilar findings, more than half of their studies revealed that FC could improve students' academic performance. This research finding echoes the previous research "that non-traditional instruction are able to promote academic achievement" (Jeong et al., 2019b).

The scoping review provided an overview of FC studies conducted in the domain of teacher education. The categories developed in the review might be adapted to guide future reviews of FC pedagogy both inside and outside teacher education. Furthermore, the study findings might indicate useful directions for future FC studies to identify critical knowledge gaps and opportunities. For example, only one article (Dove and Dove, 2017a) examined consecutive FCs, and as students might need time to get used to learning with a new teaching approach, more research on consecutive FCs should be conducted.

This review study should be viewed as a pioneering attempt to explore studies on FCs in teacher education rather than an exhaustive review. Even though only 33 articles were found by searching the two databases and through a manual search, there might be other potential articles that could be found in other databases, such as Scopus and Science Direct. As FC pedagogy continues to grow in popularity, more review studies will likely be conducted and listed in more databases. Furthermore, this review utilized specific inclusion and exclusion criteria to screen identified articles. These criteria allowed the authors to narrow the scope of the search to select the most representative studies. However, different search criteria might have produced slightly different search results. For example, if book chapters were included, the data analysis might have been different. Further research should address review research identified by searching more databases and should extend to include more publication types, such as book chapters and conference proceedings.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

HH is the first author of the article and has done the database searchers, analyzed the data, and written the main parts of the manuscript. FR is the second author of the article and has developed the conceptual framework, developed the research design, aided in the analysis, and writing/revisions of the manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2020.601593/full#supplementary-material

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Article II

Teacher Educators' Perceptions of Flipped Classroom in Teacher Education: Insights from EFL Teacher Educators in Norway

Abstract: Flipped Classroom (FC) is a popular pedagogical instruction model in education with a steady increase in the number of studies in teacher education (TE). However, few studies focus on teacher educators' perspectives on how FC is used for subject-disciplinary teaching and learning in TE. This article explores teacher educators' perceptions regarding using FC with student teachers (STs) in the field of English as a foreign language (EFL) in Norwegian primary and lower secondary school teacher education. Through an online survey and in-depth interviews, teacher educators' experiences with FC are examined, revealing both out-of-class and in-class activities adopted in EFL. Meanwhile, teacher educators' perceptions of FC with three pairs of advantages and challenges were investigated. Lastly, implications and suggestions for teacher educators on enacting FC are provided.

Key words: Flipped Classroom, teacher education (TE), teacher educators' perceptions, English as a foreign language (EFL), information and communications technology (ICT)

Introduction

Increasingly, teaching and instructional design in teacher education emphasize student-active and learner-centered teaching methods, such as Flipped Classroom (FC) (Bergmann & Sams, 2012; Helgevold & Moen, 2015; Hwang et al., 2019a). As a contemporary teaching approach and pedagogical instruction model, FC—swapping instruction and homework (Bergmann & Sams, 2012)—has gained popularity in teacher education (TE) due to several advantages, including the promotion of active learning (Akçayir & Akçayir, 2018; O'Flaherty & Phillips, 2015), the facilitation of higher-order thinking (Hwang et al., 2019b; Yurniwati & Utomo, 2020) and the improvement of learning performance (Kurt, 2017; Jeong et al., 2018). Especially during the Covid-19 lockdown, many universities adopted online teaching to

maintain teaching and learning, and FC has drawn more researchers' attention in education (Campillo-Ferrer & Martínez2021; Khodaei et al., 2022; Tang et al., 2020; Yurniwati & Utomo, 2020).

Most studies on FC in TE seem to focus more on the perceptions of FC from student teachers (STs) than from teacher educators (Authors, 2020). Research in TE found that STs generally have positive opinions of FC and believe FC can promote academic achievement, self-learning, flexibility, and innovation (González-Gómez et al., 2016; Kurt, 2017; Jeong et al., 2018; Ng, 2018). Studies also find that despite the generally favorable attitudes towards FC, STs think FC is challenging concerning time management and responsibility (Conner et al., 2014). Moreover, STs' perceptions of FC are closely related to their learning experience with FC and impact learning outcomes (Conner et al., 2014).

However, teacher educators play a central role in "enacting new instructional approaches" (Revelle, 2019, p. 96). Furthermore, teacher educators act as important "role models" (Smith, 2011, p. 343) in preparing STs to integrate technology in future classrooms such as FC (Authors, 2016). In addition, studies show that teachers' and teacher educators' perceptions of information and communications technology (ICT) influence how they integrate, experiment, and implement novel teaching approaches with digital technologies (Galanouli et al., 2004). Also, teacher educators contribute significantly to the development of STs' subject-disciplinary knowledge and professional competencies, such as how to teach EFL with ICT (Smith, 2011). Yet, a recent scoping review on FC in TE found that only two out of 33 studies have examined teacher educators' perceptions of FC (Authors, 2020). This study explores teacher educators' perceptions of the FC in teacher education and offers insights from teacher educators' standpoints. The following research questions are examined:

RQ1: What experiences with the Flipped Classroom approach do teacher educators report?

RQ2: How do teacher educators perceive the Flipped Classroom in teacher education?

Review of previous research

Flipped classroom and student teachers' perceptions

Most research on FC in TE involves examining the participants' perspectives, including STs and teacher educators. While some studies have investigated STs' perceptions of FC, other studies find similar or contrasting findings. For example, González-Gómez et. al (2016) examined STs' perceptions of FC through a post-task survey in Spain. The authors reported that most participating STs found FC useful for both achieving learning objectives and improving engagement. STs in this study also perceived FC as more learner-oriented than a traditional classroom setting. Ng (2018) interviewed eight STs through a focus group meeting in Hong Kong SAR, China, and found that all of them liked FC. Yet, there were STs who perceived FC negatively. Conner et al. (2014) revealed STs' negative perceptions of FC through focus group interviews in the United States. The participating STs felt that the learning activities used in FC were a waste of time and did not contribute to learning.

Flipped classroom and teacher educators' perceptions

The number of studies focusing on teacher educators' perspectives is limited (Authors, 2020). Moreover, in these studies, researchers' self-reflections are the main research approaches used by Ford (2015) and Tomas, Evans, Doyle, and Skamp (2019), presenting some methodological limitations. Ford (2015) shared her experiences with flipping a mathematics course for elementary school preservice teachers. She reported that her students "are actively engaged in learning" (p. 376) and felt she got to know her students "better than in… traditional lecture classes" (p. 378). She concluded that her experiences had only strengthened her desire to continue implementing the FC. Similarly, Tomas et al. (2019) wrote a "narrative account" (p. 8) of the first and second authors' own experiences of

enacting a flipped classroom for preservice teachers in a science and sustainability education course.

As both researchers and implementers of FC, the authors of these two studies provided firsthand data about their perceptions of the approach. However, it is equally valuable to yield common thoughts shared by more teacher educators to understand their perceptions and reduce the possible risk of bias. The current study aims to comprehensively understand teacher educators' perceptions of the FC using a mixed-methods research design and multiple data collection methods.

Methodology

A mixed-methods sequential explanatory design was adopted to allow a broad and deep insight into the FC from teacher educators' viewpoints. The research design consisted of two distinct phases: a quantitative phase followed by a qualitative phase (Creswell et al., 2003). Quantitative research can provide "baseline information" and allow researchers to explore a phenomenon in breath by avoiding "elite bias" (Johnson et al., 2007, p. 115). On the other hand, qualitative research can offer a deep understanding of participants' beliefs and allow researchers to construct a holistic picture for answering research questions (Creswell & Poth, 2018).

First, quantitative data were collected from the respondents to understand teacher educators' experiences with and perceptions of FC. Second, by building on the statistical results from the quantitative phase, qualitative data were collected and analyzed to help explain and refine the results by exploring teacher educators' insights in depth (Creswell et al., 2003).

Data collection

Two instruments, an online survey and in-depth interviews, were adopted to collect data. A pilot survey was first conducted among three educators in higher education to assist in the

planning and modification of the final version of the survey. Afterward, an online survey was developed (see Appendix A and Figure 1 in supplementary materials), including 26-questions with five multiple-choice questions, 19 questions using a 5-point Likert scale, and two open-ended questions.

Interviews can collect detailed information regarding interviewees' experiences and yield "rich and meaningful data" (Knox & Burkard, 2009, p. 566) on their beliefs. Thus, in-depth interviews with teacher educators were used to collect qualitative data regarding their perceptions of FC. Based on a descriptive statistical analysis of the collected survey data, an interview protocol was developed and applied in a pilot interview. After the pilot interview, a finalized interview guide was advanced to explain further and interpret the survey results. The interview guide (see supplementary material Appendix B) consisted of six main questions with 15 follow-up questions covering teacher educators' experiences of implementing FC and their perceptions.

Participants and Sampling

Participants in the present study were EFL teacher educators in Norwegian primary and lower secondary school TE programs. We distributed the online survey by email—through a national professional list—to EFL teacher educators in 14 higher education institutions with EFL teacher education programs in Norway. The prerequisite to participating in this survey was that participants had implemented the FC in their teaching. Given this precondition, we collected responses from 25 teacher educators (N=25, see demographic information in supplementary material Figure 2).

Participants for the interviews were voluntarily recruited from those who participated in the survey. Ten teacher educators (N=10, see demographic information in supplementary material Figure 3), who worked in the field of TE for EFL in six different universities in

Norway and had implemented FC in their teaching, were invited to participate in in-depth interviews.

Among the ten participating teacher educators, their average teaching experience as a teacher educator was 10.4 years. Although all participating teacher educators worked in Norway, some originated from America and three countries in Europe.The participants' different cultural and educational backgrounds represented teacher educators' perspectives from different nations. The interviews were conducted in English and online using the virtual meeting platform Zoom and lasted for 30 to 60 minutes.

Data analysis

Descriptive statistics were used to analyze the survey responses to describe the most frequent answers and display the distribution of different replies. The statistical results provided simple summaries of these teacher educators' experiences and perceptions of FC.

Thematic analysis, here understood as a "method for identifying, analysing and reporting patterns (themes) with data" (Braun & Clarke, 2006, p. 79), was used to analyze the interview data. A thematic analysis approach "can explore the context of teaching and learning at a level of depth" (Castleberry & Nolen, 2018, p. 808). We aimed to explore teacher educators' shared experiences and insight with FC.

The transcription of the interviews resulted in approximately 45,000 words of qualitative data. Each of the transcribed interview texts was returned to the corresponding participant for member checking to validate the trustworthiness of the present study's results. After participants' member checking, the interview data were imported and analyzed using NVivo 12, where the two research questions guided the analytic process.

Results

Teacher educators' experiences with FC

While implementing FC, teacher educators prepared various out-of-class activities for their STs, with video lectures being the most popular (96.2%), as shown in Figure 1. Similarly, as Figure 2 shows, teacher educators organized numerous in-class, group, and pair activities that were employed the most often (92.3%). Furthermore, as shown in Figure 3, FC was implemented in diverse courses focused on different English skills and was enacted in pedagogical courses the most often (57.7%, illustrated as "Other" in Figure 3).

Figure 1: Out-of-Class Activities Prepared by EFL Teacher Educators
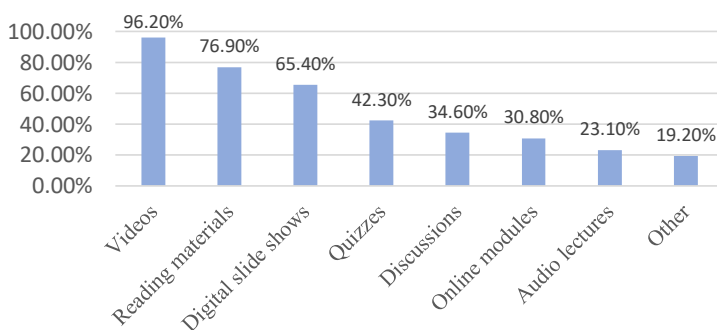
Figure 2: In-Class Activities Organized by EFL Teacher Educators
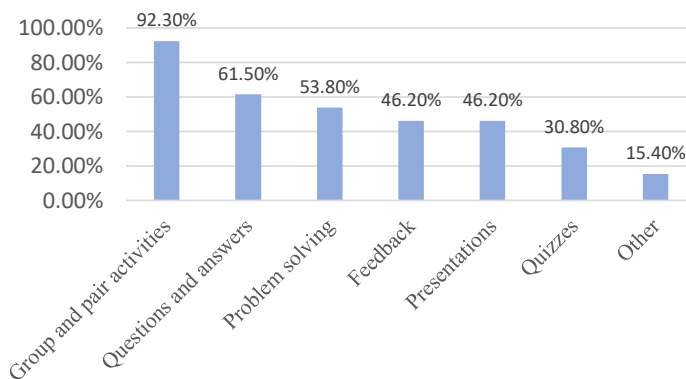
Figure 3: Courses with the FC Focusing on Different English Skills
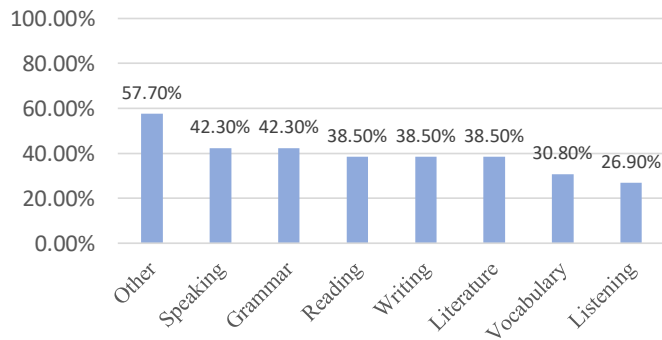
Teacher educators' personal experiences with FC were examined through eight 5-point Likert scale questions. 80% of the teacher educators agreed that preparing out-of-class activities for FC was time-consuming, and 60% agreed that FC required a higher working load. Meanwhile, higher technology competence seemed challenging for some teacher educators (32%). On the other hand, 80% could tell whether STs had partaken in out-of-class activities. More teacher educators reported that their STs were motivated to study out-of-class materials. In addition, none of the participants found it challenging to manage in-class activities. The Covid-19 lockdown triggered 20% of the participants to implement FC. Nonetheless, 92% became interested in FC due to the characteristics of the approach instead of the lockdown.

Besides the survey findings, the interviews provided an in-depth understanding of the teacher educators' experiences with the FC. Based on the thematic analysis, we constructed three themes with underlying sub-themes from the interview data, including *teacher educators' experiences*, *FC's advantages*, and *FC's challenges* (Figures 4-6).

Figure 4: Themes Generated from Teacher Educators' Experiences with FC
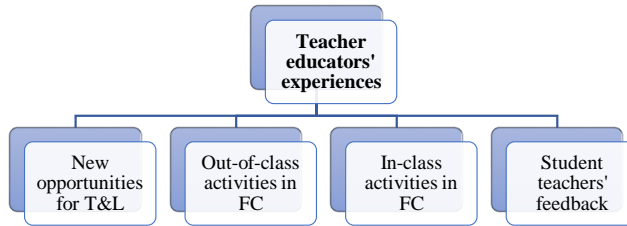
New opportunities for teaching and learning

Almost all teacher educators report that they cherish in-class time and try to find ways to free up class time for more active work, in-depth discussions, and problem-solving activities. Therefore, FC is chosen as a solution because this approach can move teacher educators' physical or digital lecturing time out-of-class:

> *We need time… to have nuanced discussions about them.* (Participant4)

Lockdown due to the global COVID-19 pandemic played a vital role as a trigger for some teacher educators to flip their classrooms:

> *I didn't start with what I would call flipped classrooms until March of last year [2020] when everything became digitized because of the lockdown.* (Participant1)

Out-of-Class Activities in FC

Many teacher educators state that they provide a variety of out-of-class activities for STs to review, read, or prepare for in-class activities. These out-of-class activities included, but were not limited to, video and audio lectures, PowerPoints, reading materials, and online modules:

> *[…] like having Google Forms or having surveys or Padlets. That's a little bit more different than just seeing a video.* (Participant7)

While preparing out-of-class activities, several teacher educators experienced a change from being stressed to becoming more relaxed or recognized that preparatory work is not as hard as they expected:

> *When I initially started using this model for some of the lectures, I spent a lot of time preparing. […] over the years, I became much more relaxed about this.* (Participant$_2$)

> *I actually was surprised that it was not that much work.* (Participant$_5$)

In-Class Activities in FC

Some of the teacher educators describe that they provided various in-class activities when implementing the FC physically or digitally, typically group or pair activities and discussions:

> *My goal was variety, so I didn't want to see the same old thing every week. Every week we had the students work on different activities according to the theme of that particular week's class.* (Participant$_8$)

Furthermore, these in-class activities emphasize collaborative and active learning:

> *They have to work and talk together then. Also, this is the course of English, so they have to speak English, they have to be active users of the language.* (Participant$_3$)

Student Teachers' Feedback

"Like, positive, good, and overwhelming(ly)" are terms frequently used when teacher educators talk about STs' feedback with being taught in an FC:

> *They have been extremely positive. We got a lot of good feedback from our students.* (Participant$_6$)

However, teacher educators also notice STs' negative feedback, which is mainly concerned with technology and pressure:

> *Basically, the feedback we've gotten with complaints has to do with technical things.*
> (Participant₃)

Teacher educators' perceptions of FC in TE

Teacher educators perceived both potential advantages and latent disadvantages of FC. All (100%) of the participants agreed that FC could use class time efficiently. 92% agreed that FC could improve interactions between teacher educators and STs; while improving interaction among STs, the number decreased a bit, and 84% agreed this affect occurred because of FC. Furthermore, 88% agreed that FC could improve STs' learning performance, 88% agreed that FC could enhance STs' engagement in learning, and 64% agreed that FC could improve the level of STs' motivation for learning. Compared with the abovementioned potential advantages of FC, 96% of the participants agreed that viewing FC lecture materials in advance is essential to participate in the class activity successfully. However, this might be a latent pitfall of FC because if some STs did not view lecture materials in advance, it was likely that they could not successfully participate in the class activities.

In addition, 88% of the participants agreed that FC was an appropriate teaching model for their teaching, and all (100%) would continue implementing this approach in future teaching. Meanwhile, 88% agreed that FC is an appropriate teaching approach for physical and digital teaching, and 88% agreed that FC was appropriate during the Covid-19 lockdown.

The interviewees were practitioners of FC and observed both the advantages and challenges of FC. They expressed numerous benefits with enacting FC, which were categorized into three facets as illustrated in Figure 5; at the same time, they also voiced several disadvantages when implementing FC, which were also classified into three patterns as shown in Figure 6.

Figure 5: Themes Generated from Teacher Educators' Perceptions of FC's Advantages
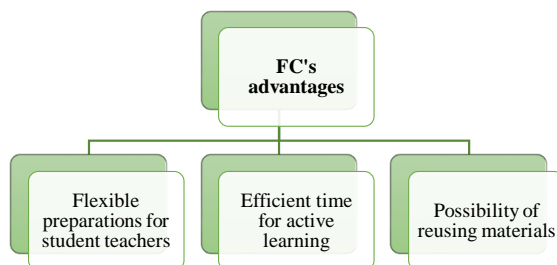
Flexible Preparations for Student Teachers

One of the advantages that teacher educators note is that STs have the freedom to manage

their out-of-class time:

> *They can re-watch the parts they want, ... listen to my example again. ... It's easier for*
>
> *them to have the clarity.* (Participant9)

Efficient Time for Active Learning

Another advantage is that STs seem to participate in more high-quality activities with more

motivation and engagement during the in-class time, based on the fact that STs come to the

classroom prepared:

> *A clear benefit of the flipped classroom, my opinion is that it opens up possibilities to*
>
> *include more meaningful activities, student-centered activities.* (Participant2)

> *I think my students are more engaged now.* (Participant5)

Teacher educators advocate that FC promotes more interaction between teacher educators

and STs. Moreover, they express that they can better understand their STs' difficulties and

misunderstandings and provide formative assessments:

It's also easier for me as an instructor to see where is it that they are in their learning,

what do they need help with and to help them along the road, than when the spotlight is

on me. (Participant₂)

Possibility of Reusing Materials

Teacher educators bring up other advantages of FC, such as the possibility of reusing

teaching and learning materials:

For me, the time is more worth using because I can see that I can possibly use it again

when it's done well. (Participant₇)

In parallel with the perceived advantages, teacher educators have also perceived some

drawbacks of this approach. Figure 6 illustrates three negative aspects of FC based on teacher

educators' perceptions.

Figure 6: Themes Generated from Teacher Educators' Perceptions of FC's Challenges
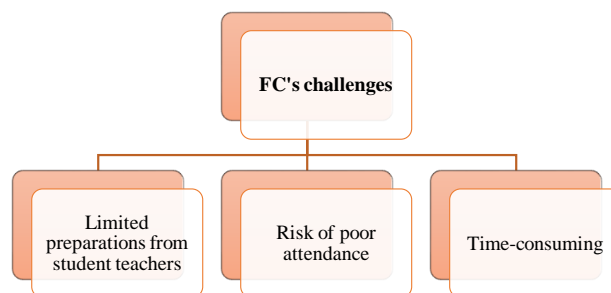
Limited Preparations from Student Teachers

One of the characteristics of FC is that students need to work on the out-of-class activities

that their teachers prepare for them and then come to class prepared. The process and

completion of in-class activities depend on the students' preparation. Thus, one of the

challenges that teacher educators mention is whether or not STs were prepared and how much knowledge they developed before coming to class:

> *It makes it very difficult for the teacher when students just boycott the setup.*
> (Participant3)

In addition, adequate and proper preparation demand STs' endeavors:

> *I just think that it takes more effort than traditional teaching.* (Participant1)

Risk of Poor Attendance

Teacher educators argue for the potential impact that FC can have on STs' in-class attendance when they have prepared or not:

> *Because they have the lectures, they feel 'then I don't have to show up to class'. Some of*
> *them have misunderstood certain things completely.* (Participant4)

> *That might be a challenge as well if you feel that you would be totally embarrassing to*
> *come if you haven't watched the video and do the preparation tasks, so maybe you can*
> *lose some students when you flip the class.* (Participant6)

Time-Consuming

Teacher educators mention facing challenges with preparing activities for FC. When trying out the FC for the first time, the majority point out that the preparation is both time and energy-consuming:

> *The biggest drawback is just that getting started takes time and creating the repertoire,*
> *creating the videos, creating the tasks beforehand, explaining to the students what a*
> *flipped classroom is and why, and getting some of them on board.* (Participant1)

While one of the advantages of FC was the possibility of reusing materials, this likelihood is also perceived as a drawback that could hinder teacher educators from updating and re-developing their materials:

> *Maybe as a teacher, you get attempted to just reuse material from last year, when you actually shouldn't. You trick yourself into not being as a good teacher as you could be.* (Participant9)

Discussion

Combining Figures 5 and 6, an overall model of teacher educators' perceptions of FC can be developed (see supplementary material Figure 4).

From teacher educators' perspectives, the advantages and challenges of FC are two sides of the same coin or tensions of three strings. Three pairs of teacher educators' positive and negative perceptions of FC are one-to-one correspondence. STs have the freedom to choose when, where, and how to work on the out-of-class activities. However, there is a possibility that they come to class unprepared. Adequate or proper preparations can help STs learn actively in class, while some STs may choose not to show up to class either because they are not prepared or they think that they are well-prepared, and they do not need to come to class. Although it is time-consuming and may increase teacher educators' workload when preparing video lectures, reusing these materials is possible. Thus, it may save teacher educators' time in the long run.

Interpretations and Implications

Based on reports from the participants, this study revealed teacher educators' experiences with FC and outlined their thoughts about both the advantages and challenges. Participants were between 30 and 60 years old and were of both genders (see Figure 2 and Figure 3 in supplementary materials). Therefore, the research results of this study were representative of

teacher educators of different ages and genders in EFL TE in Norway. As shown in Figure 4, FC provided new opportunities for teaching and learning in TE, and more teacher educators enacted this approach with the advancement of educational tools (Ng, 2015). Teacher educators prepared various resources in advance, and STs viewed or studied these resources during their out-of-class time. In this manner of moving teacher educators' lecturing out of class, in-class time was freed up. Thus, when teacher educators and STs meet in the classroom—whether physical or digital—they could make the most of the in-class time for various activities that can promote both active learning and collaborative learning and "foster deeper understanding" (Ng, 2015, p. 150). Among different types of in-class activities, group and pair activities are used the most, which echo the findings of Bishop and Verleger (2013). Even though the link between FC and active learning was "rarely explicitly addressed or operationalized" (Li et al., 2021, p. 17) in published studies, teacher educators—as practitioners of FC—noticed and declared the link in interviews. Teacher educators prepare diverse in-class activities requiring high-order thinking, which could promote active learning, focusing on developing STs' competency instead of the transmission of information. The benefits brought by active learning are well documented and include increasing students' learning performance (Bonwell & Eison, 1991) and students' engagement (Wolff et al., 2015). Similarly, when STs are engaged in pair or group discussions in the classroom, FC can enhance their learning (Van der Linden et al., 2000) and critical thinking (Gokhale, 1995) by working together, which promotes collaborative learning (Korucu-Kış, 2021). Therefore, STs' feedback to FC was positive, though they might have encountered problems concerning technology or pressure.

Meanwhile, this study also revealed that teacher educators perceived both advantages and challenges of FC by implementing this approach, as shown in Figure 5 and Figure 6. Ng (2015) summarized "Merits and Issues of Flipping the Classroom" (p. 160) from previous

research. Some findings from the present study echoed her research, such as the fact that FC could maximize class time "on collaborative work with peers" (Ng, 2015, p. 161), and the preparation work "could be time consuming" (Ng, 2015, p. 161). On the other hand, some findings from this study supplemented Ng's research. For instance, the present study revealed one challenge brought by FC was that it might hinder teacher educators from updating and re-developing their materials. From teacher educators' perspectives, the advantages and challenges of FC are the tensions of three strings. Teacher educators' positive and negative perceptions of FC are close to each other, and their perceptions are a one-to-one correspondence. FC creates flexible environments (Pearson & the Flipped Learning Network, 2013, cited in Hamdan et al., 2013). These flexible environments allow STs to choose when, where, and how to work on the out-of-class activities. Still, some students may be liable to misapply this flexibility and come to class unprepared. Through preparations, STs can obtain prior knowledge that can help them learn actively in classroom. At the same time, some may decide not to go to the classroom because they do not prepare, or they think they have already had lectures from their teacher educators.

On the other hand, although preparing video lectures may be time-consuming and energy-consuming for teacher educators, they may reuse these materials. Thus, it may save teacher educators' time in the long run, which resounded with Hew et al.'s (2021) research that reusing resources "may make the flipped classroom less expensive in the long term" (p. 144). Overall, the tensions of the three strings can move towards either the advantages' or the challenges' directions. Teacher educators should do their utmost to make each tension advance to the direction of advantage. Through how teacher educators perceive FC, some teaching behaviors can be predicted or suggested for teacher educators. For example, teacher educators must explain to STs how FC works at the beginning of implementation. Some STs may have been accustomed to learning in a traditional lecture-based way. Therefore, teacher

educators need to highlight the importance of STs' preparation before they come to class and spotlight the potential influence on in-class activities and learning outcomes by preparation. Meanwhile, teacher educators need to encourage STs to engage in in-class activities and underscore that only viewing video lectures out of class but without showing up to class is not ideal. In addition, teacher educators can reuse materials from previous FC teaching. However, teacher educators also need to improve and update materials by developing pedagogical knowledge and skills.

Suggestions for Teacher Educators

As Appendix B shows, one of the follow-up questions in the interview guide was asking the participants to provide suggestions for other teacher educators concerning FC.

First, they suggested that the FC is worth trying for them to "spice up" (Participant$_7$) their teaching. It is also advisable to try FC "with small steps" (Participant$_2$); for example, implementing FC in one lecture first instead of a whole course. Second, the success of FC depends on both teacher educators' and STs' "commitment" (Participant$_2$), so teacher educators should discuss in advance with STs how FC works and make "clear expectations" (Participant$_3$) of STs. Furthermore, teacher educators need to stress the importance of completing out-of-class activities before coming to class and participating actively in in-class activities. Last, when preparing out-of-class activities, such as a video or audio lecture, it is wise to "disregard this feeling of perfectionism" (Participant$_1$), because a live lecture "wouldn't be perfect" (Participant$_5$) either. The participants also advised to limit the time-length of a video lecture, which should be within 20 minutes; 10-15 minutes is preferable. This is due to "the attention span" (Participant$_2$) and "feasibility of uploading files" (Participant$_9$). They suggested breaking down long lectures into digestible parts. In addition, "a sense of direction" (Participant$_5$), such as "guiding questions" (Participant$_4$), is helpful for

STs while viewing a video lecture, and it is also advisable to ask STs to "pause and think and reflect" (Participant$_6$). Furthermore, the participants proposed a hint of reusing video lectures to avoid mentioning a date or a timeline.

Conclusions, Limitations, and Future Research

This study aimed to explore teacher educators' perceptions of FC. The findings were based on the statistical analysis of the data from survey responses and the thematic analysis of the data from in-depth interviews with EFL teacher educators in Norway. This study addressed the first research question regarding teacher educators' experiences with FC by outlining four aspects. Meanwhile, the present study answered the second research question regarding teacher educators' perceptions of FC by drawing on three advantages and challenges. At last, this study provided practical suggestions for teacher educators on implementing FC. The present study contributes to our understanding of the FC in teacher education by providing viewpoints from teacher educators' perspectives.

Since the participants in the present study were working in the field of TE for EFL in Norway, even though they came from several different countries, their perspectives might be constricted by the Norwegian context. Thus, it would be more insightful to hear teacher educators' voices working in different countries. In addition, as a case study, the present study examined teacher educators' perceptions of FC in EFL teacher education. Research on perceptions of FC from teacher educators of different subject disciplines could broaden the knowledge of FC in TE. Furthermore, this study explored teacher educators' perceptions of FC through teacher educators who had implemented FC. It would also be meaningful to discover teacher educators' insights from those who dislike or refuse to try out FC.

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Article III

Student teachers' perceptions of flipped classroom in EFL teacher education

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Abstract

This paper aims to provide evidence on student teachers' perceptions of Flipped Classroom (FC) to help teacher educators (TEs) to make informed decisions about implementing FC and support student teachers to reflect on the value of FC in their teaching practice. FC, a pedagogical model requiring digital competence of students and teachers, has been a popular teaching approach for nearly two decades in K-12 and higher education. After the outbreak of Covid-19, more teachers have started to implement FC. In post-Covid-19, with the possibility of reusing video lectures made during the pandemic and the familiarity of digital skills to create digital lectures, a question for teachers is whether to continue with this approach. This paper follows an explanatory sequential mixed methods research approach. Insights from student teachers (STs) in the field of English as a foreign language (EFL) in Norway are the primary data, and surveys and focus group interviews are the main instruments to collect the data. FC's advantages and challenges perceived by STs are reported, and the possibility of STs becoming future flippers is explored. Findings from this paper indicate that STs would like to have more courses flipped in their studies, yet STs seem hesitant about flipping their courses in their teaching practice. STs also provide some practical suggestions on implementing the FC approach.

Keywords Flipped classroom · Student teachers · Digital competence · Post-Covid-19

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1 Introduction

Flipped Classroom (FC) has been a popular teaching approach for nearly two decades in K-12 and higher education (Han, & Røkenes, 2020; Van Alten et al., 2019). Different from a *chalk and talk* way of teaching in which teachers write on a blackboard (with chalk) and lecture whole classes, with the FC approach, "students study instructional material before class (e.g., by watching online lectures) and apply the learning material during class" (Van Alten et al., 2019, p. 1). The theoretical underpinning of FC is centered on "student-centered learning theories based on the works of Piaget 1967 and Vygotsky" (Bishop & Verleger, 2013, p. 5). Research has revealed that with the support of information and communication technology (ICT) (Zheng et al., 2020), FC can improve students' learning achievement, active learning, high-order thinking, motivation, engagement, and ease students' anxiety (e.g., Akçayır & Akçayır, 2018; Bergmann & Sams, 2012; Dove & Dove, 2017; Meyliana et al., 2021). However, some teachers have been reluctant to adopt FC for various reasons such as possibly increasing preparation time or lack of professional digital competence (Røkenes et al., 2022; Meyliana et al., 2021; Polly et al., 2018).

Nevertheless, after the mode of teaching was forced to change from face-to-face to fully online due to Covid-19, researchers indicate that both teachers and students have adapted to mere digital teaching and learning environments (Khlaif et al., 2021), and more teachers have started to implement FC (Collado-Valero et al., 2021). In post-Covid-19, with the possibility of reusing video lectures made during the pandemic and the familiarity of digital technologies for creating digital lectures, a question for teachers is whether to continue with the FC approach and take it as the new normal in teaching. Students' thoughts on FC can be helpful for teachers to make informed decisions about whether and how to implement FC. There is ample research on students' perceptions of FC (e.g., Adnan, 2017; Conner et al., 2014; Fraga & Harmon, 2014; Van Wyk, 2018), yet these studies were mainly conducted before the outbreak of Covid-19. Currently, limited published studies have explored students' perceptions of FC after the pandemic. In response to this need, this study aims to explore student teachers' perceptions of FC after the outbreak of Covid-19 by providing evidence from student teachers (STs) studying at a teacher education program in Norway. STs are students learning to be teachers in the future. On the one hand, as students, STs' perceptions of FC can provide useful information for teacher educators (TEs) to consider whether and how to implement FC in teaching (Cabi, 2018; Fraga & Harmon, 2014). On the other hand, as potential teachers-to-be, STs' insights into FC can indicate whether FC will be applied in primary and secondary education (Graziano, 2017). This study intends to discuss two research questions:

(1) What are student teachers' perceptions of Flipped Classroom regarding advantages and disadvantages?

(2) To what extent do student teachers prefer Flipped Classroom, and what are their suggestions for its future implementation?

2 Background

This section first describes the definition of FC and the connection between FC and digital competence. Second, social constructive theory as the theoretical framework is discussed regarding the relation to FC. Finally, previous research on STs' perceptions of FC is presented and linked to the purpose of this study.

2.1 Flipped classroom and digital competence

Several researchers and practitioners have proposed definitions to capture the essence of FC. Lage et al. (2000), without proposing the term, provided a simple definition of the inverted (or flipped) classroom: "Inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa" (Lage et al., 2000, p. 32 Saldaña). Bishop and Verleger (2013), however, argued that the explanation of Lage et al. (2000) did not "adequately represent the practice" (p. 5) of FC. Therefore, they highlighted two aspects of FC's activities: "interactive group learning activities inside the classroom" (p. 5) and "direct computer-based individual instruction outside the classroom" (p. 5).

FC involves using ICT for teaching and learning, and thus, implementing and taking advantage of FC requires digital competence in teachers and students. The European Commission (2019, p. 10) notes that digital competence "involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society". When designing lessons using an FC approach, teachers often need to prepare video lectures as "direct computer-based individual instruction" (Bishop & Verleger, 2013, p.5), involving "talking head" lectures, voice-over PowerPoint presentations, or interactive video lectures with embedded quiz sections. In addition, teachers must design learning activities (with or without ICT) for students to work on the subject discipline during in-class time. Consequently, following an FC approach requires teachers to possess pedagogical or professional digital competence (PDC). The teacher's PDC can be understood as "proficiency in using ICT in a professional context with good pedagogic-didactic judgment and his or her awareness of its implications for learning strategies and the digital Bildung of pupils and students" (Krumsvik, 2011, pp. 44–45). A deep understanding of digital technologies in teaching and learning beyond technical proficiency is an important part of PDC (Lund et al., 2014). While students seem to only need to know how to open and watch the video lectures that their teachers have produced, they also need digital competence involving "basic digital skills" (Røkenes & Krumsvik, 2016, p. 3), such as using learning management system, digital devices, and interactive learning tools. Students' digital competence usually refers to "skills, knowledge, creativity, and attitudes required to use digital media for learning and comprehension in a knowledge society" (Røkenes & Krumsvik, 2016, p. 2; Erstad et al.,

2021). In teacher education, when TEs are modeling good pedagogical practice with technology in FC, STs also develop their PDC in the dimension of "Didactical ICT-competence" (Røkenes & Krumsvik, 2016, p. 3). Meanwhile, STs start to see how they can implement FC in their teaching practice.

Although post-Covid-19, teachers and students are returning to campus and physical classrooms, promoting PDC and providing quality digital teaching still needs to be emphasized in educational research, also for preparing teachers and students for future scenarios (Olofsson et al., 2021). In teacher education, developing STs' PDC also need to be continous effort to increase the quality and contribution of ICT training to their ICT self-efficacy (Guðmundsdóttir & Hatlevik, 2018). Reports from the Norwegian Agency for Quality Assurance in Education (Bakken, 2022; Wiggen, 2022) showed that few newly graduates from teacher education considered themselves digitally competent enough to master the digital forms of teaching in schools.

2.2 Flipped classroom and social constructive theory

In an FC approach, teachers use classroom time to work as facilitators instead of lecturing, and use "interactive group learning activities" (Bishop & Verleger, 2013, p. 5) to provide a student-centered learning space to promote students' learning. Student-centered or active learning theories look primarily to social constructive theory. According to social constructivism, learning occurs through social interaction and the help of others, including peers and teachers. In addition, when teachers follow a social constructivist teaching approach, they need to shift their role from "sage" to "guide". With the FC approach, students learn through discussing or solving problems with their peers inside the classroom, with the knowledge they acquired from watching video lectures and working on other materials outside the classroom. Meanwhile, inside the classroom, students learn by asking questions, receiving guidance, collaborating in groups, and working on materials related to the subject disciplinary content.

2.3 Purpose of study on student teachers' perceptions of flipped classroom

With the FC approach, students' roles have also change from passive receivers to active learners (Bergmann & Sams, 2012). Several researchers have started examining students' thoughts on FC in a teacher education context (e.g., Conner et al., 2014; González-Gómez et al., 2016), and how STs perceive FC has drawn researchers' attention in teacher education (Han & Røkenes, 2020). González-Gómez et al. (2016) reported that STs found FC useful for achieving learning objectives and improving engagement. In the study of Ng (2018), all the STs liked FC. In addition, FC was associated with "a general positive perception" (Jeong et al., 2018, p. 163) from STs not only in the face-to-face learning environment but also in the online environment (Van Wyk, 2018). Yet, there were STs who perceived FC negatively

(Conner et al., 2014), and STs complained about more responsibility with the FC approach (Dove & Dove, 2017; Graziano, 2017). Besides responsibility, Fraga and Harmon (2014) found that STs mainly disliked FC due to two reasons: "issues of time management and confusion" (p. 22).

Whether STs, who have experienced FC in teacher education, would like to take more FC courses and implement the FC approach in their teaching practice is another interesting topic for researchers in teacher education (e.g., Dove & Dove, 2017; Jeong et al., 2018).

In light of previous research, STs seemed to favor having more FC courses in the future (Jeong et al., 2016, 2018). However, for future implementation of FC in their teaching, STs seemed to have different opinions. Many STs planned to flip their classrooms in the future (e.g., Graziano, 2017; Kurt, 2017). Yet, there were other varying thoughts as well. For instance, one ST commented, "I will not have the time during my first few years of teaching to accurately gather or make videos on my own" (Graziano, 2017, p. 124).

Students' suggestions are helpful for teachers to improve teaching pedagogy, and researchers in teacher education should be interested in their input (e.g., Cabi, 2018). The STs in Conner et al.'s study (2014) gave several practical suggestions, including preparing questions for students to answer or offering "a set of partially completed notes" (p. 73) for students to "fill in the blanks" (p. 73) while watching online videos and increasing the interaction between students and teachers during the in-class time. In Adnan's (2017) study, the STs suggested that since students might not be familiar with the FC approach, "students should be clearly informed to understand the flipped classroom model" (p. 220). Therefore, teachers should explain to students what FC is and what students are expected to prepare with the FC approach.

Given previous research, surveys, questionnaires, and focus group interviews were the most used instruments to explore STs' perceptions. Employing surveys and focus group interviews in one study may provide a better understanding of STs' thoughts due to the methods' "potential complementary strengths" (Johnson & Christensen, 2017, p. 51). This study adopts both surveys and focus group interviews as the primary instruments to collect the data. Furthermore, the abovementioned previous studies were conducted before the outbreak of the Covid-19. Therefore, it is valuable to examine STs' perceptions post-Covid-19 and explore whether they want to have more FC courses and implement the FC approach in their teaching career.

3 Method

This study implements an explanatory sequential mixed methods design (Creswell & Creswell, 2018) and analyses both quantitative data and qualitative data (Johnson & Christensen, 2017) (see Table 1). In this section, the setting of FC context in this study is described first. Table 1 shows the participants in this study and instruments for collecting data are clarified.

Table 1 Research design, data-collection instruments, and participants

Explanatory Sequential Design	Data-collection Instruments	Number of Participants
Phase 1 (quantitative data)	Survey on Perceptions of FC	$N_{(Survey)} = 34$
	Exit Tickets from Each Session	$N_{(Exit\ Ticket)} = 143$
Phase 2 (qualitative data)	Focus Group Interviews	$N_{(Interview)} = 19$

3.1 Setting of flipped classroom context

An obligatory course focusing on English linguistic knowledge was taught with the FC approach at a large teacher education program in a Norwegian university in autumn 2020. This course was scheduled with five physical teaching sessions over one academic semester and four hours for each session. However, due to the outbreak of Covid-19, the participating university took preventive measures where STs were divided into smaller groups (10–19 STs in each group) to socially distance in the classroom. The in-class time for each session was reduced from four to two hours. Due to the Norwegian Covid-19 situation, the first four sessions were conducted physically, while the last session was taught using a hybrid solution.

The TE of this course pre-recorded six video lectures and posted corresponding ones to the learning management system about one week before each session. Besides viewing video lectures, STs needed to read from the reading list offered by the TE and work on obligatory written assignments as their out-of-class activities. As for the two-hour in-class activities, group discussions and pair or group activities were the main formats. To answer STs' common questions or clear up general misunderstandings, the TE also had mini-lectures in the classroom. To gain rich information from the teaching sessions, the first author of this study acted as a non-participating observer in the classroom, taking field notes about in-class activities and collecting exit tickets (see Fig. 1) after each session. The field notes showed that the in-class time was mainly devoted to STs' activities, because based

Fig. 1 Exit ticket

on the classroom observation, over 50% of the in-class time was allocated to group discussion.

3.2 Participants

The participants who took the required course in this study are second-year English as a Foreign Language (EFL) STs qualifying to teach grades 1–7 and 5–10.[1] As can be observed in Table 1, 34 participants completed a survey in Phase 1, and 19 participants joined in focus group interviews in Phase 2. In addition, after each session, all STs taking the course were invited to fill in an exit ticket (see Fig. 1). 143 exit tickets in total were collected in Phase 1 for this study.

3.3 Instruments for collecting data

To understand how STs perceive FC and what their suggestions are for implementing the approach, data were collected using a survey on STs' perceptions of FC, focus group interviews with STs, and immediate feedback from their exit tickets.

3.3.1 Survey on perceptions of flipped classroom

To investigate STs' perceptions of FC, a paper-based survey was developed by the authors, piloted with five EFL graduates, and then revised. This survey consisted of 19 questions in English using a five-point Likert scale and six open-ended questions (see Appendix 1). The participants completed the survey right after their last session of the course.

3.3.2 Focus group interviews

19 STs (13 females, six males) participated in focus group interviews (Merriam & Tisdell, 2016) after they completed the course but before taking the course exam. Each interview (see Appendix 2 for the interview guideline), between five to seven participants and the first author, was physically conducted in English and lasted for 45–60 min. In total, there were three focus group interviews.

3.3.3 Exit tickets from each session

To obtain immediate feedback from STs, all EFL STs taking the course were invited to voluntarily answer a three-question exit ticket after each session (see Fig. 1), and 143 exit tickets were collected in total through the digital quiz software Socrative.[2] Three questions concerned how STs understood sessions' materials, what they learned from sessions, and what they thought about the FC approach.

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[1] In Norway, grades 1–7 are elementary schools and grades 8–10 are lower-secondary schools.
[2] https://www.socrative.com/

3.4 Data analysis

Descriptive statistics were applied to analyze the survey responses to describe the most frequent answers and display the distribution of different replies. Word frequency on the collected exit tickets was counted.

Thematic analysis was used to analyze the interview data and the responses to the survey's open-ended questions, aiming to explore STs' shared perceptions of FC. The qualitative data were imported and analyzed using NVivo 12. Following Braun and Clarke's step-by-step guide for thematic analysis (Braun and Clarke, 2006), the analytical process is recursive, with movements back and forth between the six steps. According to Saldaña (2016), a code is "a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data" (p. 4). The approaches of coding and categorization, sub coding, and pattern coding in Saldaña (2016) were adopted during the analytical process to answer the research questions proposed.

4 Results

4.1 Student teachers' perceptions of flipped classroom

STs' perceptions of FC were explored by analyzing both the quantitative and qualitative data from the survey, focus group interviews, and exit tickets. The analytical process concentrated on the advantages and challenges of FC as perceived by the STs.

4.1.1 Advantages of FC perceived by student teachers

Among 34 survey participants, 91.18% of STs reported that FC used class time more efficiently. 85.29% of STs stated that they learned better and more effectively with the FC approach, and 79.41% of STs acknowledged that improving learning performance was one of FC's advantages. Through open-ended survey questions, the STs explained that FC could take advantage of class time efficiently because by watching video lectures at home they might "get a taste of the material beforehand" and "come to class more prepared". Meanwhile, the STs argued that TEs "spend less time explaining easy material" as to "free up time for deeper learning", and therefore, the STs "can use class time on discussions and reflections". Furthermore, they also stated that having their TE use more time walking around the classroom to "answer difficult questions" was helpful.

In the focus group interviews, the participating STs stated their perceptions of the advantages of FC, which were categorized into five themes (Fig. 2).

Flexibility and efficiency in out-of-class activities The STs found that FC afforded flexibility in the course because they could work at their own pace, choose when and where to complete their out-of-class activities, and pause or rewind as many times as needed while watching video lectures. The STs also observed that English linguistic
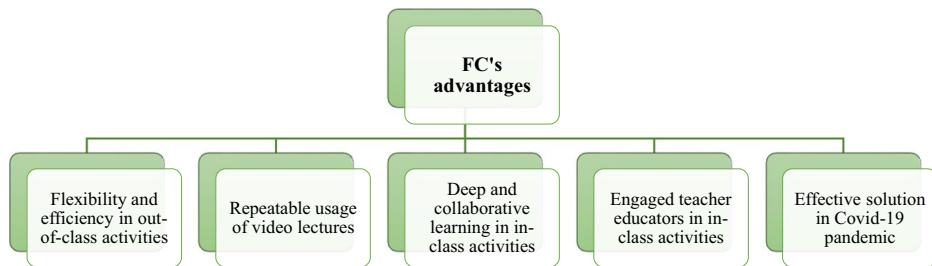
Fig. 2 Advantages of flipped classroom

knowledge, which was included in video lectures, focused on the most critical points and was core and selected elements or essence of certain topics, which was seen as helpful to prepare and learn efficiently in the classroom. In the focus group interviews, one participant noted the efficiency of using FC:

> *It's very time efficient…You can just do it whenever you want, and you can do it as quickly as you want.* (Participant$_{11}$)

Repeatable usage of video lectures The STs realized that it was easy for them to look back if they did not understand, and beneficial to repeatedly watch video lectures, especially when preparing for the exam in the course. Compared to traditional lectures in classroom, where the STs could only refer to their notes, the STs could re-watch the video lectures whenever they needed, which was also echoed in the interviews:

> *I think it also makes me a bit calmer in this (exam) period that we can go back and watch them.* (Participant$_{14}$)

Deep and collaborative learning in in-class activities The STs noticed that by viewing video lectures during the out-of-class time, they might find out what they struggled with in advance so that during in-class time with FC, they could spend more time trying to understand those challenging parts. Moreover, the STs also found group and pair activities motivating, as one participant pointed out in the interviews:

> *Most of us are prepared, and most of us have some ideas of what we didn't understand, then, we discuss them in smaller groups so we are more prepared with our questions with what we need more help with.* (Participant$_4$)

Engaged teacher educators in in-class activities The STs found it easier to ask the TE questions in FC because the TE visited and supported each group during the in-class time. They also got more time to ask questions and sensed that the in-class time was for getting help. Furthermore, they reported during the interviews that the TE had more time to answer their questions and clarify issues.

> *We get some much more time to ask questions. I think I've asked much more questions in this semester than I have done in the last semester.* (Participant$_{15}$)
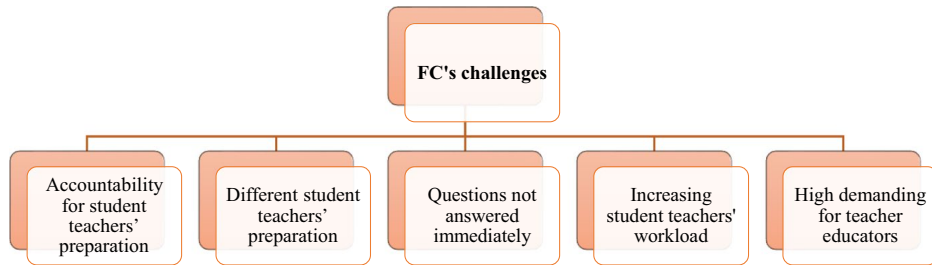
Fig. 3 Challenges of flipped classroom

Effective solution in Covid-19 pandemic The STs regarded FC as an effective way of teaching during Covid-19. With less time in the classroom, they still learned a lot because they could watch video lectures in the out-of-class time and learn efficiently in group discussions when in the classroom. They stated in the interviews that:

> *It's also kind of helpful in the world situation where Corona is a thing.* (Participant$_{12}$)

4.1.2 Challenges of FC perceived by student teachers

Among 34 survey participants, 67.65% of STs found that being unable to ask questions while viewing FC video lectures was challenging. 64.71% of STs thought that TEs could not know about their students' preparation, and 55.88% of STs reported that their workload increased. Through open-ended questions in the survey, the STs stated that they might become "confused about new materials at home", while working on out-of-class activities, such as viewing video lectures. Furthermore, they could not "ask questions right away", and what they could do was to "either send an email (to the TE) or wait until class". Since in-class activities in FC "depended on students coming prepared", STs argued that it was "difficult to control if students have done the required work before class" and thus challenging for TEs to "make sure everyone meets up prepared". For those who "come unprepared", the STs noted that they could not "contribute equally in class". In addition to reporting "a lot of readings and assignments", the STs underscored that they should also "watch video lectures" in FC. Consequently, some sensed that "the workload on the students increases".

In the focus group interviews, the participating STs expressed their perceptions of the challenges of FC, which could be categorized into five themes, as presented in Fig. 3.

Accountability for student teachers' preparation The STs expressed that they had more responsibility in FC. The STs were required to come to class prepared. Otherwise, they argued that they could not actively participate in the in-class activities and could not learn as much. Some STs said they might not even show up to the classroom if they did not complete the out-of-class activities. One participant pointed out in the interviews that:

With the flipped classroom, the preparation is half of the class, so when you don't prepare, you lose way more… It requires a lot of self-discipline. (Participant$_5$)

Different student teachers' preparation Since the STs were responsible for coming to class prepared, the level of preparation might vary. The STs noted in the interviews that they found it challenging when one or two or more peers in the same group could not contribute ideas in FC discussions. One participant noted that:

What can happen is when you work in groups, the level might be on kind of different stages. (Participant$_2$)

Questions not answered immediately While working on out-of-class activities alone and coming across some questions, the STs found it challenging because their questions could not be answered immediately. Instead, they stressed in the interviews that they had to wait until they returned to the classroom. Sometimes, they might have already forgotten their questions by then, as one participant stated:

If there is something that you don't understand and you try to go back and back and back to look at it, then you have to wait maybe a long time to ask in class. (Participant$_9$)

Increasing student teachers' workload The STs also addressed that they had to spend much time working on out-of-class activities with FC. As to coming to the classroom prepared, the STs reported in the interviews that they spent time watching video lectures and reading materials in advance, as one participant emphasized:

I spend one and a half hour on 20 minutes of video. (Participant$_{13}$)

High demanding for teacher educators The STs noticed that FC demanded more of the TE compared to the *chalk and talk* way of teaching. The STs argued during the interviews that the TE needed to prepare video lectures and in-class activities and be ready for harder questions from STs during classroom time, which was echoed in the interviews:

(The TE) really knows his subject and he's also a good facilitator, but both of those are highly needed for flipped classroom to be an efficient learning method. (Participant$_{10}$)

4.1.3 Immediate feedback on FC from student teachers

Figure 4 is a word cloud that visualizes the words that appeared most often across the exit tickets and provides an overview of STs' immediate feedback on FC. As can be observed, "good" and "well" appeared more frequently than "difficult". Meanwhile, "easier" and "liked" could also be noticed.

4.2 Future flippers

After having experienced learning in FC, 70.59% of the 34 participating STs agreed or strongly agreed that they would like to take another course designed as FC.
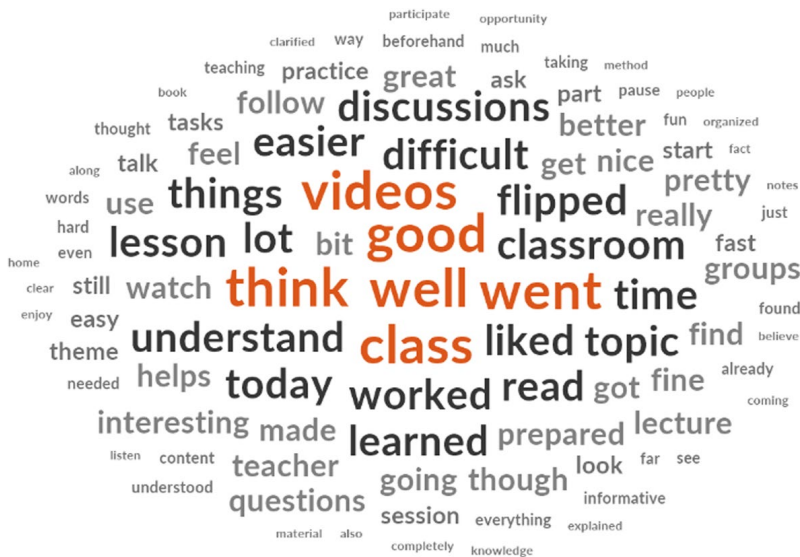
Fig. 4 Immediate feedback on FC from student teachers

Furthermore, 79.41% of participants agreed or strongly agreed that with the learning experience of FC, they could do better in another FC course. However, compared with the willingness and fondness of taking another FC course by themselves, less than half of the participating STs (41.18%) agreed or strongly agreed that they would like to adopt FC in their teaching.

On the one hand, the STs stated that they would like to "apply different teaching approaches as students learn differently". They believed that "with students ranging from almost fluent to struggling", FC might "be easier for each student to adapt the materials to their own needs" and "open for more activities done in class". On the other hand, as future teachers teaching in elementary or lower-secondary schools, the STs were concerned with FC's utilization with "younger students", because "the pupils are too young", "need their teacher to be there physically", and "might not be motivated enough by a video".

In the focus group interviews, the STs communicated their perspectives on future flippers. From the interviews, all participating STs seemed to desire to take more FC courses. The STs also discussed the possibility of implementing FC in their teaching. However, some STs also mentioned that they might not implement FC in their teaching practice mainly due to the young age of their pupils (in Norway, first graders are at the age of 6).

> *With all the benefits, I'd definitely like to have more flipped classroom courses.* (Participant$_{18}$)
> *Because they're too small, they're too young and they always expect that the teacher is going to elaborate and explain, so they won't be prepared, at least not at lower levels. But maybe for high school level, it could be beneficial.* (Participant$_{11}$)

4.3 Student teachers' suggestions for flipped classroom

Based on the participating STs' answers to the last question of the survey and their thoughts expressed through the focus group interviews, recommendations regarding three aspects for implementing FC were generated.

4.3.1 Suggestions on out-of-class activities

In line with their learning experience with FC, the participating STs suggested that video lectures should not be too long as out-of-class activities for students, and several short videos are better than a long one. The participants also emphasized creating variety in the out-of-class activities. However, various out-of-class activities should share a commonality: TEs need to be engaged to motivate their STs. In addition, the STs also suggested making space for pauses for students in the video lectures, and signal when they would like to have their students reflect. Even though their TE posted video lectures one week before physical classes, the participating STs would suggest viewing videos one or two days in advance to get clearer pictures in mind. Participants stated in the interviews that:

> *It's more motivating to sit down and watch one video on 15 minutes now and I can watch the other one later.* (Participant$_{16}$)
> *There are many different types of presentations you can use, and to have variation is always good.* (Participant$_{14}$)

4.3.2 Suggestions on in-class activities

With FC, lecturing time is moved out of the classroom, yet it does not mean that TEs cannot hold mini-lectures in the classroom. On the contrary, the participating STs suggested that TEs follow up on what STs did with video lectures, clear up potential misunderstandings after viewing video lectures, and repeat important information that needed attention during discussions or other activities. As one of the advantages brought by FC, the in-class activities could promote deeper and collaborative learning. Thus, TEs could prepare for more detailed or sophisticated questions from the STs and plan various student activities to promote their learning, such as group discussions. Furthermore, digital learning tools were suitable for out-of-class activities and fitting for in-class activities. Participants expressed that:

> *Repeat some of the important things like in the class discussions or before the class discussions that you'll be aware of what you have to focus on.* (Participant$_8$)
> *Like Padlets, not just during the digital lessons, but also in class, so the groups can write together, and it will come up on the smart board.* (Participant$_{11}$)

4.3.3 Suggestions on courses suitable to be flipped

Since the participants were studying English language teaching, they emphasized several courses in their program that might be suitable for flipping, such as

didactics, grammar, and phonetics. Meanwhile, the participating STs underlined some characteristics of a course suitable to be flipped. On the one hand, a course that contains complicated concepts or theories might be suitable for adopting FC. With the help of FC materials, such as video lectures, STs can review videos several times to better understand or assimilate complex information. STs can also take their questions and confusion to class to discuss with their peers or TEs. On the other hand, FC is suitable for a course that emphasizes incorporating activities, such as discussion or hands-on actions. With moving lectures out of class, STs can use longer in-class time for discussing or practicing, which also echoes the benefits perceived by participants arguing that FC can improve deep and collaborative learning. With courses that have the potential to be flipped, the STs underlined in the interviews a balance between flipped and non-flipped courses because of the increasing workload for them with the FC approach. Participants confirmed in the interviews that:

It's nice to have the videos and see if there's something you don't understand, you can always go back and ease to check. (Participant$_6$)

I like it, but I would not want to have this approach in every subject the same semester. (Participant$_3$)

5 Discussion and conclusion

In this study, STs' perceptions of Flipped Classroom were explored by analyzing data from the survey, focus group interviews, and exit tickets. The participants perceived both benefits and drawbacks of FC. Most participating STs agreed that FC was an effective teaching approach because FC used class time more efficiently. Therefore, FC could improve STs' learning performance compared to the *chalk and talk* way of teaching. These findings support previous studies (e.g., González-Gómez et al., 2016; Jeong et al., 2018; Ng, 2018) that STs generally have positive perceptions of FC. Furthermore, this study categorized FC's advantages perceived by STs into five aspects, as shown in Fig. 2. As a study conducted after the outbreak of Covid-19, the results of this study diverge to some degree from previous studies (e.g., Akçayır & Akçayır, 2018) regarding FC's advantages. Yet, the study is also innovative because FC is suggested to be an effective solution during Covid-19. At present, the world is moving into a new post-pandemic phase. Moreover, hardly anyone knows whether something resembling a similar scenario could enforce remote teaching in schools and higher education. Based on the STs' perceptions, FC is suggested as a pedagogical approach suitable in a pandemic or other critical situations, where remote teaching can be an alternative to physical teaching, such as during conflicts and natural disasters.

Besides FC's advantages, over half of the participants found FC challenging for STs and TEs. In the study of Fraga and Harmon (2014), the STs mentioned time management and confusion as FC's challenges. This study discovered the other two

challenges for STs, i.e., they could not ask questions while viewing video lectures and experienced an increased workload. Apart from these challenges for STs, the participants thought that FC was also challenging for TEs since they were unable to know how the STs engaged in out-of-class activities. This study categorized FC's challenges into five aspects, as Fig. 3 illustrates. On the one hand, these findings support the previous studies (e.g., Conner et al., 2014), but on the other hand, these findings also refer to FC' challenges for TEs from the view of STs (e.g., Akçayır & Akçayır, 2018).

The STs' opinions on being future flippers may predict what will happen in the future, in teacher and higher education and primary and secondary education. More than 70% of the participating STs would like to take another course designed as FC, and this result supports the previous studies (e.g., Dove & Dove, 2017; Jeong et al., 2016, 2018). Moreover, after getting familiar with FC, nearly 80% of the participants believed they could do better in another course with the FC approach. Therefore, educators in higher education, especially TEs in teacher education, may consider providing more courses with the FC approach.

However, as future teachers teaching in elementary or lower-secondary schools, only 40% of the participating STs wanted to adopt FC in their teaching career. This result is lower than Graziano's study (2017), where most participating STs wanted to flip their classrooms in the future. The STs in this study are reluctant to implement FC in their classrooms mainly because of the age of their future pupils. In contrast, Graziano's study (2017) participants were worried about the limited time. Nevertheless, there are STs in this study who would like to use FC or incorporate the approach in specific topics. These findings reveal that there may not be many future flippers among the participating STs, but FC may appear in some teachers' classrooms in the future. Meanwhile, FC may be less desirable to implement in primary schools. Though none of the participants in this study and Graziano's study (2017) mentioned a lack of PDC as a reason to refuse to implement FC in their teaching practice, a higher level of digital competence might help STs overcome those difficulties (Røkenes & Krumsvik, 2016; Erstad et al., 2021). If STs master the digital technologies required to produce a video lecture, with the possibility of reusing video lectures, STs can save time and energy in a long run. Furthermore, STs who have developed PDC in teacher education, such as through observing TEs' modeling of FC in their coursework, are more likely to use technologies in a pedagogical and didactical manner to design and create out-of-class or in-class activities suitable for their future pupils' age (Røkenes & Krumsvik, 2016; Guðmundsdóttir and Hatlevik, 2018).

As for suggestions for FC, the participating STs in this study proposed practical implications for TEs, some of which echo the previous studies (e.g., Conner et al., 2014). The STs suggested a couple of short video lectures instead of long ones and recommended pauses for students during video lectures. This idea shares the commonality with the STs' suggestion of offering "a set of partially completed notes" (p. 73) in Conner et al.'s study in 2014. In addition to the length of video lectures, the STs emphasized the variety in the out-of-class activities and assessment forms. Besides PowerPoint presentations, Prezi presentations or

podcasts were recommended. TEs needed to be engaged to motivate their STs, model pedagogical use of FC, and set aside time for student-centered in-class learning activities (Røkenes & Krumsvik, 2016; Røkenes et al., 2020). The STs recommended out-of-class activities that can promote critical reflection to support students as active thinkers and producers rather than as passive consumers of knowledge. Even though lecturing time is moved out of the classroom with the FC approach, the STs mentioned the necessity of including a mini-lecture or a recap during the in-class time. Moreover, the STs also advised TEs to be prepared for more detailed or sophisticated questions from STs and plan various in-class activities. For TEs who teach a course containing complex concepts or theories, it may be appropriate to consider implementing FC. Since the participants were studying English language teaching, they emphasized several courses in the subject discipline of English that might be suitable to be flipped, such as didactics, grammar, and phonetics. In addition, it is also advisable to consider the balance between the number of courses with and without FC.

The FC approach requires a different proficient level of digital competence of students and teachers, such as PDC (Krumsvik, 2011; Lund et al., 2014). FC demands students' basic digital skills to use learning management systems, laptops, and interactive learning tools and requires a higher level of digital competence of teachers (Røkenes & Krumsvik, 2016). With the FC approach, teachers' "didactic ICT-competence" and "learning strategies" are needed to reflectively and pedagogically use ICT and seamlessly integrate ICT in preparing video lectures and understand ICT's impact on learning environment and assessment forms (Røkenes & Krumsvik, 2016). On the one hand, for those STs who would like to become future flippers, it is valuable to develop their digital competence and utilize the FC approach in their teaching. On the other hand, STs reluctant to implement FC need to continuously develop their PDC for meeting future scenarios and emerging technologies, such as dealing with the artificial intelligence software ChatGTP and plagiarism. The study of Jimoyiannis and Koukis (2023) also confirmed that "the role of digital technologies in education will be more important" (p. 13) after Covid-19. Therefore, it is valuable to highlight digital competence in education. The FC approach is potentially helpful as an approach requiring the digital competence of both teachers and students.

6 Limitation and future research

This study examined students' perceptions of FC through evidence from STs. The participants in this study were all from an EFL teacher education program at a university in Norway. The conclusions might be more reliable and generalizable if the participants were more diverse, such as from different subject disciplines and teacher education institutions. In addition, this study investigated a course with the FC approach over one academic semester. Future studies should address various subject disciplines, including participants from several teacher education programs, and examine the long-term effects of implementing FC. Furthermore, since some STs are concerned with implementing FC in primary schools, conducting further research of FC in primary education is advisable.

Appendix 1

Table 2 Survey on perceptions of flipped classroom teaching approach

No.	Please rate statements below:	Strongly Disagree	Disagree	Neither/ Nor Agree	Agree	Strongly Agree
1	I think that viewing Flipped Classroom lecture materials in advance are essential to successfully participating in the class activity.	O	O	O	O	O
2	I believe that Flipped Classroom lecture materials is more effective than traditional classroom instruction.	O	O	O	O	O
3	I am more comfortable with Flipped Classroom lecture materials than traditional classroom instruction.	O	O	O	O	O
4	I get bored when studying Flipped Classroom lecture materials on my own.	O	O	O	O	O
5	I like Flipped Classroom lecture materials, because: I dislike Flipped Classroom lecture materials, because:					
6	I learn better through instructor-directed classroom-based activities than through completing homework alone.	O	O	O	O	O
7	I find that learning through collaboration with other classmates is more effective than through completing homework alone.	O	O	O	O	O
8	I am more engaged when collaborating with other classmates than completing homework alone.	O	O	O	O	O
9	I find it difficult to collaborate with other classmates in the classroom.	O	O	O	O	O
10	I like completing homework/task with other classmates in the classroom instead of on my own, because: I dislike completing homework/task with other classmates in the classroom instead of on my own, because:					
11	One of the advantages of Flipped Classroom teaching approach is that it can improve learners' learning performance.	O	O	O	O	O
12	One of the advantages of Flipped Classroom teaching approach is that it can improve learners' motivation.	O	O	O	O	O
13	One of the advantages of Flipped Classroom teaching approach is that it can improve learners' engagement.	O	O	O	O	O
14	One of the advantages of Flipped Classroom teaching approach is that it can make class time more efficient.	O	O	O	O	O
15	As far as I am concerned, the greatest advantage of Flipped Classroom is: because:					
16	One of the challenges of Flipped Classroom teaching approach is that instructors are unable to know how learners are engaged in out-of-class activities.	O	O	O	O	O
17	One of the challenges of Flipped Classroom teaching approach is that learners' workload increase.	O	O	O	O	O
18	One of the challenges of Flipped Classroom teaching approach is that learners are unable to ask questions while viewing Flipped Classroom lecture materials.	O	O	O	O	O
19	One of the challenges of Flipped Classroom teaching approach is that learners are anxious about the new teaching approach.	O	O	O	O	O
20	As far as I am concerned, the greatest challenge of Flipped Classroom is: because:					
21	I would like to join in a course that adopts Flipped Classroom teaching approach in the future.	O	O	O	O	O
22	I believe that after having taken a course that adopts Flipped Classroom teaching approach, I can do better in another course with the same approach.	O	O	O	O	O
23	I would like to apply Flipped Classroom teaching approach in my own teaching career in the future.	O	O	O	O	O
24	I would like to apply Flipped Classroom teaching approach in my own teaching career in the future, because: I would not like to apply Flipped Classroom teaching approach in my own teaching career in the future, because:					
25	In relation to Flipped Classroom teaching approach, I have more to say:					

Appendix 2

Table 3 Guideline for focus group interview

Warm-up

- When and how did you first encounter Flipped Classroom?
  ○ Please elaborate on what the activity was and what you thought about flipped classroom the first time you encountered it

Perceptions

- How do you think the online video lectures impacted your learning?
- How do you think group discussions and teamwork impacted your learning compared to listening to lectures and doing individual work?
- What do you believe are some of the benefits of using Flipped Classroom in this course?
- What do you believe are some of the drawbacks of using Flipped Classroom in this course?
  ○ What solutions do you suggest solving the problems experienced?

Future teaching

- How do you like having more courses with Flipped Classroom teaching?
  ○ In English language teaching, do you think that there are topics that are work better than others using Flipped Classroom (e.g., grammar, literature, vocabulary, reading, writing etc.)?
  ○ What advice would you give another teacher who was thinking of making a similar change to one of his or her courses?
- How do you like using Flipped Classroom in your own teaching?

Declarations

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Han, Han; Røkenes, Fredrik Mørk; Krumsvik, Rune Johan. Flipped Classroom's impact on students' motivation and engagement.

This paper is submitted for publication in British Journal of Educational Technology and is therefore not included.

Article IV

Appendices

Appendix I Ethical permission by the Norwegian Centre for Research Data (NSD)

Assessment of processing of personal data

🖶 Print   ☰ 03.03.2023 ▾

Reference number
778391

Assessment type
Standard

Date
03.03.2023

Project title
Flipped Classroom in Language Education for ESL/EFL Student Teachers

Data controller (institution responsible for the project)
Norges teknisk-naturvitenskapelige universitet / Fakultet for samfunns- og utdanningsvitenskap (SU) / Institutt for lærerutdanning

Project leader
Han Han

Project period
01.09.2019 - 16.07.2023

Categories of personal data
General

Legal basis
Consent (General Data Protection Regulation art. 6 nr. 1 a)

The processing of personal data is lawful, so long as it is carried out as stated in the notification form. The legal basis is valid until 16.07.2023.

Notification Form 🗗

Comment
Data Protection Services has assessed the change registered on 03.03.2023.

The research period has been extended until 16.07.2023.

Please note that in case of further extensions, it may be necessary to inform the sample.

Data Protection Services will follow-up the project at the new end date in order to determine whether the processing of personal data has been concluded.

Good luck with the rest of the project!

Appendix II Invitation letter to teacher educators to participate in the online survey

Dear Teachers,

Happy New Year to you all!

My name is Han Han, a PhD candidate from Department of Teacher Education in NTNU. My research project is about Flipped Classroom in language education and my supervisors are Fredrik Mørk Røkenes and Rune Johan Krumsvik. In a flipped classroom, teachers provide teaching content outside classrooms, such as videos and PowerPoints, while students complete learning tasks with knowledge application inside classrooms. My research study including survey and interview questions has been reviewed and approved by the NSD.

As a part of my research study, I would like to explore how teacher educators perceive Flipped Classroom teaching approach through an online survey since most of previous research only focus on student teachers' perceptions on Flipped Classroom. You are being invited to participate in the online survey and it will take less than 5 minutes to complete the survey. If you have implemented Flipped Classroom in your teaching and are interested in participating the survey, I really appreciate it.

Here is the survey link: https://nettskjema.no/a/179475

Thanks again!

Best regards,
Han Han

Appendix III Consent form for in-depth interviews

Consent Form

You are being invited to participate in a research study titled *Flipped Classroom in Language Education for ESL/EFL Student Teachers*. This study is being done by Han Han from the Department of Teacher Education in NTNU.

The purpose of this research study is to explore the pedagogical-didactical use and impact of flipped classroom in language education, with a special focus on ESL/EFL teacher education.

Your participation in this research study is voluntary. You may choose not to participate. If you decide to participate in this research study, you may withdraw at any time. If you decide not to participate in this study or if you withdraw from participating at any time.

If you agree to participate in this research study, you will be invited to an interview that will take approximately 30 minutes. The format of the interview and the interview guide have been reviewed and approved by the NSD. The interview will be digitally conducted on Zoom between you and the researcher, Han Han. The interview will be recorded for the purpose of transcribing and stored in NTNU-administered and encrypted laptop. The researcher, Han Han, will be the only person to have access to the recorded interview and transcribed data. Furthermore, the researcher will send you the transcribed text for member checking before analyzing the data and will allocate the interview with a fake participant name when the research result is published. Han Han's supervisors, Fredrik Mørk Røkenes and Rune Johan Krumsvik, will have access to the transcribed text with the fake participant name.

If you agree to participate in the interview, please reply this email with "Yes".

Appendix IV Consent form for paper surveys

Consent Form

You are being invited to participate in a research study titled *Flipped Classroom in Language Education for ESL/EFL Student Teachers*. This study is being done by Han Han from the Department of Teacher Education in NTNU.

The purpose of this research study is to explore the pedagogical-didactical use and impact of flipped classroom on the education of student teachers in Norway, with a special focus on ESL/EFL teacher education.

Your participation in this research study is voluntary. You may choose not to participate. If you decide to participate in this research survey, you may withdraw at any time. If you decide not to participate in this study or if you withdraw from participating at any time, you will not be penalized.

If you agree to participate in the study, you will be asked to complete the following survey that will take approximately 15 minutes. Your responses will be confidential and none of the identifying information such as your name, email address or IP address will be collected. The survey questions will be about your motivation and engagement in all the courses at the university level. The results of this study will be used for scholarly purposes only.

If you agree to participate in the research study, please accept participation by crossing "Yes". If you do not wish to participate in the research study, please decline participation by crossing "No".

Yes ☐

No ☐

NTNU
Norwegian University of
Science and Technology