



Flipping the classroom in physiotherapy education: experiences, opportunities and challenges

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ABSTRACT

In higher education, resistance to shifting educational methods presents a challenge in fulfilling the opportunities offered by new methods. The purpose of the present study is to document the experiences of a flipped classroom intervention in a Norwegian physiotherapy programme, from the perspectives of the students and the teachers. The findings demonstrate that the students' attitudes were mainly positive. In particular, the students evaluated autonomous group work and unlimited access to digital material as positive. The academic outcomes from the final exam were similar to previous years. Interviews with the teachers showed that the learning environment associated with the group work in the flipped classroom was a different and highly appreciated experience. In conclusion, the present study indicates that there is potential in implementing digital approaches in physiotherapy programmes.

Keywords

flipped classroom, physiotherapy, technology in higher education

INTRODUCTION

A recent status report on Norwegian higher education showed that although there seems to be increasing attention on the pedagogical use of digital technology in higher education institutions, the possibilities are far from utilised (Kunnskapsdepartementet, 2018). Pedagogical use of digital technology is closely related to active learning strategies. Survey findings on teaching in Norwegian higher education show that higher education learning environments are still characterised by traditional, passive teaching methods, and that educators have little trust in their students' contributions to quality improvement (Amundsen, Damen, Haakstad, & Karlsen, 2017). Due to these findings, a recent review on learning and teaching with technology in higher education suggested an institution-wide, scholarly approach to teaching, as a means of promoting active learning (Lillejord, Børte, Nesje, & Ruud, 2018). Other reports claim that the development of robust strategies for integrating teaching with technology, is a question of survival for higher education institutions (Adams Becker et al., 2017).

Consistent findings from research show that learning outcomes are improved when students actively engage in learning activities (Freeman et al., 2014; Michael, 2006; Prince, 2004). The flipped classroom is a blended learning approach in which students receive digital lectures as homework, while group-based problem-solving activities are used in the classroom (Abeysekera & Dawson, 2014; Bergmann & Sams, 2012; J. L. Bishop, 2013; J.L. Bishop & Verleger, 2013; L.-L. Chen, 2016; Foldnes, 2016). The underlying premise of the flipped classroom is that classroom time should be used for active-learning activities instead of traditional lectures (O'Flaherty & Phillips, 2015). Although the flipped classroom model offers different opportunities of in-class learning activities, there is evidence suggesting that collaborative working releases the model's full potential (Foot & Howe, 1998; Johnson, Johnson, & Smith, 1998; Prince, 2004; Springer, Stanne, & Donovan, 1999). There is also evidence that the flipped classroom facilitates engagement and interaction (L.-L. Chen, 2016; Laal & Ghodsi, 2012; O'Flaherty & Phillips, 2015; Ruiz, Mintzer, & Issenberg, 2006).

A number of studies report increased student satisfaction with the flipped approach (O'Flaherty & Phillips, 2015). However, not all students embrace this type of learning. A study with a mixed population of undergraduate and postgraduate health education students found that they were divided into those who embraced the flipped classroom and those who, although neutral on some elements, did not endorse its pre-learning aspects (McNally et al., 2016). Other findings suggest that students enjoy the increased flexibility associated with the flipped classroom and want personalised learning through interactive, collaborative, well-structured learning activities (Wanner & Palmer, 2015). A recent qualitative study on student engagement in a flipped classroom concluded that affective dimensions of learning should not be underestimated. Dimensions such as commitment to peers, being recognized, feeling safe and the instructor relationship were particularly highlighted as conducive to student learning (Steen-Utheim & Foldnes, 2018). The teacher views and experiences with flipped classrooms have been less investigated. However, an Australian study concluded that the main concern of higher education teachers was the time commitment and lack of institutional support for flipped classrooms (Wanner & Palmer, 2015). In line with this concern, it has been suggested that flexible learning interventions require

additional resources: staff time, instructional design, technical support and administrative support (D. T. Chen, 2003). Xu & Wang (2009) claimed that in hybrid environments such as the flipped classroom, the traditional roles of the teachers as information providers and knowledge transmitters are challenged. Due to this, teachers are putting on new “hats” as expert learners, facilitators, course designers and organisers (Xu & Wang, 2009).

Blended learning interventions seem to be highly context-dependent, with the generalisation of concepts across disciplines being a challenge (Harris P, Connolly JF, & L., 2009). Within the field of physiotherapy education, a systematic review found that the use of online technologies has the potential to enhance practical skills performance, knowledge acquisition and enhance deep learning and reflection (Mącznik, Ribeiro, & Baxter, 2015). The results of this review also indicate that flipped classroom interventions have been little investigated within physiotherapy education. The aim of this study is to explore student and teacher perceptions about flipped classrooms in physiotherapy education. The research questions are:

1. What are the advantages and disadvantages of flipped classrooms from a student perspective?
2. How do students report self-perceived learning outcomes of traditional teaching and flipped classroom education?
3. How do teachers experience teaching with technology?

METHODS

The study took place within a course on musculoskeletal disorders (15 ECTS) for second-year students of the Bachelor’s Programme in Physiotherapy at Oslo Metropolitan University, in autumn 2016. The study had a cross-over design: first, the students underwent about three weeks of traditional lectures. During this period, no active learning interventions were organised. Thereafter, the students underwent a three-week period of flipped classroom education. The traditional lectures and flipped classroom intervention preceded a practice period and an individual oral exam (on a six-point grading scale). Altogether, forty-five students participated in the course.

Materials consisted of student self-perceived learning outcomes assessments, given after the traditional lectures and the flipped classroom intervention. The students’ opinions were registered anonymously in a survey. The survey contained an open-ended question, where the students were encouraged to identify three positive and three negative factors in relation to the flipped classroom intervention. In addition, the students were asked to rate their overall self-perceived learning outcome from the flipped classroom intervention and the traditional lectures, separately on ten-point numerical scales. The numerical scales were provided without any qualitative descriptions of the endpoints.

In order to explore the three teachers’ opinions about their participation in the development and implementation of the flipped classroom intervention, informal, individual interviews were conducted with each of them. In the interviews, the teachers were asked about issues relating to lecture production, their teaching role at the seminars, and teaching with technology in general. All interviews were conducted by the course leader (YR).

None of the interviews were recorded, but notes were taken during each interview and expanded upon shortly thereafter. The teachers had at least five years' experience in the physiotherapy programme.

The flipped classroom intervention entailed pre-classroom digital learning resources, and in-class collaborative learning activities. The digital learning resources consisted of twenty-two digital lectures (five hours in total), YouTube videos, podcasts and blog posts. The learning resources were organised in themes, consistent with the structure of the in-class learning activities. The digital lectures were recorded using Microsoft Office Mix, a free extension of PowerPoint that transforms PowerPoint presentations into online lessons, and allows both implementation of audio and video. In this intervention, most of the digital lectures included a video, with the teacher on the first and last slides. The rest of the slides only contained an additional voice track. The digital lectures were saved as video files, which the students were able to access from several platforms, including mobile phones. The digital lectures were made available for the students at least one week before the in-class activities.

In-class learning activities consisted of six full-day seminars where the students worked on assignments. Each seminar focused on a theme (i.e. persistent pain and evidence-based physiotherapy). A leaflet, with exercises for each seminar, was distributed to the students. The exercises were theoretical, with different levels of difficulty. Typically, the students would start with exercises requiring a brief answer, and end with more complex assignments, typically patient cases. All seminars had a similar structure, starting with a plenary session of about forty-five minutes, where the students were encouraged to clarify misunderstandings or identify particularly difficult areas. Thereafter, the students worked in groups of about seven, based on the exercise leaflet. This session lasted about five hours, and included lunch. The students were encouraged to take regular breaks during the group work. At the end of the seminars, a forty-five-minute plenary session was organised, wherein the groups had the opportunity to clarify misunderstandings or discuss difficult parts of the assignments with the others. The assignment solutions were the property of the group. At the seminars, two teachers circulated during the group work, and were responsible for organising the plenary sessions at the beginning and end of the seminars.

The students were informed that they were expected to be familiar with the digital learning resources before the seminars. In addition, it was announced that the assignment solutions were highly important for the course's final theoretical exam.

The positive and negative factors of the flipped classroom intervention, reported by the students, were analysed separately using frequencies. In addition, the self-perceived learning outcomes of the traditional lectures and the flipped classroom intervention were analysed with mean (standard deviation), and compared with a Paired Samples Test (T-Test) (Tabachnick & Fidell, 2007).

The analysis of the informal interviews was informed by Braun and Clarke's thematic analysis (Braun & Clarke, 2006). Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data (Braun & Clarke, 2006). The analysis followed a stepwise recommendation and consisted of becoming familiar with the data, generating initial codes, searching for themes, reviewing themes and defining and naming themes. In line with the recommendations, the prevalence of themes within each data item, as well as

across the entire data set, was emphasised (Braun & Clarke, 2006). The material was first analysed independently by two researchers (YR and TD-M). These analyses were then discussed in four meetings: two online and two face-to-face. Although there was little disagreement between the researchers, the meetings contributed to a more in-depth analysis of the data.

RESULTS

Students' opinions

Altogether, thirty-nine students (91%) returned the questionnaires. Based on the responses, eighty-nine positive and fifty-seven negative factors of the flipped classroom intervention were identified.

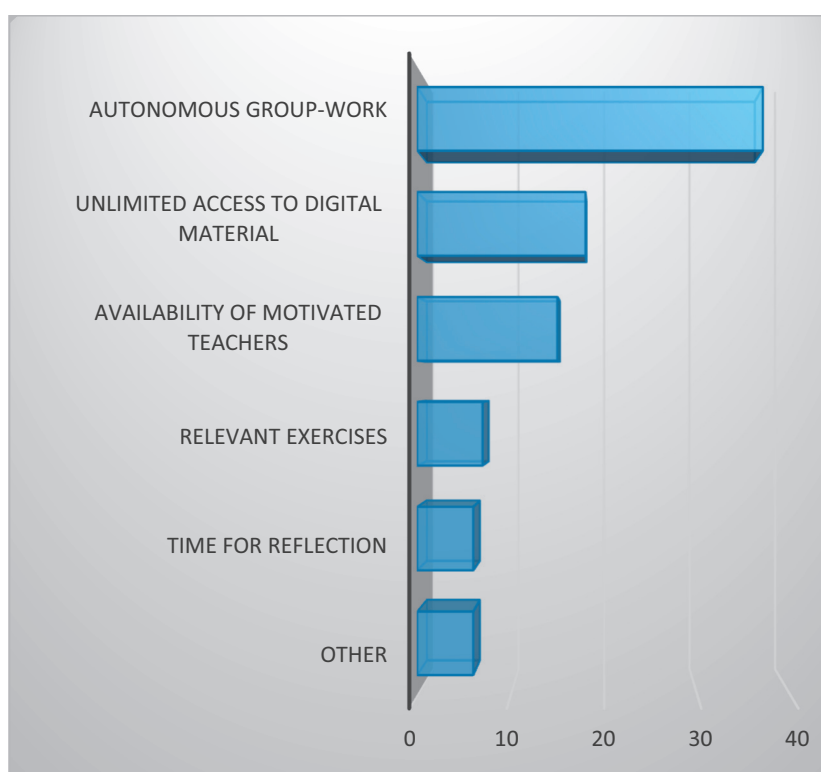


Figure 1: Frequent positive factors of the flipped classroom intervention, in ranked order

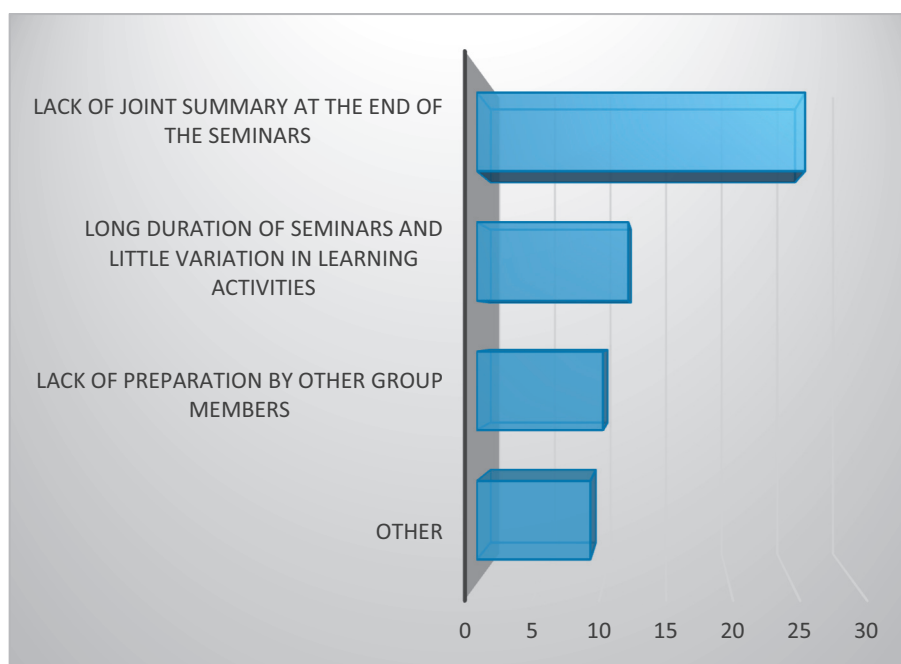


Figure 2: Frequent negative factors of the flipped classroom intervention, in ranked order

There was a significant difference in the scores for student satisfaction of the flipped classroom intervention ($M=6.85$, $SD = 1.39$) and traditional lectures ($M=5.62$, $SD = 1.33$); $t(38) = -4.459$, $p < 0.001$. These results suggest that the students really were more satisfied with flipped classroom learning than traditional lectures.

Teachers' experiences

The teacher interviews ($n = 3$), revealed noteworthy experiences with the flipped classroom intervention. The experiences revolved around three themes: digital lectures as technical issues and pedagogical concerns, the new teacher role, and increased responsibility of students. Notably, these themes occurred interrelatedly. However, in order to increase readability, we present them as separate themes.

Digital lectures

Notably, the teachers reported that the production of the digital lectures was time-consuming far beyond their expectations. In particular, they emphasised that they needed to record their lessons repeatedly, because many issues of concern occurred to them as they watched and listened to their lectures. The teachers moderated the somewhat negative experiences of time-consuming practices by emphasising that new approaches are always time-consuming, and in particular by foregrounding their experiences of being inspired by the new approaches. As one of the teachers expressed:

I think, it takes [a certain] amount of time to do it, far more than we are compensated for in the work plan. But you know, it is still very fun. It is fun to see how it develops and to see the results. When you see the results, you get very inspired. (Teacher 2)

This experience of the teacher points to how the digital lecture production is far more time-consuming than the resources allocated by their work plan; however, the teachers still find the work inspiring. Moreover, these findings highlight how the digital lecture production is not merely production, but relates to a pedagogical process: finding the time spent on digital lecture production worthwhile seemingly relates to the teachers' positive experiences of pedagogical development.

The teachers thought that the technical issues concerning production of digital lectures was challenging, although they only experienced minor difficulties. Notably, the teachers say that they are used to technology and describe themselves as above-averagely interested in technology. Still, they found that there were many decisions to be made for the recording, such as the length of the lectures and the examples to use for clarifying a theme. In short, they found that it was different to talk to the computer instead of the students. As one of the teachers said:

You know, the natural way you speak in the classroom does not work when you produce digital lectures. You have to keep to the point all the time. So there were technical issues concerning being clear enough and not [beginning] to speak about something else in the middle of an explanation. (Teacher 3)

Although the teachers talked about technical issues, these seem to be closely linked to pedagogical decisions and concerns, a point we elaborate on further in the next theme, addressing the teacher role.

The new teacher role

The digital lectures were followed by in-classroom seminars. In the seminars, teachers experienced a flipped classroom teaching role for the first time. At first, they thought that their new role was a bit odd, and they were worried that the new role was less effective than traditional teaching. In short, the teachers describe how they have been familiar with being the one that drives the lecture forward by showing enthusiasm for what they are teaching and telling students. Due to this, being available and transferring more responsibility to the students is experienced as a very different teaching environment. The teachers had been worried initially because the students asked few questions, thus they questioned the effectiveness of this type of teaching and learning. However, the feeling of being a stranger in the classroom during the seminars gradually changed, as the teachers became more familiar with their new role. As one of the teachers said:

You realise that it is a different type of relation to the students. After a few times, I became more familiar with it and it felt more natural to be a participant in their group work when they invited me in to talk with them. (Teacher 1)

Teachers said that they gradually came to enjoy being a teacher in the seminars and underscore how they found it important to spend time in preparing for the group work. By putting effort into the preparation of the group work, they experienced students more easily being put in the situation of being the active ones in the seminar. This approach made teachers feeling innovative. Moreover, the new teaching role, as expressed by these teachers, gradually flourished concurrently with the teachers becoming more familiar with and used to the flipped classroom design. Notably, the teachers observed that the student role also seemed to change significantly during this intervention.

Increased responsibility of students

Initially, the teachers raised concern about the students' ability to handle the responsibility and increased autonomy associated with the flipped classroom. Indeed, the teachers noted that the amount of preparations made by students differed. Whereas some students were able to (and comfortable with) addressing what they did not fully understand, others had not listened to the digital lectures and thus were not able to participate in the discussions in the seminars. How teachers should deal with these issues are concerns addressed in the interviews. Indeed, these concerns demonstrate how students' preparations or lack of preparations becomes more visible to teachers in the flipped classroom design, compared with traditional lecturing. However, as the students get used to the flipped classroom learning environment throughout the seminars, the interaction gradually improves and the students seem to take more responsibility. As one teacher expressed:

The group work was kind of autonomous work. I thought that students wanted me to comment or provide feedback on their work, most of the time. However, to my experiences, they preferred working independently most of the time, and then afterwards, me providing feedback at the end of the working sessions. (Teacher 3)

Notably, the teachers observe that the students seem to interact differently than in a traditional learning environment, with respect to taking responsibility and thereby challenge the traditional master-novice roles. Still, they want the teacher to sum up the lessons and ask for the expert opinion as well.

DISCUSSION

Benefits and disadvantages with the flipped classroom

Findings in educational research show that collaborative learning efforts tend to enhance autonomous learning, and boost self-esteem and student satisfaction (Johnson et al., 1998; O'Flaherty & Phillips, 2015). Consistent with these findings, the student-reported data from the present study demonstrate that self-perceived learning outcomes of the students were higher in the flipped classroom intervention than in the traditional lectures. In addition, autonomous group work and unlimited access to learning resources were frequently reported as positive factors of the flipped classroom (Figure 1). The results of the present study are consistent with the findings in a study on undergraduate students of social science in Australia (Wanner & Palmer, 2015). In the Australian study, the flexibility in

learning and collaborative, well-structured, face-to-face learning activities were appreciated (Wanner & Palmer, 2015). It is, however, worth noting that the in-class learning activities in the Australian study were more varied than in ours.

In our view, the positive attitudes towards autonomy and flexibility in our study, contrast with previous experiences in the physiotherapy programme, where flexibility and self-regulation are little emphasised. Nevertheless, flipped classroom education may not be embraced by all students. A study from Australian health education found that students divided into those who embraced most aspects of the flipped classroom environment (*flip endorsers*) and those who especially did not endorse the pre-learning aspects (*flip resisters*) (McNally et al., 2016). The authors argue that improved learning outcomes are reliant on assessment integration into the intervention, in-class learning activities based on a theoretical perspective and that the entire course is flipped (McNally et al., 2016). In our study, only the self-perceived learning outcomes were assessed. Our intervention was not consistent with the recommendations of McNally et al. (2016). However, an explanation for the mostly positive attitudes of the students, probably is that they immediately embrace the technology and the flexibility associated with pre-classroom activities (Bergmann & Sams, 2012).

Lack of a joint summary at the end of the seminars, their long duration, and little variation of learning activities, were the most frequently reported negative factors of the flipped classroom intervention (Figure 2). In retrospect, it is easy to acknowledge that the learning activities in the present study did not exploit the full potential of the flipped classroom model. Implementation of a variety of well-documented learning activities has been claimed to be a success factor for educational interventions (Gurung, Weidert, & Jeske, 2012; Morehead, Rhodes, & DeLozier, 2016; Uttl, White, & Gonzalez, 2016). Consistent with this idea, a redesigned model of flipped learning has been suggested (Blau & Shamir-Inbal, 2017). In this model, the learning activities of the flipped classroom are implemented both at home and in the classroom, through extensive use of technology (Blau & Shamir-Inbal, 2017). Nevertheless, we would argue that the redesigned flipped classroom model requires extensive planning and access to support, beyond what was available for the present study.

An overview of the digital learning platform onto which the lectures were uploaded indicated that up to one-third of the students had not accessed the digital lectures prior to the seminars. This finding is echoed by data from the student evaluations, where lack of preparation from and engagement by fellow students was a frequent complaint (Figure 2). Besides motivational factors, a high work burden and lack of time allocated for autonomous study are possible explanations for the lack of preparation. In order to allow students to work structurally within normal working hours, time for self-studying likely needs to be included in the timetables for future interventions. In addition, expectations regarding preparations should have been more explicitly communicated prior to the course. Lastly, students should experience the responsibilities associated with a flipped classroom: for example, group work could begin with a session wherein all members present a summary of the material. We believe that maintaining stable groups throughout the seminars will enhance individual responsibility among each student.

The present in-class learning activities mostly developed based from long experience in teaching and a conviction that collaborative working is often beneficial to learning. In

Johnson et al. (1998), five key elements in relation to collaborative learning were highlighted: positive interdependence, individual accountability, promoted interaction, social skills and group processing. The affective and social aspects of learning, should not be underestimated. In a recent qualitative study on student experiences in a flipped classroom intervention, Steen-Utheim and Foldnes (2018) highlight a number of categories that the students reported as especially conducive to their learning, such as commitment to peers, being recognized, feeling safe and instructor relationship. Unfortunately, it was not possible to investigate whether these categories were equally important in our study. Considering these results, keeping stable groups throughout the seminars would have been preferable. This is also supported by the findings of Foldnes (2016), which implemented cooperative learning activities from team-based learning in a flipped classroom intervention. In the literature on team-based learning, four practical elements are emphasized: permanent teams, readiness assurance, application activities and peer evaluation (McMahon & Jeffries, 2010; Michaelsen & Sweet, 2011; Rezaee, Moadeb, & Shokrpour, 2016). It is also possible that immediate feedback methods, as advocated in team-based learning, could have replaced the urge for a joint summary, as frequently reported as a disadvantage by the students (Figure 2). Within medical education, team-based groups generated significantly better learning outcomes than smaller groups in a course aimed at preparing students for practice (Thomas & Bowen, 2011).

Teacher experiences with technological education

Although there seems to be increasing attention on the pedagogical use of digital technology within higher education institutions, the possibilities are far from utilised (Amundsen et al., 2017; Kunnskapsdepartementet, 2018). In order to create a shift in higher education, the role of teachers is essential. In the present study, the interviews of teachers who had participated in the flipped classroom intervention, revolved around three themes: production of digital lectures, the new teaching role and the new student role.

The teachers found the production of digital lectures time-consuming, beyond what they had expected. These views are similar with findings from an Australian qualitative study, where forty-seven higher education teachers were interviewed (Wanner & Palmer, 2015). The interviews showed that a concern shared by all teachers was the time commitment and workload associated with the flipped classroom (Wanner & Palmer, 2015). Nevertheless, in the present study, the time consumption seemed to be overshadowed by the excitement of developing the teachers' first digital lectures. Although lack of technical competence among teachers has been identified as a barrier to digital education, the teachers in the present study only experienced minor difficulties in the production of digital lectures (Schneckenberg, 2009). The reasons for this may have been the generally user-friendly interface of Microsoft Office Mix and the step-by-step guide put together by the course leader. In addition, the technical competence of the participating teachers in this study may have been higher than that demonstrated elsewhere. Thus, we suspect that technical support and education should be carefully addressed in other, similar interventions. In addition, the interviews show that lecture production involves a number of pedagogical issues, such as the length of lectures, use of voice and the number of examples provided in

the lectures. One teacher observed the use of fewer examples in the digital lectures and that he considered this advantageous.

Many sources argue that the flipped classroom increases interactions between students, as well as between teachers and students (Adams Becker et al., 2017; Bergmann & Sams, 2012; L.-L. Chen, 2016). Based on the interviews, the teachers experienced a new and completely different teaching role, as well as observed a new student role. The new teaching role was described as unfamiliar. In the first seminars, one of the teachers (Teacher 3), was concerned that this type of learning would not be effective. However, during the seminars, this gradually changed. As Teacher 3 put it, 'Actually, I think that this way of teaching [the seminars] is much more inspiring than lecturing.' This shows that not only the students, but equally the teachers, were socialised into their new roles. It is easy to see how this new teaching role challenges traditional beliefs about learning. The research on teachers' role in teaching with technology is limited. However, Englund, Olofsson & Price (2017) investigated a ten-year longitudinal study on Swedish teachers' individual beliefs about teaching and the strategies they adopt for their practice. The results of the study show that novice teachers demonstrated more rapid change during the period than the experienced teachers (Englund, Olofsson, & Price, 2017). The study concluded that if a more effective use of educational technology is to be achieved, change in beliefs about teaching should be a central component of professional development (Englund et al., 2017). The teachers in our study, although hesitant in the beginning, rapidly adapted to the new learning environment. They cannot be considered novices, as they had more than five years of teaching experience. Another qualitative study identified five different approaches to teaching strategies among educators in higher education, ranging from teacher-focused strategies, with the information of transmitting information to the students, to student-focused strategies, aimed at students changing their conceptions (Trigwell, Prosser, & Taylor, 1994). The authors argue that teacher intentions and conceptions must be addressed in order to change teaching strategies (Trigwell et al., 1994).

One strength of this study is that the flipped classroom intervention was analysed from the perspectives of both students and educators. However, some limitations should be noted: first, due to the lack of a control group, careful interpretation of the results regarding perceived learning outcomes is recommended. Another weakness was that no validated measure was used in the assessments of the students' experiences. Thirdly, the number of teacher interviews was relatively low, which restricts the generalisation of results. Considering these limitations, this exploratory study could yield further research.

CONCLUSION

This study generated promising results, with respect to the use of the flipped classroom model in Norwegian physiotherapy education. In particular, students embraced the increased flexibility and responsibility associated with the flipped classroom. The disadvantages reported by the students were associated with little feedback and variation during learning activities. Experienced higher education teachers participating in their first flipped classroom intervention revealed initial worries about learning outcomes, but gradually developed positive attitudes about new teaching roles and learning environments.

Future research will investigate beliefs and strategies about teaching with technology among different groups of educators within higher education. In addition, more research will analyse the learning outcomes of flipped classroom education within physiotherapy and health education.

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