Collaborative Online Learning Using a Blended Learning Design for a Physiology Course in Nursing Education

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Abstract

Background: This paper is based on implementation of Salmon's model for online collaborative learning in a blended learning context for part-time nursing students at a Norwegian university.

Objectives: The aim of this study was to explore and describe students' experiences and to assess the relevance of Salmon's model applied in a blended learning course in physiology.

Methods: The study used a qualitative descriptive design. Data were collected from students enrolled in a physiology course in 2011 and 2012. Qualitative data came from survey and focus group interviews.

Findings: Three themes emerged from this study: participation in both steps of the two-step design is important but challenging; online socialisation and a sense of group community support student participation and learning in group e-tivities; and the students' perception of responsibility when collaborating online.

Conclusions: The teacher's facilitation of online socialisation, participation, collaboration, feedback and intervention promoted a sense of community and was crucial for the students' learning of physiology. However, a lack of confidence concerning professional physiology knowledge led to a greater dependency on the teacher than Salmon's model suggests. The model may have limited potential in physiology, which requires causal reasoning. We suggest combining Salmon's asynchronous model with synchronous activities.

Keywords: student's role, teacher's role, nursing, Salmon's model, bioscience, physiology

Introduction

With the increase in online teaching approaches, including nursing education, a new teacher role has developed (Koch, 2014; Massey et al., 2019). Similarly, students' experiences with online learning influence their role as learners in terms of the challenges and opportunities of productive collaborative learning processes (Jeong & Hmelo-Silver, 2016; Massey et al., 2019). The aim of this study was to explore and describe students' experiences and to assess the relevance of Salmon's (2004, 2011) model applied in a blended learning course in physiology.

The effect of learning is highest when the teaching programme helps students to be active and reflective (Biggs & Tang, 2007; Means et al., 2010). Furthermore, social interactions are essential components in learning and knowledge creation (Fossland & Tømte, 2019; Lave & Wenger, 1991). Collaborative learning is one of the most common forms of active learning (Prince, 2004), and interaction is an essential factor in online collaboration (Markova et al., 2017). Collaborative blended learning refers to a careful mix of educational activities conducted face-to-face and online (Garrison & Kanuka, 2004). The use of blended learning strategies has increased in the nursing curriculum (McGarry et al., 2015).

A challenge in nursing education is that students often struggle more with the study of physiology than other nursing subjects. Research shows that this is both an international challenge (Bakon et al., 2016) and a national issue in Norwegian nursing education (Bingen et al., 2019; Jensen et al., 2018). Physiology is often taught early in the curriculum as a separate discipline, and it can be difficult for students to understand its relevance to nursing practice (Craft, Hudson, et al., 2017; McVicar et al., 2015). McVicar et al. (2015) identified obstacles to supporting students' learning of the principles of human physiology. Craft, Christensen, et al. (2017) recommended integration of active learning strategies in

physiology courses. However, physiology may be difficult to learn due to the nature of the discipline (rather than the way that it is taught), as it requires causal reasoning (Michael, 2007; Slominski et al., 2019).

Online collaborative learning may be synchronous or asynchronous. Synchronous communication between students and the teacher takes place simultaneously (i.e., in verbal or written dialogues). Asynchronous communication is flexible regarding time and location; the students read and write online when they have the time and opportunity (Massey et al., 2019; Morley, 2012). Asynchronous written communication could give students more time to reflect on the topic discussed (Dysthe & Hertzberg, 2008; Garrison & Kanuka, 2004).

Teachers have begun to adopt a new and more involved role in e-learning by designing online learning activities; facilitating and intervening in online collaboration; and dealing with the challenges of student participation (Brindley et al., 2009; Dodson, 2017). The use of a didactic model in online collaboration to clarify roles, expectations and obligations is recommended (Koch, 2014; Mattsson, 2008).

Salmon's (2004, 2011) model of online teaching and learning is a theoretical framework for online collaboration through facilitating, guiding, supporting, counseling and teaching online groups. The teachers' role changes from that of lecturer to guide in an online environment, as they become e-moderators who facilitate online collaboration through asynchronous written communication (Salmon, 2004, 2011). Online education is valuable because it offers flexibility regarding time and space as well as the opportunity for students to reflect between log-on times. Teachers must lead and encourage students to find and construct knowledge online together with peers. Salmon (2004, 2011) also emphasised that socialisation between students and non-threatening communication can help students to feel confident in the online learning environment.

A review of students' perceptions regarding online instruction found that teachers should focus on design, technology, socialisation, interaction, dialogue and feedback (Mancuso-Murphy, 2007). Another study on how students experience the teacher's role in an asynchronous learning environment identified five established roles – pedagogical, design, social, technical and managerial – and one new one, life skill promotion (Gómez-Rey et al., 2017).

Studies of the students' role have focused on active learning with peers, responsibility, time management skills and being self-directed and -motivated (Fossland & Tømte, 2019; Mancuso-Murphy, 2007). Technology gives students opportunities to engage in joint tasks, communicate, share resources, monitor and regulate collaborative learning as well as find and build groups and communities (Jeong & Hmelo-Silver, 2016). Further, Diep et al. (2016) found that a sense of belonging and norms of reciprocity significantly predicted

increased student participation in online collaboration.

There has been a lack of intervention studies in physiology in nursing education (Jensen et al., 2018). Much research has been conducted on the teacher's and students' roles in online collaboration, but there is still a need for further studies in this area (Koch, 2014). Some researchers have applied Salmon's model in the study of reflective, discursive topics in health studies (Mettiäinen & Vähämaa, 2013; Westbrook, 2012). However, to the best of our knowledge, no studies have applied Salmon's model to physiology courses, which require causal reasoning rather than discursive reflection (Michael, 2007; Slominski et al., 2019). Based on this, the research question is: Based on Salmon's model, how do nursing students experience their own, their peers' and their teacher's roles in physiology learning through online activities?

A Two-step Intervention

For this study, we used a four-year part-time nurse education programme offered by the university. The students lived geographically dispersed and had job and family commitments alongside their studies. For many, it had been some years since they had last attended school, and their data skills varied. Few had experience with studying online, and most lacked experience in writing academic posts online.

Based on this, the students were offered a two-step intervention, with an introductory pre-course before the physiology course began to prepare them for online learning. Both courses were designed in line with Salmon's (2004, 2011) five-stage model of teaching and learning online (Figure 1).

- **Stage 1: Access and motivation** focuses on welcoming the students and giving them access and technical support to help them to explore and master the online learning environment. A feeling of mastery increases motivation.
- **Stage 2: Online socialisation** involves the students establishing online identities and finding others with whom to interact. Salmon emphasised that online socialisation is important for successful online collaboration. While the students are learning to send and receive simple online messages, they are also getting to know each other.

- **Stage 3: Information exchange** revolves around exchanging information and performing tasks. Interaction takes place at two levels: with the course content and with other participants and the teacher. The participants exchange information relevant to the

course and the topic of study.

- **Stage 4: Knowledge construction** results in course-related group discussions and interactions that becomes more collaborative and dependent on a common understanding. The teacher's role is to facilitate the discussion by following up on the content, summarising, giving feedback and sparking further professional reflection.
- **Stage 5: Development** results in decreased collaboration. The participants focus on achieving personal goals and furthering their own learning process.

Figure 1. *Salmon's Five-Stage Model of Teaching and Learning Online*

A form of cooperation occurs in Stages 1–3, which are meant to support the students' learning process. The interaction between the participants is highest during Stages 3 and 4 and then gradually decreases in Stage 5 (Salmon, 2004, 2011).

In Salmon's (2006, 2013) concept, online learning activities are referred to as e-tivities. Key features of successful e-tivities are described in Figure 2.

Successful e-tivities should be motivating, engaging and purposeful; based on the interaction between participants; and mainly provided through written message contributions (asynchronous). They should be designed and led by an online teacher.

Key features:

- A small piece of stimulus, information or challenge,
- Online activities, such as individual participants posting a contribution,
- A participative or interactive element, such as responding to others' postings,
- Summary, feedback or critique from an e-moderator, and
- All the instructions needed available in one online message.

Figure 2. *Successful e-Tivities*

The pre-course and the physiology course were planned in 2010. The design of the e-tivities was therefore based on the second edition of Salmon's (2004) model, which focuses on written asynchronous online collaboration through a learning management system (LMS).

The pre-course was scheduled for December in preparation for the course beginning in January. It was designed as an online Christmas calendar that revealed a new e-tivity each day. The purpose was to prepare the students for online collaborative learning. The

physiology course was designed for blended learning. A teacher facilitated and followed up with eight online groups during the learning e-tivities. Each e-tivity in the Christmas calendar had exactly the same design as each e-tivity in the physiology course, in line with Salmon's model. Each e-tivity had a purpose; task; spark; completion date; and instructions telling the students what to do, how to respond to peers and how the teacher would intervene (Salmon, 2006). Participation in e-tivities was voluntary in the two-step design of the two courses.

The physiology curriculum was divided into five topics. Four of these included online collaboration, each of which represented one group e-tivity. In parallel with the e-tivities, teachers also gave lectures in anatomy and physiology inside the LMS through videos, illustrations and text, according to the blended learning context. Both in physiology and other subjects, asynchronous online lectures were chosen to increase the flexibility for the students. Physiology was taught throughout their first semester in parallel with other subjects, and the course concluded with an exam at the end of the semester. Half of the study time per week was allocated to the physiology course.

Table 1. *An Overview of the Christmas Calendar and the Blended Learning Physiology Course in Relation to Salmon's Five-Stage Model*

Christmas Calendar (Stages 1-3)		
Stage 1: Access and Motivation **Purpose:** Get to know some of the peers in the class and write your first post in an online forum	**Stage 2:** Online Socialisation **Purpose:** Get to know your group and help each other to manage the LMS	**Stage 3:** Information Exchange **Purpose:** Get to know some of the peers in the class and write your first post in an online forum
Videos and information behind the doors of the calendar: Welcome and greetings from the university • Presentations of the staff • Study information • How to write in an online forum *Individually e-tivity:* • Log onto the LMS • Send an email to the teacher and get a welcome greeting	*Videos and information behind the doors of the calendar:* • Presentation of the teachers and the first semester subjects • How to collaborate in an online forum • How to find what you are looking for in the LMS *Group e-tivity in an online forum:* • Present yourself and give a response to a peer	*Videos and information behind the doors of the calendar:* • Presentation of study strategies within the blended learning design • Presentation of how to study in online groups *Group e-tivity in an online forum:* • Share with your group how and where you study best and give a response to a peer (maybe you have some recommendations or want

from the teacher *Group e-tivity in an online forum:* ● Describe the weather where you are and give a response to a peer who is a place you would like to be	(maybe you have something in common) ● Find specified material on the LMS, ask for help from peers and assist peers	your peer to elaborate) *Group e-tivity (2011 class):* ● Share with your teacher and group why you want to study nursing (write this in a word document and upload it to the LMS) *Group e-tivity (2012 class):* ● Share with your group whether you trust information you find online, and respond to a peer's post about what you think is important to look for in these situations *Videos behind the doors of the calendar:* ● Christmas greetings

Physiology Course
(Stages 3-4)

Stage 3: Information Exchange **Purpose:** Get to know some of the peers in the class and write your first post in an online forum	**Stage 4:** Knowledge Construction **Purpose:** Integrate knowledge from different parts of the syllabus and help each other to understand physiology

The 5 subjects:

● Subject 1: Hygiene and care
● Subject 2: Circulation and respiration
● Subject 3: The movement apparatus
● Subject 4: Senses and reproduction
● Subject 5: Digestion and elimination

For each subject, online lectures include:

● Videos in which the teacher makes drawings and offers explanations
● Texts that summarise the explanations

For Subject 1, 2, 4 and 5, one of the group e-tivities includes:

● Background information about the exercise question
● A question: 'Explain why...'
● Hints and tips from the teacher
● Assignment: write 1–2 sentences and respond to at least two posts from peers regarding anything they are missing, how to simplify their explanation and if their explanation requires elaboration and then make suggestions on how to reformulate this

Methods

The study used a qualitative descriptive design, with the data collected from a survey with open-ended questions and two focus group interviews. Open-ended survey questions can be used to collect qualitative data about experiences from multiple informants simultaneously (Sverdrup, 2002). Because students collaborate in groups, focus group interviews allow researchers to learn more about their experiences, attitudes and viewpoints in an interactive setting. Focus groups can generate data not found in individual interviews as a result of group dynamics (Malterud, 2011).

Participants and Data Collection Methods

Data were collected from first-year part-time nursing students from two different classes (2011 and 2012) who participated in a blended learning nursing programme. The two classes completed identical online group e-tivities in the Christmas Calendar and the physiology course. Table 2 gives an overview of how pre-course e-tivities and group e-tivities in physiology were dispersed throughout the timeline and when and how the data were collected.
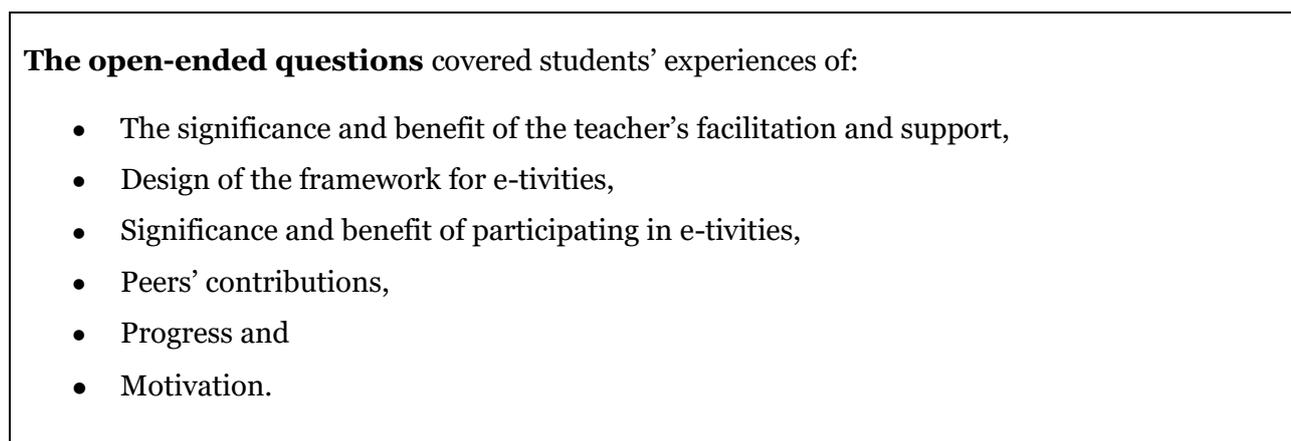
Table 2. *An Overview of e-Tivities and Data Collection for Class 2011 and Class 2012*

Pre-Course e-Tivities						
	Christmas Calendar					
2011 class	Week 48–50, 2010					
2012 class	Week 48–51, 2011					
Group e-Tivities in Physiology						
	Subject 1	*Subject 2*	*Subject 3*	*Subject 4*	*Subject 5*	*Exam*
2011 class	Weeks 2 and 5	Weeks 6 and 7	Learning activities in the nursing subject	Weeks 13 and 14	Weeks 15 and 17	Week 23
2012 class	Weeks 2 and 5	Weeks 6 and 7	Learning activities in the nursing subject	Weeks 13 and 15	Weeks 16 and 17	Week 23
Data Collection						
	Electronic Survey		*Focus group Interview nr 1*		*Focus group Interview nr 1*	
2011 class	Weeks 26–35; Answer open-ended questions					

2012 class		Week 4	Week 19

Electronic Survey in Class 2011

A questionnaire consisting of both closed and open-ended questions was sent to the nursing students enrolled in the physiology course in spring 2011 (n = 63). The survey had a response rate of 65%. It was distributed electronically inside the LMS at the same time that the results from the physiology exam were published. The questionnaire was developed to investigate students' experiences regarding attending all the physiology group e-tivities in the LMS. The questions were based on experiences from surveys in previous classes, as recommended by Sverdrup (2002; Figure 3). The data material compiled from the answers to the open-ended questions in the electronic survey for Class 2011 consists of 24 pages.

The open-ended questions covered students' experiences of:

- The significance and benefit of the teacher's facilitation and support,
- Design of the framework for e-tivities,
- Significance and benefit of participating in e-tivities,
- Peers' contributions,
- Progress and
- Motivation.

Figure 3. The Themes in the Open-Ended Questions Used in the Survey

Focus Group Interviews in Class 2012

The findings from the survey conducted in 2011 were further explored by inviting a group of nursing students enrolled in the physiology course in 2012 to participate in two focus groups interviews. Purposive sampling was used and a group of seven students from one of the eight learning groups were included. The group consisted of both males and females, some of whom actively attended e-tivities and others who did not actively engage in e-tivities in the Christmas calendar. They were aged 22−45 years, and none of them knew each other before enrolling in the nursing programme.

The first focus group interview was conducted in January 2012 when the students attended the first face-to-face meeting at the campus after having participated in one of four e-tivities in the physiology course. The second interview was conducted in May 2012, after

the physiology course had ended and prior to the exam (Table 2). The interviews lasted 45–50 minutes. Author 3 acted as the moderator, while Author 1 served as the secretary. An interview guide with two initial open-ended questions and predetermined themes was used to facilitate reflection and discussion during the interviews (Figure 4). The interview guide was based on the answers from the open-ended questions in the survey.

Figure 4. *Interview Guide*

The initial open-ended question was: Tell us about your experience with the activities in the Christmas Advent calendar and what you have learned from working with peers in your online learning group. The predetermined subjects were:

- Attending e-tivities,
- Getting to know peers and options for communication,
- Design of e-tivities,
- Writing and reading posts,
- Giving and receiving responses,
- Experiences with support in the group and
- Helpfulness or challenges of group work when it comes to learning.

The first interview was audiotaped and transcribed verbatim by an external transcriber. The audio recorder failed to tape the second interview. The moderator and secretary immediately wrote a summary separately and thereafter compared and merged their results. This summary complemented the data of the analysis of the first interview. It also supported the analysis of statements in the survey data collected among the students who had participated in four group e-tivities in the physiology course.

Data Analysis

The open-ended responses from the survey and the first interview were analysed using qualitative content analysis as described by Graneheim and Lundman (2004) and based on the guidelines created by Frankland and Bloor (1999). The data from the survey and the interview were first analysed separately. Authors 1 and 3 first read the statements from the survey to become familiar with the content. The statements were reread, and index codes related to the aims were created based on the study's research questions to generate sub-themes.

The interview was also analysed independently by Authors 1 and 3. The transcript was read to gain an understanding of the content of the material as a whole and to note patterns or themes of interest. The data were reread while attaching index codes based on the research questions to generate sub-themes. The authors then discussed the sub-themes with a

special focus on deviant cases until a consensus was reached. The authors reread the transcript independently a third time to ensure consensus regarding sub-themes and to identify quotations corresponding to the sub-themes.

The sub-themes found in the analyses of the survey and the first interview were then analysed together. The sub-themes from the transcribed interview and from the survey were compared, final consensus was reached, and a theme emerged.

Table 3. *Excerpts from the Analysis*

Data Source	Meaning Unit	Condensed Meaning Unit and Interpretation of the Underlying Meaning	Sub-Themes	Themes
Electronic survey: answers to open-ended questions	This form of learning is new to me, and voluntary participation in group activities does not run counter to seeking my or others' contributions to group activities. One of my challenges is being able to participate within the deadline, as I am in a 100% job alongside the studies. Against this background, I need to learn how to be more proactive and plan more concerning the group assignments. (Survey)	Although the course is voluntary, the teacher should contact group members and encourage them to participate because engaging with online group e-tivities is a new study skill that is crucial for learning in the physiology course.	The voluntariness of the two-step design was a challenge in learning physiology in group e-tivities	Participation in both steps of the two-step design is important but challenging
First focus group interview	If I hadn't participated in that Christmas calendar, I wouldn't have known that on January 2 I'm going to start reading that and tomorrow I'm going to read that. Because [by] then I	Participation in the Christmas calendar was crucial in order to succeed in the following physiology	The voluntariness of the two-step design had impact on initial competence in	

Data Source	Meaning Unit	Condensed Meaning Unit and Interpretation of the Underlying Meaning	Sub-Themes	Themes
	had quite clearly figured out [that I needed] to read as much as possible to keep up with the syllabus. (Student B) In week one where you were discussing physiology, I had to sit down and try to get the Christmas calendar done to try to learn the LMS. Then there was a backlog all the way forward' (Student D)	course.	group e-tivities at the start of the course	
	Maybe point out in the beginning that there is so much group work that it is important to get started with the group right away so that you do not fall off with the group right away, because then it is a little harder to hook up again (Student E) Took some time before I got into that Christmas calendar … so it was a bit much to catch up with. So I agree that it should have been a little better information in the welcome letter. (Student F)	The school did not clearly communicate how important participation in the Christmas calendar was for preparation for the physiology course.	The voluntariness of the two-step design had impact on participation in group e-tivities in the physiology course	

Trustworthiness

Author 3, who was one of the teachers of the physiology course, conducted the interviews. Author 1 acted as the secretary and was familiar with the students as a teacher of another course. The development of the interview guide, data collection and interpretation of the data may have been affected by the authors' preconceptions (Kvale & Brinkmann, 2009). Nevertheless, the authors' knowledge about the physiology course and the e-tivities was essential for developing the interview guide. To enhance reflexivity, the interview guide was developed through collaboration between Authors 1 and 3 and was based on the findings from the survey. During the interview, the secretary asked questions such as 'Do you mean...?' or 'Have I understood you right if...?' to assess the validation of immediate interpretations. During the interview, the students were relaxed, spoke in a friendly tone, actively engaged and highlighted things they believed could have been done differently.

Investigator triangulation was used to facilitate credibility. There was a continuous dialogue between Authors 1 and 3 during the analysis process. The findings were discussed in a research group that had diverse research and pedagogical expertise, which enhanced different perspectives during the analysis of the data and interpretation of the findings. Transferability was facilitated by providing a description of the student group and the data collection and analysis processes.

Ethics

All participants were given information in advance of the study and informed that participation was voluntary. One of the questions in the questionnaire was 'May we anonymise what you have written and use it in research?' All students who answered the open-ended questions answered yes. The privacy policy of the Norwegian Centre for Research Data was followed, and the audiotape was deleted after transcription. Students attending the focus group interview gave written informed consent to participate.

Findings

Three themes emerged from the data analyses: 1) participation in both steps of the two-step design of the physiology course is important but challenging, 2) online socialisation and a sense of group community support student participation and learning in group e-tivities and 3) the students' perception of responsibility when collaborating online. An overview of themes and sub-themes is shown in Table 4 below.

Table 4. *Overview of themes and descriptions of sub-themes*

Themes	Sub-themes
Participation in both steps of the two-step design is important but challenging	a. The design should give a clear description of what could be expected from the teacher. b. The design should give a clear description of what is expected of the students. c. Clearer communication for why the Christmas calendar is crucial for preparing for the physiology course could facilitate participation. d. The volunteerism of the two-step design is a challenge to participation and learning in the physiology course.
Online socialisation and a sense of group community support participation and learning in group e-tivities	a. A sense of group community makes the students feel confident in relation to other students in the group. b. Feelings of being left outside increase the risk for dropout. c. A sense of group community can contribute to a caring attitude for group members at risk for dropout. d. A sense of group community strengthens the students' motivation to learn together and to give and receive constructive, critical feedback.
The students' perception of responsibility when collaborating online	a. The teacher should facilitate collaborations and feedback. b. The students' perceptions of responsibility regarding participation and learning c. The students' sense of achievement concerning professional knowledge enhances their sense of responsibility for participation and learning.

Participation in Both Steps of the Two-Step design is Important but Challenging

According to the students, the two-step design should give a clear description of the teacher's and students' roles concerning expectations, obligations, time schedules and group e-tivities. The course design was perceived as clearly stating what could be expected from the teacher. The students found it valuable that the teacher fulfilled the course

promises and followed up with them during their learning process. They appreciated that the e-tivities provided a concise description of their content and layout: a spark, a purpose, a task, a completion date and instructions on how to give feedback.

After completing all group e-tivities, the survey participants described the teacher as motivating, supporting and knowledgeable. The teacher's monitoring, feedback, summaries and reassurance of the professional quality of their collaborative work was perceived as crucial for their learning. The students expressed that physiology was a very difficult subject to learn. They felt confident that the teacher would intervene if they were confused or mistaken about the academic content, and they expressed a need for feeling professionally confident and being reassured that they correctly understood the physiological mechanisms: 'Nice to get feedback on posts and stuff you are working on,... so you know that you're on the right track' (Survey).

The following survey responses illustrate that the design helped the students to structure the study: 'The design facilitated group e-tivities, and helped me learn physiology in a structured way, with steady progression' (Survey) and 'There was a systematic and orderly review of the themes that provided inspiration and cohesion with the desire to contribute to the group activities' (Survey).

However, the students experienced uncertainty about what to expect of their own and their peers' roles. They seemed uncertain and frustrated regarding how to handle the fact that course participation was voluntary. Several expressed that participation in the Christmas calendar was crucial. It helped them to explore and master the online learning environment and to gain an initial competence that was necessary for mastering group e-tivities in the physiology course. The following comment illustrates the potential impact of not participating in the Christmas calendar on the learning of physiology:

> If I hadn't participated in that Christmas calendar, I wouldn't have known that on January 2 I'm going to start reading that and tomorrow I'm going to read that. Because [by] then I had quite clearly figured out [that I needed] to read as much as possible to keep up with the syllabus. (Student B)

According to another student: 'In week one where you were discussing physiology, I had to sit down and try to get the Christmas calendar done to try to learn the LMS. Then there was a backlog all the way forward' (Student D). The students emphasised that it should have been more clearly communicated how important the Christmas calendar was as preparation for the physiology course.

The students wanted to know how many peers they could count on in the collaborative learning activities. They valued the teacher's monitoring of participation and activities, and most of them agreed that the teacher would contact those who did not attend. However,

they disagreed on whether the two-step design should be voluntary or mandatory. Some emphasised that voluntary participation enhanced flexibility, which is necessary for part-time students. Others expressed frustration:

> It's a paradox that one is requested in something that is voluntary. Therefore, I think group e-tivities shouldn't be voluntary.... If you have to work in a group, you have to and [should] not have the choice to drop it. (Survey)

Some students felt that participation in the Christmas calendar could prevent dropouts: 'If they don't get that Christmas calendar when they start, they don't understand the LMS, and then they don't know where to begin reading subjects. Then they realize that it's too much for one to manage' (Student B). It was challenging to achieve full participation in the two-step design, which was important for participation and learning through group e-tivities in the physiology course.

Online Socialisation and Sense of Group Community Support Participation and Learning in Group e-Tivities

Several students appreciated that they got to know each other through the Christmas calendar e-tivities and the physiology course: 'The group e-tivities were a great way to communicate with fellow students' (Survey). Online communication, which allowed them to become familiar with each other before meeting face-to-face, was highly valued by the students and enhanced their participation in e-tivities.

Socialisation and a sense of group community enhanced the students' motivation and feelings of confidence. However, two students experienced challenges socialising with the rest of the group; it should be noted that neither of them participated in the Christmas calendar. One voiced a lack of engagement in participation, both online and face-to-face on the campus, and gave an impression of not feeling confident, being demotivated and being at risk for dropout. The student appeared lost concerning expectations, obligations, time schedules and group e-tivities. She seemed uncertain whether she was welcome in the group, while at the same time expecting her peers to send her information.

Students with a sense of group community were concerned about how they could contribute to a caring learning environment and how to include peers who were feeling left out of the online group. They encouraged these peers to be persistent and sent supporting messages such as 'Come on, join us, don't give up!' (Student C).

Regarding a sense of group community, the students considered their own and their peers' roles as more important than that of the teacher. A strong sense of belonging enhanced the motivation for learning physiology together through group e-tivities while simultaneously getting to know each other: 'It is fun to learn together with other students!' (Survey).

This enabled them to remind each other of the fact that they were undergoing the same learning process and all struggling with a subject that was perceived as difficult to learn and understand. Several experienced a sense of group community by sharing feelings, thoughts and knowledge with the online group:

> For me, the threshold was high when I first had to post a message. I was worried about being misunderstood, writing something wrong or showing my ignorance. However, when I had done the first posting, I realised it was pretty harmless. You are allowed to try and to fail. That's how we learn. (Student E)

Socialisation and a sense of group community were prerequisites for giving and receiving constructive peer feedback. The students had various opinions of the value of peer assessment in the course design, but they were mostly positive about receiving feedback from peers: 'It's nice that someone has read what you wrote' (Student B). Many found it challenging to give critical feedback instead of praise, or they did not feel confident enough about the academic content, as demonstrated by this student: 'I didn't experience peer responses [as] very constructive. I was often unsure whether the peers understood the topic, or I was unsure myself. The responses often sounded like this: Awesome! How clever you are!' (Survey).

The e-tivity's specific demand for providing feedback and the explanation of how it should be done was helpful, as illustrated in the interview:

> We are often more hesitant when it comes to providing critique – not negative feedback, but constructive – but now when we have met, it's OK. It helps that providing a response is required. It is somewhat difficult to say something about your peer student in the beginning, but not later. (Student A)

The students' participation and learning were supported by online socialisation and a sense of group community.

The Students' Perception of Responsibility when Collaborating Online

The sense of group community promoted the students' ability to feel and act responsibly. However, they experienced a conflict between taking responsibility themselves and counting on their peers to act responsibly. Several claimed that it would have promoted responsibility if participation in the online group had been mandatory instead of voluntary. The students were unsure about if and when they should take responsibility in the group, and how long they should wait for those who had not participated before continuing the e-tivity. The 'waiting game' was a concept that resonated with many students: 'I believe we could have been without the voluntary ideas from the beginning. Then we would all have been more committed. It became a "waiting game". We sat and waited out of politeness

and to allow others to participate' (Student A).

The students wanted their peers to take responsibility and to be committed to group collaborations. One student felt that it was 'positive that people are demanded [to participate], [as] some need it to get started. Yet it was frustrating to wait for people in the group who might still not attend' (Survey).

The students were concerned about the balance between the teacher's responsibility for monitoring participation and follow-up and the students' responsibility for coordinating and ensuring collaboration. Some claimed that it would have been easier if the teacher had designated a leader for the group, while others accentuated their own responsibility: 'We all have a responsibility to keep ourselves updated. It is important that you take responsibility for your own learning' (Student E).

Some said that if the teacher had emphasised more clearly the importance of online participation, it would have enhanced their sense of responsibility. The students' sense of achievement concerning professional knowledge seemed to enhance their perceived responsibility for participating in e-tivities. Lacking a sense of achievement affected the participation: 'It was challenging to write follow-up questions and quality-assure peers because I was often not up to date with the syllabus. I felt stress from questions from peers and certain insecurity regarding the way of communicating' (Survey).

Insufficient time was perceived as an obstacle to participation, which complicated the students' learning process. They were surprised by the workload, high number of group e-tivities and deadlines in the course. Moreover, the students claimed that responsibility for participation had an influence on their learning. For example, one student felt that 'one of my challenges is to participate within the deadline, because I work fulltime. I have to be pro-active and plan according to the group e-tivities. Overall, the experience [of] learning physiology online is positive' (Survey).

Another student said:

> When someone put something out, they might put in mechanisms that make something happen in the brain, which means that you suddenly understand something because it's phrased a little bit differently. Then you could take the discussion further because a process has been started. I believe this way of working is important for learning. (Student A)

This last quotation shows the student's perception of the learner's responsibility and illustrates how learning contributed to a positive experience of mastering a task through group e-tivities.

Discussion

The study aimed to explore and describe the students' experiences and to assess the relevance of Salmon's model when applied to a blended learning course in physiology.

Teachers's vs. Students' Roles

The students wanted a clear description of what could be expected from the teacher in the online learning environment for the physiology course. In line with research recommendations (Jeong & Hmelo-Silver, 2016), the course's design facilitated a careful selection of the learning tasks, sequencing of activities and technical and social support. The students felt that promises were fulfilled by the teacher. As recommended in a previous study on the Christmas calendar (Bingen & Lid, 2012), the two-step design facilitated online socialisation and participation in the pre-course according to Salmon's (2004) model, and it prepared the students for the physiology course.

The way the teacher performed her role seemed to have a strong impact on the students' participation. In line with previous studies (Michael, 2007; Slominski et al., 2019), our students found physiology difficult to learn. Nursing students often experience anxiety related to this subject (Craft et al., 2013; McVicar et al., 2015). However, our students perceived the teacher's knowledge, motivation, support and intervention (if they were mistaken concerning the academic content) as crucial for their learning.

Participation in the pre-course appeared to enhance the students' sense of belonging and group community and to promote their online participation in the physiology course. A sense of belonging could predict online participation (Diep et al., 2016). Moreover, some students stated that participation in the Christmas calendar could prevent dropouts. Similar to Diep et al. (2016), we found that the students needed time and the opportunity to build a trusting relationship and to develop a group culture in which learning could take place in a social context. A previous study indicated a mutual self-reinforcement between increased participation in asynchronous written collaboration and an increased sense of group community (Bingen & Aasbrenn, 2012).

The students claimed that the teacher should have emphasised more clearly the importance of the Christmas calendar as preparation for the physiology course. Perceived learning benefit is an important factor for online participation, which must be made clear for the students (Diep et al., 2016). The teacher monitored participation and activities and made friendly contact with those who did not attend or interact with fellow students. This was highly valued by the students. Those students who were contacted by the teacher felt 'seen' and appreciated that demands were made of them. Social involvement from the teacher may enhance online participation (Markova et al., 2017) and may be more important to prevent dropout than socialisation with peers (Aurlien et al., 2019). The

teacher acted in line with Gómez-Rey et al.'s (2017) five roles for teachers in an asynchronous learning environment: pedagogical, design, social, technical and managerial. Further, the teacher also fulfilled a new, sixth role discovered by Gómez-Rey et al. (2017) dubbed life skill promotion. This new role includes helping students to behave responsibly, to develop positive attitudes towards themselves and others, to communicate effectively and to acquire negotiation skills (Gómez-Rey et al., 2017).

Despite the two-step design's focus on online participation, it was surprising to find that students felt uncertain and frustrated about how to perform their roles in online collaboration. One explanation could be that participation was voluntary. The dilemma of voluntary vs. mandatory participation was a challenge without a clear solution. Because the pre-course was scheduled before the beginning of the semester, participation in the two-step design had to be voluntary. Mandatory participation is challenging due to the principles of flexible learning for part-time students (Garrison & Kanuka, 2004).

Similar to Mancuso-Murphy (2007), we found that a lack of initial participation may impede feelings of confidence; hamper the ability to accomplish tasks; and, as a worst-case scenario, contribute to feelings of loneliness, demotivation and a desire to drop out. In contrast, students with a sense of group community took initiative to motivate peers to be persistent, to not give up and to participate in tasks before the deadline. This resembles what Xie et al. (2017) described as relationship and task leadership. Relationship leadership facilitates team interactions like caring and empowerment and can improve group wellbeing. Task leadership behaviour involves coordinating task logistics and keeping track of tasks, which improves learning performance. Both task and relationship leadership can encourage group cohesion, online engagement and self-directed learning strategies (Xie et al., 2017).

The Waiting Game and Self-directed Learning Strategies

The waiting game was a concept that resonated with the students. The students were unsure about when they should take responsibility in the group and how long they should wait for peers to catch up with the course programme or to participate in e-tivities before continuing the discussion. Not knowing whether or when a response would come seemed to demotivate and inhibit communication and reflection in e-tivities. The students hesitated to take responsibility for joint learning progress. Several said it would have been helpful if peers clearly stated when they would respond or whether or not they could attend. This could have decreased the frustration and allowed voluntary participation to continue as intended. Flexibility regarding time and location are advantages of asynchronous online collaboration (Garrison & Kanuka, 2004). However, the students' perception of the waiting game seemed to decrease their flexibility regarding time, as the waiting game delayed the collaboration and learning process.

The physiology course was designed to give the students freedom within given limitations. However, the determined structure may have inhibited students from using self-directed strategies to identify their learning needs and to make their own plans to achieve learning outcomes. Aurlien et al. (2019) highlighted the importance of self-directed strategies to help students continue their studies and complete a study programme. Asynchronous communication made our students feel frustrated about unclear expectations of responsibility and the time spent reading and writing numerous messages and waiting for written feedback. Furthermore, the role of the student in online collaboration should transform from that of a passive recipient to an active, autonomous and self-directed learner who assumes responsibility for learning, has self-discipline and exhibits time management skills (Mancuso-Murphy, 2007). The students must be able to identify their own learning needs, make plans to achieve learning objectives and be knowledgeable about online course expectations (Aurlien et al., 2019).

Our students perceived insufficient time as a critical obstacle to participation, which also may have decreased their motivation to participate in the online groups (Brindley et al., 2009). The students were frustrated with the workload and felt overwhelmed by the curriculum. Although the students appreciated the peer assessments, they found it challenging to give critical feedback on the professional physiology content. Three steps were needed to evaluate other students' arguments: 1) understanding the physiological statement, 2) assessing the correctness of the other students' understanding of physiology and 3) providing a comment that was useful both for the other student and for the rest of the group (the social aspect). Our students felt confident and had a sense of group community; however, they hesitated to give responses to other students for fear of saying something wrong. Consequently, the teacher should use active and self-directed learning strategies to help students integrate the content (Craft, Christensen, et al., 2017).

 The teacher should be present in the online learning environment (Dodson, 2017; Thomas, 2013), but students' expectations of teachers' response times is often based on what is technically possible instead what is humanly reasonable (Salmon, 2004, 2011). The comprehensive tasks in Salmon's model, especially at Stages 3 and 4, put an unaffordable workload on the teacher, who had to follow eight groups with seven to eight students each in the physiology course.

The students perceived online asynchronous communication as challenging regarding time issues, design and workload. This may have decreased their perception of flexibility in the physiology course. Researchers recommend strategies for facilitating online synchronous learning that complement asynchronous learning in a blended learning design (Yamagata-Lynch, 2014).

The Relevance of Salmon's Model to Online Collaboration Within the Physiology Course

Given the right conditions, we consider Salmon's (2004, 2011) model to be helpful for students learning physiology through online collaboration. Our study supports that the model enhances online socialisation to create a welcoming learning environment and has useful recommendations on how the teacher can develop and facilitate group e-tivities (Salmon, 2006, 2013). However, the students' experiences ranged from being successful in the course to being at risk of drop out. Their participation in both steps of the two-step design was a key factor for success. We found an embedded challenge in the design, as voluntariness inhibited many students from participation and, furthermore, appeared to enhance the risk of drop out.

A goal for the e-tivities was that the students should reach Stage 4 (knowledge construction) together to advance their understanding of physiology. However, the students never reached Stages 4 or 5 (development). A lack of confidence concerning professional knowledge in physiology seemed to lead to a greater dependence on the teacher than Salmon's model suggests. The waiting game was another obstacle; however, if we had assigned a leader, as Salmon (2004, 2011) recommended, this may have helped the students to feel and act more responsibly. Because of scarce resources, the recommendation that one teacher should not follow-up more than 20 students became unattainable. This is a serious issue considering that physiology is difficult to learn. Insufficient time to learn physiology is an international challenge in nursing education (Taylor et al., 2015). This was supported by our study, in which the part-time students also had other obligations alongside their studies.

Our study supports the challenges Salmon (2004, 2011) addressed regarding time issues and the risk of providing too much structure in the course design. A too tight course structure may be perceived as inflexible and may prevent students from developing self-directed learning strategies. Furthermore, the waiting game illustrates that asynchronous online collaboration may counteract the advantages of having more time to reflect. Salmon (2013) proposed the addition of synchronous online activities. In line with this suggestion, we recommend that asynchronous online collaboration be combined with synchronous online activities to help the students avoid the waiting game in blended learning courses in physiology. We argue that the application of an asynchronous online collaboration model like Salmon's (2004, 2011) could be especially challenging for physiology courses. In addition to the challenges discussed above, we suggest that the model could have even greater potential for reflective and discursive topics in health studies (Mettiäinen & Vähämaa, 2013), unlike physiology, which requires causal reasoning.

Limitations

The students' relationship with Author 3 as their teacher in physiology may have influenced what they were willing to share during the focus group interviews, which may have affected the data collected. According to Neumann and Neumann (2012), it is essential that researchers situate themselves and reflect on how their social position and background can influence the research process. Throughout the research process, Authors 1 and 3 reflected on their own roles and preconceptions as well as the power relationship between teachers and students to remain cognizant of how this could affect the study's reliability and data validity. Due to technical problems with the audio recorder, the data material from the second focus group interview was based only on written notes after the interview. These notes may have been influenced by the authors' interpretations. However, summaries of the interview were written down immediately after it was conducted and was agreed upon by both Authors 1 and 3, who were both present during the interview.

The quotes provided in the Findings section were translated from Norwegian into English. Due to the translation, the wording may deviate slightly from the speakers' original meaning.

Conclusion

The students who participated in this research perceived the teacher's design for facilitating online socialisation, participation, collaboration, feedback and intervention as crucial for learning physiology. The students' participation in the pre-course promoted a sense of group community and online collaboration in the physiology course. However, the voluntary nature of the participation in e-tivities in the pre-course and the physiology course created uncertainty regarding their own and peers' responsibilities and increased the risk of drop out. A lack of confidence in the professional content and uncertainty about how to perform their role prevented the students from acting responsibly. A waiting game occurred, which may have prevented them from developing self-directed learning strategies. We recommend combining Salmon's asynchronous model with synchronous activities. Physiology is difficult to learn, and a lack of confidence concerning professional knowledge could lead to a greater dependency on the teacher than Salmon's model suggests.

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