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'The idea is nice… but not for me': First-year students' readiness for large-scale 'flipped lectures'—what (de)motivates them?

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Abstract
The flipped classroom is proposed as an answer to challenges in higher education. However, studies that explore its influence on first-year student motivation are largely lacking. Using the self-determination theory, this study examines the influence of *large-scale flipped lectures*, here called 'expert labs', on first-year student motivation in the context of a health sciences course ($n = 219$ students). A mixed-method approach was used, including questionnaires and focus groups with students and tutors. Paper-and-pencil surveys included questionnaires based on the Basic Personal Needs Satisfaction and Frustration Scale to compare student motivation in both traditional lectures and expert labs. Focus groups explored student's and teacher's experiences in relation to strengths and points for improvement of the flipped classroom. Results suggest that *a large-scale flipped setting* offers a possibility to enhance the relatedness of first-year students through increased interaction and in-class group assignments. First-year students appreciate the flexibility of pre-lecture preparation and an increased understanding of content through active application and peer learning. Nonetheless, first-year students indicate a need for guidance in pre-lecture preparation, explicit expectation management, and possibly the addition of external incentives to be motivated. When designing a large-scale flipped course, the challenge remains to tailor a blended course to support first-year student motivation by, for example, combining teacher support, scaffolding, and an autonomy supporting environment.

Keywords Flipped classroom · First-year students · Self-determination theory · Student motivation

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Introduction

An increasingly popular form of blended learning is the *flipped classroom*. In a flipped classroom, students actively prepare for class via online tools: video lectures, games, quizzes, and articles. This frees up valuable time for interactive and problem-based learning activities during face-to-face contact time, as lectures can be moved to the online learning environment. The flipped classroom has the potential answer to budgeting constraints, to serve the diversity in students' learning styles, and consequently to provide the ideal performance environment for each individual student (Abeyserkera and Dawson 2015; Cruzado and Román 2015; O'Brien and Verma, 2019; O'Flaherty and Phillips 2015). For example, students can determine their own pace in preparing the online course materials (Goedhart et al. 2019). While several studies show that in some settings, there is no difference in learning outcomes (e.g. grades) in a flipped setting compared with a traditional classroom setting for undergraduate courses (Davies, Dean and Ball 2013; Findlay-Thomsom and Mombourquette 2014), others conclude that the learning outcome and the educational *experience* (e.g. engagement, motivation) in undergraduate courses (2nd to 3rd year of the bachelor) are superior in the flipped setting compared with the traditional classroom (Cottle and Clover 2011; El-Deghaidy and Nouby 2007; Northey et al. 2015; Sayeski et al. 2015; Sung et al. 2008; Thai, de Wever and Valcke 2017).

Furthermore, the flipped classroom has a positive effect on self-efficacy beliefs intrinsic motivation, and a higher perceived engagement (Findlay-Thomson and Mombourquette 2014; Northey et al. 2015; Thuy Thi Thai et al. 2017). However, several studies indicate that first-year students are less 'ready' for the flipped classroom (Artino and Stephans 2009; Hao et al. 2016; McCarthey 2016). In the reflections of McCarthy (2016) on his course, the younger students (17–18) preferred the traditional lectures, while the older students (19–25) strongly preferred the flipped classroom. Other research shows that first-year students score significantly lower on the 'readiness scale' for the flipped classroom when compared with 2nd and 3rd year undergraduates, especially on the dimensions of self-directed learning, self-efficacy, and motivation for learning (Artino and Stephans 2009; Hao et al. 2016).

Usually in a flipped classroom, students only have face-to-face contact in *small-scale* work groups (< 30 students) guided by a tutor (junior lecturer). In this study, an experimental format for the flipped classroom is implemented in a first-year course. It follows the same format Konijn et al. (2018) successfully implemented in a graduate course: students follow traditional work groups and *large-scale flipped lectures* (> 50 students) for which they prepare in advance via online study materials and videos. These interactive lectures with an expert in the field include activities similar to the regular flipped classroom small-scale work groups. For example, students have discussions guided by the expert, conduct in-lecture hall group assignments, and give group presentations to peers. The large-scale contact time is a new setting worth researching, because it offers the opportunity for a large and diverse student population to obtain higher attainment and to interact with experts (Konijn et al. 2018). This is something that is not always possible in the small-scale workshop due to the expert's limited time for education and financial constraints. The large-scale flipped lectures are a promising educational format in the changing educational landscape.

This paper therefore aims to contribute to establishing the suitability of an experimental *large-scale* flipped classroom for first-year students and understanding how contextual factors (e.g. instructions, tasks, activities) of such a flipped classroom influence first-year student motivation. It does so by quantitatively and qualitatively comparing first-year student motivation between traditional lectures and a large-scale flipped lectures of the same course, making use of self-determination theory.

Theoretical background

Motivation and self-determination theory

Increasingly, contemporary approaches to motivation conceptualize *motivation* not merely as a dispositional trait of the learner but rather as a complex and personalized function of tasks and activities, interest, and context (Maehr and Zusho 2009; Paris and Turner 1994). Self-determination theory (SDT) is a suitable theory for research on student motivation in the educational domain, because the theory not only gives importance to students' experiences but also includes the supportive impact of one's cultural and/or institutional context on their motivation (Ryan and Niemiec 2009). Furthermore, SDT has many practical and analytical tools to research how situational factors of new educational methods, like in this study, influence student motivation (Chen et al. 2015; Ryan and Deci 2000).

Ryan and Deci (1985, 2000, 2008) developed SDT, which includes different types of motivation and three basic personal needs (BPN) to facilitate student motivation. First, the theory describes a continuum of motivation from being *a motivated* (not doing the activity at all) through being *extrinsically* motivated (doing things to achieve a desirable outcome) to being *intrinsically* motivated (doing activities because they are experienced as interesting or enjoyable). Intrinsically motivated students tend to perform better in the classroom (Deci et al. 1991; Niemec and Ryan 2009). They present themselves as *active and engaged* students and students that enjoy working in a social context and also have higher study outcomes (e.g. grades) (Niemec and Ryan 2009). Extrinsically motivated students will need external regulation (e.g. marks, obligations, punishments, and enthusiastic teachers) to be motivated for a certain task or goal. However, whether students are intrinsically or extrinsically motivated is not a fixed personal trait.

Second, SDT states that students can be supported to *move* along the motivational continuum (a motivation—extrinsic—intrinsic) depending on the *satisfaction* of their basic personal needs (BPN): autonomy, competence, and relatedness. The satisfaction and frustration of these needs for individuals can be quantitatively measured by the Basic Personal Needs Satisfaction and Frustration Scale (BPNSFS) (Chen et al. 2015). *Autonomy* is the sense of control the student feels (s)he has over the (learning) process. Student autonomy can be supported by providing choice, and rationale and value for tasks. Furthermore, student autonomy can be supported by integrating student perspectives into instructional and meaningful activities that (preferably) align with the students' interest (Deci and Ryan 2008; Reeve 2009, Niemec and Ryan 2009). Only in an autonomous supporting environment, internalization of motivation can take place (Deci et al. 1991). *Competence* is the confidence a student has that (s)he will be good at a given task. Student competence support can be facilitated by offering optimally challenging activities tailored to their capabilities and providing the right tools. Teachers can also support student competence by providing feedback and being responsive to student questions. Finally, creating structure that includes explicit information and clarifies expectation supports competence (Reeve et al. 2007; Niemec and Ryan 2009). *Relatedness* is the feeling of belonging to a certain group during the task. It is the development of satisfying connections with others in the classroom (e.g. peers, teachers). Teachers can support this by supporting a pleasant atmosphere in class and promoting peer acceptance (Deci et al. 1991). Teachers can do this by, for example, taking the time to get to know the class and by incorporating peer feedback assignments.

A well-designed course has the potential to support students in the satisfaction of their BPN. In such a course, extrinsically motivated students could—in theory—internalize their motivation (Niemec and Ryan 2009; Ryan and Deci 1985, 2000, 2008). This study explores the contextual factors that influence first-year student motivation in a large-scale flipped setting by answering the following questions:

RQ1: How do first-year students rate their satisfaction and frustration of basic personal needs in a traditional lecture compared with a large-scale flipped setting?

RQ2: What are, according to first-year students and tutors, the contextual factors that influence first-year student motivation in a large-scale flipped setting?

Methods

Course context

The course is part of the compulsory programme (6 ECT) for first-year students in the study programme of Health & Life Sciences at the VU University Amsterdam, The Netherlands. Learning outcomes of the course in 2017 were that students were able to (1) understand how different environmental factors influence human health, (2) describe how computer models and research with humane studies provide insight in the influences of environmental factors on public health, (3) conduct a simple toxicological experiment and report on this, (4) understand and apply basic concepts of ecology in relation to public health, and (5) present a chosen project/subject to peers (Vrije Universiteit, 2016).

Over the course of 8 weeks, students followed a weekly, large-scale lecture in which exam content was discussed. The first 4 weekly lectures were given in a traditional lecture format with a university lecturer. The last 4 weekly lectures were in a flipped setting. These were called 'expert labs' and were given by academic and non-academic professionals from outside university. The expert labs aimed at providing all students the opportunity to actively interact with (non-)academic experts in a dynamic setting with student-centred activities. The student-centred activities were mostly group assignments. For example, students were asked to prepare a short presentation in their group about a subject or to participate in a group discussion under the guidance of the expert. All expert labs were accompanied by online material, such as videos, that students could access beforehand to prepare for expert lab activities (e.g. asking questions, participate in discussions).

Students attended ten work groups (of 2 h each) in which they worked on assignments related to the content of lectures, expert labs, and on a group poster for a poster presentation to peers. They were supervised by tutors (junior lecturers) during the work groups. The tutors had no previous experience with a flipped setting. Students also conducted an experiment and kept a logbook with reflections on their personal development (working together, planning, giving and receiving feedback) and learning process in the course.

Students were informed about the flipped class format in the course syllabus and by an introductory lecture at the beginning of the course. The work group before the first expert lab focused especially on 'how to prepare for an expert lab'. Attendance of lectures and expert labs was not obligatory. To pass the course, it was obligatory to be present at the work groups and practical. The final grade was based on a written exam (60%), group poster (20%), experiment (10%), and a reflection log book (10%).

Participants

At the start of the course, students ($n = 219$) were informed about the study and asked to participate by the course coordinators. Further announcements on the study were made during the work groups, so all students could be reached. Student participation in this study was voluntarily. In total, 186 students participated in the first questionnaire (84.9%). The students' age in this sample ranged between 17 and 23 years old (M = 19.3, SD = 1.22), and 83.2% of the students was female. Thirty students (16%) indicated that they had a learning difficulty, including dyslexia ($n = 14$) and AD(H)D ($n = 5$). Recruitment for the focus group with students took place via the first questionnaire, in which students were invited to leave there name and e-mail address if they were interested in participating in a focus group. Out of the forty-seven students who left their contact details, six students showed up for the focus groups. Furthermore, all tutors ($N = 3$) participated in another focus group.

Procedures

This study used a mixed-methods approach, combining hard copy questionnaires and focus groups (data were collected by NB, MZ, and colleagues) following what can be referred to as a one group pretest-posttest design. While in order to test the effects of one educational approach versus another a randomized controlled experiment would have been preferable, this design was considered infeasible within a real-life educational setting due to teaching constraints. Quantitative data were collected via three paper-and-pencil questionnaires (see Table 1). Questionnaires included general evaluation questions and validated survey items (see "Measures") to compare motivation between the traditional lectures and expert labs. Questionnaires were administered at three different moments in time: (1) in the work group a week before the first expert lab, (2) during the final expert lab, and (3) immediately after the final exam. The response rate varied between the three survey moments (Table 1), as relatively few students were present in the last expert lab.

Qualitative data were collected through focus groups with students and tutors. These provided a broader picture of perspectives on the flipped classroom and contextual factors that influenced student motivation.

Table 1 Overview of questionnaires used in this study, variables included, time of administration, and response rate

#	Variables	Time of administration	Response *n* (%)
Questionnaire 1	Demographics; previous experiences with blended learning	Work group before first expert lab	186 (85)
Questionnaire 2	Comparison traditional lectures vs. expert labs on motivation: autonomy, competence, and relatedness. Appreciation of specific expert lab elements (e.g. in-class assignments)	During last expert lab	66 (29)
Questionnaire 3	General appreciation of expert labs	After examination	146 (67)

Measures

Questionnaire 1: Demographics and previous experiences.[1] This survey included questions about students' age, sex, learning difficulties, and previous experiences with the flipped classroom.

Questionnaire 2: Comparison of motivation in expert labs and traditional lectures. The Basic Personal Needs Satisfaction and Frustration Scale (BPNSFS) of Chen et al. (2015) formed the starting point for the questionnaire to compare students' autonomy, competence, and relatedness in the traditional lectures and the expert labs. A student assistant contextualized and reformulated the original items into a Dutch survey within the educational context of this flipped VU course. Some items did not fit the educational setting. For example, contextualizing 'I experienced a warm feeling with the people I spend time with' to 'I experienced a warm feeling with the [teacher] I spent time with in the [lecture/expert lab]' was not appropriate. Thus, items from the Extended Course Experience Questionnaire by Griffin, Coates, McInnis, and James (2003, original CEQ by Wilson, Lizzio and Ramsden 1997) were used as inspiration for relatedness items. This resulted in relatedness items concerning, for example, 'I felt able to share ideas/opinions with fellow students'. Students were asked to rate the statements for the traditional lectures as well as the expert labs on a 5-point Likert scale with the following options: 'completely not true' (1), 'somewhat not true' (2), 'neutral' (3), 'somewhat true' (4), 'completely true' (5), and 'not applicable'. The results of this survey give an indication about the fulfilment of the BPN's within both settings. The complete survey, which is back translated to English for publication purposes, can be found in Appendix A. Furthermore, students rated statements about different elements in the expert labs on a 5-point Likert scale with the options 'totally disagree' (1), 'disagree' (2), 'neutral' (3), 'agree' (4), and 'totally agree' (5). Exemplary statements are 'Testing my knowledge for the exam with the app game motivates me' and 'It motivates me when the expert is enthusiastic'.

Table 2 presents Cronbach's alphas for each subscale in both settings. Chen et al. (2015) proved that the Basic Personal Needs Satisfaction and Frustration Scale functions cross culturally and independent of individual desires for need satisfaction. The internal consistency of the Basic Personal Needs Satisfaction and Frustration Scales was 0.69 or higher across 4 cultures. All alphas in this study are above the acceptable threshold of 0.5 (Pallant 2007) for subscales containing less than 5 items, except for the relatedness satisfaction in the traditional lectures. After careful consideration, one item was deleted from the relatedness satisfaction subscale which resulted in an α's increase from .20 to .33 in the traditional lectures. The results should be interpreted with caution. It is assumed that the low α's—in comparison with the internal consistency of Chen et al. (2015)—are due to suboptimal translation and over-adjustment to the flipped context.

Questionnaire 3: Appreciation of the flipped setting. This questionnaire focused on students' appreciation of the expert labs. Student were asked to rate their appreciation for every traditional lecture and every expert lab on a 5-point Likert Scale: negative (1), somewhat negative (2), neutral (3), somewhat positive (4), and positive (5). The averages for the traditional lectures and the expert labs are used in this research.

[1] This research is part of a larger research study into experiences of students, teachers, and staff in the flipped classroom.

Table 2 Cronbach's alpha values for the subscales of the Dutch and context adjusted BPNSFS questionnaire

	# items	Traditional lectures		Expert labs	
		α	N	α	N
BPNSFS subscales					
Autonomy satisfaction	4	0.70	58	0.77	64
Autonomy frustration	4	0.71	51	0.55	65
Competency satisfaction	4	0.71	51	0.71	65
Competency frustration	4	0.59	52	0.70	62
Relatedness satisfaction	3	0.33*	62	0.51	66
Relatedness frustration	4	0.52	59	0.73	65

BPNSFS Basic Personal Needs Satisfaction and Frustration Scale. *Based on 3 items. After careful consideration, one item of this subscale was deleted due to a low Cronbach's alpha

Student focus groups The first part of student focus groups started by asking participants to write down two strong and two improvement points of the expert labs on post-its. Participants were then asked to deliberate about these points and group them if possible. Then, they were asked to think of a solution for the improvement points. The second part of the focus group focused on the differences between the expert labs and the traditional lectures. Prior to the focus groups, the research team selected a list of variables considered important to successful education (i.e. level of student participation, explanation of concepts, level of motivation to attend, relevance of lecture for exam, student-student interaction, student-teacher interaction, difficulty of lecture, time/attention spend on non-relevant subjects, lecture pace, teacher quality, mastering lecture content, use of PowerPoint, motivation to prepare for lecture, usefulness of lecture for personal development, social pressure to go to lecture, feeling of reward after attending lecture). Students were asked to rate these subjects individually according to their experience between 1 'low' and 5 'high' for the traditional lecture and for the expert labs. Participants were then asked to further discuss their ratings and the differences among them.

Tutor focus group The tutor focus group started with the identification of strengths and points for improvement in relation to the flipped classroom, from the perspective of the tutors. They were asked to elaborate on their answers and come up with improvement strategies. Secondly, the tutors were also asked to formulate strengths and points for improvement from the perspective of the students. Again, the tutors were asked to elaborate, explain, and specify their answers. Finally, the facilitator asked the participants to share their experience on the following elements: level of student participation in the lectures, student interaction, student-teacher interaction, mastering of content, and relevance of lectures for the exam.

Ethical considerations

The research complied with the national Code of Ethics for Research in the Social and Behavioural Sciences involving Human Participants (NECSB, 2018). Prior to the start of the study, all students and tutors were informed verbally about the purpose and procedures of the study during a lecture and in writing on the course website. Ethical considerations included confidentiality, the voluntary nature of participation, the opportunity to withdraw at any time, and reassuring students that participation would not affect their course participation and grades in any way. Students were asked to sign an informed consent form upon participation in the study. At the end of the focus groups, students received a small gift for their contribution, which they were not informed about beforehand.

Data analysis

Quantitative data from the questionnaire were analysed in SPSS, version 26. A dependent *t* test was conducted to compare normally distributed data from the surveys. Wilcoxon signed-rank test was conducted for non-normally distributed data.

All focus groups were transcribed using online software (oTranscribe). Focus group data were thematically analysed in several coding rounds (Braun and Clarke 2012). Two researchers (RV, NB) read all transcripts to familiarize themselves with the data and to identify preliminary codes. Thereafter, one researcher (RV) coded all transcripts using the software program MAXQDA2018. New codes were created when new themes emerged from the data. To increase the inter-researcher reliability, coding was regularly discussed between researchers (RV, NB, NL) in face-to-face meetings. When different interpretations of the data appeared, consensus was reached by discussion. Finally, the most prominent sensitizing topics were, if possible, deductively related to one of the three basic personal needs: relatedness, autonomy, and competence (Deci and Ryan 2008). Results from the quantitative and qualitative data were compared for data triangulation.

Results

The results start with descriptive data on students' previous experience with blended learning (Table 3) followed by the comparison of BPNSFS scores of autonomy, competence, and relatedness in the flipped setting and the traditional classroom (Tables 4, 5). Then, the qualitative results from the focus groups elaborate on the strong points and points for

Table 3 Descriptive data on student's experience and appreciation as measured with questionnaires 1 and 3

Question	Descriptives	
Prior experiences blended learning (N = 72)	Frequency *n* (%)	
Positive	49 (68.1)	
Neutral	22 (30.6)	
Negative	1 (1.4)	
*How motivating were the following parts of the expert labs?** (*N* = 66, scale 1–5)	Median	IQR
When the teacher was enthusiastic	4	1
To test my knowledge with the app game	4	1
To watch video at my own pace	4	1
To receive information for the exam and/or the poster	3	2
To work on assignments with other students	3	2
To receive challenging assignments in the expert labs	2	1
*Appreciation of the lectures** (*N* = 139, scale 1–5)	Median	IQR
Traditional lectures	3.5	1
Expert labs	3	1.5

*All items were distributed non-normally. Measured on a 5-point Likert scale

Medians are accompanied by the interquartile range (IQR)

Table 4 Mean scores, standard deviation, median, and interquartile range for the autonomy, competence, and relatedness as reported by students on the traditional lectures and the expert labs

	Traditional lectures					Expert labs				
BPNFS subscales	N	M	SD	Mdn	IQR	N	M	SD	Mdn	IQR
Autonomy satisfaction	66	3.15	0.88	3.00	1.13	66	2.33	0.83	2.25	1.25
Autonomy frustration	*65	2.33	0.87	2.25	1.33	66	3.46	0.75	3.50	1.13
Competency satisfaction	66	3.47	0.80	3.50	1.00	66	2.92	0.81	3.00	1.25
Competency frustration	66	2.28	0.78	2.25	1.13	66	2.69	0.86	2.75	1.50
Relatedness satisfaction**	66	3.22	0.75	3.33	0.75	66	3.68	0.58	3.75	0.75
Relatedness frustration	66	2.84	0.74	2.75	0.75	*66	2.20	0.73	2.25	1.38

BPNSFS Basic Personal Needs Satisfaction and Frustration Scale. *Non-normally distributed. **1 item was deleted for relatedness satisfaction in the traditional lectures

improvement with respect to the contextual factors that influence first-year student motivation in a large-scale flipped setting. The qualitative results are also structured after the BPN: autonomy, competence, and relatedness.

Descriptive data: diversity in student learning and motivation

About one-third (32.3%) of the students reported to have previous experience with the use of videos as replacement of lectures and regarded this as a positive (68.1%), neutral (30.6%), or negative (1.4%) experience. The average student appreciation of the course's traditional lectures (Mdn = 3.5) was higher than the expert labs (Mdn = 3). Students enjoyed the following aspects of the expert labs (as measured on a scale from 1 to 5): having an enthusiastic expert (Mdn = 4), that the expert labs tested their knowledge with an app game (Mdn = 4) and that they could watch videos before class at their own pace (Mdn = 4) (Table 3).

Self-reported BPNSFS scores showed that students experience more autonomy in the traditional lectures compared with the expert labs. Autonomy satisfaction was higher in the traditional lecture (M = 3.15, SD = 0.88) than in the expert labs (M = 2.33, SD = 0.83; t(65) = 6.38, $p < .001$). Autonomy frustration scores were lower in the traditional lectures (Mdn = 2.25) than in the expert labs (Mdn = 3.50; $Z = -6.138$, $p < .001$). These data suggest that the experimental large-scale flipped setting in this study, in comparison with traditional lectures, negatively affected the perceived autonomy of the first-year students.

Students also reported to feel more competent in the traditional lectures than in the expert labs, as competence satisfaction was higher in the traditional lectures (M = 3.47, SD = 0.80) than in the expert labs (M = 2.92, SD = 0.81; t(65) = 4.78, $p < .001$). At the same time, competence frustration was lower in the traditional lectures (M = 2.28, SD = 0.78) than in the expert labs (M = 2.69, SD = 0.86; t(65) = −4.40, $p < .001$). These data suggest that the first-year students' perceived competence was negatively influenced by the experimental large-scale flipped setting in this study, in comparison with traditional lectures.

Students' reported sense of relatedness was higher in the expert labs than in the traditional lectures. Relatedness satisfaction scores were lower in the traditional lectures (M = 3.22, SD = 0.75) than in the expert labs (M = 3.68, SD = 0.58; t(65) = −4.83, $p < .001$). Relatedness frustration[2] scores were higher in the traditional lecture (Mdn = 2.75) than in the expert labs

[2] Non-normally distributed. Therefore, the median is presented, and a Wilcoxon signed-rank test was done for analysis.

Table 5 Results from the paired *t* test with self-reported scores on the autonomy, competence, and relatedness as compared between the traditional lectures and the expert labs and results from Wilcoxon signed-rank test scores for subscales that include non-normally distributed data

BPNSFS subscales	M	SD	SEM	*t*	df	Sig [1]	*Z*	Sig.
Autonomy satisfaction	0.82	1.04	0.13	6.38	65	< .001		
Autonomy frustration[2]	− 1.13	1.07	0.13	− 8.48	64	< .001	− 6.138	.000
Competency satisfaction	0.55	0.94	0.12	4.78	65	< .001		
Competency frustration	− 0.41	0.76	0.09	− 4.40	65	< .001		
Relatedness satisfaction	− 0.45	0.76	0.09	− 4.83	65	< .001		
Relatedness frustration[2]	0.64	0.76	0.09	6.76	65	< .001	− 5.316	.000

BPNSFS Basic Personal Needs Satisfaction and Frustration Scale. [1] 2-tailed, significant at $p < .05$. [2] Includes non-normally distributed data

(Mdn = 2.25; $Z = -5.316$, $p < .001$). These data suggest that the experimental large-scale flipped setting in this study positively influences first-year students' sense of relatedness, in comparison with traditional lectures.

In sum, the quantitative data show that students' perceived autonomy and competence were lower for the expert labs than for the traditional lectures. Perceived relatedness, however, appeared higher in the flipped setting as compared with traditional lectures. The qualitative results shed light on barriers and facilitators for student motivation in the large-scale flipped setting, related to the BPN: autonomy, competence, and relatedness.

Experiences in the expert labs

The qualitative results follow from the focus group discussions with students and tutors and elaborate on the perspectives of students on their motivation to attend the expert labs and to participate. Table 6 shows a summary of the facilitators and barriers for student motivation in the flipped classroom, separated for autonomy, competence, and relatedness. Overall, students were positive about the *idea* of the flipped classroom, but students in the focus groups said 'it was not for them'.

Autonomy The students appreciated the flexibility that they received in preparation for the expert labs, because they could *choose* when to prepare. However, during the focus groups, students also indicated that they felt that they did not know what to expect of the expert labs and that it was not clear what they could *gain* from the expert labs, and thus, they were less motivated to come to the expert lab (quote 1).

> [1] If you go [to the expert lab] with more expectations or you know what you will gain, then you are more motivated, and you will go[3]—student focus group 1

Students based their decision to come to the expert labs on whether they thought the expert lab would be *useful and/or relevant* towards their final grade (contributing to the exam). Students indicated in the focus groups that they did not see the alignment between the expert labs and the exam (quote 2, 3). Also, students labelled the expert lab as being relevant 'for the poster assignment'. Considering that the poster assignment was 'only' 20% of the final grade, this was of less importance to students.

[3] Translation of quotes has been done by the first author RV.

Table 6 Overview of facilitators and barriers to student motivation in the large-scale *flipped* setting as identified by thematic analysis of student and tutor focus groups, separate for autonomy, competence, and relatedness

Basic personal need	Facilitators	Barriers
Autonomy	Flexibility of pre-class preparation	Unclear expectations from students in the expert labs
	Pre-class preparation triggers curiosity/interest	Perceived dis-alignment expert labs—exam (low value)
Competence	Relatively easy pre-class preparation	Complexity of expert labs too low
	Active pre-class preparation	Expert labs not well tailored to preparation
	Active application of elements in-class	More guidance in pre-class preparation needed
	In-depth knowledge from the expert in-class	
	Distinguish important things in-class	
Relatedness	Increased interaction among students	
	Increased interaction with expert	
	Peer learning in group assignments: increased confidence and better understanding	
	Working *with* an enthusiastic expert	

> [2] I did not know we would do that sort of stuff [making a matrix in the expert lab, which was relevant for the exam]. Then you notice that it is really important to stress the importance of the expert labs.—student focus group 1

To which another student responded:

> [3] Yes exactly. They [students who did not come to the expert labs] thought “it is just an expert lab, I do not have to go”—students focus group 1

Students explained in the focus groups that it would help them if presence and preparation for the expert lab would be *obligatory*. Then, they would come, even if the first impression of the flipped classroom was not that good (quote 4).

> [4] Yeah, I heard people needed more stimuli to do the preparation, for example via a Turnitin [a program for handing in assignments]. In that very moment it sucks but I notice that it helps a lot if you were actively working on something, that you do not enter a lecture ‘blanc’.—student focus group 2

Tutors indicated they would have appreciated a better preparation for the flipped concept and their role within this educational method. They felt that they were not always able to answer student questions concerning *the relevance, gain, and importance* of the expert labs. Tutors therefore proposed to better *formulate and communicate expectations* to students about the expert labs.

Competence In the focus groups, students indicated that working actively on the content during the expert lab helped them to better understand the materials and recall information at a later moment. They also enjoyed the relatively low complexity of the online study materials and online learning activities. The online video preparation was *relatively easy* compared with reading. Students said the preparation with video clips and questions ‘stuck’ better than reading a chapter in a book because it was *more active* and it was easier to do (quote 5).

> [5] With an expert lab they really hand you something to prepare. With a regular lecture you think... yeah, I never know how to prepare or anything. So when they hand you something I am more motivated.—student focus groups 2

Also, students used the video clips as a reference after the lecture. However, some students in the focus group expressed the need for more *guidance* in their preparation for, for example, the Q&A with the expert in one of the expert labs. Students also indicated they were not satisfied with the *complexity* of the *in-class* expert lab content. They argued that the content was not complex enough, partly because they had already prepared at home (quote 6). Students got easily bored, as they finished quite quickly and did not know what to do when they were done (quote 7).

> [6] Well, you know, because you could prepare all at home you could already understand a lot. And then I think the motivation to go [to the expert lab] is lower because you can just do it at home—students focus group 2

> [7] You were given 45 minutes to work on an assignment, well, yeah in such a big group everybody who is not motivated will leave, nobody is really motivated to… to be put to work right away.—student focus group 2

Students appreciated that fewer concepts were covered in the expert labs but more in depth. They noted that, as a result, they were able to better discriminate between what was important and what not. However, if an expert would go too much in-depth on a subject, it was seen as *less relevant* (for the exam). Other students missed academic depth (some experts worked in non-academic environments). In general, students said they would be more motivated by the *right balance* in complexity.

Tutors recommended to prepare students in the small-scale work groups for each weekly expert lab. In this course, they had done this in just one of the work groups and noticed two things: students had *prepared better* for the following expert lab and also *enjoyed* the expert lab more. Finally, the tutors suggested to give the experts a certain degree of freedom but to always give them a format for the expert labs. This was due to students’ complaints about inconsistencies between the different expert labs. Overall, the tutors had their doubts about how these expert labs are better than an interactive ‘traditional’ lecture.

Relatedness All students in the focus groups noted, and most of them appreciated, the increased student-teacher and student-student interaction and increased active student participation in the expert labs. However, some students noted the increased interaction compared with the traditional lecture was a barrier for them: it was [8] ‘too much effort’ because [9] ‘you actually have to participate and make an effort’.

A motivating social aspect of the expert labs over the traditional lectures was the contact with the experts. During the focus groups, students noted that the experts were enthusiastic, which made students eager to stay and motivated to listen. Teachers/experts in the expert labs looked [10] ‘less tired of teaching’ compared with the teachers in the traditional lectures. Furthermore, students noted that the experts had in-depth knowledge, which gave students confidence to believe them. One student said she felt like she was working *with* the expert instead of *for* the expert.

The groups in which the students worked on in-class assignments enhanced their confidence to speak up (quote 11) and present their work in the lecture hall. Peer groups also enabled them to learn from others in their group as well as in the lecture hall (quote 12). Students who did not have their peer group present felt less urged to speak up, and the group absence sometimes even resulted in a reluctance to attend class.

> [11] The groups that were complete were a bit more motivated to participate interactively than others [students whose group was not complete].—student focus group 1

> [12] I think you can learn a lot from you fellow students anyway. … One [a student in the group] can communicate the material better or can articulate the matter in a way it is slightly more accessible [to the other students in the group].—student focus group 1

Not all students saw the *usefulness* of a group to do assignments with during the expert labs, and they preferred to work individually. Although peer groups seemed to increase students' motivation to participate actively in class, students mainly considered coming to the lecture as an individual responsibility (quote 13).

> [13] Look, to go is your own responsibility. But I think that once you are in there [the lecture hall] then social control is pleasant now and then. Then you are more motivated to do something, or at least I am.—student focus group 2

The tutors noticed that the flipped part of the course intensified their relationships with students, and also amongst students themselves, due to the group work and in-class assignments. Students were more active, and there was more interaction. However, students were afraid to present their work during the expert labs for the big group and would therefore leave early and ended up missing valuable information. They suggested to use other tools like Mentimeter (Mentimeter, 2019) to work around these 'social barriers'.

Other results Others barriers mentioned included physical barriers in the classroom and the facilitation of in-class activities. The large group size and consequently the lecture hall size sometimes stood in the way of participation in discussion because students in the back of the room could not properly follow a discussion in front and vice-versa. The tutors also noticed that students were not yet used to the expert lab format. Students asked the guides to get 'the right' question or answer, while the expert labs focused more on discussion and construction of meaning than deriving at one 'right' answer.

Discussion

This study aims to contribute to the understanding of what contextual factors influence first-year students' motivation in a *large-scale flipped setting*, called *expert labs* in this study. Overall, first-year student motivation was lower for the expert labs than for the traditional lectures. Quantitative self-reported data on students' autonomy and competence show a lower satisfaction and a higher frustration for the expert labs in comparison with the traditional lectures. Contextual factors in the large-scale flipped classroom influencing autonomy and competence included the flexibility of pre-class preparation, active application of course material in-class, and managing expectations and the complexity of the course material. In contrary, self-reported data on relatedness showed a higher satisfaction score in the expert labs and a higher frustration in the traditional lectures. In support of this, students in the focus groups commented that they particularly enjoyed the increased in-class interaction among students and between expert and students. Implications of these findings are discussed below with respect to (1) first-year students' readiness for the large-scale flipped classroom and (2) opportunities for the flipped setting to increase first-year student motivation by supporting relatedness, competence, and autonomy in large-scale flipped settings.

Readiness of first-year students for large-scale flipped lectures

Students in this study were quite positive about the *concept* of the flipped classroom but gave a relatively low rating for their motivation in the expert lab in comparison with the traditional lecture, primarily reflected in decreased self-reported levels of autonomy and competence. The students had a strong need for more teacher guidance in pre-class preparation, expectation management, and self-regulation in a large-scale flipped setting. This suggests a low 'readiness' for flipping in our study and is supported by research suggesting that first-year students in general are less 'ready' for the flipped classroom in comparison with older students (McCarthy 2016; Artino and Stephans 2009; Hao et al. 2016). Kim et al. (2014) indicate that clearly defined and well-structured guidance is an essential design principle for a successful flipped classroom, and this may be even more the case for first-year students. Especially in a *large scale* flipped setting where presumably less time is spent on individual student support in-class than in the regular flipped classroom. Teacher support can eventually be reduced in time when students are more comfortable in the flipped classroom, but in the early stages, more structure and clear expectations are necessary. Cho and Cho (2014) and Zheng et al. (2019) show that this so-called scaffolding will result in better planning, higher cognitive performance, and improved group work in blended courses.

Students *themselves* suggest to increase their external motivation by introducing incentives like making things obligatory, increase social control, and adjusting the grading to fit the lessons. External incentives, like deadlines, may be an initial necessary evil to use in a first-year flipped classroom (Abeyserkera and Dawson 2015), as first-year students' study strategies, regardless of their GPA, are based primarily on deadlines and thus 'whatever is due soonest' (Hartwig and Dunlosky 2012, p127). However, simply adding these features will not promote intrinsic motivation. External incentives like rewards, feedback, and deadlines, which are standard educational practices, only support and promote autonomous self-regulation and motivation if used in non-controlling way (Deci et al. 1991; Reeve 2007; Reeve 2009). The large-scale flipped classroom and other blended learning forms offer students and instructors new learning environments aimed to facilitate higher order learning, but this will only work if blended learning is considered a possibility to completely redesign education: online *and* offline activities need to be constructively aligned (Biggs et al. 2011; Cottle and Glover 2011; Garrison and Vaughan 2008; Konijn et al. 2018; Roehl 2013).

Opportunities for the large-scale flipped lectures to support first-year student motivation

The findings in this study suggest that a large-scale flipped setting can support a sense of relatedness of first-year students. Students in this study report to be motivated by the enthusiasm of the expert and the increased interaction with the experts during the expert labs.

This is not suprising, as enthusiasm of the teacher has frequently been correlated with an increase in intrinsic motivation among students (Patrick et al. 2000). The large-scale flipped classroom offers the opportunity to increase interaction between first-year students and an expert from the field, just like it did for master students in the course of Konijn et al. (2018). Despite the large group size (on average 60 students in the expert labs), the expert lab format managed to motivate students to speak up, participate in in-class activities, and increase interactivity during the expert labs. Other studies on blended first-year courses also report a significant (self-reported) increase in interactivity and the positive effect of the discussions, in-class assignments, and active engagement on the learning experiences of students (Cottle and Clover 2011; McLaughlin et al. 2014; Northey 2015; Rovai 2004; Papadapoulos and Roman 2010). Students in this study indicate that they learn in collaboration with peers during the expert labs. Peer learning has a positive effect on student development and achievement (Topping 2005). Social interaction learning strategies, like peer learning, have a positive effect on the first-year university experience which, in turn, affects permanence of students at their respective universities (García-Ros et al. 2018).

Students in this study who prepared beforehand indicate that the pre-class preparation sparks their interest and curiosity into the expert labs. Student's interest and interest-related activities play a role in autonomy support (Niemec and Ryan 2009). However, two-thirds of the students in our study had no previous experience with the use of videos as a replacement for lectures, and the format was thus relatively new. Novel teaching methods, especially student-centred learning, are often met with resistance in students and could also lower students' belief in their own ability (competence) in completing tasks (McNally et al. 2017). McNally et al. (2017) also note that resistance to *pre-class* learning, which is essential to the flipped format, instead of *in-class* learning could contribute to demotivation of students. Turnbull, Docherty, and Zaka (2018) stretch the importance of a proper student preparation on new formats of teaching, like large-scale flipped lectures. First-year students might simply need more than an introductory talk and a course description in the syllabus to feel 'in control' (autonomous) in such a new setting. Tutors suggest to design every expert lab according to the same format, independent of the expert. This supports autonomy as students will know what to expect and can assign value to every flipped lecture. Providing students with value and rationale for the used educational methods supports autonomy, which in turn promotes intrinsic motivation (Niemec and Ryan 2009).

Strengths and limitations

This study seeks an answer to a practical problem in education, particularly, in light of large-group education, which is not only a growing challenge but also a daily reality in higher education. It uses a mixed methods approach, combining focus group interviews and questionnaires in a pretest-posttest design. Thereby, a comparison in student motivation could be made between the traditional lectures and the expert labs (large-scale flipped setting). Although the questionnaires measuring our variables of interest were administered following the intervention—rendering a 'clean' pretest-posttest design impossible—the study yields clear results pertaining to the different methods. To assess the effects of educational methods, ideally, a randomized controlled experiment would have been conducted, using naïve participants. This would have enhanced the internal validity of our approach, providing experimental control. However, we deemed this approach infeasible and opted for a real-life study setting. Compromising experimental control, we thereby enhanced the ecological validity of our study. Students were actual students at the VU Amsterdam who followed an actual course of the bachelor curriculum. The assessment of naïve participants' motivation would have been inherently different from real students' motivation.

Another limitation concerns the translation of survey items tapping into participants' motivation into Dutch, as well as to fit an educational setting. Translating the items into Dutch without a back-translation procedure may have resulted in a loss of nuances in the original scale items of the validated BPNSFS (Chen et al. 2015). To fit the educational setting, we opted to remove specific items that would have been deemed inappropriate when referring to a teacher-student relationship (e.g. 'experiencing a warm feeling when spending time with a teacher'). To retain the original scale structure of the three factors, autonomy, competence, and relatedness, we introduced 7 new items (e.g. 'I felt the teachers were easily accessible'). It goes without saying that the new (Dutch) scale focusing on student motivation should be validated in future studies.

Future studies should focus on elaborating exposure to the intervention to confirm and solidify present findings. Within the scope of the present study, students were exposed 8 h to the 'expert labs' (large-scale flipped setting). It is not unthinkable that expanded exposure has stronger effects. Another point for attention for future research is the effect of mid-point response bias in odd-numbered Likert scales. Additional qualitative studies may be conducted, like in this study, to support and elaborate on the subtle differences in quantitative comparisons. More so, future studies may focus on other potential (confounding or mediating) effects, including but not limited to teacher engagement, students' prior educational experiences, timing (e.g. end-of-semester tiredness), and course content.

Conclusion

Large-scale flipped settings offer the possibility for a large group of students to interact with a prominent expert in the field. This format can also support first-year students' sense of relatedness which in turn increases intrinsic motivation. Relatedness contributes positively to the first-year experience and may enhance the connection between students and the university. Many studies show positive results with the regular flipped classroom (online preparation with videos and small-scale face-to-face work groups). This study shows that intensive preparation, guidance, and expectation management are perquisites for a *large-scale flipped* setting for first-year students. First-year students' self-regulation and self-efficacy are still developing, and this makes them less 'ready' for the large-scale flipped setting. *Scaffolding* (reduction of teacher support over time) and the initial use of external incentives in a non-controlling way (e.g. peer grading/feedback, rewards for non-obligatory deadlines) might be a necessary evils in this form of the flipped classroom. Most important of all, the flexibility of blended learning can be used to design a course that is specifically tailored to the context of first-year students' needs, their teachers, and universities.

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Data availability Upon request.

Compliance with ethical standards

The research complied with the national Code of Ethics for Research in the Social and Behavioural Sciences involving Human Participants (NECSB, 2018).

Conflicts of interest The authors declare that they have no conflict of interest.

Code availability Not applicable.

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