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Students' basic psychological needs in blended teacher learning groups

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Introduction: Student teachers (henceforth: students) in higher education often experience feelings of emotional loneliness that negatively impact upon their well-being and motivation to learn. Consequently, the importance of social learning for students has gained increased prominence, with Teacher Learning Groups (TLGs), that is, social configurations in which students, in-service teachers, and teacher educators, sometimes supplemented by researchers and/or experts, collaboratively learn through social interactions, being introduced in teacher training institutes. Ordinarily, TLGs organized their meetings face-to-face; however, due to COVID-19 measures, they had to rapidly transition to blended meetings, which in turn impacted upon students' basic psychological needs.

Methods: In the present study, a convergent parallel mixed-methods design was utilized. The variables Social Configurations (Practice integration, Long-term orientation and goals; Shared identity and equal relationships) and Basic Psychological Needs (Competence, Autonomy, Relatedness) were assessed through the use of qualitative interviews and by administering two online quantitative surveys: the "Dimensions of Social Learning Questionnaire" and the "Basic Psychological Need Satisfaction and Frustration Scale". Seventy students completed the questionnaires, while 14 students were interviewed. The students were recruited from four teacher training institutes.

Results: The analyses reveal that the more students perceive Shared identity and equal relationships in blended TLGs, the greater the fulfillment of Basic Psychological Needs they experience. Moreover, the more students experience the fulfillment of the need for Competence, the more students perceive TLGs' Social Configurations.

Discussion: Based on the findings, we conclude that, although in-depth learning is more challenging during distance learning, blended TLGs are valuable for students' Basic Psychological Needs during unpredictable times.

KEYWORDS

teacher learning groups, social configurations, basic psychological needs, blended learning, social learning

1. Introduction

Social learning is increasingly advocated within teacher training institutes as a means through which to enhance students' motivation to learn (de Laat, 2012). Social learning is especially important in light of the voluminous individual work that undergraduate students are required to carry out as part of their studies, which can lead to them experiencing a lack of

connection with both their educational institution and peers (Vrieling-Teunter et al., 2022a), exacerbate feelings of emotional loneliness that negatively impact upon their well-being, motivation for learning, and study performance, and ultimately result in dropout (Dopmeijer, 2021). Consequently, the topic of student well-being is currently high on the agenda of higher education institutes (Litjens and Ruijfrok, 2019; Social and Economic Council, 2019).

Grounded in the ambition to improve social learning and student well-being in teacher training institutes, Teacher Learning Groups (TLGs) are posited as providing a means through which to foster social learning environments that support students' motivation to learn. TLGs can be defined as social configurations in which in-service teachers, teacher educators and students, sometimes supplemented by researchers and/or experts, collaboratively learn through social interactions, which in turn affords students opportunities to exchange knowledge and practical advice with other professionals (Doppenberg et al., 2012; Vrieling-Teunter et al., 2022a). According to Vrieling-Teunter et al. (2022b), social configurations in TLGs comprise three social learning dimensions: (1) Practice integration (i.e., the relationship between the knowledge shared and created in the TLGs and members' daily teaching activities), (2) Long-term orientation and goals (i.e., TLGs' activities that focus on short- and long-term goals and reflect the TLG members' social learning attitude), and (3) Shared identity and equal relationships (i.e., the way TLG members work interdependently in equal relationships with a shared purpose and responsibility for collective success). Through social interactions and dialog, problems and insights are shared constructively in TLGs, and new knowledge is jointly created (Wenger et al., 2011).

In addition to enhancing students' motivation to learn, working and learning together in TLGs is also an important competence for teachers to possess in contemporary society. In a context characterized by ongoing professional development in a constantly evolving professional practice, TLGs provide a crucial opportunity for teachers to engage in lifelong learning (van Schaik et al., 2019). It is thus important to involve students and encourage their active participation in TLGs (Vrieling-Teunter et al., 2022a). The rationale for engaging in TLGs is considered to be in line with the principles of self-determination theory, in that the collaborative activities undertaken and the knowledge acquired may help to encourage intrinsic motivation by meeting people's basic psychological needs for autonomy, competence, and relatedness (cf. Deci and Ryan, 2000; Vansteenkiste et al., 2020). That is to say, TLGs can support students' basic psychological needs insofar as participants create new knowledge from theoretical and practical perspectives within a group that is characterized by diverse professional backgrounds (i.e., competence), that makes autonomous choices in their collaboration (i.e., autonomy), and provides peer support in a safe atmosphere (i.e., relatedness).

However, developing students' basic psychological needs in TLGs does not occur naturally, but rather must be facilitated (Vrieling-Teunter et al., 2022a). From this perspective, Vrieling-Teunter et al. (2022a) searched for relationships between TLGs' social configurations and the motivation of participating students from four Dutch primary teacher training institutes. Analyses of these relations revealed seven variables for realizing student support in TLGs: (1) Autonomous choices regarding content, (2) New knowledge, (3) Sharing, support, and social skills, (4) Personal goals, (5) Autonomous choices regarding collaborating partners, (6) Scaffolding, and (7) Equality in an informal atmosphere. Besides these variables, both homogeneous (students only) and heterogeneous (students, teachers, teacher educators, researchers, and experts) TLGs turned out to be valuable for students' basic psychological needs, and, hence, both forms were advised to be integrated within the teacher training curricula. Homogeneous TLGs were found to be valuable for process sharing, peer support (feedback and emotional support) and the development of social skills with peers, whereas heterogeneous TLGs were found to be valuable for knowledge creation and developing social skills within a group of participants from diverse professional backgrounds.

Over the past years, TLGs would ordinarily convene face-to-face on a regular basis (Vrieling-Teunter et al., 2022a). However, this changed abruptly as a result of the COVID-19 pandemic. In light of the governmental measures (e.g., strict isolation measures), educational institutes had to switch constantly, flexibly and sometimes abruptly between face-to-face learning and distance learning (Meeter et al., 2020; Pokhrel and Chhetri, 2021). The alternation between face-to-face and distance learning is referred to as blended learning (Müller and Mildenberger, 2021). As a consequence, TLGs also had to switch to blended learning for their meetings (De Vocht et al., 2022). The expected result of this educational reform in the constitution of social configurations of TLGs is that it may have put considerable strain upon the fulfillment of students' basic psychological needs (De Vocht et al., 2022). This expectation is in line with research showing that students within educational institutes in the Netherlands and other Western countries experienced a decline in their well-being and increased psychological problems during COVID-19 (e.g., Morbée et al., 2020).

The present study examines the relationship between social configurations and the basic psychological needs of students in TLGs during the pandemic. Due to the COVID-19 measures, the alternation between face-to-face and distance TLG meetings was flexible and often difficult to plan. Therefore, the flexible, unplanned blended TLG (henceforth: blended TLG) was not a pure form of blended learning. The students ($n = 70$) participated in blended TLGs for one academic year (2020–2021) within four different primary teacher training institutes in the Netherlands. Given that the four teacher training institutes differed with respect to key elements of their TLGs (e.g., goals and composition; see Table 1), we had the opportunity to investigate: (a) in which ways students experienced a variety of social configurations and fulfillment of basic psychological needs within blended TLGs and (b) the extent to which the social configurations of blended TLGs were related to students' basic psychological needs.

This results in the following research questions:

- RQ1: In which ways do students experience a variety in social configurations of blended TLGs?
- RQ2: In which ways do students experience a variety in the fulfillment of basic psychological needs in blended TLGs?
- RQ3: To what extent are blended TLGs' social configurations related to students' basic psychological needs?

2. Materials and methods

2.1. Design

In this study we utilized a convergent parallel mixed-methods design (Creswell, 2014). Data was gathered at the end of the academic year (April/June 2021). The quantitative data consisted

TABLE 1 TLGs' organization of participating institutes.

	Institute 1 (*n*=48)	Institute 2 (*n*=9)	Institute 3 (*n*=10)	Institute 4 (*n*=3)
Frequency meetings	8 times per year	12 times per year	6 to 8 times per year	20 times per year
Duration meetings	210 min	80 min	90 to 240 min	240 min
Goals	Collective + Individual goals	Mutually exchanging feedback and ideas pertaining to subject of the minor; Individual goals	In a Research and Development line to enhance research skills, collaborating on one research project centered around a question from educational practice; Collective goals	Developing answers to students' individual research questions related to innovative education; Individual goals
Contact and/or distance learning	Contact learning with 1.50 m distance *(September–November)* Occasionally partly contact learning, partly distance learning (half class); Regularly distance learning *(December–April)* Contact learning with 1.50 m distance *(May)*	Contact learning with 1.50 m distance *(September–November)* Occasionally partly contact learning, partly distance learning (half class); Regularly distance learning *(December–May)*	One-time partly contact learning (student), partly distance learning (externals); Regularly distance learning *(January–June)*	Contact learning with 1.50 m distance *(September–November)* Occasionally partly contact learning, partly distance learning (student's choice); Regularly distance learning *(December–May)* Contact learning with 1.50 m distance (student's choice) *(June)*
Guidance	Supervised by teacher educators	Students take initiative inviting teachers, teacher educators, researchers and experts themselves	Leadership by teachers; a senior researcher in the lead of research activities	Side-line support by teacher educators
Composition	Heterogeneous	Homogeneous	Heterogeneous	Homogeneous
Assessment	Formally assessment of final product; students' social skills were formally assessed by teacher educators with an educational tool	Practical or research assignment that was formally assessed by teacher educators employing a rubric that fitted the personal learning question and the way in which this learning question had been answered	Based on a logbook, the students were formally assessed by teacher educators on how they spent their TLG hours as part of their portfolio	Formally assessment by portfolio conversation with teacher educators in which students reflected on their learning in the TLG
Gender	Male (*n* = 13) Female (*n* = 35)	Male (*n* = 1) Female (*n* = 8)	Male (*n* = 3) Female (*n* = 7)	Male (*n* = 1) Female (*n* = 2)
Age Range	16–20 years (*n* = 24) 21–25 years (*n* = 21) 26–30 years (*n* = 1) > 30 years (*n* = 2)	16–20 years (*n* = 1) 21–25 years (*n* = 8)	16–20 years (*n* = 8) 21–25 years (*n* = 2)	16–20 years (*n* = 1) 21–25 years (*n* = 2)
Training program	Regular (*n* = 42) Academic (*n* = 4) Part-time (*n* = 2)	Regular (*n* = 9)	Academic (*n* = 8) Missing (*n* = 2)	Regular (*n* = 3)
Academic year student	Year 3 (*n* = 47) Year 4 (*n* = 1)	Year 4 (*n* = 6) Year 5 (*n* = 2) Missing (*n* = 1)	Year 1 (*n* = 10)	Year 4 (*n* = 3)

of questionnaires about students' Social Configurations and Basic Psychological Needs in blended TLGs. The qualitative data consisted of retrospective semi-structured interviews that prompted for students' experiences with respect to Social Configurations and Basic Psychological Needs within blended TLGs.

2.2. Participants

2.2.1. Students In TLGs

The TLGs in the four teacher training institutes varied with respect to the frequency of the meetings, duration of the meetings, goals, contact and/or distance learning, guidance, composition, assessment, gender, age range, training program and academic year of the students (see Table 1).

2.2.1.1. Institute 1

In the heterogeneous TLGs at this institute, 48 third- and fourth-year students collaborated with teachers, teacher educators and researchers on one research project centered around.

a question from educational practice that students could choose from their minor. These questions included topics such as pedagogical sensitivity, giftedness, and film education. The TLGs collaborated on the same theme across two academic years, but students participated only for one academic year. A maximum of 12 students were allowed to participate for each TLG. The TLGs had eight meetings lasting 210 min. In preparation for the TLG meetings, eight lessons were organized for students in the presence of the teacher educator. The TLG meetings took place in the form of both contact learning with 1.5 meters distance (September/November 2020; May 2021) and distance learning (December 2020/April 2021). In some instances, meetings took place partly in the form of contact learning and partly in the form

of distance learning (half class; December 2020/April 2021). Students pursued both collective and individual goals in collaboration with the other TLG members. In addition to the final product, students' social skills were formally assessed by teacher educators *via* the use of an educational tool.

2.2.1.2. Institute 2

Within this institute, nine fourth-year students participated in homogeneous TLGs who chose the same minor. TLG topics were inquiry-based learning, learning by playing, and diversity. TLG members collaborated during one academic year and students could invite teachers, teacher educators, researchers, and experts if necessary. The 80-min TLG meetings were held 12 times a year. The TLG meetings took place in the form of both contact learning with 1.5 meters distance (September/November 2020) and distance learning (December 2020/May 2021). In some instances, meetings took place partly in the form of contact learning and partly in the form of distance learning (half class; December 2020/May 2021). The students formed a TLG to develop answers to their own individual research questions by mutually exchanging feedback and ideas. The assessment involved a practical or research assignment that was formally assessed by teacher educators employing a rubric that fitted both the personal learning question and the way in which this learning question had been answered.

2.2.1.3. Institute 3

Because of the research and development focus at this institute, ten first- to third-year students participated together with teachers, teacher educators, and researchers in heterogeneous TLGs. While students enhanced their research skills, all the participants collaborated on one research project centered around a question from educational practice. These questions pertained to a variety of topics such as personalized learning with ICT, reading motivation, and ICT in self-direction and coaching. TLGs collaborated during two academic years, however all the students in this study participated for the first year. A maximum of three students were allowed to participate for each TLG. The TLGs had six to eight meetings of 90–240 min. The TLG leadership lay with the teachers, while a senior researcher from the teacher education institute primarily took the lead in the research activities. The TLG meetings were organized in the form of distance learning (January/June 2021). On one occasion, the TLG meeting took place partly in the form of contact learning (students) and partly in the form of distance learning (externals; January/June 2021). Students worked toward a collective TLG goal. Based on a logbook, students were formally assessed by teacher educators on the basis of how they spent their TLG hours as part of the portfolio.

2.2.1.4. Institute 4

The homogeneous TLGs at this institute consisted of three fourth-year students collaborating on educational innovation topics, such as, for example, Jenaplan education, Dalton education and personalized learning during one academic year. TLG members met weekly for 240 min. Although the teacher educators were not officially part of the TLG, they were often present in the classroom to answer students' questions. The TLG meetings took place in the form of both contact learning with 1.5 meters distance (September/November 2020; June 2021) and distance learning (December 2020/May 2021). In some instances, meetings were held partly in the form of contact learning and partly in the form of distance learning (students' choice; December 2020/May 2021). Students formed a TLG to develop answers to their personal goals and individual research questions. They were formally assessed by teacher educators as part of a portfolio conversation, which meant that students had to reflect on their learning in the TLG.

2.2.2. Data collection

For the quantitative data, students were selected based on convenience sampling (Creswell, 2014). Overall, 135 TLG students were approached to participate in the present study, with 70 students ultimately completing the quantitative questionnaires (response rate of 52%). The students were recruited from four institutes, namely Institute 1 ($n = 48$), Institute 2 ($n = 9$), Institute 3 ($n = 10$), and Institute 4 ($n = 3$). Because of the low number of participants, we could not obtain reliable quantitative correlations for Institute 4. Therefore, we also had to exclude the students from Institute 4 in our quantitative analyses. With respect to the gender composition of the final sample, 26% were males and 74% were females. The age of the participating students ranged from 16 to 20 years (49%), 21–25 years (47%), 26–30 years (1%), and older than 30 years (3%). The majority of the students attended the full-time regular training program (77%), 17% attended the full-time academic program, 3% participated in the part-time regular program, while in 3% of cases the data on program variants were missing.

To collect the qualitative data, students were selected based on typical sampling (Creswell, 2014). Typical sampling allows students to represent the *typical* perspectives and detailed context of the TLGs within the four different institutes. Fourteen students participated in semi-structured interviews. The students were spread out across the four institutes, namely Institute 1 ($n = 5$), Institute 2 ($n = 3$), Institute 3 ($n = 3$), and Institute 4 ($n = 3$). Given that we were interested in the Social Configuration and Basic Psychological Needs within each institute, two different interviews were designed and conducted separately with various interviewees. This was legitimated on the grounds that the relationships say something about Social Configuration and Basic Psychological Needs within each of the institutes.

2.2.3. Materials

2.2.3.1. Dimensions of the social learning questionnaire

Social Configurations were measured quantitatively using the Dimensions of Social Learning Questionnaire (DSLQ; Vrieling-Teunter et al., 2022b; see Supplementary files). This validated questionnaire is a self-reported instrument for capturing Social Configurations of TLGs. The questions are based on the three dimensions of social learning, namely (1) Practice integration, (2) Long-term orientation and goals, and (3) Shared identity and equal relationships. Table 2 contains the number of items for each scale, a sample question from each dimension of Social Configurations, and the reliability of the scales. The students scored the questions on a four-point Likert scale ranging from 'Totally disagree' to 'Totally agree.' The questionnaire took around 5 min to complete and was administered *via* an online application. Taking into account the number of items within each scale (3–5), homogeneity was considered to be high ($\alpha \geq 0.70$; see Table 2; Field, 2018).

2.2.3.2. Dimensions of the social learning interview

Qualitatively, Social Configurations were measured *via* a biographical interview based on the DSLQ by Vrieling-Teunter et al. (2022b); see Supplementary files. A biographical interview is a form of narrative inquiry (Nurse and O'Neill, 2018) in which students were asked to reflect on Social Configurations, dynamics, developments, and their future perspectives within the TLGs. Table 2 reports a sample question from the Dimensions of Social Learning Interview (DSLI) for each dimension of Social Configuration. The biographical interview was extended to include questions about the influence of COVID-19 (Morbée et al., 2020) on Social Configurations of TLGs (e.g., In what way has COVID-19 affected your personal and collective goals?). The DSLI lasted approximately 45 min and was conducted *via* Microsoft Teams.

2.2.3.3. Basic psychological needs questionnaire

Basic Psychological Needs were measured quantitatively using the Basic Psychological Need Satisfaction and Frustration Scales (BPNSFS; Chen et al., 2015). The BPNSFS is a validated self-report instrument that measures three Basic Psychological Needs: (1) Autonomy, (2) Relatedness, and (3) Competence. For the present study, the BPNSFS was adapted to the Basic Psychological Needs Questionnaire (BPNQ; see Supplementary files) to connect more closely to the situation of learning within TLGs. For example, the original statement "I feel warmly about people I spend time with" was adapted to "I feel warmly about people in my TLG." Items were rated on a four-point Likert scale ranging from 'Totally disagree' to 'Totally agree.' The questionnaire took approximately 5 min to complete and was administered *via* an online application. Table 3 shows the number of items for each scale, a sample question for each aspect of Basic Psychological Needs, and the reliability of the scales. Taking into account the number of items within the scale (4–7), the internal consistency of the Autonomy scale was considered to be low ($\alpha < 0.70$; see Table 3; Field, 2018). The reliability could not be increased by removing items. Yet, all items correlated well with the scale (item-total correlation ≥ 0.3; Field, 2018). We retained the scale since it was validated in earlier research (Vrieling-Teunter et al., 2022a; $\alpha = 0.71$) and allowed us to compare the present study with other research. The internal consistency of the other BPNQ scales (i.e., Relatedness and Competence) was high ($\alpha \geq 0.70$; see Table 3).

2.2.3.4. Basic psychological needs interview

Qualitatively, Basic Psychological Needs were measured *via* the semi-structured Motivation Interview (Jansen in de Wal, 2016). The interview included open-ended key questions for each scale of Basic Psychological Needs in order to capture students' perspectives from each institute. For the purposes of this study, the original semi-structured interview was adapted to the Basic Psychological Needs Interview (BPNI; see Supplementary files). Questions that focused on Autonomy, Relatedness, and Competence were retained. Table 3 presents a sample question of the interview for each aspect of Basic Psychological Needs. The interview was supplemented with questions about the influence of COVID-19 on learning (Morbée et al., 2020) in TLGs (e.g., In what way has COVID-19 affected your Relatedness in the TLG?), the (non)perception of fulfilled Basic Psychological Needs (Chen et al., 2015; e.g., What is your main reason for choosing this TLG?) and motivation of students in TLGs (Vrieling-Teunter et al., 2022a; e.g., How is it ensured that everyone gets equal input in the TLG?). The BPNI lasted approximately 45 min and was conducted *via* Microsoft Teams.

2.2.4. Procedure

This study was ethically approved by the Research Ethics Committee (cETO) of the Open Universiteit. Students received an information letter from the project leaders at their own institute during the first TLG meeting. By actively giving their informed consent, the students agreed to participate in the study. To collect the quantitative data, all students were invited to complete the questionnaires (i.e., DSLQ and BPNQ). To encourage a high response rate, the students were given the opportunity to complete the questionnaires during the TLG meetings. Students who did not complete the questionnaires due to absence subsequently received a reminder *via* an online application after 2 and 4 weeks. To collect the qualitative data, students were invited to participate in a semi-structured interview (i.e., DSLI or BPNI) by the project leaders at their own institute (see Table 4). These interviews were recorded with a voice recorder and then transcribed verbatim. All quantitative and qualitative data were anonymized, analyzed, and stored in Full Disclosure on RESEARCH drive, a storage service for education and research that complies with European privacy laws.

2.2.5. Data analysis

2.2.5.1. Quantitative analysis

Quantitative analyses were conducted through IBM SPSS 29. Nonparametric testing was performed because of the non-normal distribution of the data (Field, 2018) for DSLQ and BPNQ, which

TABLE 2 Reliability and number of items of the quantitative measurement of social configurations *via* the scales practice integration, long-term orientation and goals, and shared identity and equal relationships.

Scale	Number of items	Example items questionnaire	Cronbach's alpha	Example item interview
Practice integration	5	"To what extent are practical experiences with materials developed in the TLG discussed?"	0.85	"In what ways practical experiences are discussed within the TLG?"
Long-term orientation and goals	3	"To what extent conversations about short- and long-term goals occur?"	0.92	"As a student, what goals do you hope to achieve when you participate in the TLG?"
Shared identity and equal relationships	5	"To what extent reciprocal relationships among group members occur?"	0.90	"Describe the relationships between you and other TLG members?"

TABLE 3 Reliability and number of items of the quantitative measurement of experienced basic psychological needs *via* the scales autonomy, relatedness, and competence.

Scale	Number of items	Example items questionnaire	Cronbach's alpha	Example items interview
Autonomy	4	"In my TLG, I have a sense of choice and freedom in the things I do."	0.55	"How does the TLG selection process work?"
Relatedness	7	"I care about the people in my TLG."	0.84	"Why are TLG members (not) valuable to you?"
Competence	6	"In my TLG, I feel able to achieve my goals."	0.87	"Why do you feel you can (not) achieve individual and/or collective goals?"

TABLE 4 Number of participants in the dimensions of social learning interview and the basic psychological needs interview per institute.

	Institute 1	Institute 2	Institute 3	Institute 4
DSLI	$n = 2$	$n = 2$	$n = 2$	$n = 1$
BPNI	$n = 3$	$n = 1$	$n = 1$	$n = 2$

DSLI, Dimensions Social Learning Interview; BPNI, Basic Psychological Needs Interview.

could be a consequence of the small number of respondents (see "Students in TLGs").

To gain insight into both the direction and strength of the relationship between the three dimensions for Social Configurations and the three aspects of Basic Psychological Needs, correlation analyses were conducted for each institute. Kendall's Tau-b tests were chosen because of the small data set with a large number of equal ranks (four-point Likert scale). The methodological assumptions for Kendall's Tau-b were met (Allen et al., 2014). Two-sided testing was conducted since theory does not predict direction in correlation (see "Introduction").

2.2.5.2. Qualitative analysis

The qualitative analysis was conducted using ATLAS.ti 22. The coding schemes were generated deductively from the literature (Geisler and Swarts, 2019) for both variables (i.e., Social Configurations: Practice integration, Long-term orientation and goals, and Shared identity and equal relationships; and Basic Psychological Needs: Autonomy, Relatedness, and Competence). In addition, to capture the blended TLG component (i.e., contact learning, distance learning, and blended learning), the coding schemes for both variables were extended inductively. Two coders independently coded 10% of the qualitative data to calculate inter-rater agreement (O'Connor and Joffe, 2020). An acceptable inter-rater agreement reliability was obtained for Social Configurations ($\alpha = 0.70$) and Basic Psychological Needs ($\alpha = 0.70$; Krippendorff, 2018). A distinction was drawn between positive and negative feelings and the number of relevant quotes were calculated for each institute.

For Practice integration (see "Social configurations", Table 5, label Practice integration), students' statements were deductively organized by the labels extracted from DSLQ (i.e., Practice integration): Communication about classroom practice, Integration of group products in classroom practice, Adjustments of group products after discussion or feedback, Application of knowledge created in TLGs during training assignments, and Application of knowledge created in TLGs during assignments for classroom practice. Inductively, students' statements were organized *via* the labels: *Discussions about practical experiences through ICT during distance learning, Conducting practical research as scheduled during blended learning, and Exchanging of practical experiences during distance learning.* For Long-term orientation and goals (see "Social Configurations", Table 5, label Long-term orientation and goals), students' phrases were deductively organized *via* the labels extracted from DSLQ (i.e., Long-term orientation and goals): Description of collective goals, Description of individual goals, Communication about TLG goals, and Relation between TLG activities and group and/or individual goals. Inductively, students' phrases were organized *via* the label: *Achievement of goals in depth during blended learning.* For Shared identity and equal relationships (see "Social Configurations", Table 5, label Shared identity and equal relationships), students' narratives were deductively organized *via* the labels extracted from DSLQ (i.e., Shared identity and equal relationships): Reciprocal relationships between group members, Feeling of belonging to the group, Sense of equality between group members, and Feeling of safety to interact within the group. Inductively, students' narratives were organized *via* the labels: *Sense of equality because of contact learning and Informal conversations during distance learning.*

For Autonomy (see "Basic Psychological Needs", Table 6, label Autonomy), students' statements were deductively organized *via* the labels extracted from BPNQ (i.e., Autonomy): Take initiative, Ownership over TLG activities, Freedom of choice in content, Freedom of choice in collaborating partners, and Voluntary performance of tasks. Inductively, students' statements were organized *via* the label: *Choice of assessment conditions during blended learning.* For Relatedness (see "Basic psychological needs", Table 6, label Relatedness), students' phrases were deductively organized by the labels extracted from BPNQ (i.e., Relatedness): Sense of belonging, Content support, Emotional support, Eager to learn together and Care about TLG members. Inductively, students' phrases were organized *via* the labels: *Sense of belonging because of contact learning, Sense of relatedness through full distance learning instead of partly physical and partly onli*ne, and Emotional support during distance learning. For Competence (see "Basic Psychological Needs", Table 6, label Competence), students' narratives were deductively organized *via* the labels extracted from BPNQ (i.e., Competence): Feeling competent in training assignments, Feeling competent in assignments for classroom practice, Feeling competent in social skills, Achieving results, Achieving goals, Receiving positive feedback, and Clear structure. Inductively, students' narratives were organized *via* the labels: *Achieving results during distance learning and Discussing study schedule after adjustment contact/distance learning.*

3. Results

Shapiro–Wilk and Levene's tests were used to evaluate the assumptions of normality and homogeneity of variance, respectively. The distribution departed significantly from normality for Practice Integration (Institute 1: $W(47) = 0.94$, $p = 0.02$); Long-term orientation

TABLE 5 Social configurations at the four different institutes.

	Institute 1	Institute 2	Institute 3	Institute 4
Practice integration				
Communication about classroom practice	+ ($n = 1$)	+ ($n = 2$)		
Integration of group products in classroom practice		+ ($n = 3$)		+ ($n = 2$)
Adjustments of group products after discussion or feedback	+ ($n = 1$)	+ ($n = 2$)		
Application of knowledge created in TLGs during training assignments	+ ($n = 4$)	+ ($n = 3$)	+ ($n = 3$)	+ ($n = 1$)
Application of knowledge created in TLGs during assignments for classroom practice	+ ($n = 4$)	+ ($n = 1$)	+ ($n = 1$)	+ ($n = 1$)
Discussions about practical experiences through ICT during distance learning	+ ($n = 1$)			
Conduction of practical research as scheduled during blended learning			− ($n = 3$)	
Exchanging of practical experiences during distance learning				− ($n = 1$)
Long-term orientation and goals				
Description of collective goals	+ ($n = 2$)			
Description of individual goals				+ ($n = 2$)
Communication about TLG goals	+ ($n = 2$)	+ ($n = 1$)		
Relation between TLG activities and group and/or individual goals	+ ($n = 6$)		+ ($n = 7$)	
Achievement of goals in depth	+ ($n = 1$)	− ($n = 3$)	− ($n = 3$)	
Shared identity and equal relationships				
Reciprocal relationships between group members	+ ($n = 7$)	+ ($n = 6$)	+ ($n = 3$)	+ ($n = 3$)
Feeling of belonging to the group	+ ($n = 1$)	+ ($n = 1$)	+ ($n = 1$)	
Sense of equality between group members	+ ($n = 10$)	+ ($n = 2$)	+ ($n = 3$)	+ ($n = 1$)
Feeling of safety to interact within the group	+ ($n = 4$)	+ ($n = 2$)	+ ($n = 1$)	+ ($n = 1$)
Sense of equality because of contact learning	+ ($n = 3$)			+ ($n = 1$)
Informal conversations during distance learning			+ ($n = 1$)	

+, positive experiences; −, negative experiences; empty box, no expressed experiences; *n*, number relevant quotes.

and goals (Institute 1: $W(47) = 0.92$, $p < 0.01$, Institute 2: $W(9) = 0.78$, $p = 0.01$); Shared identity and equal relationships (Institute 1: $W(47) = 0.88$, $p < 0.01$); Relatedness (Institute 1: $W(47) = 0.95$, $p = 0.04$); and Competence (Institute 1: $W(47) = 0.94$, $p = 0.01$). Homogeneity of variance could not be assumed for Long-term orientation and goals ($p = 0.01$). These outcomes could be a consequence of the small number of respondents (see "Students in TLGs"). Hence, nonparametric testing was performed (Field, 2018).

Table 7 presents the descriptive data for the TLGs at the three institutes with respect to Social Configurations and Basic Psychological Needs. Kruskal-Wallis revealed that the variables Practice integration and Long-term orientation and goals differed significantly between the institutes. More specifically, significant differences were found between the institutes for Practice integration ($H(2) = 19.84$, $p < 0.001$), particularly between Institute 1 and Institute 2 ($p < 0.05$) and between Institute 1 and Institute 3 ($p < 0.001$). These were medium and large effects, respectively. Based on the rankings, students from Institute 1 ($n = 47$, Mean Rank = 39.20) provided significantly higher scores for Practice integration than students from Institute 2 ($n = 9$, Mean Rank = 21.56) and Institute 3 ($n = 9$, Mean Rank = 12.06). A significant difference was found between the institutes for Long-term orientation and goals ($H(2) = 9.94$, $p < 0.01$). The follow-up analysis once again showed a significant difference, with a medium effect between Institute 1 and Institute 2 ($p < 0.01$). Based on the ranking, students from Institute 1 ($n = 47$, Mean Rank = 36.60) experienced Long-term orientation and goals significantly more often than students from Institute 2 ($n = 9$, Mean Rank = 15.33). For the remaining variables, no significant differences between the institutes were found.

To gain insight into the relationship between Social Configurations and Basic Psychological Needs of students in blended TLGs (see Correlation between social configurations and basic psychological needs; RQ3), students' experiences of Social Configurations in the different institutes are first discussed (see Social configurations; RQ1). A brief overview of Social Configurations is presented for each institute in Table 5. Secondly, students' perceptions of the fulfillment of Basic Psychological Needs across the institutes are discussed (see Basic psychological needs; RQ2). In Table 6, a brief overview of the Basic Psychological Needs for each institute is presented. In order to better understand the blended TLG context, students' statements that pertained explicitly to this blended context are discussed in greater detail for the variables Social Configurations and Basic Psychological Needs.

3.1. Social configurations

Overall, students had positive feelings (+) with regard to Social Configurations in blended TLGs (see Table 5). Negative feelings (−) were expressed toward blended learning, distance learning and the

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TABLE 6 Fulfilling of basic psychological needs in the four different institutes.

	Institute 1	Institute 2	Institute 3	Institute 4
Autonomy				
Take initiative	+ (*n* = 2)	+ (*n* = 1)		+ (*n* = 1)
Ownership over TLG activities	+ (*n* = 2)		+ (*n* = 3)	+ (*n* = 3)
Freedom of choice in content	+ (*n* = 3)	+ (*n* = 2)		+ (*n* = 4)
Freedom of choice in collaborating partners	+ (*n* = 2)			
Voluntary performance of tasks	+ (*n* = 1)			+ (*n* = 1)
Choice of assessment conditions		+ (*n* = 1)	− (*n* = 5)	
Relatedness				
Sense of belonging	+ (*n* = 3)	+ (*n* = 2)	+ (*n* = 1)	+ (*n* = 2)
Content support	+ (*n* = 11)	+ (*n* = 9)	+ (*n* = 4)	+ (*n* = 2)
Emotional support		+ (*n* = 1)		
Eager to learn together	+ (*n* = 5)	+ (*n* = 1)		
Care about TLG members		+ (*n* = 1)	+ (*n* = 1)	
Sense of belonging because of contact learning				+ (*n* = 1)
Sense of relatedness through full distance learning instead of partly physical partly online	+ (*n* = 1)			
Emotional support during distance learning		+ (*n* = 1)		
Competence				
Feeling competent in training assignments	+ (*n* = 10)	+ (*n* = 3)		+ (*n* = 1)
Feeling competent in assignments for classroom practice				
Feeling competent in social skills		+ (*n* = 1)		+ (*n* = 1)
Achieving results	+ (*n* = 5)	+ (*n* = 4)		+ (*n* = 1)
Receiving positive feedback	+ (*n* = 1)			+ (*n* = 1)
Clear structure		+ (*n* = 4)		
Achieving results during distance learning	+ (*n* = 3)		− (*n* = 7)	+ (*n* = 1)
Discuss study schedule after adjustment contact/distance learning		+ (*n* = 1)		

+, positive experiences; −, negative experiences; empty box, no expressed experiences; n, number relevant quotes.

depth of the learning. Students from all institutes experienced Practice integration (see Table 5, label Practice integration). For example, all of the students in blended TLGs reported positive feelings about the application of knowledge generated in the TLGs during training assignments: "The interview from the academic workshop [TLG], I could use it for my own minor" (Female 1 - Institute 1). Students reported both positive and negative feelings concerning blended learning and Practice integration (see Table 5, label Practice integration, Institutes 1, 3, 4). Although students were satisfied with how the ICT applications (in subgroups) allowed them to share practical experiences during blended TLGs: "First, just in a large group, than in smaller *Meets*" (Male 1 - Institute 1), students also felt there was insufficient time to share these practical experiences during distance learning: "[We discuss] in breakout rooms. That's not every meeting. … There is not always room to discuss what we do in practice" (Female 2 - Institute 4). Furthermore, practice research was sometimes delayed due to distance learning and TLG meetings were intermittently canceled: "I think that [distance learning] caused the research at school to start later, and I think that [distance learning] also caused several meetings to be canceled" (Female 3 - Institute 3).

Long-term orientation and goals was perceived by students from all institutes (see Table 5, label Long-term orientation and goals). For instance, students in blended TLGs reported positive feelings concerning the relation between TLG activities and individual goals: "This [giving feedback] allows me to get a better idea of how the theoretical framework is constructed, so that benefits my learning goals" (Male 2 - Institute 3). Students expressed both positive and negative feelings about the depth of the learning during blended learning and Long-term orientation and goals (see Table 5, label Long-term orientation and goals, Institutes 1, 2, 3). In blended TLGs, the depth of the learning (see also "Correlation between social configurations and basic psychological needs", correlation between Long-term orientation and goals and Relatedness) was either achieved (Institute 1) or compromised (Institutes 2 and 3) insofar as goals were adequately or inadequately accomplished. "Due to the lack of physical contact … I think we were very limited in what we wanted to get out of our network [TLG]" (Female 4 - Institute 2).

Wholly positive feelings were expressed by students from all institutes regarding Shared identity and equal relationships (see Table 5, label Shared identity and equal relationships). For instance,

students in blended TLGs reported positive feelings toward reciprocal relationships between the TLG members: "Everybody gets along well, so it's just a very nice working atmosphere" (Male 1 - Institute 1). There were similar sentiments expressed with respect to the blended context and Shared identity and equal relationships, (see Table 5, label Shared identity and equal relationships, Institutes 1, 3, 4), with the difference between contact and distance learning being particularly notable. On the one hand, students noticed that contact learning helped to cultivate an atmosphere of equality (Institutes 1, 4): "I also like that [contact learning] the most because I feel it's more equal there" (Female 2 – Institute 4). On the other hand, when informal conversations were organized during distance learning, the impact of distance learning on the interaction with other TLG members was minimal: "Those [little moments to catch up] are also sufficiently interspersed during meetings. So, yes, there has been some influence. But that's not too bad" (Male 2 - Institute 3).

3.2. Basic psychological needs

Overall, students in blended TLGs expressed positive feelings (+) with regard to the fulfillment of Basic Psychological Needs (see Table 6). Negative feelings (−) were reported toward blended and distance learning. Students from all institutes experienced the fulfillment of the need for Autonomy in blended TLGs (see Table 6, label Autonomy). For example, students reported positive feelings concerning freedom of choice in content: "I was just able to do what I wanted to do and discuss what I wanted to discuss" (Female 5 - Institute 2). Students expressed both positive and negative feelings toward blended learning and the need for Autonomy (see Table 6, label Autonomy, Institutes 2, 3). While some students experienced positive feelings toward having autonomy over flexible assessment conditions during blended learning: "They offered some more space for extra submission dates" (Female 5 - Institute 2), other students experienced externally imposed pressure due to the mandatory assessment conditions whose fulfillment was sometimes threatened because of sudden switches between contact and distance learning: "We must make 40 h in a year [assessment condition: 40 h TLG work per academic year]. … From college [Institute 3] it is an obligation. … First, I was intrinsically motivated because I liked the subject. … Now I'm extrinsically motivated because I'm pushed by those hours" (Female 6 - Institute 3).

In the interviews, students from all institutes expressed fulfillment of the need for Relatedness in blended TLGs (see Table 6, label Relatedness). For instance, students had positive feelings about content support: "We are looking for a solution together, this has created more relatedness between the students" (Female 3 - Institute 3). Students expressed solely positive feelings toward blended learning and Relatedness (see Table 6, label Relatedness, Institutes 1, 2, 4). They experienced Relatedness as a result of having TLG meetings entirely at distance rather than being partly online and partly physically present: "That link between online and physical was just difficult" (Male 3 - Institutes 1). Furthermore, during distance learning students set goals to support each other emotionally: "First, talk about the lesson and then just talk about how it's going. … The PLG [TLG] has kept the same function, but it has also gained a bit of a different context" (Female 5 - Institute 2). Students also felt a sense of Relatedness due to experiencing similar difficulties: "I also feel a pretty strong connection … Because we encounter some of the same struggles" (Female 7 - Institute 4).

Regarding the fulfillment of the need for Competence, overall, the students reported positive feelings toward blended TLGs (see Table 6, label Competence, Institutes 1, 2, 4). For example, students expressed that they became more competent in the training assignments: "I provide input and I can tell and share things with the people in that team [TLG]. .. I've grown in that compared to last time" (Female 2 - Institute 4). Students reported both positive and negative feelings toward distance learning and Competence (see Table 6, label Competence, Institutes 1, 2, 3, 4). Specifically, students experienced a sense of Competence when they achieved results despite distance learning (Institutes 1, 4): "But to see that it succeeded in the end, that does give a boost" (Female 1 - Institute 1). Also, students had positive feelings when obtaining a structured study schedule after discussing the modified schedule because of the sudden switch between contact and distance learning: "So, that's kind of nice that we can just offer some more direction and some more clarity to each other" (Female 5 - Institute 2). However, students expressed negative feelings toward Competence, and, in particular, were disappointed with the results they achieved when the TLG project was delayed due to the isolation period: "I thought I would learn a lot. … It's just, because it's so often postponed and so often … canceled at the last minute, I do get a little more frustrated" (Female 6 - Institute 3).

TABLE 7 Descriptive statistics for social configurations and basic psychological needs for Institutes 1, 2, and 3.

	Institute 1[a] n=48	Institute 2 n=9	Institute 3[b] n=10	Kruskal–Wallis **p<0.05
Dimensions of social learning				
Practice integration **	3.04 (0.08)	2.33 (0.23)	1.82 (0.24)	< 0.01
Long-term orientation and goals **	3.03 (0.09)	1.93 (0.31)	2.78 (0.31)	< 0.01
Shared identity and equal relationships	3.30 (0.10)	3.44 (0.12)	2.89 (0.23)	0.14
Basic psychological needs				
Autonomy	2.84 (0.06)	3.11 (0.20)	2.60 (0.22)	0.06
Relatedness	3.16 (0.08)	3.16 (0.15)	3.00 (0.19)	0.62
Competence	3.25 (0.08)	3.26 (0.13)	3.10 (0.18)	0.78

Students scored the questions on a four-point Likert scale ranging from "Totally disagree" to "Totally agree." Means and standard deviations (between brackets) are provided.[a]For dimensions of social learning n = 47.
[b]For dimensions of social learning n = 9.

3.3. Correlation between social configurations and basic psychological needs

To describe the correlation between the three dimensions of Social Configurations and the three aspects of Basic Psychological Needs in blended TLGs, first the results of the qualitative analysis are presented for each institute. Because of the uneven sample sizes among the participating institutes, results of the quantitative analysis should be interpreted with caution. Statistic significant correlations were found in Institute 1 with the largest group size. Next, the relations between the qualitative and quantitative outcomes are discussed. In Table 8, the outcomes of the quantitative analysis are presented for each institute.

Students from Institutes 1 and 4 referred to the relationship between Practice integration and Autonomy in the interviews that corresponded to the label *Autonomous choices regarding content* (see "Introduction", variable 1): "You got to choose your own topic… Because it was all about what you wanted to learn and what you wanted to achieve" (Female 8 - Institute 4). Students in blended TLGs also highlighted two important preconditions for the relationship between Practice integration and Autonomy: (1) ownership over practice research: "To do things the way I like. … I am given a lot of responsibility and I do appreciate that" (Male 4 - Institute 1), and (2) ownership over practice assessment: "In this minor … you had to make your own assessment form" (Female 8 – Institute 4). There was no relationship found between the amount of experienced Practice integration and the fulfillment of the need for Autonomy for any of the institutes.

Students from Institutes 1, 2, and 4 described the relationship between Practice integration and Relatedness in the interviews that corresponded to the label *Sharing, support, and social skills* (see "Introduction", variable 3). The students in blended TLGs opined that it was necessary to exchange practical experiences during distance learning (i.e., Sharing): "That you have more people around you that you can talk to about your internship. Because of course that is a bit less in this time" (Female 5 - Institute 2). Moreover, the students experienced relatedness through sharing practical materials developed in the blended TLG (i.e., Sharing): "They are so enthusiastic about it [children's book publication] too, so I do feel more of a connection with them" (Female 8 - Institute 4). The students in blended TLGs also asked for help from experts (i.e., Support) and enjoyed learning with them (i.e., Social skills): "I also really enjoy being able to ask questions to people I would not normally be able to ask questions to, like an elementary school principal" (Male 4 - Institute 1). There was no relationship found between the amount of perceived Practice integration and the fulfillment of the need for Relatedness.

During the interviews, students from Institutes 1, 2, and 4 made reference to the correlation between Practice integration and Competence that corresponded to the label *New knowledge* (see "Introduction", variable 2): "As the year progresses you learn a lot more because … so I could … give my opinion, because I had more knowledge about it" (Female 9 - Institute 1). In blended TLGs, students also drew special attention to the precondition of achieving results through modifying practical materials after online TLG discussions: "We had a lot of consultation moments online. … What can we improve? … We made adjustments and then another prototype came out" (Male 1 - Institute 1). The students also felt that they achieved results despite distance learning because the materials developed in the blended TLG were wholly applicable in practice (Institutes 2, 4): "Looking back now, I do not mind at all that certain things did not work out physically, because it did bring us where we are now [children's book publication]" (Female 8 - Institute 4). The more Practice integration the students experienced, the greater the perception that the need for Competence had been fulfilled ($\tau = 0.34$, $p < 0.010$; Institute 1).

For Institute 4, a relationship between Long-term orientation and goals and Autonomy that corresponded to the label *Personal goals* (see "Introduction", variable 4) was expressed by the students in the interviews. The students in blended TLGs experienced freedom of choice over how to achieve their Personal goals: "We got information from different sources, and we processed all this to .. how we would like to present it. … So, we really needed our own creativity" (Female 8 - Institute 4). There was no relationship found between the amount

TABLE 8 The results of Kendall's Tau-b test for social configurations and basic psychological needs per institute.

	Social configurations		
Basic psychological needs	Practice integration	Long-term orientation and goals	Shared identity and equal relationships
Institute 1 (n =48)			
Autonomy	< 0.01	0.20	0.38*
Relatedness	0.13	0.19	0.47**
Competence	0.34*	0.29*	0.64**
Institute 2 (n =9)			
Autonomy	−0.13	−0.10	−0.54
Relatedness	0.55	0.42	0.09
Competence	0.52	0.45	0.26
Institute 3 (n =10)			
Autonomy	−0.15	0.15	0.29
Relatedness	0.15	−0.03	0.35
Competence	−0.06	0.29	0.45

|0.11–0.30| = small correlation; |0.31–0.50| = medium correlation; |0.51–0.80| = large correlation.
*$p < 0.010$; **$p < 0.001$.

of perceived Long-term orientation and goals and the fulfillment of the need for Competence.

The interviews for Institutes 1 and 2 showed a relationship between Long-term orientation and goals and Relatedness that we labeled as *Goal discussion*. Students in blended TLGs noted that they achieved goals due to discussions with TLG members: "Our goal was to make an infographic and to start working with a website. … someone who knows about it joined us and … we explained our whole process" (Male 3 - Institute 1). In contrast, the students in blended TLGs also opined that goals were negatively impacted by distance learning: "I think the goals we pursued were very limited because of the lack of physical contact" (Female 4 - Institute 2). There was no relationship found between the amount of perceived Long-term orientation and goals and the fulfillment of the need for Relatedness.

In the interviews, students from Institutes 1 and 3 referred to the correlation between Long-term orientation and goals and Competence that we labeled as *Goals in depth*. During the period of distance learning, the TLG goals were pursued at a deep level, which in turn led to a sense of competence among the students in blended TLGs: "Because of corona we went even further. .. And so, it's actually much better no" (Male 1 - Institute 1). In contrast, students in blended TLGs also experienced a lack of purposiveness, which in turn led to doubt about their own effectiveness: "We cannot work on anything in a focused way. … I feel like I'm just doing whatever" (Female 6 - Institute 3). The more Long-term orientation and goals was experienced, the more fulfillment of the need for Competence was experienced ($\tau = 0.29$, $p < 0.010$; Institute 1).

Students from Institute 1 made reference to the correlation between Shared identity and equal relationships and Autonomy in the interviews that we labeled as *Equality through volunteer input*. According to the students, volunteer input in blended TLGs helped to cultivate an atmosphere of equality: "At the end of the day, I think there's quite a lot of volunteer input. So .. without an assignment attached to it" (Female 1 - Institute 1). The more students experienced Shared identity and equal relationships, the greater the perception that the need for Autonomy was fulfilled ($\tau = 0.38$, $p < 0.010$; Institute 1).

Students from all institutes referred to the relation between Shared identity and equal relationships and Relatedness in the interviews that corresponded to the label *Equality in an informal atmosphere* (see "Introduction", variable 7): "There's not so much of a hierarchy. .. the proper mutual appreciation …, so that's kind of nice" (Male 4 - Institute 1). The students in blended TLGs experienced reciprocal relationships among the TLG members, which in turn established a sense of Relatedness: "The contact in the network became easier and the learning together also, because I notice that in the meetings we really dare to react to each other, positively and negatively" (Male 3 - Institute 1). Students in blended TLGs also experienced secure relationships between TLG members, which in turn helped to foster a sense of connection (Institute 2) and made them eager to learn together (Institute 3): "It's an .. atmosphere where we can just ask questions and where it's also not crazy if you make a comment that everyone else knows and you do not understand" (Female 6 - Institute 3). Students indicated that reciprocal, equal relationships, and a sense of belonging were strengthened by physical contact between TLG members: "The connection is stronger. … I see them more often [physically]. … I feel like it's more equal" (Female 2 - Institute 4). The more Shared identity and equal relationships the students experienced, the greater the perception that the need for Relatedness was fulfilled ($\tau = 0.47$, $p < 0.001$; Institute 1).

In the interviews, students from all institutes made reference to the coherence between Shared identity and equal relationships and Competence that corresponded to the label *Scaffolding* (see "Introduction", variable 6). Students began to equally participate in the blended TLG as their sense of competence increased over the course of the academic year (Institutes 1, 3 and 4): "In the beginning I was a little afraid that it was not good, because I had less knowledge. As the year progressed, I noticed that I dared to take more initiative" (Female 9 - Institute 1). Students also highlighted two important preconditions in the blended TLG regarding the relationship between Shared identity and equal relationships and Competence: (1) students felt competent because of the collective responsibility in the TLG: "You still have the experts, of course, and I'm still a student, but you do it together, so you'll actually soon be an expert together" (Male 3 - Institute 1), and (2) students found a structured study schedule during distance learning as a result of the reciprocal relationships within the TLG: "Everyone is reconfiguring what do I need to do and how. And by also being able to discuss that in a PLG [TLG]" (Female 5 - Institute 2). The more students perceived Shared identity and equal relationships, the more fulfillment of the need for Competence they experienced ($\tau = 0.64$, $p < 0.001$; Institute 1).

4. Discussion

Undergraduate students in higher education often have to carry out a large amount of individual work as part of their studies, which can lead to a lack of connection between students and their educational institutions (Vrieling-Teunter et al., 2022a). This lack of contact can result in feelings of emotional loneliness and a lack of belonging that negatively impact upon students' well-being, motivation for learning, and academic performance (Dopmeijer, 2021). While face-to-face TLGs can support students' well-being and motivation (Vrieling-Teunter et al., 2022a), due to the COVID-19 measures, educational institutes – including TLGs – were forced to switch to blended learning (Meeter et al., 2020; Pokhrel and Chhetri, 2021). This more flexible way of learning may constitute a challenge for the Social Configurations of blended TLGs, which in turn can undermine students' ability to fulfill Basic Psychological Needs (*cf.* Morbée et al., 2020). In order to gain insight into the variables that support students' Basic Psychological Needs in blended TLGs, we investigated: (a) in which ways students experienced a variety in Social Configurations and fulfillment of Basic Psychological Needs of blended TLGs and (b) the extent to which Social Configurations of blended TLGs were related to students' Basic Psychological Needs. These two inquiries culminated in three research questions whose conclusions we describe below.

> In what ways do students experience variation in Social Configurations within blended TLGs? (RQ1).

In our interviews, it is evident that the students experienced positive and negative feelings toward Practice integration and Long-term orientation and goals. The differences in feelings toward Practice integration may stem, in part, from differences in how practice research was organized and how discussions about practical experiences took place within the institutes during distance learning. In one institute, discussions about practical experiences during distance learning were organized in (sub)groups using new functionalities within ICT. In other institutes, practice research was delayed and TLG meetings were canceled during distance learning. One potential explanation for this is the sudden switch to blended learning due to COVID-19 measures, and the fact that distance learning may have made it more challenging for students to

conduct practice research or exchange practical experiences. The differences in feelings expressed toward Long-term orientation and goals may be explained by how COVID-19 measures influenced the depth of students' learning goals. In one institute, the measures caused goals to be developed and pursued in depth, which in turn led to a competent feeling among students. In another institute, the measures led students to either superficially pursue or suspend goals, which made students feel ineffective and like they had failed to achieve results. Students in blended TLGs thus stressed the importance of pursuing goals in depth and achieving results to feel a sense of Competence. These findings are in line with Locke and Latham (2012) Goal Setting Theory, which posits that specific and challenging goals can lead to high motivation and satisfactory performance, because goal setting provides direction for actions and behaviors.

> In what ways do students experience variation in the fulfillment of Basic Psychological Needs within blended TLGs? (RQ2).

Overall, interviewed students experienced positive feelings regarding the fulfillment of Basic Psychological Needs. Surprisingly, the students reported solely positive feelings toward the fulfillment of the need for Relatedness within blended TLGs. For instance, the students reported experiencing a relatively high fulfillment of the need for Relatedness even in situations characterized by full distance learning. This finding also emerged in Admiraal's (2022) study, which emphasized that the sense of Relatedness during COVID-19 was enhanced by whole-group distance learning. However, these results contradict the findings of previous studies within educational institutions in the Netherlands and other Western countries during COVID-19, which demonstrated that students experienced reduced fulfillment of the need for Relatedness (e.g., Meulenbroeks, 2020; Morbée et al., 2020) and that the pandemic had emotionally impacted upon them (Müller et al., 2021). An explanation for the contradicted results could be the difference in the learning environment where the studies were conducted. Students in the present study and in the study by Admiraal (2022) were enrolled in group learning whereas students in the other cited studies were enlisted in individual learning paths.

> To what extent are blended TLGs' social configurations related to students' basic psychological needs? (RQ3).

From the quantitative findings, especially in Institute 1, we found that the more students experienced Shared identity and equal relationships, the greater the fulfillment of Basic Psychological Needs they perceived. Also, the more students encountered fulfillment of the need for Competence, the more they experienced blended TLGs' Social Configurations. The interviewed students experienced more fulfillment of their Basic Psychological Needs when working voluntarily in an equal relationship (i.e., Equality through volunteer input) and in an informal atmosphere (i.e., Equality in an informal atmosphere). In relation to the level of perceived Competence, the interviewed students reported an increase in equal participation which was built up gradually (i.e., Scaffolding). They also highlighted the importance of collective responsibility in the blended TLG and the possibility of relying on a structured study schedule. Due to the COVID-19 measures and sudden switches between contact and distance learning, students' study schedules were regularly adjusted. Discussing the modified study schedule with other TLG members helped some of the interviewed students to achieve a structured study schedule, as not all students are equally skilled in handling this flexible study schedule independently. These challenges in students' capabilities to plan and monitor their learning relate to findings of the studies of Graham (2019) and Günes and Alagözlü (2021). Their studies show that within learning environments in which contact and distance learning are continually alternating, high standards for students' self-regulation must be set because students need guidance to handle the autonomy to effectively direct their own learning. Graham (2019) also suggests that particularly students who lack self-regulation skills encounter difficulties during blended learning. In addition, the interviewed students in the present study perceived more Social Configurations when they created and shared new knowledge in the blended TLG (i.e., New knowledge) and when they pursued deep goals (i.e., Goals in depth). The practical use of materials developed in blended TLGs was also cited as being important for developing Competence. Conversely, according to the interviewed students, unclear goals led to feelings of incompetence.

These findings are in line with Vrieling-Teunter et al. (2022a), who found that there is a relationship between face-to-face TLGs' Social Configurations and Basic Psychological Needs among students. When comparing both studies (see "Introduction"), the following relationships for realizing student support are present in both face-to-face and blended TLGs: (1) Autonomous choices regarding content; (2) New knowledge; (3) Sharing, support, and social skills; (4) Personal goals; (5) Scaffolding; and (6) Equality in an informal atmosphere. One relationship that was reported in face-to-face TLGs but not expressed by students in blended TLGs is Autonomous choices regarding collaborating partners. Although students did express the importance of making autonomous choices in terms of collaboration partners (e.g., the importance of providing and receiving feedback in a familiar atmosphere), they did not relate these autonomous choices to TLGs' Social Configurations in the interviews. The students in the present study shed light on three new relationships within blended TLGs: i.e., Equality through volunteer input; In-depth goals; and Goal discussion. Regarding Equality through volunteer input, students underlined the importance of voluntary participation in blended TLGs to enhance equal relations between the TLG members. This finding is in line with Gray and Stevenson (2020), who described group relations' dynamic among volunteer participants as being one of equality, rather than hierarchy, since volunteer participants share an identity with others promoting feelings of belonging and impacting the participants' well-being. In addition, the students pointed out the importance of pursuing deep goals in dialog with others for fulfilling Basic Psychological Needs. Similar to Locke and Latham (2012), challenging but achievable goals can lead to high motivation when feedback from others is given regarding the goal-direction, so the approach to achieving the goal can be adjusted.

5. Conclusion and limitations

There are a number of limitations with the present study, which inform suggestions for follow-up research. A first limitation pertains to the low number of respondents ($n = 70$) in the study (see "Data collection"). We chose to combine quantitative findings with qualitative data obtained from in-depth interviews with students from different teacher education institutes. This restricted the amount of participants that we could select for our analyses. Moreover, the sample consists

solely of teacher education students, and it is unclear whether the findings can be applied to other disciplines with similar small-scale teaching. Therefore, we must be careful to generalize the Social Configurations and fulfillment of Basic Psychological Needs to the experiences of all Dutch students in blended TLGs. Follow-up research is recommended in blended TLGs in the Netherlands and other (Western) countries, with particular attention being paid to securing a sufficiently large response group so that the results yield more insights and a better understanding of related processes and contextual factors (such as culture, national policies, etc.) can be considered.

A second limitation pertains to the reliability of the quantitative questionnaire for Basic Psychological Needs. For BPNQ, the value of the internal consistency of the scale Autonomy is $\alpha = 0.55$. Taking into account the number of items within the scale (4), these values are insufficient ($\alpha < 0.70$) for a reliable scale construct (Field, 2018). The value of internal consistency cannot be increased by removing items. However, all items correlate well with the scale (item-total correlation ≥ 0.3; Field, 2018). Moreover, in previous research this scale proved to be sufficiently reliable $\alpha = 0.71$ (see Vrieling-Teunter et al., 2022a). Therefore, we retained the scale Autonomy containing all the items. However, the BPNQ may lead to insufficiently consistent results for the scale Autonomy and thus should be interpreted with caution. Follow-up studies with larger and equally distributed sampled groups should ascertain the extent to which our scales are reliable.

A third limitation with the present study concerns the unpredictability of the form of education in which students in blended TLGs were taught due to COVID-19 measures. We conducted our research in a chaotic time in which switching between contact and distance learning was unplanned and depended on externally imposed COVID-19 measures. Therefore, blended learning in this context implies another interpretation of blended learning as was defined by Müller and Mildenberger (2021), namely that it involves a thoughtful integration of contact and distance learning. This study adds to research in showing that institutes in higher education were able to implement and uphold TLGs in an unpredictable context in which the fulfillment of students' Basic Psychological Needs were guaranteed and showed relations with how the Social Configurations were perceived by students. A (quasi-) experimental study comparing several TLGs in different forms of learning contexts (i.e., contact, distance, planned and unplanned blended education) may help to identify differences in Social Configurations and their relations to students' motivation and well-being.

To conclude, the results of the present study show that, similar to Vrieling-Teunter et al. (2022a), within blended TLGs students perceived that there is a positive relation between Shared identity and equal relationships and the fulfillment of Basic Psychological Needs. Moreover, the students in this study perceived that there is a positive relationship between the fulfillment of the need for Competence and blended TLGs' Social Configurations. In-depth learning thus appears to be more challenging in distance learning, according to some students, while the unpredictability of the COVID-19 measures on the way that learning is organized also poses notable difficulties. However, even during the unpredictable period of the pandemic, the TLGs' Social Configuration was still related to more fulfillment of Basic Psychological Needs, especially concerning Shared identity and equal relationships, which indicates that TLGs have a positive influence upon the well-being of students during uncertain times. This means that in the development and design of higher education curricula, educators should keep in mind that collective learning in TLGs is important for students' motivation and well-being, and that it is important to make conscious choices in this regard. Furthermore, experiencing collective learning may be important for students' motivation and well-being beyond the boundaries of their current TLGs for more general applications for professional development such as Community of Practice (Wenger et al., 2011), Professional Learning Communities (Huijboom et al., 2021) or learning networks.

Based on the findings the following success factors could be taken into account when organizing blended TLGs:

- Awareness of the difficulties that may be encountered during distance learning regarding the organization of practice based research and the exchange of practical experiences is important. For instance organizing (sub)groups using new functionalities within ICT can be supportive herein. [Practice Integration]
- The depth of students' learning goals can be a challenge in blended TLGs. For instance paying attention to the development and the pursuing of specific and challenging goals adequately in dialog with other TLG-members is pertinent. [Long-term orientation and goals]
- Equality in an informal atmosphere should be developed gradually, based on, for example, autonomous choices, ownership and voluntary input. [Shared identity and equal relationships, Autonomy]
- In blended TLGs – were students are enlisted in group learning – distant TLG-meetings organized in whole-group learning is recommended. [Relatedness]
- Collective responsibility, planning and monitoring of the learning processes, the utilization of developed tools in blended TLGs in educational practice, can lead to students' feelings of competence. [Competence]

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the cETO committee of the Open Universiteit under number U2019/03249/HVM. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2023.1135844/full#supplementary-material

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