

ORIGINAL RESEARCH

Learning nursing during the COVID-19 pandemic: The importance of perceived relatedness with teachers and sense of coherence

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ABSTRACT

Background and objective: In March 2020, the COVID-19 pandemic infected populations worldwide. To limit the spread, many countries declared stay-at-home orders. Teachers were suddenly obliged to teach and facilitate learning online, whereas students had to manage online education alone from home. Within self-determination theory (SDT), the need for relatedness is considered crucial for personal growth, well-being, motivation and learning, whereas sense of coherence (SOC) is a salutogenic health concept explaining humans' coping with stressful situations. The aim of this study was to investigate the importance of teacher relatedness as well as SOC, including the concepts of comprehensibility, manageability and meaningfulness, among nursing students during the COVID-19 pandemic.

Methods: Survey data were collected from 329 nursing students at a large university in Norway. Twelve hypotheses of the associations between teacher relatedness, SOC and perceived learning were tested by means of structural equation modelling (SEM) using Stata.

Results: The SEM yielded an acceptable fit ($\chi^2 = 177.60, p = .000, df = 80, \chi^2/df = 2.22, RMSEA 0.063, CFI = 0.96, SRMR = 0.048$), showing significant, positive relationships between the latent variables of teacher relatedness, SOC and perceived learning. Eleven out of the twelve hypotheses found support, showing both direct and indirect relationships between the latent variables.

Conclusions: The study indicates that caring and close teachers seem very important for nursing students' learning during the COVID-19 pandemic. Many students do not experience such a teacher relationship, resulting in difficulties studying and learning under crisis. Knowledge about how teachers may mobilize care and close relationships with nursing students is important for students' learning during a pandemic situation when teaching go digital.

Key Words: Nursing students, Online learning, Teacher relatedness, Sense of coherence

1. INTRODUCTION

In March 2020, the COVID-19 pandemic infected populations worldwide as it spread with alarming speed, infecting millions and bringing economic activities to a standstill. To

limit the spread, many countries decided to lock down. Students as well as employees in schools and universities had to manage the new situation by utilizing digital tools, learning platforms and video communication, studying and teaching

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from home. Isolated from their peers and families, students were obliged to manage online learning alone at home. This situation created an upheaval, leading to problems with motivation, concentration, manageability and efficiency, emotions of nervousness, fear, worry and sleeplessness among students.^[1-4]

In Norway, there is an increasing shortage of Registered Nurses (RNs), causing serious challenges for the health care sector and the society in the years to come. Consequently, it is crucial that students choose to study nursing and complete their education. However, during the pandemic RNs as well as nursing students experienced severe stress caused by increased work schedules (alongside their studies) as well as decreased work schedules caused by COVID-19-restrictions.^[5,6] Globally, nursing students express stress, anxiety and uncertainty about how to approach the present pandemic situation.^[1,7-9] Therefore, knowledge about how to support learning nursing digitally from home is vital.

Looking at learning by utilising the salutogenic health theory^[10,11] in interaction with the Self-determination theory (SDT),^[12,13] this study explores nursing students' experiences during the pandemic. Humans have three basic, innate psychological needs that must be satisfied for optimal growth and well-being: these are autonomy, competence and relatedness. Students' perceived satisfaction of these needs relates closely to their healthy and optimal functioning. Students' learning environment can either support or thwart these needs, and thus influence on students' motivation, school-related attitudes, emotions and behaviours. In consequence, academic engagement, learning outcomes and completion of the study will be influenced as well.^[12,13] This study looks specifically at relatedness. Relatedness refers to both experiencing others as responsive and sensitive and being able to be responsive and sensitive to them. Associated with the need for relatedness are interpersonal connection, acceptance, trust, recognition, caring, and benevolence.^[12,13] Hence, teacher relatedness might be fundamental not only to students' learning, but for their need of relatedness and well-being.

However, the COVID-19 caused several restrictions on students' relatedness, both concerning peers and teachers; relatedness was largely only possible by digital tools. In this situation, finding new ways to support students' need for relatedness is highly welcome. Therefore, this study explores nursing students' perceived relatedness while studying digitally from home.

The salutogenic health theory^[10,11] involves activation of inner coping resources, among which sense of coherence (SOC) is fundamental. SOC represents a life orientation in-

volving three dimensions: comprehensibility, manageability and meaningfulness.^[14] According to Antonovsky, comprehensibility refers to the extent to which nursing students perceive their internal and external environments as understandable. Hence, information should be perceived as ordered, consistent, structured and clear, rather than chaotic, disordered, random, accidental and inexplicable. The second component, manageability, concerns the extent to which nursing students perceive that adequate resources are at disposal while facing demands posed by the new pandemic situation. The third component, meaningfulness refers to the extent, which nursing students find their learning environment to make sense emotionally. This life orientation has a great impact on managing stressful situations and ultimately solving them.^[10,11]

Successful coping, depends on the SOC as a whole. Nevertheless, Antonovsky^[10,11] underscored meaningfulness to be the most crucial: without meaningfulness, comprehensibility and manageability are likely to be temporary. Since high manageability is contingent on understanding, comprehensibility appears to be the next in importance. If one does not believe that resources are at one's disposal, meaningfulness decreases and coping efforts weaken. For nursing students, several coping resources were restricted by the COVID-19 pandemic and its severe consequences. How did the university approach these facts? How did the education facilitate students' learning environment and learning processes in this specific situation?

In several populations, SOC performs as a significant resource for coping with stressful and unforeseeable situations in daily life.^[15] As previously stated, among nursing students the COVID-19 pandemic caused an upheaval of stress, anxiety, nervousness, uncertainty, fear and sleeplessness causing low motivation, concentration and study efficiency.^[1-4] Consequently, universities should embrace the pandemic situation in health promoting ways, as well as identifying salutogenic learning resources. Currently, there is a call for studies applying salutogenesis to fields beyond the health care sector.^[16] Thus, the present study applies salutogenesis and pedagogical knowledge to nursing education.

Summing up, knowledge about health promoting education is scarce,^[14,17] the same goes for relatedness (connectedness) and SOC as salutogenic resources for students' learning.^[14,18] As disclosed in the present literature review, the COVID-19 pandemic caused various challenges to nursing students globally: uncertainty, stress, loneliness and mental health problems,^[1,4,8] sleeplessness,^[3] problems with concentration and learning efficiency,^[1,4] fear of infection as well as anxiety regarding grades, passing the

lesson and final graduation.^[6,7,9] Hence, the pandemic directs the significance of developing health promoting educations/universities, specified by a health promoting learning environment utilizing salutogenic learning resources, such as SOC and teacher relatedness. Therefore, this study investigates the relationships between teacher relatedness, Work-SOC related to nursing students' learning and learning environment (or study situation) by means of advanced statistics such as structural equation modelling (SEM). The research questions are as follows: During the first year of the COVID-19 pandemic:

- 1) Does perceived teacher relatedness affect nursing students' learning?
- 2) Do students' experiences of comprehensibility, manageability and meaningfulness affect students' learning?

One-dimensional measurement models for perceived learning and teacher relatedness and a three-dimensional construct of Work-SOC^[19] were applied. Based on the theoretical and empirical knowledge about teacher relatedness, Work-SOC and learning, the following 12 hypotheses were stated and portrayed in Figure 1:

Hypothesis 1 (H1): Teacher relatedness directly affects perceived learning.

Hypothesis 2 (H2): Teacher relatedness directly affects meaningfulness.

Hypothesis 3 (H3): Teacher relatedness directly affects comprehensibility.

Hypothesis 4 (H4): Teacher relatedness directly affects manageability.

Hypothesis 5 (H5): Meaningfulness directly affects perceived learning.

Hypothesis 6 (H6): Manageability directly affects perceived learning.

Hypothesis 7 (H7): Meaningfulness directly affects comprehensibility.

Hypothesis 8 (H8): Meaningfulness directly affects manageability.

Hypothesis 9 (H9): Comprehensibility directly affects manageability.

Hypothesis 10 (H10): Teacher relatedness indirectly affects comprehensibility, manageability and perceived learning.

Hypothesis 11 (H11): Meaningfulness indirectly affects manageability and perceived learning.

Hypothesis 12 (H12): Comprehensibility indirectly affect perceived learning.

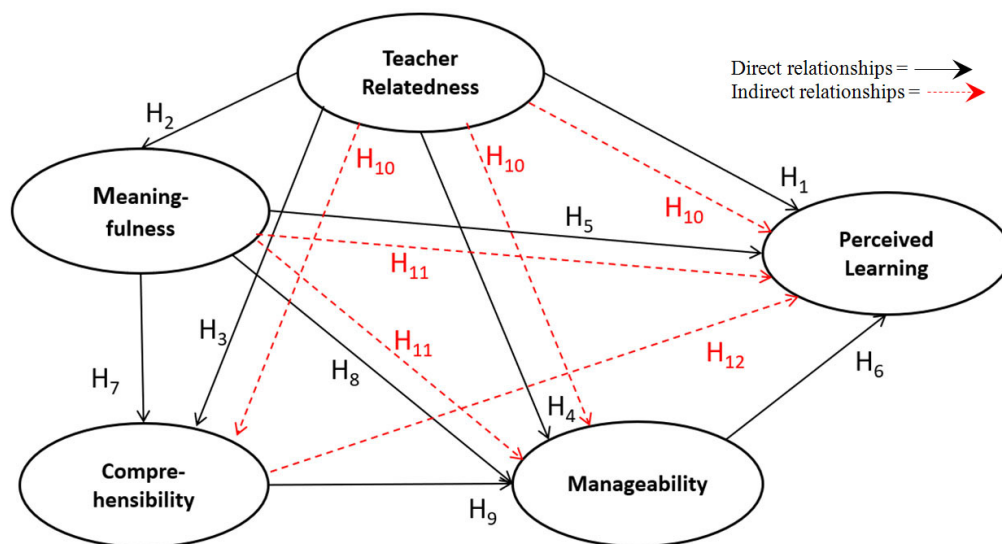


Figure 1. Hypotheses H1-H12

2. MATERIAL AND METHODS

2.1 Participants and Procedure

This study is part of a larger Norwegian study on learning nursing and focuses on student-active learning methods, students' study-effort, motivation and perceived learning. The nursing education program at a large university in Norway was included. The university's management unit approved the study. In a cross-sectional design, data were collected

during 2020; all nursing students (1st year, 2nd year and 3rd year) during spring 2020 and new first-year students in autumn 2020 were included.

The potential participants received information about the study by e-mail and announcements on the students' learning platform (Blackboard), with three reminders to participate. The 329 participating students responded to an online questionnaire. All participation was voluntarily, anonymity was

guaranteed and they received no compensation. The total sample comprised 329 (37%) of 883 students. Missing data were handled listwise; 306 students were included in the analyses.

2.2 Measures

The following scales were included and assessed in the following order: 1) Teacher relatedness, 2) Perceived learning and 3) Work-SOC.

Teacher relatedness experienced by students includes five items from the Adapted Basic Satisfaction Needs at Work scale.^[20] The relatedness items were altered asking students to report the amount of connection they feel with their nursing teachers. Teacher relatedness is characterized by empathy, friendliness, affiliation and caring, all of which are recognized as important requirements for a sense of belonging, relatedness or connectedness.^[11,12] Example items are: 'I get along with the teachers in the courses' and 'The teachers in the courses care about me'. A previous study has reported a Cronbach's alpha of .86.^[21]

Perceived learning was assessed by two validated items,^[20] showing a Cronbach's alpha of .58: 'I felt that I learned a lot in the courses' and 'I understand the content of the courses well'. Applying the three-indicator rule,^[21] a third item was created: 'I felt that I was able to learn what was expected to be learned in the courses'. The response categories were provided on a 7-point scale ranging from 'Absolutely disagree' (1) to 'Absolutely agree' (7) with a midpoint of 'Neither' (4).

The Work-SOC scale developed by Bauer and colleagues^[19] assessed nursing students' perceived comprehensibility, manageability and meaningfulness related to their study situation during the COVID-19 pandemic. The three dimensions represent cognitive, instrumental and motivational components of the Work-SOC concept respectively, each of which were embodied by three bipolar items. Grødal et al.^[22] translated and validated the Norwegian version of the Work-SOC scale in two samples. Comprehensibility covers 'the extent to which the study situation is perceived as structured, consistent, and clear', manageability involves 'the extent to which the students perceive that their external or internal resources are adequate and available to cope with the study demands', while meaningfulness includes 'the extent to which a situation at work/university is seen as worthy of commitment and engagement'.^[23] An example of sample items is 'On a scale from 1 to 7 (two extremes), I experienced my study situation during the corona pandemic as: meaningless – meaningful, clear – unclear, and manageable – unmanageable' etc. Previous studies have reported Cronbach's alpha ranging from .71 to .84 for the sub-dimensions^[19,22] and .83 for the total

Work-SOC.^[19,23,24] The Work-SOC scale is a rather new and promising measure in assessing what creates healthy workplaces and work environments. The measurements and the corresponding items are presented in Appendix 1 along with values for means, standard deviation, skewness and kurtosis.

2.3 Statistical analysis

The data were analysed by descriptive statistics using IBM SPSS version 27.^[25] The hypothesized relations between the latent variables of teacher relatedness, perceived learning, meaningfulness, comprehensibility and manageability were tested by means of a structural equation model (SEM) using Stata 16.^[26]

Research has indicated that Cronbach's alpha cannot be generally relied on as an estimator of reliability.^[27] Therefore, composite reliability was estimated with the formula by Hair and colleagues^[21] as shown in Table 2; a coefficient of ≥ 0.7 is good for both reliability coefficients. For the correlation analyses, the p-value was set to 1%, whereas the estimates based in SEM-analyses commonly include both 5% and 1% p-values. Factor loadings below 0.32 are considered poor, ≥ 0.45 fair, ≥ 0.55 good, ≥ 0.63 very good, and above 0.71 are excellent.^[28]

2.4 Model fit

Since the standard errors are estimated under non-normality, the Satorra-Bentler-scaled chi-squared statistic was applied as a goodness-of-fit statistic, which is the correct asymptotic mean even under non-normality.^[29] In line with the rule of thumb of conventional cut-off criteria, the following fit indices were used to evaluate model fit: chi-square (χ^2)-a small χ^2 and a non-significant p-value corresponds to good fit; $\chi^2/\text{degrees of freedom}$ should be ≤ 2 for good fit, and ≤ 3 for an acceptable fit. Further, the root mean square error of approximation (RMSEA) and the standardized root mean square residual (SRMR) with values smaller than 0.05 indicate good fit, whereas values below 0.08 are interpreted as acceptable.^[30] Also, the comparative fit index (CFI) and the Tucker Lewis Index (TLI) were used with an acceptable fit at 0.95/0.90, respectively, and good fit at 0.97/0.95 and above.^[30]

3. RESULTS

3.1 Descriptive analysis

Among the 306 students, 266 students were females (87%) and 40 were males (13%). Moreover, 178 students were in their first year of study (58%), 49 the second year (16%) and 79 students in the third year of the nurse education program (26%). Table 1 presents the means (M), standard deviations (SD), Cronbach's α and Pearson's correlation matrix for the

latent variables included in the SEM. The correlations between the latent variables ranged between 0.44-0.67, all in

the expected direction. The α -levels for the various measures indicated an acceptable level of inter-item consistency with Cronbach's alpha coefficients, ranging between 0.73-0.91.

Table 1. Mean, Cronbach's alpha, and correlation coefficients for the study variables

Construct	Mean (SD)	Items	Cronbach's Alpha	1	2	3	4	5
1. Perceived Learning	4.48 (1.23)	3	0.79	1				
2. Teacher Relatedness	3.98 (1.44)	3	0.89	.48**	1			
3. Comprehensibility	3.30 (1.46)	3	0.85	.47**	.44**	1		
4. Manageability	4.21 (1.26)	3	0.73	.47**	.44**	.69**	1	
5. Meaningfulness	4.67 (1.49)	3	0.91	.52**	.45**	.56**	.55**	1

Note. **p-value < .01. Listwise N = 306, Missing N = 23 (7%)

Table 2. Measurement models for teacher relatedness, and perceived learning, and the concepts of SOC; Comprehensibility, Manageability, and Meaningfulness

Items	Parameter	Satorra-Bentler Coef [†]	t-value	Bentler-Raykov Squared multiple correlation (R ²)	Composite reliability [§] ρ_c
Teacher Relatedness (Rel)					
Teach_Rel1	$\lambda_{x1,1}$	0.83	34.83**	0.70	0.89
Teach_Rel2	$\lambda_{x1,2}$	0.89	49.83**	0.80	
Teach_Rel3	$\lambda_{x1,3}$	0.84	35.73**	0.70	
Perceived Learning (Learn)					
Perc_Learn1	$\lambda_{x2,1}$	0.79	21.74**	0.62	0.79
Perc_Learn2	$\lambda_{x2,2}$	0.76	23.17**	0.57	
Perc_Learn3	$\lambda_{x2,3}$	0.70	17.55**	0.49	
Work-SOC					
Comprehensibility (Comp)					
SOC_Comp3	$\lambda_{x3,3}$	0.78	25.48**	0.60	0.85
SOC_Comp6	$\lambda_{x3,6}$	0.87	36.33**	0.76	
SOC_Comp9	$\lambda_{x3,9}$	0.78	27.81**	0.61	
Manageability (Manag)					
SOC_Manag1	$\lambda_{x4,1}$	0.70	21.15**	0.48	0.73
SOC_Manag4	$\lambda_{x4,4}$	0.54	9.94**	0.30	
SOC_Manag7	$\lambda_{x4,7}$	0.85	35.35**	0.72	
Meaningfulness (Mean)					
SOC_Mean2	$\lambda_{x5,2}$	0.86	37.64**	0.73	0.91
SOC_Mean5	$\lambda_{x5,5}$	0.93	66.53**	0.87	
SOC_Mean8	$\lambda_{x5,8}$	0.84	40.04**	0.71	
Comp-Manag	$\phi_{3,4}$	0.84	24.17**		
Manag-Mean	$\phi_{4,5}$	0.63	14.57**		
Comp-Mean	$\phi_{3,5}$	0.61	14.56**		
Rel-Learn	$\phi_{1,2}$	0.57	11.95**		
Rel-Comp	$\phi_{1,3}$	0.52	10.58**		
Rel-Manag	$\phi_{1,4}$	0.52	9.97**		
Rel-Mean	$\phi_{1,5}$	0.50	9.51**		
Comp-Learn	$\phi_{3,2}$	0.55	10.90**		
Manag-Learn	$\phi_{4,2}$	0.61	12.47**		
Mean-Learn	$\phi_{5,2}$	0.59	11.10**		
Manag1- Mean2	$\theta\delta$	0.26	4.32**		

[†] Satorra-Bentler Completely Standardized Factor Loadings.

[§] Composite reliability $\rho_c = \frac{(\sum \lambda_i^2)}{(\sum \lambda_i^2) + \sum (\theta)}$

3.2 Model testing and model fit

To investigate how teacher relatedness related with the Work-SOC and learning among nursing students and how the dependent latent variables were inter-related, we estimated SEM comprising five latent variables with three items each. Before examining the hypothesized relationships, the complete measurement model of 15 items was tested by confirmatory factor analysis (CFA) using Stata 16.^[26]

3.3 The complete measurement model

The measurement model revealed an acceptable fit ($\chi^2 = 177.39, p = .000, df = 79, \chi^2/df = 2.25, RMSEA = 0.064, p\text{-close} = 0.005, CFI = 0.96, TLI = 0.95, SRMR = 0.048$). The standardized factor loadings were significant, ranging between .54-.93 ($p < .01$). Composite reliability (ρ_c) was good

for all concepts: comprehensibility (0.85), manageability (0.73), meaningfulness (0.91), teacher relatedness (.89) and perceived learning (0.79). The modification indices indicated that a covariance between the items Meaningfulness2 and Management1 would improve the measurement model, so we allowed one correlated error covariance showing 0.26**. Table 2 lists the measurement model with factor loadings, t -values, R^2 -values and ρ_c -values.

3.4 The structural model

Figure 2 portrays the SEM's representation of the measurement models with factor loadings, structural regression coefficients, explained variance in the endogenous latent variables as well as the fit indices.

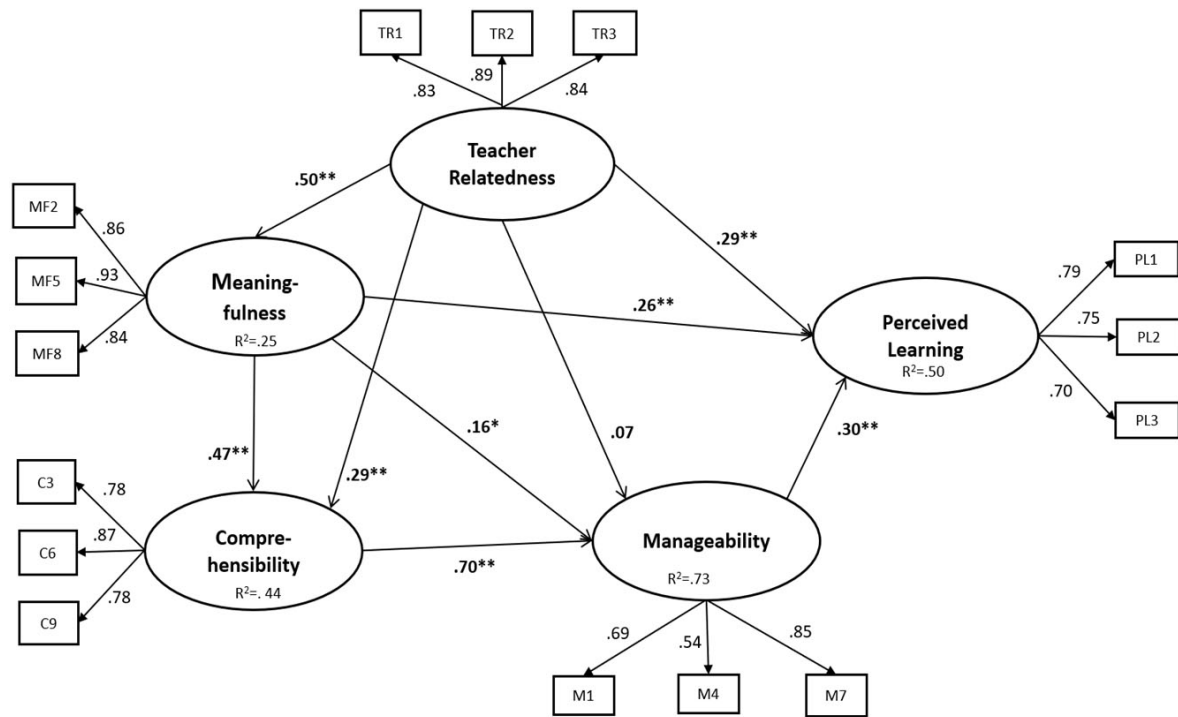


Figure 2. The estimated. SEM-model. Fit indices; $\chi^2 = 177.60, p = 0.00, df = 80, \chi^2/df = 2.22, RMSEA = 0.063, p\text{-close} = .01, CFI = 0.96, TLI = 0.95, SRMR = 0.048$. Theta Delta ($\theta\delta$) = correlated error terms, M1 and MF2 = 0.26^{**}

The SEM yielded an acceptable fit to the data ($\chi^2=177.60, p = .000, df = 80, \chi^2/df = 2.20, RMSEA = 0.063, CFI = 0.96, TLI = 0.95, SRMR = 0.048$). Table 3 shows the standardized regression coefficients of the direct, indirect (mediated) and total effects between the latent variables.

As displayed in Figure 2 and Table 3, significant directional paths appeared from teacher relatedness to perceived learning (H1: $\gamma_{1,1} = 0.29^{**}$), meaningfulness (H2: $\gamma_{4,1} = 0.50^{**}$) and comprehensibility (H3: $\gamma_{2,1} = 0.29^{**}$). The direct path from teacher relatedness to manageability was not signif-

icant (H4: $\gamma_{3,1} = 0.07$). As assumed in H5 and H6, the direct relationships from meaningfulness ($\beta_{1,4} = 0.26^{**}$) and manageability ($\beta_{1,3} = 0.30^{**}$) to perceived learning displayed significant values. Furthermore, the direct relationships assumed in H7–H9 displayed significant values from meaningfulness to comprehensibility ($\beta_{2,4} = 0.47^{**}$) and manageability ($\beta_{3,4} = 0.16^*$), and from comprehensibility to manageability ($\beta_{3,2} = 0.70^{**}$).

Looking at the indirect effects representing the mediated influences, teacher relatedness revealed significant impact

on comprehensibility and manageability (H10) mediated by meaningfulness. Teacher relatedness indirectly affected perceived learning through the three SOC-concepts (H10). Moreover, meaningfulness displayed significant influence on

manageability and students' perceived learning, mediated by comprehensibility (H11), and comprehensibility displayed significant influence on perceived learning by manageability (H12).

Table 3. SEM-model. Direct and indirect relationships between Teacher Relatedness (Teach_Rel), Work-SoC Comprehensibility (SOC_Comp), Work-SOC Manageability (SOC_Manag), and Work-SOC Meaningfulness (SOC_Mean), and Perceived Learning (Perc_Learn)

Constructs	Hypothesis	Direct effects		Hypothesis	Indirect effects		Total effects	
	Parameter	Estimate	t-value		Estimate	t-value	Estimate	t-value
Perc_Learn								
Teach_Rel	$\gamma_{1,1}$ (H ₁)	.29**	4.12	(H ₁₀)	.28**	5.67	.57**	8.87
SOC_Mean	$\beta_{1,4}$ (H ₅)	.26**	3.60	(H ₁₁)	.15**	3.96	.41**	5.74
SOC_Manag	$\beta_{1,3}$ (H ₆)	.30**	4.29				.30**	4.29
SOC_Comp				(H ₁₂)	.21**	4.25	.21**	4.25
SOC_Comp								
Teach_Rel	$\gamma_{2,1}$ (H ₃)	.29**	4.69	(H ₁₀)	.23**	5.60	.52**	8.31
SOC_Mean	$\beta_{2,4}$ (H ₇)	.47**	7.44				.47**	7.44
SOC_Manag								
Teach_Rel	$\gamma_{3,1}$ (H ₄)	.07	1.31	(H ₁₀)	.45**	7.49	.52**	8.27
SOC_Mean	$\beta_{3,4}$ (H ₈)	.16*	2.50	(H ₁₁)	.33**	5.79	.50**	7.34
SOC_Comp	$\beta_{3,2}$ (H ₉)	.70**	9.04				.70**	9.04
SOC_Mean								
Teach_Rel	$\gamma_{4,1}$ (H ₂)	.50**	8.06				.50**	8.06

Note. [†]Gamma (γ); standardized regression coefficients representing directional relationships between the exogen variable Teacher Relatedness and the four endogen variables in the model (the three concepts of Work-SOC and Perceived Learning). [‡]Beta (β); standardized regression coefficients representing directional relationships between the three concepts of Work-SOC and Perceived Learning.

4. DISCUSSION

Since March 2020, the COVID-19 pandemic has caused most university teaching in Norway to go online. The situation has been very uncertain and unpredictable due to the virus' spread and mutations, causing stress and mental health issues among nursing students. In this situation, development of health promoting universities identifying and utilizing salutogenic resources for students' learning is crucial. This study hypothesized that teacher relatedness and Work-SOC might perform as such salutogenic resources, affecting nursing students' learning positively in this stressful period. We could show that both teacher relatedness and Work-SOC functioned as salutogenic resources for students' learning: teacher relatedness affected learning directly as well as mediated by meaningfulness, comprehensibility, and manageability. Eleven out of the twelve hypotheses were significant, among which ten were significant at the 1% level.

4.1 Teacher relatedness and Work-SOC as salutogenic resources for learning

Teacher relatedness involves among other things communication, and seems to be fundamental for learning nursing

during the COVID-19 pandemic. Relatedness concerns the sense of social connectedness, acceptance and a sense of being cared about,^[13] all of which may prove difficult when teaching is solely going digitally. These aspects of relationships, also associated with the concept emotional support, are often highlighted at the K-12 level.^[31] However, university learning environments have hardly recognised the importance of emotional support and care, as vital aspects of a health promoting learning environment. A recent study by Murray and colleagues^[32] highlights that, resulting from the pandemic situation, teachers should re-evaluate their way of practicing relatedness detecting new ways to mobilize care in higher education pedagogy. A recent study among nursing students direct the necessity for universities to work from a holistic viewpoint, in terms of not only responding to academic needs but also from psychological, communicative, social, health, and well-being perspectives.^[2] The salutogenic perspective utilized in this study is holistic,^[10,11,14] representing an answer to this necessity.

The mean values of the present relatedness items range between 3.52 and 4.25 on a scale from 1-7, indicating a large

spread across the students' experiences of the teacher-student relatedness. Many students perceived the teacher relatedness as good and close, while many experience the opposite. Those experiencing a good teacher-relatedness report to a greater extent that they have learned what is expected of them, despite the pandemic.

A strong Work-SOC, that is high levels of comprehensibility, manageability and meaningfulness, positively affected nursing students' learning under COVID-19. As shown in Table 1, all Work-SOC dimensions related significantly to the feeling of having learned and understood the content in the courses well. However, SEM-analysis indicate that the three dimensions of SOC operate differently related with students' learning. Meaningfulness demonstrates both a direct and an indirect influence on perceived learning. Manageability, like meaningfulness, significantly and directly associates with perceived learning, whereas comprehensibility shows a strong indirect effect mediated by manageability. The theory of salutogenesis highlights that a strong manageability relies on a strong comprehensibility.^[11] The path from comprehensibility to manageability in Figure 2 is highly significant (0.70), supporting that understanding precedes the ability to manage. On the other hand, the low mean score for comprehensibility (see Table 1) indicates that many students struggle to understand the content in the courses, which will influence whether they are able to manage and thus complete their education. In nursing education, in particular during the stressful situation during the current pandemic, teacher relatedness supporting nursing students' understanding of the subject matter, as well as their study situation at home and in the clinical field is essential.

In this study, Work-SOC comprising comprehensibility, meaningfulness and manageability, significantly explained the variation on learning: a high score on the three SOC-dimensions related with perceived learning. A strong Work-SOC enables students to view the study situation as coherent, comprehensible, manageable and meaningful. Furthermore, a strong Work-SOC implies that the students experience necessary resources to be available within themselves and in their immediate environments.^[14] Additionally, Work-SOC is a way of thinking, being and taking action as a human being; simultaneously Work-SOC does not only concern an individual human being but a person in interaction with the living context.^[14] This brings us to the hypotheses concerning teacher relatedness mediated through SOC.

4.2 Perceived teacher relatedness affects nursing students' learning indirectly through SOC

When living in a seemingly chaotic and unpredictable world, expecting that one can manage well might prove difficult.

The sense that the necessary resources are available to meet the current demands requires a clear picture of what these demands are,^[14] which was difficult during the pandemic. A recent study on learning nursing during the COVID-19 revealed by qualitative data that nursing students called for clear instructions by the teachers about how to cope with their study alone at home.^[33] In addition, under the pandemic students have been struggling with economic uncertainty, risk of infection and anxiety about passing the lesson and qualifying to graduate^[6,7,9] to complete their study is extremely important for the individual, as well as for the society. Our findings indicate that teachers utilizing relatedness by means of emphasizing students' meaningfulness and comprehensibility influence students' learning positively. Moreover, the present results suggest that teachers using relatedness to boost students' meaningfulness simultaneously support their manageability helping them to comprehend the material, the learning environment and this life situation caused by the pandemic.

Along with the three SOC-dimensions, teacher relatedness explains 50% of the variance in perceived learning (see Figure 2). This signifies that universities should work on identifying salutogenic resources for students' learning: that is, finding effective ways of enhancing students' sense of comprehensibility, meaningfulness and manageability. Teacher relatedness seems exceptionally important in facilitating such health promoting aspects of students' learning environment. Consequently, nursing educations should develop sufficient modes of teacher relatedness in order to ensure students' learning and study completion.^[9]

4.3 Limitations

The cross-sectional design implies that we cannot draw conclusions on causality. Even if the paths in the SEM are specified in accordance with the salutogenic theory (Antonovsky, 1987), we cannot define the direction of the paths with certainty.^[21]

Some scepticism exists concerning the universality of teacher relatedness. SDT maintains that well-being and high-quality relationships require individuals, regardless of gender, while other schools of thought suggest that relatedness is more important for females.^[34,35] This might be noteworthy since the sample for this study consists of 87% females and operates within the nursing field, in which caring and relationship represent central learning content and vital aspects of professional RNs' competence. Accordingly, relatedness is perhaps more valued in nursing than in other study programs.

It is also important to underline that the outcome in this study is perceived learning, not students' academic achievements,

exam results or graduation. Studies have shown that compared to a typical school year, school closures and online learning may impact learning, resulting in both lost ground and gains.^[36] About 58% of the study subjects were first-year students. Recently, the exam results in anatomy, physiology and biochemistry for the present participants of first-year nursing students showed a slightly higher failure rate (3.2%) than last year.^[37] It is difficult to say how online learning and COVID-19 have influenced these results. Further research is needed.

5. CONCLUSION

During the lockdown caused by the COVID-19 pandemic, nursing students who experienced meaningfulness, comprehensibility and manageability, more often reported that they successfully achieved the expected learning outcomes. Teacher relatedness is crucial for nursing students' learning during such a stressful period. Nevertheless, many students did not experience positive teacher relatedness, which influenced negatively on their meaningfulness, comprehensibil-

ity and thus manageability, accompanied by limited learning outcomes. Mobilizing teacher relatedness giving emphasis to the salutogenic resource of students' Work-SOC benefits students' learning environment, learning outcome, study completion, mental health and well-being. The faculty should acknowledge the importance of the teacher-student-relationship; e.g. arranging a workshop during which this knowledge could be presented and discussed among the teachers, including teachers' evaluation of what is needed, and what could be done to support their relatedness with the students. Possibly, to ensure teacher-student-relatedness, some structures could be developed and implemented in the pedagogical approach.

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CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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