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Exploring the relationship between the learning environment and bullying: PLS-SEM evidence from Norwegian higher education

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Abstract
Increasing awareness of the consequences of bullying leads to efforts to address deficiencies in the learning environments in which bullying occurs. This study explored factors that determine the learning environment and their influence on bullying experiences at two universities in Norway. The study employed a cross-sectional design involving 438 students. Students' perceptions of various learning environment variables were correlated with their experiences of various negative behaviours and victimisation using partial least squares structural equation modelling (PLS-SEM). The results show that students' perceptions of the universities' general learning environments are inversely associated with various negative behaviour constructs and victimisation, and the results are notable among bachelor students and married and cohabiting people. The study shows that an improvement, mainly in the universities' general learning environment, relative to the validated variables, would reduce the occurrence and experience of bullying.

Keywords Learning environment · Higher education · Bullying · Victimisation · PLS-SEM · Norway

Introduction

Besides the family, schools and groups of individuals in schools constitute essential social networks for the developing person. Nonetheless, relationships in these networks sometimes take sour turns, and some individuals acquire disadvantageous positions and become victims of ridicule and contempt. Situations when individuals persistently become victims of ridicule and contempt in schools became known as "bullying." Bullying is the systematic intimidation or humiliation of targeted individuals by physically stronger or more prominent persons who threaten, demean, or belittle the victims by abusing their power. Bullying is mainly about the intention to hurt another person by

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repeating harmful behaviour(s), possibly because of the power imbalance in the relationship between the aggressors and the victims. By bullying the victims, the bullies make the victims or targets feel powerless, with the victims becoming helpless to defend themselves or physically or mentally weaker than the bullies (Olweus, 1993).

Bullying has become an aspect of interpersonal relationships in the learning environment in most universities (e.g. Gómez-Galán et al., 2021; Muluk et al., 2021; Pörhölä et al., 2020; Sinkkonen et al., 2014; Sivertsen et al., 2019; Vveinhardt et al., 2019). Bullying in higher education takes subtle forms, such as exclusion, discrimination, and other person-related intimidations like name-calling, gossiping or spreading of malicious rumours, reprimanding, discrimination in treating different students, and exposure to public ridicule. It could involve giving or receiving inappropriate assignments, impolite communications, sexual harassment, belittling, and giving ambiguous advice on purpose (Pörhölä et al., 2016, 2019; Sinkkonen et al., 2014). There could be instances of withholding information from a targeted individual, non-response to requests for help, unfair reports to indicate incompetence, or being repeatedly reminded of one's mistake (Marraccini et al., 2015).

Few studies have investigated bullying in a higher educational context in Norway. However, Sivertsen et al. (2019) reported incidents of sexual harassment from 50,054 participants in a national students' health survey in 2018. About 24.2% of the participants reported sexual harassment in their lifetime, and 16.7% reported sexual harassment occurring the previous year. The most common harassment behaviours include unwanted touching, hugging, or kissing; sexual suggestions; comments and expressions about private life, body, or appearance; near-rape; and incidents of rape. Lund (2017) also studied five higher education institutions involving 3254 participants in Norway. The results revealed that about 9% of the participants reported bullying behaviours, including exclusion-related acts such as being ignored or purposefully excluded from group activities. The above findings suggest that interpersonal interactions among students and their lecturers can take ugly turns that could affect the victims' well-being.

The broader domains of bullying behaviours

Broadly, bullying experiences in the above or many other studies could be classified as person-related or general bullying; work-related; cyberbullying (see Einarsen et al., 2009; Jóhannsdóttir & Ólafsson, 2004; Platts et al., 2023); and sexual harassment (Klein & Martin, 2021; Singh & Ramdeo, 2023). Person-related bullying involves negative behavioural acts that aim to degrade the target. Work-related bullying involves negative behavioural acts directed at the target through their work or professional role that intimidate or affect their ability to do their work effectively (Gupta et al., 2017). Cyberbullying entails all negative behaviours, whether person-related or work-related, carried out repeatedly or once, using information technologies through the internet. It exposes the person to perpetual harm and a larger audience because the act can remain in circulation for a lifetime (Platts et al., 2023). Sexual harassment involves all verbal or physical abuse, intimidation, harassment, or discrimination that is sexually oriented. It may involve unwanted sexual advances, demands for sex in exchange for a favour, or intimidation based on the target's sex (Klein & Martin, 2021). Whatever form bullying takes, it affects the target's well-being (Berthold et al., 2019; Boudrias et al., 2021), necessitating a need to prevent it.

The focus of bullying prevention

The need to prevent bullying at institutions creates the desire to tackle the most vital factors that cause it. First, the definition implies that some individuals or groups are either powerful enough to bully or are prone to bullying—a view confirmed by Glasø et al. (2007). Individual or social risk factors such as gender, age, race, sexual orientation, health status (like depression and anxiety), developmental or learning disability, and poverty have been identified as some of the risk or protective factors that influence bullying experiences (Khiat, 2012; Salin, 2021).

At the universities, one would expect seniority to create a power imbalance, with junior students or faculty being bullied by senior ones (Hodgins & McNamara, 2019; Prevost & Hunt, 2018; Taunu et al., 2021). More so, some studies reported sexual harassment at universities (Klein & Martin, 2021; Sivertsen et al., 2019), so we opine that a person's marital status might determine their bullying experiences. However, there are inconsistent findings (Cemaloglu, 2007; Ovayolu et al., 2014; Yang & Zhou, 2021) concerning marital status and bullying, so no definitive agreement can be reached that single or married and cohabiting individuals are bullied most. There are also limited examples of personality factors that can be altered to prevent bullying. More so, Cowie et al. (2016) argue that personality factors inconsistently explain bullying in higher education. Leymann (1996) also disagrees that personality factors influence bullying, and Schott and Søndergaard (2014) opine that personality factors do not independently influence bullying but only do so based on institutional factors.

Space would not allow us to touch on all the factors that emerge in bullying prevention efforts. However, there is heightened acknowledgement of the association between learning environments and bullying (Aldridge et al., 2018; Konishi et al., 2017; Thornberg et al., 2018). Juvonen and Graham (2014) argue that the learning environment has been the most consistent correlate of bullying in schools. Eliot et al. (2010) argue that the learning environment should be the structure that prevents or helps victims report or overcome the effects of bullying. Aldridge et al. (2018) also opine that authorities could directly influence the learning environment to prevent bullying. We argue that because bullying occurs through repeated negative behaviours with power imbalances, institutions can regulate it, at least after the first occurrence. When this expectation is unmet, we must find the factors in the learning environment that promote bullying.

Learning environment domains and their associations with bullying

When we consider the views of different authors, what constitutes a learning environment is unspecific and lacks consistent definitions. Despite the lack of specific definitions, existing literature describes the learning environment as the quality and supportiveness of the atmosphere in which teaching and learning occur (Cohen et al., 2009). The learning environment thus describes both social and physical environments (Johnson, 2009).

To describe the learning environment, Cohen et al. (2009) identified safety, teaching and learning, relationships, and physical environmental structures as constituting a learning environment. Research (see Capp et al., 2020) differentiates between the social-emotional and physical conditions of a learning environment. Social-emotional safety defines attitudes in the face of individual differences and disruptive behaviours like bullying and conflict. It also concerns the effectiveness and fairness of conflict resolution. Social-emotional

safety further communicates a unified and fair response to violations through clear rules. Physical safety describes a crisis plan, provisions that guarantee safety from physical harm and violence, awareness about rules, and attitudes towards violations (Cohen et al., 2009). Williams et al. (2018) also found students' relationships with colleagues and their teachers, the enforcement of rules and disciplinary measures, and levels of cleanliness, crowdedness, and noise to be predictors of safety. These perspectives reveal issues concerning a general value system that ensures effective functioning, social safety, teaching and learning, relationships, and the physical environment. They indicate that the learning environment can potentially prevent or encourage bullying, depending on whether it is positive or negative. In the following paragraphs, we will look at how these factors influence bullying.

Social safety and bullying

Social safety is to ensure that the school climate is safe and that actors are conscious of everything concerning bullying. Social safety entails establishing, maintaining, and consistently enforcing rules regarding rewards and punishment and communicating clear behaviour expectations, which successfully reduce bullying (Gottfredson & Gottfredson, 1985). Konishi et al. (2017) identified discipline, clarity of rules, and fairness in their application as three of the most significant correlates of bullying. They found that when students perceive rules as transparent and fairly applied, there is less delinquency and victimisation. This association is best explained by Johnson (2009), who found that when students are aware of rules and believe that authorities apply them fairly, their relationship with authorities is positive, and they feel they are in an orderly environment. This gives them a sense of ownership with a focus on learning, which leads to less violence. Social safety safeguards against a reactive response to bullying, which Fantus and Newman (2021) opine is inadequate because authorities only react when bullying has already occurred.

Cho et al. (2017) described everything about rules and their enforcement by authorities as "formal guardianship" in the extant literature. Formal social control, as it may also be termed, is steered by norms and values (i.e. policies) that universities and their governing bodies have endorsed within a framework of societal and national standards. It influences the experience of students by moderating tensions between individual and collective rights and interests (Faucher et al., 2015). Vaill et al. (2021) wrote that policies inform students about definitions, actions, support, and resources. They indicate universities' stances or intolerance for bullying and harassment, which helps to ensure a bullying-free culture. Concurrently, awareness of rules and behaviour expectations is also an important component of social safety. Notelaers and Einarsen (2013) opined that awareness goes with policies and improves relationships among students because they know behaviours that are expected of them and are able to identify bullying. It also helps with reporting bullying (Vaill et al., 2020) and bystander response (Johnston et al., 2018; Nickerson et al., 2014). Awareness also prepares authorities to monitor and collaborate on bullying prevention (Nielsen et al., 2010). All of these guarantee a sense of social safety from bullying (Vaill et al., 2021).

Teaching and learning and bullying

Teaching and learning represent instructional quality, social, emotional, and ethical learning, professional development, and leadership regarding accessibility to administrators. The learning environment should ensure high student achievement, "help," diverse need-based

learning, rewards, and appraisals for instructional quality. There should be opportunities for professional development, and the leadership must communicate expectations (Cohen et al., 2009). De Luca et al. (2019) found an association between teachers' job satisfaction and lower levels of bullying and indicated that when teachers feel fulfilled, it influences classroom climates, and so would the impact on bullying. More so, regardless of the level of education, teachers serve as influential people whose presence can moderate bullying or to whom students can make complaints (see Wachs et al., 2019).

Concerning students' achievement, learning environment, and bullying, Einarsen et al. (2003) argue that frustration and aggression occur when there is a deprivation of desired exam results. In this case, depriving students of their fair grades may be bullying in itself (Cooper et al., 2011), while the frustration and sense of injustice experienced by the victim of an unfair grade can be a source of aggression towards others when victims displace their anger on lesser targets (Neuman & Baron, 2011).

Relationships and bullying

Relationships refer to connections between students, faculty, and administrators, with people's connections being fundamental to a positive school climate (Cohen et al., 2009). It also describes atmospheres that value diversity and student and faculty collaboration in decision-making (Capp et al., 2020; Thapa et al., 2013). Relationships also describe how faculty should care about students (Capp et al., 2020). We do not know much about how faculty should care about students in higher education. However, in the extant literature, caring values are described as informal guardianship, which involves helping students with their problems and treating them respectfully (Cho et al., 2017; Thapa et al., 2013). Meyers et al. (2019) described caring values as showing empathy, which Cai et al. (2022) consider an integral element in determining students' sense of belongingness and eventual learning achievement. Relationships also describe how students care about one another and provide mutual respect (Thornberg et al., 2018).

Espelage et al. (2014) argue that there is limited bullying when there is a positive relationship between colleagues, teachers, and students, and teachers and staff are committed to preventing bullying with fairness, order, and discipline. Bullying could occur when a student does not feel accepted, respected, supported, and treated fairly, considering that bullying, among other things, could be a reaction that individuals exhibit to different kinds of social insecurity (Søndergaard, 2012). Sinkkonen et al. (2014) also argue that when the academic staff is too busy, coupled with limited resources and stressful working conditions, it can create anxiety for students and faculty, which can induce bullying. Thapa et al. (2013) wrote that schools that do not have supportive norms and relationship structures are prone to violence.

The physical learning environment and bullying

The physical environment describes general sanitation, the adequacy of materials and space, the aesthetic quality and size of institutions, and their ability to offer curricular and extracurricular opportunities (Cohen et al., 2009). The physical environment concerns space design and its use, with the physical environment determining security or physical safety (Johnson, 2009). Physical safety also means maintaining facilities to ensure efficient functioning (Capp et al., 2020). The physical environment is also defined in terms of logistical support (Capp et al., 2020) or resource provision (Sinkkonen et al., 2014).

Researchers (D'Cruz et al., 2018; Sinkkonen et al., 2014; Zawadzki & Jensen, 2020) have noted that limited resources can create conflicts during resource acquisition, and so would cramped spaces create avenues for bullying.

While one might think of design in terms of size, location, openness, and lighting to prevent hideouts that favour crime, Johnson (2009) indicates that physical status also concerns deterioration or aesthetic appearance. The deterioration or aesthetic appearance creates a perception of investment in a learning environment and commands a reciprocal responsibility for appropriate behaviours, or vice versa. A scoping review by Francis et al. (2022) on the physical environment factors among 12–18-year-olds and young people revealed dilapidated walls, doors, and windows, as well as littered and dirty schools and neighbourhoods as physical features. Bradshaw et al. (2014) opined that these could communicate social disorder and lead to irresponsible behaviours. Francis et al. (2022) again identified decorating classrooms with antibullying elements and brochures that communicate dislike for bullying as physical environment features that did not reveal any connection with bullying. However, we opine that these could create social safety and reduce bullying. On the other hand, research (Brewer et al., 2017; Francis et al., 2022) found that the availability of graffiti that communicates hate words and symbols is capable of inducing bullying.

Tang and Lee (2021) also identified heating, temperature, lighting, sound or noise levels, cleanliness, maintenance, and building quality as learning environment factors that enhance the school climate. Patra (2022) cautioned that multiple factors could cause aggression but opined that crowding and transgression of personal space, loud noise, foul odour, and increased temperatures could lead to aggressive behaviours. The irritating conditions of these factors could lead to bullying (Baillien et al., 2008).

The general learning environment and bullying

The above notions about the learning environment only define significant components of the learning environment, but the components are a product of values, beliefs, and attitudes. Koth et al. (2008) argue that a learning environment is the collective values, beliefs, and attitudes nurtured through the social interrelations among students, their teachers, and other staff. Aldridge et al. (2016) defined the learning environment as embodying norms, attitudes, values, beliefs, and expectations underlying school life and the school community's sense of safety. In this vein, the learning environment is about tendencies that make people feel socially, emotionally, and physically safe (Cohen et al., 2009), which defines the general learning environment in this study. The general learning environment thus describes responsiveness and competence in handling reports of danger and harm, accountability on all levels, knowledge about redress opportunities, and general knowledge regarding student achievement.

Leadership styles and bullying

We do not rule out the possibility that leadership styles influence the learning environment. Rayner et al. (2002) wrote that leaders in an organisation (human resource personnel, managers, safety personnel, and union representatives) have the legitimacy to initiate changes that can reduce bullying in organisations. Therefore, Cohen et al. (2009) argue that the leadership style of a school's principal is essential in facilitating or making decisions concerning students' learning. Hoel et al. (2010) studied the association between various

leadership styles and bullying and found that bullying is associated with autocratic, tyrannical, and laissez-faire leadership.

Autocracy does not permit constructive criticism, and there could be rage, threatening, and shouting, which can create frustration and aggression among subordinates and increase the possibility of peer aggression (Hoel et al., 2010). Laissez-faire leaders do not act in expectation of punishment for behavioural misconduct, which may also nurture a culture of bullying (Einarsen et al., 2003; Hoel et al., 2010; Nielsen, 2013). In conclusion, it is noteworthy that bullying culture is cultivated and maintained in institutions if its prevalence receives inadequate responses by denying and avoiding it (Rayner et al., 2002). It calls for commitment to identify learning environment factors that favour bullying to prevent it.

The aim of this study

Recent studies (Acosta et al., 2019; Aldridge et al., 2018; Cho et al., 2017; La Salle, 2018; Varela et al., 2020) and their perspectives of the learning environment, as well as those of other earlier works (e.g. Gottfredson et al., 2005; Zullig et al., 2010), have identified factors that influence bullying. They vary in showing variables that define the learning environment and how they influence the psychosocial experiences of students due to institutional or unique contexts.

This study tried to unravel the various aspects of the Norwegian university environment that influence (either positively or negatively) the occurrence of bullying. It is a necessary step towards strategies for a positive psychosocial learning environment. In doing this, we considered the fact that the various authors (e.g. Aldridge et al., 2018; Klein et al., 2012; Låftman et al., 2017; Souza et al., 2018) have used varied instruments to investigate learning environments, and most of these learning environment studies have been conducted at the school level. Compulsory schools are relatively different from higher education (Campbell, 2015), and so in designing this research, we considered the opinions of La Salle (2018) and Pinto (2014) that one size would not fit all and that no single research approach would suffice when one attempts to expand an existing and thriving research issue.

We carefully observed the predominant descriptions of the learning environment in the extant literature and solicited students' and administrators' views through informal interviews to complement and reconcile (see Moeller et al., 1980; Swain & King, 2022) the components of the learning environment. We then decided on four components of the universities' learning environment: "university general environment," "order, safety, and discipline," "relationships" (i.e. among students and between students and lecturers), and "university physical environment." We have already explained the dimensions in our description of the domains, and the variables that make up our constructs can be accessed in "Appendix 1". More so, given that levels of education and marital status can influence bullying in varying ways and the fact that these insights are hard to find in the extant literature, we tried to ascertain how the association between our participants' perceptions of their learning environment and bullying varied based on these groups.

The study addressed the question: Does the university learning environment influence bullying? Specifically:

- RQ1: How do the universities' general environments relate to students' experiences of negative behaviours and victimisation?
- RQ2: How do order, safety, and discipline relate to students' experiences of negative behaviours and victimisation?

- RQ3: How do relationships relate to students' experiences of negative behaviours and victimisation?
- RQ4: How does the university's physical environment relate to students' experiences of negative behaviours and victimisation?
- RQ5: Are there differences in the association between the learning environment and negative behaviours and victimisation in terms of the level of study and marital status of the participants?

Research design

Conceptual model

This study explored students' perceptions of the learning environment in connection with negative behaviours and bullying or victimisation among students, using two Norwegian universities as the context. Figure 1 shows the study's conceptual model and summarises what we explored. The figure shows the relationships between university learning

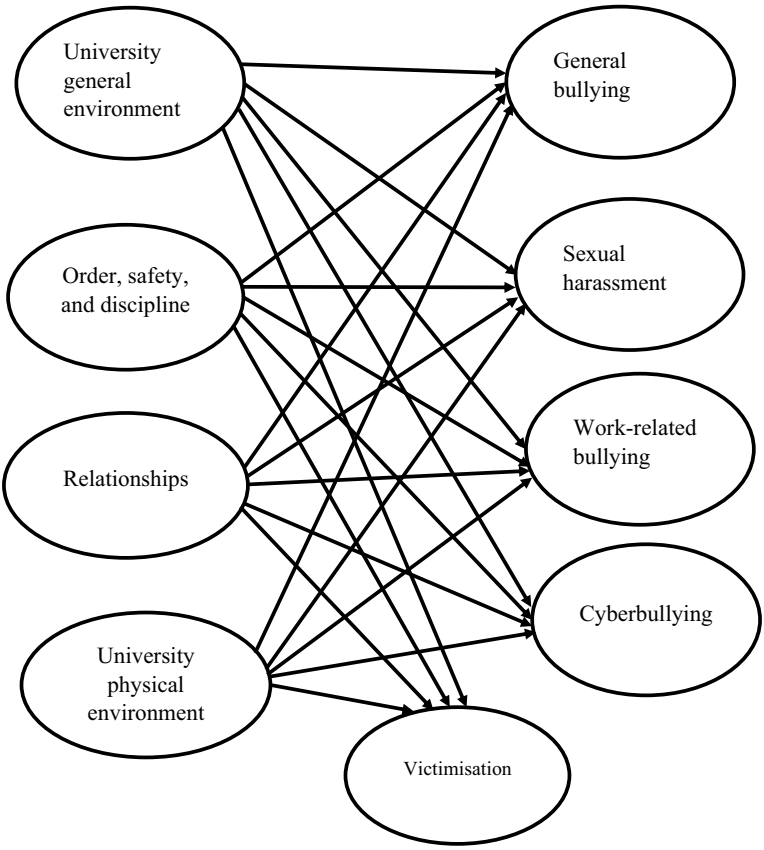

Fig. 1 Conceptual model—path diagram. Note: Fig. 1 shows the relationships in the structural model. The measurement component has been omitted to avoid the complexity of the conceptual model

environment constructs, negative behaviour constructs, and victimisation among university students. We have discussed the learning environment constructs above, and as most studies have indicated (e.g. Aldridge et al., 2018; Zacharia & Yablon, 2022), we expected the learning environment to be negatively associated with negative bullying-related behaviours and victimisation if the learning environment contributes to bullying in any way. However, we note the reverse of a positive relationship between a harmonious learning environment or any element of it and bullying when the learning environment does not favour bullying, as argued by Zacharia and Yablon (2022).

The learning environment constructs are the "universities' general environment," "order, safety, and discipline," "relationships" to represent relationships among students and between students and faculty, and the "universities' physical environment." The bullying constructs are general bullying, sexual harassment, work-related bullying, cyberbullying, and victimisation.

Sampling and the sample

We purposely chose students who had experienced the learning environment for not less than two years or who, possibly because they were in subordinate positions (e.g. master's and PhD students under supervision), were relevant to the research (Bryman, 2012). They were final-year bachelor's and master's students, PhD students, and others who could be postdoctoral students from the two universities we chose in Norway. The participants were contacted with a web-based questionnaire during October 2020 and March 2021 through Survey Xact after collecting sets of 2554 and 3307 email addresses from the two universities' administrators.

There were four reminders through regular emails and Facebook platforms. Eventually, of the 2554 emails from one university, 118 (4.6%) participants responded partially, and 182 (7.1%) completed the questionnaires. Of the 3,307 emails from the other university, 167 (5%) questionnaires returned were partially completed, and 256 (7.7%) were fully completed. This amounted to a total of 438 valid questionnaires for analysis.

According to Hair et al. (2022), the minimum sample size for partial least squares structural equation modelling (PLS-SEM) is 10 times the number of arrows pointing to a construct (i.e. 10 times the number of independent variables). Thus, for this study, which has four independent constructs, the minimum sample size is 40. Our final sample size of 438 has exceeded the minimum sample size of 40 and those presented in Exhibit 1.7 in Hair et al. (2022). We conducted a power analysis to further ensure the adequacy of our sample (438) for the statistical analysis. According to Cohen (1992), the effect size index f^2 for multivariate analysis for small, medium, and large effect sizes is 0.02, 0.15, and 0.35, respectively. Cohen (1992) recommended the medium effect size since it approximates the average effect size in different fields. Thus, using the medium effect size of 0.15, a significance level of 5%, and our sample size of 438, the Wald test shows a statistical power of 1.00, which is above Cohen (1992)'s 0.80 threshold. Even the small effect size of 0.02 yielded a statistical power of 0.85, which is higher than the threshold. It shows that our sample size of 438 respondents is sufficient for the statistical analysis of this study.

Respondents' demographics

As seen in Table 1, most respondents were at the universities for over two years and were mainly master's students, followed by bachelor's students, PhD students, and others. Most

Table 1 Background information

Variable	*N*	%	Variable	*N*	%
Gender			*Academic level*		
Male	161	36.8	Bachelor's	195	44.5
Female	271	61.9	Master's	211	48.2
Transgender	2	0.5	PhD	26	5.9
Others	4	0.9	Others	6	1.4
Total	438	100	Total	438	100
Age group			*Length of time at the University*		
18–22 y	105	24	1 y	30	6.8
23–27 y	200	45.7	2 y	100	22.8
28–32 y	62	14.2	3 y	134	30.6
33–37 y	37	8.4	4 y	50	11.4
38–42 y	12	2.7	5 y	67	15.3
43–47 y	12	2.7	6 y+	57	13
48 y+	10	2.3			
Total	438	100	Total	438	100
Marital status					
Single				248	56.6
Married/Partner cohabitants				181	41.3
Separated/Divorced				9	2.1
Total				438	100

were between the ages of 23 and 27 years, followed by 18–22 years and 28–32 years. There were more female respondents than their male counterparts. More students indicated they were single, pointing out they had no active intimate relationships.

Research ethics

We fulfilled the standards certification process with the Norwegian Data Protection Authority (NSD) to ensure that the data collection and reporting met ethical standards. However, the email addresses of the participants were collected without their prior consent because Article 6(1d) of the European Union General Data Protection Regulation states that private data can be processed when *"processing is necessary to protect the data subject's vital interests*."

Instrument

We used a questionnaire modelled on the pattern of the Negative Acts Questionnaire-Revised (NAQ-R) (Einarsen et al., 2009) for the bullying experiences. Overall, 30 questions explored students' experiences of negative social behaviours. Eleven (11) questions were adopted from samples of the NAQ-R and NAQ-Short (see Bulutlar & Öz, 2009; Einarsen et al., 2009; Salin, 2001). Three (3) other items were adapted from the NAQ, and two (2) other ones were self-developed based on the learning environment. We grouped them as general and work-related bullying. Eight questions representing sex-related experiences

can be traced to Fitzgerald et al., (1988, p. 157). Six adapted items on cyberbullying came from Akbulut and Eristi (2011, p. 1161). Variables representing these constructs can be found in "Appendix 1". A single item investigated victimisation by allowing participants to indicate whether their experience of negative behaviours could be considered victimisation after presenting them with a definition of bullying, as above.

We initially had 29 items to measure the universities' learning environments. We either adapted or adopted the questions to reflect the literature (Aldridge & Ala'I, 2013; Cho et al., 2017; Furlong et al., 2005; Juvonen & Graham, 2014; Konishi et al., 2017; Thornberg et al., 2018; Zullig et al., 2010) and the context in Norway. Details of the variables that represent the learning environment constructs retained are also in "Appendix 1". A 5-point Likert scale (i.e. 1 = strongly disagree to 5 = strongly agree) investigated students' perceptions of the learning environment.

Regardless of the psychometric properties of the items in previous studies, we tried to calculate Cronbach's alpha across the cohort of respondents for each construct (see Tavakol & Dennick, 2011) to reflect the test properties of the respondents and the observable dynamics of the learning environment in this study (see Table 2). The Cronbach alpha criteria ensured the reliability and internal consistency of the constructs (Tavakol & Dennick, 2011). However, the items' groupings are unique to this study. We collectively ensured the definitional context of the constructs or the degree to which the content of the variables aligned with the definition of the constructs (i.e. face validity) (Hulin et al., 2001) based on personal judgement (see Hair et al., 2019a).

Partial least squares structural equation modelling (PLS-SEM)

The empirical analysis started with a psychometric analysis of the data. First, we conducted a confirmatory factor analysis (CFA) using the Lavaan package (version 0.6–13) in R and chose the Mplus option and maximum likelihood estimation. CFA provides information on measures such as the Chi-square test of significance, the Comparative Fit Index (CFI), the Tucker–Lewis Index (TLI), also called the non-normed fit index, Steiger's Root Mean Square Error of Approximation (RMSEA), and the Standardised Root Mean Squared Residual (SRMR). CFI and TLI values greater than or equal to 0.95 indicate a good fit, and RMSEA and SRMR values less than 0.08 also indicate a good fit (Browne & Cudeck, 1992).

Next, we employed a statistical technique, Harman's single factor test, to check for common method bias (Podsakoff et al., 2003). If the single factor explains less than 50% of the variance, we can conclude that there is no common method bias. Finally, we employed the PLS-SEM approach to test the conceptual model (Fig. 1). Adding to the sample justification for using PLS-SEM, PLS-SEM is also appropriate for this study because (1) the study is exploratory; (2) the study is complex, involving many items and constructs; and (3) the data are not normally distributed (Hair et al., 2017).

Specifically, we used SmartPLS (version 4.0.9.4) (Ringle et al., 2022) to execute the PLS-SEM model (Fig. 1). SmartPLS simultaneously produces results for reflective measurement and structural models, including their reliability and validity (Hair et al., 2019b).

Table 2 Construct reliability

Construct	Item	Item loading	Alpha	AVE	CR
General bullying			0.82	0.65	0.88
	Gbul1	0.70			
	Gbul2	0.79			
	Gbul3	0.86			
	Gbul4	0.84			
Sexual harassment			0.78	0.69	0.87
	Sbul1	0.89			
	Sbul2	0.83			
	Sbul3	0.76			
Work-related bullying			0.82	0.65	0.88
	Wk1	0.72			
	Wk2	0.78			
	Wk3	0.88			
	Wk4	0.83			
Cyberbullying					
	Dig1	1.00			
Victimisation					
	Victim1	1.00			
University general environment			0.76	0.57	0.84
	General1	0.77			
	General2	0.78			
	General3	0.73			
	General4	0.74			
Order, safety, and discipline			0.67	0.60	0.82
	Order1	0.71			
	Order2	0.76			
	Order3	0.84			
Relationships (student–lecturer and student–peer relationships)			0.61	0.71	0.83
	Relations1	0.90			
	Relations2	0.78			
University physical environment					
	Physical1	1.00			

AVE represents average variance extracted, Alpha represents Cronbach's Alpha, and CR represents composite reliability

Results

Measurement model (i.e. construct validity and reliability)

The psychometric quality of the data was analysed using CFA ($\chi^2 = 491.66$, $df = 197$, $p < 0.001$; CFI = 0.89; TLI = 0.86; RMSEA = 0.058; and SRMR = 0.053). The CFI and TLI values suggest a moderate fit, and the values for RMSEA and SRMR suggest a good fit. Checking for the common method bias with Harman's single factor test, the

single factor, without rotation, explained only 23% of the variance, which is less than the recommended threshold of 50% for a good factor. The weak explanation of the variance by the single factor suggests that common method bias is not a concern in this study.

Item loading concerns the unidimensional properties of the items (whose actual meanings are in "Appendix 1") to ensure their goodness-of-fit. Table 2 presents the results of the item loading and reliability of the measurement model (i.e. average variance extracted [AVE], Cronbach's alpha, and composite reliability [CR]). Hair et al. (2019a) recommended item loadings above 0.70, which implies that the construct explains over 50% of the item's variance, leading to acceptable item reliability. Thus, in this study, items with loadings lower than 0.70 were excluded from the analysis to ensure convergent validity, which indicates the extent to which the indicators of the constructs congregate and explain the variance of the items (Hair et al., 2019a, p. 663).

The values for the Cronbach's alpha (range of 0.61–0.82) were reasonable because they were above the 0.60 threshold proposed by Hair et al. (2006). Regarding composite reliability, values between 0.70 and 0.90 are considered "satisfactory to good" (Hair et al., 2019b), which is the case in this study. Most of the composite reliability values were above 0.80. Chin (1998) argues that composite reliability should be preferred over Cronbach's alpha because the latter underestimates internal consistency and reliability. More so, Cronbach's alpha represents the lower bound, while composite reliability represents the upper bound of internal consistency reliability (Hair et al., 2019b). AVE is used to evaluate convergent validity—the extent to which a construct converges when explaining the variance of its items (Hair et al., 2019a). The threshold for AVE is 0.50 or higher (Hair et al., 2019a), which this study generally fulfilled because all the AVE values were higher than 0.50. Overall, the internal consistency, reliability, and convergent validity of the measurement model were confirmed in this study.

Table 3 shows the discriminant validity, which is how the constructs and their variables are unique from other constructs or variables, thereby capturing the phenomenon that the others did not measure and how the items represent one latent construct (Hair et al., 2019a). Specifically, the table contains the heterotrait–monotrait (HTMT) ratio of the correlations (Henseler et al., 2015). HTMT is the (geometric) mean of the average correlations for the items measuring the same construct compared to the mean value of the item

Table 3 Heterotrait–monotrait ratio (HTMT) correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Cyberbullying	1.000								
(2) General bullying	0.546	1.000							
(3) General environment	0.280	0.326	1.000						
(4) Order, safety, and discipline	0.263	0.293	0.897	1.000					
(5) Physical environment	0.204	0.201	0.344	0.428	1.000				
(6) Relationships	0.099	0.127	0.107	0.168	0.270	1.000			
(7) Sexual harassment	0.198	0.729	0.258	0.185	0.209	0.124	1.000		
(8) Victimisation	0.303	0.564	0.299	0.324	0.134	0.146	0.318	1.000	
(9) Work-related bullying	0.451	0.806	0.361	0.218	0.264	0.138	0.707	0.534	1.000

This table presents heterotrait–monotrait ratio (HTMT) correlations to confirm discriminant validity. No discriminant validity problem is found

correlations across constructs (see Henseler et al., 2015, p. 9). A threshold value of 0.90 is suggested for structural models with very similar constructs, while 0.85 is appropriate when the constructs are conceptually different (Henseler et al., 2015). Thus, discriminant validity problems arise when HTMT values exceed 0.85 or 0.90. All the values presented in Table 3 are lower than 0.90. Apart from the correlation value of 0.897 between the general environment and order, safety, and discipline, all the other values are lower than 0.85. The high correlation between the general environment and "order, safety, and discipline" is expected since the latter can be considered a component of the former. Overall, discriminant validity problems are not present in this study.

Structural model

Before one analyses the structural relationships, it is essential to ensure there are no multicollinearity problems (Hair et al., 2019a). To check the multicollinearity problem among the exogenous constructs (i.e. university learning environment constructs) in the structural model, we utilised variance inflation factor (VIF) scores, which we present in "Appendix 2". Multicollinearity issues are not severe when the VIF values are less than 5 (Hair et al., 2017), which is the case in this study. Thus, we present the main results of the structural model, which tested the relationships between the learning environment constructs and bullying constructs, and victimisation.

Figure 2 shows the coefficients of the PLS-SEM structural model, while Table 4 presents the details regarding the statistical significance. The university general environment was inversely associated with all the negative social behaviour constructs and victimisation, and the association was significant at a 99% confidence level, except for sexual harassment and victimisation, where the significance was at a 95% confidence level. It means any improvement in the general environment's variables would lead to fewer bullying incidents. For instance, the path coefficient for the association between the general environment and cyberbullying is −0.166, which means that a percentage point improvement in the general environment will lead to a 0.166 reduction in cyberbullying. The outcome and interpretation will also be the same for any other learning environment constructs and bullying incidents when there is a significant inverse relationship. The reverse would also be true of any deterioration in the learning environment variables and higher bullying incidents.

The university general environment results indicate that it is the most important exogenous construct in our model because its association with all the bullying-related constructs is statistically significant. Also, the coefficient size of the general environment construct in the model is higher than that of the rest of the exogenous constructs. "Order, safety, and discipline" is not significantly associated with either of the bullying-related constructs. It is only significantly associated with victimisation at a 95% confidence level.

We expected relationships among students and between students and lecturers to be inversely related to the experience of negative behaviours and bullying or victimisation, even if the association is insignificant. However, contrary to the general expectation, relationships show an insignificant positive association with all the bullying constructs and a significant positive association with victimisation. The results also show that the universities' physical environment is inversely and significantly related to cyberbullying, sexual harassment, and work-related bullying.

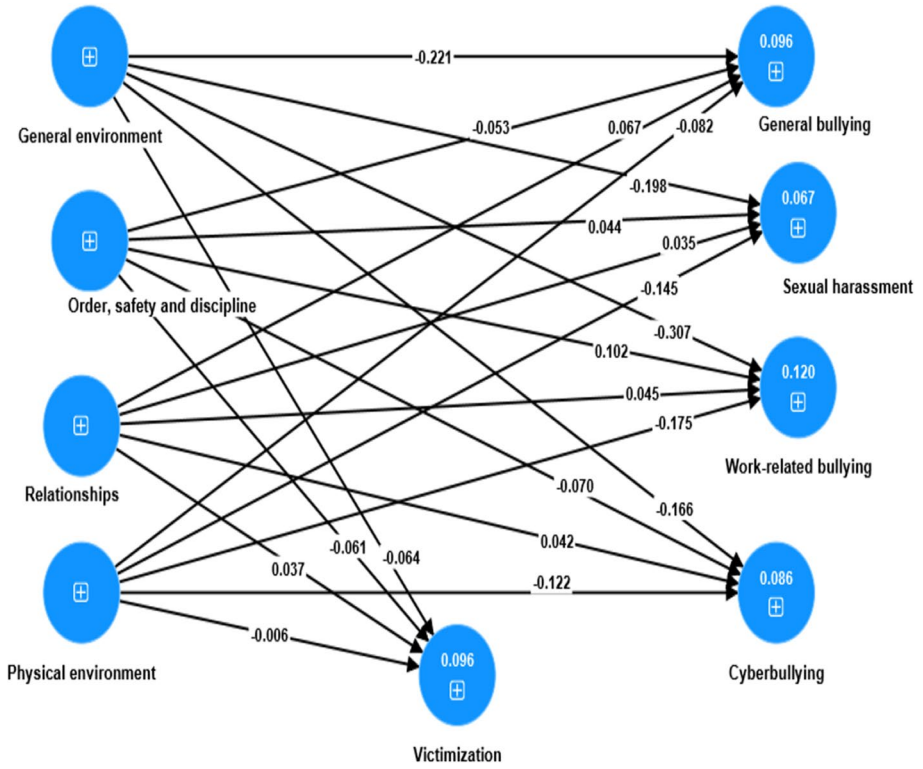

Fig. 2 Estimated path diagram. Note: Fig. 2 shows the estimated path coefficients

Table 5 provides an evaluation of the structural model regarding explanatory power and predictive power. The R-squared R^2 results indicate how much of the variance in each bullying construct is explained by the learning environment constructs. The results of the Q^2_{predict} (Q^2 hereafter) are based on the Shmueli et al. (2016) $\text{PLS}_{\text{predict}}$ procedure, which outperforms the blindfolding procedure of Stone (1974) and Geisser (1974). The Q^2 is used to assess a model's (out-of-sample) predictive power. A positive value of Q^2 means that the prediction error of the PLS-SEM model is lower than the prediction error of the naïve benchmark (i.e. the linear regression model, LM) (Hair et al., 2022). This is the case in this study. We further assessed the predictive power of our model by comparing the PLS-SEM root mean square error (RMSE) values with those of the benchmark model (see "Appendix 3"). This comparison indicates the high predictive power of our model since all the PLS-SEM RMSE values are less than the LM RMSE values (Hair et al., 2022; Shmueli et al., 2019). Thus, Table 5 presents the latent variables' prediction RMSE values and the mean absolute error (MAE) values due to the non-symmetric distribution of the prediction error (Hair et al., 2022).

Table 4 Structural model

Path	Path coefficient	t-value	F^2	Decision
General environment → Cyberbullying	−0.166***	2.694	0.017	Supported
General environment → General bullying	−0.221***	2.867	0.031	Supported
General environment → Sexual harassment	−0.198**	2.246	0.024	Supported
General environment → Victimisation	−0.064**	2.535	0.016	Supported
General environment → Work-related bullying	−0.307***	3.496	0.062	Supported
Order, safety, and discipline → Cyberbullying	−0.070	1.088	0.003	Not supported
Order, safety, and discipline → General bullying	−0.053	0.653	0.002	Not supported
Order, safety, and discipline → Sexual harassment	0.044	0.539	0.001	Not supported
Order, safety, and discipline → Victimisation	−0.061**	2.327	0.014	Supported
Order, safety, and discipline → Work-related bullying	0.102	1.335	0.006	Not supported
Physical environment → Cyberbullying	−0.122**	2.003	0.014	Supported
Physical environment → General bullying	−0.082	1.167	0.006	Not supported
Physical environment → Sexual harassment	−0.145**	2.306	0.019	Supported
Physical environment → Victimisation	−0.006	0.285	0.000	Not supported
Physical environment → Work-related bullying	−0.175***	3.114	0.029	Supported
Relationships → Cyberbullying	0.042	0.857	0.002	Not supported
Relationships → General bullying	0.067	1.420	0.005	Not supported
Relationships → Sexual harassment	0.035	0.719	0.001	Not supported
Relationships → Victimisation	0.037**	2.166	0.009	Supported
Relationships → Work-related bullying	0.045	1.002	0.002	Not supported

This table presents PLS-SEM results on the structural model about the association between the university environment and bullying behaviour and victimisation. ***$p < 0.01$, **$p < 0.05$

Table 5 Evaluation of the structural model

Construct	R^2	$Q^2_{predict}$	RMSE	MAE
Cyberbullying	0.086	0.063	0.993	0.565
General bullying	0.096	0.058	1.000	0.621
Sexual harassment	0.067	0.026	1.091	0.502
Victimisation	0.096	0.052	0.978	0.776
Work-related bullying	0.120	0.084	1.013	0.559

RMSE = root mean square error, MAE = mean absolute error

PLS multigroup analysis (PLS-MGA)

Measurement invariance analysis

We explored the data further to see whether there are significant differences between different groups (i.e. academic level and marital status) concerning our model. Before assessing any differences in the structural model across groups, we conducted a measurement invariance analysis to ensure the validity of our results and conclusions. Measurement invariance concerns whether measurement operations yield measures of the same attribute when observed and studied under different conditions (see Horn & McArdle, 1992, p. 117). We

followed Henseler et al. (2016)'s measurement invariance of composite models (MICOM) procedure to assess measurement invariance or equivalence.

Table 6 Measurement invariance test using MICOM—Academic level

Step 2	Composite	Correlation value (= 1)	95% Confidence interval	Compositional invariance?
	Cyberbullying	1.000	[0.999; 1.000]	Yes
	General bullying	0.995	[0.978; 1.000]	Yes
	General environment	0.996	[0.965; 1.000]	Yes
	Order, safety, and discipline	0.986	[0.892; 1.000]	Yes
	Physical environment	1.000	[0.999; 1.000]	Yes
	Relationships	0.962	[0.656; 1.000]	Yes
	Sexual harassment	0.978	[0.884; 1.000]	Yes
	Victimisation	0.999	[0.999; 1.000]	Yes
	Work-related bullying	0.997	[0.977; 1.000]	Yes
Step 3a	Composite	Difference of the composite's mean value (= 0)	95% Confidence interval	Equal means?
	Cyberbullying	0.075	[− 0.195; 0.186]	Yes
	General bullying	− 0.048	[− 0.183; 0.195]	Yes
	General environment	0.034	[− 0.182; 0.189]	Yes
	Order, safety, and discipline	− 0.029	[− 0.197; 0.191]	Yes
	Physical environment	0.094	[− 0.199; 0.195]	Yes
	Relationships	− 0.149	[− 0.184; 0.191]	Yes
	Sexual harassment	− 0.065	[− 0.187; 0.201]	Yes
	Victimisation	− 0.049	[− 0.079; 0.069]	Yes
	Work-related bullying	− 0.016	[− 0.189; 0.191]	Yes
Step 3b	Composite	The logarithm of the composite's variance ratio (= 0)	95% Confidence interval	Equal variances?
	Cyberbullying	0.061	[− 0.946; 0.950]	Yes
	General bullying	− 0.313	[− 0.770; 0.877]	Yes
	General environment	− 0.281	[− 0.402; 0.373]	Yes
	Order, safety, and discipline	− 0.291	[− 0.373; 0.353]	Yes
	Physical environment	− 0.188	[− 0.267; 0.272]	Yes
	Relationships	− 0.155	[− 0.188; 0.180]	Yes
	Sexual harassment	− 1.052	[− 1.756; 1.817]	Yes
	Victimisation	− 0.201	[− 0.328; 0.281]	Yes
	Work-related bullying	− 0.034	[− 1.083; 1.072]	Yes

In step (2), the permutation test substantiates that none of the correlation values significantly differ from one (1). In step (3a), the null hypothesis is that the difference in the composite's mean value between bachelor and master students is not different from zero (0). Similarly, in step (3b), the null hypothesis is that the difference in the composite's variance between bachelor and master students is not different from zero (0). Due to insufficient data, the PhD group was dropped in the permutation test. All the *p*-values of the permutation test (for steps 2 and 3) were greater than 0.05.

Table 7 Measurement invariance test using MICOM—marital status

Step 2	Composite	Correlation value (=1)	95% Confidence interval	Compositional invariance?
	Cyberbullying	1.000	[0.999; 1.000]	Yes
	General bullying	0.997	[0.983; 1.000]	Yes
	General environment	0.995	[0.974; 1.000]	Yes
	Order, safety, and discipline	0.981	[0.927; 1.000]	Yes
	Physical environment	1.000	[0.999; 1.000]	Yes
	Relationships	0.787	[0.742; 1.000]	Yes
	Sexual harassment	0.999	[0.925; 1.000]	Yes
	Victimisation	0.999	[0.999; 1.000]	Yes
	Work-related bullying	0.993	[0.982; 1.000]	Yes
Step 3a	Composite	Difference of the composite's mean value (=0)	95% Confidence interval	Equal means?
	Cyberbullying	−0.133	[−0.179; 0.186]	Yes
	General bullying	−0.128	[−0.193; 0.178]	Yes
	General environment	−0.008	[−0.206; 0.184]	Yes
	Order, safety, and discipline	0.064	[−0.181; 0.180]	Yes
	Physical environment	−0.005	[−0.191; 0.200]	Yes
	Relationships	0.029	[−0.198; 0.186]	Yes
	Sexual harassment	0.002	[−0.198; 0.183]	Yes
	Victimisation	−0.038	[−0.076; 0.077]	Yes
	Work-related bullying	0.006	[−0.194; 0.188]	Yes
Step 3b	Composite	Logarithm of the composite's variances ratio (=0)	95% Confidence interval	Equal variances?
	Cyberbullying	−0.344	[−0.766; 0.856]	Yes
	General bullying	−0.011	[−0.745; 0.828]	Yes
	General environment	0.001	[−0.347; 0.363]	Yes
	Order, safety, and discipline	−0.013	[−0.342; 0.368]	Yes
	Physical environment	−0.059	[−0.279; 0.271]	Yes
	Relationships	−0.002	[−0.193; 0.195]	Yes
	Sexual harassment	−0.043	[−1.752; 1.695]	Yes
	Victimisation	−0.147	[−0.292; 0.320]	Yes
	Work-related bullying	0.623	[−0.927; 1.060]	Yes

In step (2), the permutation test substantiates that none of the correlation values significantly differ from one (1). In step (3a), the null hypothesis is that the difference in the composite's mean value between single and married students is not different from zero (0). Similarly, in step (3b), the null hypothesis is that the difference in the composite's variance between single and married students is not different from zero (0). All the p-values of the permutation test (for steps 2 and 3) were greater than 0.05

The procedure consists of three steps: (1) configural invariance (i.e. similar setup), (2) compositional invariance (i.e. similar composite scores), and (3) equality of composite mean values and variances. Each step is an input for the next step, and complete measurement invariance is established when all steps (i.e. 1–3) are fulfilled. Step (1) is established

in this study since the measurement model has the same number of constructs for each group. SmartPLS software provides results for steps (2) and (3) based on permutation tests, which are presented in Tables 6 and 7 following Henseler et al. (2016). The permutation test results show that full measurement invariance exists in this study. Thus, a comparison of our structural model between groups is unquestionable.

Assessment of group results and differences in the structural model

The next step is to compare the structural model results between groups. First, we re-ran the structural model for the *academic level*, where we separated the results into bachelor's, master's, and PhD groups, as in Table 8. We dropped the PhD group from the PLS-MGA due to insufficient data. Table 8 shows that the results are consistent with the general findings reported in Table 4. Overall, there are significant differences in the PLS-MGA results between the bachelor's and master's groups. Further group analysis shows that the size of the path coefficient differs significantly between the bachelor's and master's groups only in the associations between physical environment, relationships, and victimisation. The significant differences are due to different directional signs of the coefficients among the groups.

In the bachelor's group, the general environment is inversely and significantly associated with all the bullying constructs except victimisation, whereas in the master's group, only its relationship with victimisation was significant. It suggests that the findings in the entire sample that the general environment is inversely and significantly associated with bullying only apply to the bachelor's group, where the coefficient sizes (effect sizes) are higher than those of the entire sample. In contrast, the entire sample's finding on victimisation only applies to the master's group. More so, like in the entire sample, only the association between "order, safety, and discipline" and "victimisation" is significant, with a negative coefficient in the bachelor's group. It suggests that the impact of order, safety, and discipline on victimisation is limited to the bachelor's group. There is no impact on the master's group. The results further show that the relationships and physical environment constructs in the bachelor's group are not significantly associated with bullying or victimisation. However, in the master's group, "physical environment" is inversely and significantly associated with work-related bullying and "relationship" is also positively and significantly associated with general bullying and victimisation.

Second, we re-ran the PLS-SEM structural model for marital status. As presented in Table 9, the results are more pronounced among married and cohabiting respondents than among single people. Among married and cohabiting people, associations between the general learning environment and all bullying constructs and victimisation were significant, which mirrored the main results in Table 4 ($n = 438$). More so, the coefficient sizes are higher in the married and cohabiting group than in the entire sample. The association between the universities' physical environment and work-related bullying is also significant among the married and cohabiting groups. However, unlike the entire sample, the relationship construct is positively and significantly associated with general bullying and victimisation in the married and cohabiting group.

Table 8 Structural model comparison between bachelor and master students

Path	Bachelor (n = 195)			Master (n = 211)			Assessment of group differences		
	Path coefficient	t-value	Decision	Path coefficient	t-value	Decision	Invariant results?	Coefficient difference	Invariant coefficient?
General environment → Cyberbullying	− 0.213**	2.109	Supported	− 0.067	0.706	Not supported	No	− 0.145	Yes
General environment → General bullying	− 0.358***	2.802	Supported	− 0.149	1.314	Not supported	No	− 0.208	Yes
General environment → Sexual harassment	− 0.375***	2.596	Supported	− 0.137	1.228	Not supported	No	− 0.238	Yes
General environment → Victimisation	− 0.040	1.058	Not supported	− 0.106***	2.641	Supported	No	0.066	Yes
General environment → Work-related bullying	− 0.491***	3.138	Supported	− 0.198	1.688	Not supported	No	− 0.293	Yes
Order, safety, and discipline → Cyberbullying	− 0.070	0.675	Not supported	− 0.104	1.141	Not supported	Yes	0.035	Yes
Order, safety, and discipline → General bullying	− 0.071	0.606	Not supported	− 0.030	0.239	Not supported	Yes	− 0.041	Yes
Order, safety, and discipline → Sexual harassment	0.056	0.427	Not supported	0.042	0.351	Not supported	Yes	0.014	Yes
Order, safety, and discipline → Victimisation	− 0.092***	2.597	Supported	− 0.005	0.121	Not supported	No	− 0.087	Yes
Order, safety, and discipline → Work-related bullying	0.141	1.140	Not supported	0.119	1.064	Not supported	Yes	0.022	Yes
Physical environment → Cyberbullying	− 0.104	1.203	Not supported	− 0.122	1.332	Not supported	Yes	0.018	Yes
Physical environment → General bullying	− 0.014	0.150	Not supported	− 0.097	0.839	Not supported	Yes	0.083	Yes
Physical environment → Sexual harassment	− 0.044	0.563	Not supported	− 0.174	1.740	Not supported	Yes	0.130	Yes
Physical environment → Victimisation	0.045	1.603	Not supported	− 0.043	1.359	Not supported	Yes	0.088**	No
Physical environment → Work-related bullying	− 0.079	1.010	Not supported	− 0.229**	2.559	Supported	No	0.149	Yes
Relationships → Cyberbullying	0.116	1.473	Not supported	0.001	0.016	Not supported	Yes	0.114	Yes
Relationships → General bullying	− 0.008	0.084	Not supported	0.164**	2.584	Supported	No	− 0.172	Yes

Table 8 (continued)

Path	Bachelor (n = 195)			Master (n = 211)			Assessment of group differences		
	Path coefficient	t-value	Decision	Path coefficient	t-value	Decision	Invariant results?	Coefficient difference	Invariant coefficient?
Relationships → Sexual harassment	0.035	0.304	Not supported	0.035	0.453	Not supported	Yes	0.000	Yes
Relationships → Victimisation	− 0.008	0.251	Not supported	0.082***	3.433	Supported	No	− 0.090**	No
Relationships → Work-related bullying	0.029	0.231	Not supported	0.086	1.600	Not supported	Yes	− 0.057	Yes

This table presents PLS-MGA results on the structural model, which concerns the association between the university environment and bullying behaviour and victimisation for subsamples regarding academic level. The question "Invariant results?" is about whether or not there are no differences in the PLS results between the two groups—coefficient difference = coefficient for bachelor—the coefficient for the master's group. The question "Invariant coefficient?" is about whether or not there are differences in the coefficient size between the two groups. A "Yes" means there is no difference, and a "No" means there is a difference. MGA = Multigroup analysis. ***$p < 0.01$, **$p < 0.05$

Table 9 Structural model comparison between single and married students

Path	Single (n = 248)			Married (n = 181)			Assessment of group differences		
	Path coefficient	t-value	Decision	Path coefficient	t-value	Decision	Invariant results?	Coefficient difference	Invariant coefficient?
General environment → Cyberbullying	− 0.114	1.198	Not supported	− 0.232**	2.286	Supported	No	0.118	Yes
General environment → General bullying	− 0.178	1.530	Not supported	− 0.299***	2.988	Supported	No	0.122	Yes
General environment → Sexual harassment	− 0.151	1.207	Not supported	− 0.242**	2.074	Supported	No	0.091	Yes
General environment → Victimisation	− 0.050	1.410	Not supported	− 0.086**	2.155	Supported	No	0.036	Yes
General environment → Work-related bullying	− 0.298**	2.139	Supported	− 0.370***	3.864	Supported	Yes	0.073	Yes
Order, safety, and discipline → Cyberbullying	− 0.066	0.579	Not supported	− 0.083	0.838	Not supported	Yes	0.018	Yes
Order, safety, and discipline → General bullying	0.032	0.248	Not supported	− 0.158	1.527	Not supported	Yes	0.190	Yes
Order, safety, and discipline → Sexual harassment	0.097	0.839	Not supported	− 0.041	0.389	Not supported	Yes	0.137	Yes
Order, safety, and discipline → Victimisation	− 0.055	1.474	Not supported	− 0.062	1.504	Not supported	Yes	0.006	Yes
Order, safety, and discipline → Work-related bullying	0.158	1.255	Not supported	0.043	0.446	Not supported	Yes	0.115	Yes
Physical environment → Cyberbullying	− 0.110	1.583	Not supported	− 0.156	1.458	Not supported	Yes	0.046	Yes
Physical environment → General bullying	− 0.155	1.571	Not supported	0.027	0.312	Not supported	Yes	− 0.182	Yes
Physical environment → Sexual harassment	− 0.156	1.521	Not supported	− 0.111	0.956	Not supported	Yes	− 0.044	Yes
Physical environment → Victimisation	0.015	0.513	Not supported	− 0.013	0.414	Not supported	Yes	0.028	Yes
Physical environment → Work-related bullying	− 0.151	1.662	Not supported	− 0.205**	2.419	Supported	No	0.054	Yes
Relationships → Cyberbullying	0.065	0.833	Not supported	0.035	0.454	Not supported	Yes	0.030	Yes
Relationships → General bullying	0.077	0.713	Not supported	0.160**	2.441	Supported	No	− 0.084	Yes
Relationships → Sexual harassment	0.060	0.548	Not supported	0.084	1.132	Not supported	Yes	− 0.024	Yes
Relationships → Victimisation	0.022	0.780	Not supported	0.071***	2.604	Supported	No	− 0.049	Yes
Relationships → Work-related bullying	0.098	0.919	Not supported	0.111	1.850	Not supported	Yes	− 0.012	Yes

This table presents PLS-MGA results on the structural model, which concerns the association between the university environment and bullying behaviour and victimisation for subsamples regarding marital status. The question "Invariant results?" is about whether or not there are no differences in the PLS results between the two groups—coefficient difference = coefficient for single—coefficient for the married group. The question "Invariant coefficient?" is about whether or not there are differences in the coefficient size between the two groups. A "Yes" means there is no difference, and a "No" means there is a difference. MGA = Multigroup analysis. ***$p < 0.01$, **$p < 0.05$

In the single group, the results were generally insignificant. It is only the association between the general learning environment and work-related bullying that is significant. The rest of the associations are insignificant. Regarding differences in the coefficient sizes, the two groups had similar coefficient sizes.

Overall, the PLS multigroup analysis suggests that the results are more pronounced in the bachelor's and married and cohabiting groups and less pronounced in the master's and single groups. This suggests that the learning environment is significant for married and cohabiting people and those studying in bachelor's programmes.

Discussion and recommendations for improvement in the learning environment

This research investigated the relationship between students' perceptions of learning environments and their experiences of various negative social behaviours and victimisation at two Norwegian universities. We tried to describe the state of affairs in the learning environments from the students' perspective (see Shelton, 2019, p. 47). The most conclusive result shows that students' perception of the universities' general learning environment is inversely related to their experience of various negative behaviours and victimisation. This implies that students consider the variables that describe the general learning environment as influencing the occurrence of bullying. To address bullying, these variables must be improved (e.g. Juvonen & Graham, 2014; Konishi et al., 2017). We will discuss the result further in relation to the research questions.

RQ1: The association between the universities' general environment and students' experiences of negative behaviours and victimisation

The association between the universities' general environment and the experience of various negative behaviours and victimisation retained a significant inverse association. The results suggest that the universities' general environment is the most impactful exogenous construct in this study because it is significantly associated with all the endogenous constructs, and its coefficient size (effect size) seems more significant than those of the other exogenous constructs. From "Appendix 1", some of the universities' general environment variables concern authorities' responsiveness to reports of bullying and the risk of danger and competence in handling those reports. This confirms recommendations for system-oriented mechanisms for dealing with bullying by Rayner et al. (2002) and Einarsen et al. (2003). As Luca (2016) recommended, students would want universities to have well-trained personnel to handle reports of bullying and victimisation. More so, the result concerning the need to equally hold lecturers and administrators accountable for any misconduct is also consistent with recommendations in the Australian Fair Work Act, as reported by Twale (2018) and the European partners' Framework Agreement on Violence and Harassment at Work (2007) (see Einarsen et al., 2020, p. 471). Bullying can be rampant when there is no fairness in how authorities and students are held accountable.

Seeing that the items that constitute the universities' general environment inversely relate to students' experiences of various negative behaviours, we would say the results imply that improvements in the learning environment concerning the retained items would reduce bullying-related incidents.

RQ2: The association between order, safety, and discipline and students' experiences of negative behaviours and victimisation

Order, safety, and discipline in this research concern university rules being fair, consistent, and strictly enforced, students receiving punishment for breaches of rules, and student and staff collaboration in problem-solving. Gottfredson and Gottfredson (1985) argued that awareness creation about rules and regulations concerning bullying, fairness and consistency in implementing the rules, supervision and training in conflict resolution and handling of bullying, and problem-solving help to reduce bullying. The results did not show a significant coefficient for order, safety, and discipline. However, its negative association with victimisation at 95% and 99% confidence levels in the general model and bachelor's sub-group, respectively, is noteworthy because victims consider their experience of negative behaviours as bullying.

The result is consistent with those of Konishi et al. (2017) and Johnson (2009) and indicates that order, safety, and discipline are significant predictors of becoming a victim of bullying or becoming a bully. As Gottfredson and Gottfredson (1985) argue, if students are aware of rules that fairly apply to everyone, they will behave according to the rules, so that bullying will be minimal. The implication is that authorities in the learning environments in our study would have to be conscious of creating awareness about rules that forbid bullying and ensuring fairness, consistency, and transparency in applying the rules.

RQ3: The association between relationships and students' experiences of negative behaviours and victimisation

The association between relationships (i.e. between students and their lecturers and among students) and the experience of negative behaviours is positive but only significant with victimisation in the larger sample as well as the masters' and married and cohabiting subgroups. It is also significant with general bullying in the masters' and married and cohabiting subgroups. Technically, this implies that a more positive perception of the environment due to relationships would result in more negative behaviours and victimisation incidents. This finding is surprising and unexpected because bullying is expected to be minimal when there is a good relationship among groups of people (Espelage et al., 2014; Søndergaard, 2012; Thapa et al., 2013). However, this contradiction can occur in bullying research (e.g. Aldridge et al., 2016, 2018).

We measured relationships in terms of lecturers caring about the students, being available to listen to their problems, and students exercising mutual respect and decency for each other. These items had good factor loadings, and whether the respondents misunderstood the variables was unclear. However, we dealt with relationships in an environment that Mikkelsen and Einarsen (2001) argue is individualistic. It is unclear whether this resulted in a low association or a sporadic one. Nonetheless, Zacharia and Yablon (2022) argue that negative relationships exist only in schools (or their aspects), characterised by an adverse climate. With this understanding, it means that relationship issues do not create avenues for bullying incidents.

RQ4: The association between the university's physical environment and students' experiences of negative behaviours and victimisation

The results indicate a significant negative association between the university's physical environment and the experience of various clusters of negative behaviours, including cyberbullying, sexual harassment, and work-related bullying. Research on the university environment is limited, but a review by Manca et al. (2020) and the findings of Salin (2015) did not show contradictions. However, the association between the university's physical environment and the experience of sex-related negative behaviours is noteworthy. This brings to the fore the results of Sivertsen et al., (2019, p. 7) concerning sexual harassment among Norwegian students, and it is unclear if the results indicate a need to improve the physical learning environment.

Knowing the Norwegian university environment, we would carefully conclude that the students were dissatisfied with the physical learning environment. However, the fact that sex-related negative behaviours have an inverse association with the universities' physical environment in this study calls for attention to what is accountable for the consistent findings. Perhaps a tacit subculture of existing unacceptable behaviours that Luca (2016, p. 145) considered "harmless sexual innuendos" that the victims do not report might readily be accountable for these results. Nonetheless, we conclude that behaviours validated as sex-related can occur in a well-designed physical environment.

More so, the Norwegian environment is well-built in terms of internet facilities. The significant association between the physical environment and cyberbullying in the larger sample is typical of environments where internet availability can facilitate intergroup interaction or be harnessed as a tool for isolating and excluding victims from social communication and networks (see Ademiluyi et al., 2022). Unsurprisingly, it is only exclusion from digital communication or social networks that accounts for the cyber-related negative behaviour in this study.

RQ5: Association based on the level of study and marital status of participants

For this level, we reported the variation in the results based on the respondents' academic levels and marital status. There has not been much research in the workplace or in higher education to show these associations. However, Cemaloglu (2007) and Ovayolu et al. (2014) researched the association between bullying and marital status and found no significant results. Our results suggest that married and cohabiting people are the ones who experience negative behaviours and victimisation, which improvement in the learning environment could mitigate. For instance, an inverse association was found between the university general environment and all bullying constructs and victimisation.

At the academic level, Sinkkonen et al. (2014) found that bullying was more prevalent among master's students than bachelor's students, with higher intensity among those who had spent about five years or more, but it occurred occasionally. Context and social dynamics influence these results, so we perceive that the research community would not witness any consistent results. As such, we relate our study to the general concept of bullying. The stronger relationship between the general learning environment and the various bullying constructs for the bachelor's group can be explained from the point of view of power dynamics, which Leymann (1996) argues is central to bullying. We argue that power dynamics might be associated with the stronger inverse relationship between the general learning environment and various negative behaviours. Bachelor students might be at the

lower end of the power dynamics, or friction leading to bullying could be higher among bachelor's students who, at this level, have much greater interaction (see Ledlow, 2008). Bachelor students do not constitute the largest proportion of respondents, so we cannot say the result is an outcome of their population.

Study limitations and recommendations for future directions

One limitation of this study is that most of the learning environment scales were self-developed. Moreover, students' interpretations of them are unknown because we did not have the opportunity to communicate them to the students for an informed response. More so, cross-sectional studies do not guarantee claims of conclusive causal connections, which is the case in this research. However, learning environment research at universities is an evolving field. Knowing that our items met the threshold for good factor loadings, we hope the effort will provide a stepping stone for universal construct development for higher education learning environment research.

The sample did not significantly satisfy the response rate, creating a research limitation. However, we could not verify the delivery of the questionnaire or the accuracy of the email addresses of the sample population. The coronavirus pandemic also prevented in-person follow-ups. However, limiting the sample to students who have experienced the learning environment for a long time or who were in a web of power-imbalance dynamics (i.e. master's, PhD fellows, and postdocs) guaranteed informed respondents and lessened the need to have a statistical representation of the population (Mason, 2002). More so, 438 respondents are enough for PLS-SEM analysis (see Hair et al., 2014, p. xii; Pirouz, 2006, p. 2). The power analysis results also confirmed that our sample size was sufficient for the empirical analysis.

Apart from the general environmental construct, which shows significant associations, the other environmental constructs have weak and sporadic associations with bullying-related negative behaviours and victimisation. Moreover, the association between relationships and students' experiences of various negative behaviours indicates positive values, which we consider to be contrary to expectations. We recommend that future research investigates these trends further.

Conclusion

Studies on learning environments to prevent the experience of bullying have had varied focuses and are very limited in university learning environments. Some researchers have proposed the need for disciplinary measures (Johnson, 2009; Konishi et al., 2017). Others, like Aldridge et al. (2018), have proposed relational interventions, and some have argued for the importance of the physical environment (Manca et al., 2020). Our results indicate the need to improve the universities' general environment to reduce most of the clusters of negative behaviours and victimisation.

The variables that emerged as components of the universities' general environment revealed that students require university authorities to act on reports of bullying or risk of danger, as well as the competence of lecturers and university staff in handling bullying-related issues. A look at the ombudsperson reports of the universities studied in this research revealed that most of the cases reported for redress concern the evaluation

of students' examinations; it was not surprising that this concern emerged as a validated item of bullying. Seeing that the university's general environment was inversely and significantly associated with the work-related bullying construct that includes issues about grades, criticism of work effort, and information dissemination means these matters must be taken seriously. Moreover, provisions for the redress of unfair exam assessments require communication.

Students also expect that students and lecturers are equally held accountable for any misconduct, and when students report faculty for misconduct, the case is handled professionally without repercussions for the students. All of these point to rules; undoubtedly, societies cannot exist without rules (Arum, 2003). Rules are needed to guide and protect people and must be communicated for reference. The universities' physical learning environments have raised some concerns concerning sexual harassment and exclusion or isolation from social communication and networks. This is noteworthy, even though the Norwegian physical environments do not look defective in their layouts.

Appendix 1

Constructs and item codes	
Bullying constructs	
General bullying (Codes)	*Bullying code names*
Gbul1	Practical jokes directed at you by people you do not get along with
Gbul2	You receive insults or offensive remarks about your person, your attitudes or your private life
Gbul3	Being ignored or excluded ('being sent to Coventry')
Gbul4	Being ignored or facing a hostile reaction when you approach
Sexual harassment (codes)	
Sbul1	Someone tells suggestive stories, makes sexist and offensive jokes or displays offensive materials about you
Sbul2	You are being maltreated, ignored or put down in a condescending or demeaning manner because of your sex
Sbul3	Someone makes sexual advances, looks, gestures, jokes or remarks towards you, which are sexually inciting and discomforting
Work-related bullying (codes)	
Wk1	Someone withholding information that affects your performance
Wk2	Repeatedly reminded of your blunders, errors or mistakes
Wk3	A persistent criticism of your work and your efforts
Wk4	You are denied the right to claim what you are entitled to (e.g. grade)
Cyberbullying (codes)	
Dig1	You are excluded from digital communication or social networks
Victimisation	
Victim1	= 1 if there was victimisation and 0 otherwise
Learning environment constructs	
University general environment	*Learning Environment Code names*
General1	Authorities act on reports of bullying or risk of danger
General2	Lecturers and university staff are competent in handling bullying-related issues

Constructs and item codes	
General3	Lecturers and administrators are equally held accountable for any misconduct
General4	Students' reporting of authority's misconduct is usually handled professionally without repercussions for the students
Order, safety, and discipline	
Order1	University rules are fair, consistent, and strictly enforced
Order2	Students receive punishment if they do not follow university rules
Order3	Students and staff solve the problems in this university
Relationships (student–lecturer and student–peer relationships)	
Relations1	Lecturers care about the students; they are available and listen to problems
Relations2	There is mutual respect and decency among students
University physical environment	
Physical1	The physical structure and facilities' design increase openness and prevent hideouts for negative behaviours (e.g. glass in office doors)

Appendix 2: Structural model—Multicollinearity check (VIFs)

	Cyberbullying	General bullying	Sexual harassment	Victimisation	Work-related bullying
General environment	1.728	1.728	1.728	1.728	1.728
Order, safety, and discipline	1.808	1.808	1.808	1.808	1.808
Physical environment	1.190	1.190	1.190	1.190	1.190
Relationships	1.039	1.039	1.039	1.039	1.039

This table presents variance inflation factor (VIF) scores to check possible multicollinearity issues among the structural model's exogenous constructs.

Appendix 3: RMSE comparison between PLS-SEM and LM

	Item	PLS-SEM_RMSE	LM_RMSE
Cyberbullying	Dig1	0.604	0.611
General bullying	gbul1	0.445	0.446
	Gbul2	0.547	0.559
	Gbul3	0.789	0.799
	Gbul4	0.632	0.641

	Item	PLS-SEM_RMSE	LM_RMSE
Sexual harassment	sbul1	0.404	0.412
	sbul2	0.421	0.425
	Sbul3	0.377	0.380
Victimisation	Victim1	0.391	0.391
Work-related bullying	wk1	0.541	0.552
	wk2	0.563	0.576
	wk3	0.545	0.554
	wk4	0.453	0.470

LM Linear regression model, *RMSE* root mean square error

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Declarations

Competing interests There is no competing interest, and there is no foreseeable competing interest.

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