

University climate in distance education contexts: developing an assessment instrument

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Abstract

The article presents the validation of an instrument for the assessment of students' perception of the university climate in distance education settings. Also in such contexts, students establish relationships with classmates and teachers, and feel the atmosphere, the sense of belonging to an institution and to a community of learners. For teachers, however, it is difficult to understand how students perceive these dynamics. Therefore, the University Climate Questionnaire for Distance Education Contexts (UCliQ-DE), composed of 22 items, has been developed and validated through factorial analysis and reliability studies among a population of freshmen in an Italian BA program in Educational Sciences. It was concluded that the UCliQ-DE is a valid and reliable assessment tool, and that it yields five interpretable factors: the perception of the relationships among students, the sense of belonging to the academic community, the previous expectations about the online university climate, the perception of the relationships between students and teachers, and the awareness of the potential limits of online interactions.

KEYWORDS: University Climate, Distance Education, Psychometric Validation, Assessment Tool, Classroom Relationships.

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1. Introduction

What happens to the university climate when all activities are online? Can we still speak of a “climate” when students never meet in person? And, if a climate exists, what are the factors that contribute to its creation?

These are some of the questions we asked ourselves during the 2020-21 Covid-19 pandemic when we, like so many other university teachers, had to teach our lessons using screens instead of physical classrooms. We were not used to doing this, we felt the difficulty of understanding what was going on among our students, and we also empathized with the troubles of young

adults who were home alone for extended periods, attending virtual lectures together with classmates they never met in person.

This was the situation encountered in institutions of higher education all across the globe during the pandemic, which we faced with open hearts and minds, hoping to return soon to our traditional ways of working. However, this is also the typical situation at distance-learning universities, which are here to stay, as it seems. We are therefore convinced that the dynamics of the university climate in distance education settings is a topic whose relevance will remain beyond this particular moment of time – if we believe in universities not as mere sites of instruction, but as places where people learn and live, build and maintain relationships, develop and grow.

Starting from these thoughts and our experience, we present here the validation of an instrument for assessing the university climate in distance education contexts. The rationale of this work, as we outline in the next section, is based on previous research on the nature of the university climate and its connection with academic achievements, negative behaviors, and a sense of community. In the ensuing sections, we then

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present the instrument we developed – including the research context and goals, the method and sample used, the statistical analyses conducted, and the results achieved – and prove its validity and reliability.

2. Assessing the university climate: state of the art

In the psychological and pedagogical literature, different but complementary definitions of “university climate” can be found. These definitions sometimes recall the research developed in the wider field of the school climate and underline distinctive nuances of the concept. For example, one of the most comprehensive definitions states that the university climate is a complex of «rules, trust, academic supports, personal and social relationships among classmates and between professors and students, and academic connectedness» (Sánchez et al., 2015, p. 390). Souza et al. (2018, p. 2073), instead, define the university climate as the way in which «university students perceive and feel about the social relations that occur in and out of the classroom». Other studies again consider the university climate as the interaction of four specific dimensions: «(i) the university historical legacy of inclusion/exclusion; (ii) the structural diversity or the capacity to include students representing various groups (race, ethnicities, religions, sexual orientations, disabilities); (iii) psychological climate, that is, the perceptions and attitudes between and within groups; and (iv) the behavioral climate which includes the formal or informal interactions between groups» (Souza et al., 2018, p. 2073).

The university climate is an important factor for the general growth of students and the development of both positive and negative behaviors. On the one hand, research has verified the effect of the university climate on academic achievements, students’ wellbeing, self-esteem, sense of community, engagement, and the development of an adequate professional identity (Gunuc et al., 2022; Kurt et al., 2022; Machado et al., 2002; McMillan & Chavis, 1986; Rania et al., 2014; Rovai, 2002; Sánchez et al., 2015). Moreover, research on international students shows that their positive perceptions of the university climate improve their social integration and allow them to overcome «challenges related to discrimination, stereotype, and linguistic barriers» (Jean-Francois, 2019, p. 1071). On the other hand, the university climate has been shown to have effects on the development of inappropriate or dysfunctional behaviors, such as internet addiction, aggressive conduct, bullying, psychological distress, and academic dropout related to feelings of isolation (Casas et al., 2013; Conley et al., 2013; Li et al., 2016; Rovai, 2002).

Because of its importance in campus life, some instruments to assess the university climate have

already been developed, each of them investigating specific dimensions of the construct. The three main examples of such instruments are the following:

- The *Classroom Social Climate Scale for Universities* (CSCS-U) by Sánchez et al. (2015), which studies three main factors: (i) the relationships among peers, (ii) the teachers’ performance and the relationships between teachers and students, and (iii) the sense of belonging as a product of following the rules.
- The *Institutional and Psychosocial Campus Climate Inventory* (IPCCI) by Souza (2018), which analyses four factors in relation to cases of cyberbullying: teacher support, institutional readiness, newcomer adjustment during socialization, and students’ feeling of wellbeing.
- The QSS-S version of the *Climate scale*, as modified by Santinello & Bertarelli (2002), which investigates ten main factors: relationships with peers, students’ relationships with teachers, signs of physical and emotional expression, interest in studying, study method, parental expectations, self-esteem related to school tasks, institutional environment, future employability, and one’s own social desirability.

None of these instruments, however, was specifically intended for studying the university climate in distance education contexts. Only one tool – the Classroom Community Scale by Rovai (2002) – partially lends itself to this particular purpose, but does not assess the university climate as a whole, as it exclusively measures the sense of community in relation to the learning achievement.

Due to the above reasons, and for the purpose of this study, we developed and validated a new assessment instrument, which is presented in this article. Among the many elements that, according to the reviewed literature, contribute to the university climate, we chose five main dimensions that were best suited for the purpose of our study: students’ initial expectations regarding the climate that would be established throughout the semester via online tools; students’ perceptions of their social interactions with peers; students’ sense of belonging to the academic community; students’ perceptions of the interactions between students and teachers; and students’ awareness of the potential limits that online tools may have had on the university climate.

3. Context and aims of the research

Since March 2020, the Covid-19 pandemic has been spreading all over the world. Italy, and in particular Northern Italy, faced severe situations, which led to massive changes in all spheres of life. In line with the legislation in effect at the time, the bachelor program in Educational Sciences at the University of Parma went fully digital [The program in Educational Sciences (Scienze dell’educazione e dei processi formativi) is a

three-year bachelor program and belongs to the Class L-19 of the Italian national classification system for university programs. Its aim is to train future social and early childhood educators in out-of-school contexts. At the University of Parma, this program started in 2006 and, in May 2021, counts 1,133 enrolled students].

All activities that usually require the physical presence of groups of people (lectures, seminars, workshops, internships, exams, graduations, etc.) were held in virtual mode, mainly via two dedicated platforms: Microsoft Teams for videoconferencing, and a customized version of Moodle, called Elly, which was used for sending messages, sharing learning materials, managing group work, and conducting exams. In addition to these dedicated teaching tools, many members of the academic community used the existing social networks to overcome isolation. The University of Parma created special online communities (for example, by department) but, for the most part, it was the students themselves creating the informal groups they felt were needed.

In this context, and based on the scientific research in this field, we designed a small-scale study with the purpose of investigating the university climate among the freshmen of the program. We elaborated a specific instrument that was intended to assess students' perceptions of the university climate in a distance education setting. The choice to focus on freshmen originated from the fact that during the said period the first author was teaching a 60-hour course to first-year students. In addition, both authors were particularly interested in understanding the dynamics emerging among students who would never meet in person throughout the course.

The semester began on September 14, 2020, with 346 newly enrolled students in the program. During three online meetings, which were open to everybody, the newcomers were given information about university life, academic services, students' duties and possibilities. These meetings were held by several teachers of the program, with the aim of making themselves acquainted to the students.

During the fall semester, the students had to take four mandatory courses (plus an additional one for only half of the group):

- Theory of Education (*Pedagogia generale e sociale*), for 12 ECTS credits, taught by the first author of this article.
- History of popular and educational literature (*Storia della letteratura popolare e giovanile*) (6 ECTS credits).
- Literature (*Letteratura generale*) (6 ECTS credits).
- English language, level B1 (6 ECTS credits).
- Educational support to social disadvantage (*Interventi educativi per la marginalità e la devianza*) (6 ECTS credits), mandatory only for those students who had chosen this focus.

Teaching these courses was a major challenge for everyone involved because of the exclusive use of online tools and the large number of students, none of whom had previous college experience. Teachers were also acutely aware of the difficulties their students were facing, making the social transition from high school to university, being confined alone at home, and without the possibility to meet their classmates in person.

The course "Theory of Education", in the context of which the research was carried out, encompassed 60 hours of lessons given by the teacher, and 240 hours of private study by the students. The course consisted of three two-hour classes per week, and lasted ten weeks. It ran from September 14 until December 3, with an intermediate break of two weeks [Specific information on this course can be found on the institutional website of the University of Parma, at <https://cdl-sepf.unipr.it/it/degreecourse/details/190554> (last accessed on April 7, 2022)].

With the specific audience and context in mind, the teacher organized the course as a learning environment made up of several fully integrated components, which allowed students to actively participate in the course, instead of being passive listeners of lectures. The learning environment was composed of the following elements:

- 30 live (synchronous) online lectures given by the teacher through Microsoft Teams. In each of these lectures, the teacher organized at least one short activating exercise, such as identifying the key aspects of the topic at hand, discussing a given subject in specifically created online groups of classmates, filling in a questionnaire, participating in online forums, and so on.
- A cycle of three live online lectures introducing the basic concepts of educational psychology (given by an expert).
- Online exercises and activities to be carried out in small groups of four to five students, which were randomly put together by Moodle. Over the ten weeks of the course and starting from week 2, when the groups were created, the teacher assigned four group activities. For two of them, groups were asked to write a paper; for the other two, they only had to discuss specific topics, based on an assigned list of questions and prompts.
- A series of handbooks and digital texts to be studied individually, guided by assigned exercises.
- Specific training, provided by teaching assistants, on academic writing during exams.

The course, as described above, received good evaluations from students who filled out the official course assessment questionnaire of the University of Parma (OPIS) [On May 21, 2021, the average score of the course was equal to 26,6/30 points, ranking fourth of the 33 courses assessed in the program (average score of the program= 24,3; N=229)].

4. Method

In the context described and for the reasons outlined above, we investigated the university climate among the students attending the aforementioned courses from home.

4.1 Research questions and hypothesis

This investigation was split into several research questions regarding: (a) students' perceptions of the university climate, its quality, and the dynamics that generated it; (b) the expectations students had, before the beginning of the semester, about the social climate they would experience; and (c) the actual interactions they had with classmates and teachers, both online and offline, if any. In addition, we also addressed the question whether it was possible to build a sufficiently reliable and valid online questionnaire to assess students' perception of the university climate in a situation of distance education.

As the first three questions can only be answered in a meaningful way if the last one is answered positively, we present here the results pertaining to the validity and reliability of the instrument we developed: the University Climate Questionnaire for Distance Education Contexts (UcliQ-DE). A detailed account of the remaining research findings will be presented elsewhere (Felini, Zobbi, in preparation).

Hence, the null hypothesis that we would like to exclude concerns the factorial structure of our questionnaire; in other words, we aim to falsify that the instrument is not able to validly and reliably assess five factors of students' perception of the university climate in contexts of distance education.

4.2 The University Climate Questionnaire for Distance Education Contexts (UcliQ-DE)

According to the relevant scientific literature, the university climate is a complex construct, composed of several elements, and its assessment therefore must respect this complexity. For this reason, an initial set of 31 items was developed, each of them followed by a Likert-type scale of possible responses from 1 to 10, from "absolutely not true" to "absolutely true". These 31 items were intended to operationalize five factors contributing to the students' perception of the university climate, namely:

1. The perception of the social interactions among peers (12 items = C1, C2, C3, C4, C5, C12, C13, C14, C15, C17, H1, H3). This factor refers to students' perceptions about social relationships among classmates in an online context: the possibility to create and maintain such relationships, their strength, the mutual roles created in them (e.g., friends or acquaintances), the benefit of the relationships for academic achievement, and the feeling that students can create relationships on their own, without help from

the university (e.g., through the assistance of tutors) or from university-driven online social networks.

2. The sense of belonging to the academic community (4 items = D1, D2, D3, D4): this factor refers to students' perception of being part of a community of people, and to the importance that the experience in the Educational Sciences program at the University of Parma has in their lives.
3. The initial expectations regarding the climate that would be established during the semester via online tools (5 items = B1, B2, B3, B4, B5). This factor refers to the expectations and feelings students had, before the beginning of the semester, about what they would experience at university, in particular: curiosity vs. indifference, worry vs. confidence, openness vs. closedness to collaboration, inclination vs. disinclination to meet new people. In line with Qazi et al. (2017), we investigated the initial expectations as remembered at the moment of compiling the questionnaire.
4. The perception of the social interactions between students and teachers (3 items = C6, C7, C8). This factor refers to the students' perceptions of the possibility to create interactions with the teachers in an online context, and of the possibility to rely on the teachers.
5. The awareness of the potential limits that online interactions may have, also compared to those offline (7 items = C9, C10, C11, E1, E2, E3, E4). This factor refers to the students' perceptions of what can damage or jeopardize the university climate, especially regarding the perceived weaknesses of online communications, and the students' sense of inadequacy when interacting online.

As previously stated, with this study we would like to confirm or reject the outlined factorial structure hypothesized for the UcliQ-DE.

4.3 Participants

On November 17, 2020, we invited all freshmen of the said program in Education of the University of Parma to fill in the UcliQ-DE, and we closed the questionnaire platform on November 30. From a population of 346 enrolled students, 173 respondents (50%) participated in the study, of which 90.2% were female. 40.5% of respondents were between 18 and 19 years old; 28.9% were between 20 and 21; 18.5% between 22 and 30; and 12.2% were over 30 years old. The median age is represented by the age range of 20-21. The geographical distribution was wide: at the moment of compiling, 32.9% of the students found themselves in the province of Parma; 17.9% were in other parts of the region Emilia-Romagna; 41.1% in Northern Italy (Emilia-Romagna excluded); and 8.1% in Central and Southern Italy. The larger part of students attended the classes from their original residence, probably their family home: during the pandemic, only 6.9% of respondents moved to Parma to attend university.

As for their secondary education, 59.5% of respondents had received mainly general/non-vocational education in a *liceo*, 16.8% had attended technical high schools, and 23.1% vocational high schools. In terms of their previous knowledge of the core subjects of the program, 42.8% had attended high schools where education and social studies were taught (28.9% *Liceo di scienze umane*, 13.9% *Istituto professionale a indirizzo socio-sanitario o educativo*).

The larger part of the students had no social connections with each other before the beginning of the semester: 59.0% of them knew none of their classmates in advance, 31.8% knew only one or two, and 9.2% knew three classmates or more.

4.4 Plan of statistical analyses

For the development of the present study, the following statistical analyses were performed:

- Descriptive analysis (see Table 1).
- Pearson correlations (see Table 2).
- A complex of three exploratory factor analyses:
 - FA1) *Factor Analysis 1*, using the orthogonal varimax method on the total sample (see Table 3).
 - FA2) *Factor Analysis 2*, using the oblique promax method on the total sample (see Table 4).
 - FA3) *Factor Analysis 3*, adopting the cross-validation method (see Tables 5 and 6).
- Reliability studies through the calculation of Cronbach's coefficient.

5. Data analysis

Statistical analysis was conducted using SPSS statistical package version 27.0.

First, a descriptive analysis (Table 1) was performed for the total variables of the UCLiQ-DE scale, considering the total sample. The univariate normal distribution was studied, and skewness and kurtosis values were corrected when they exceeded 1 in absolute value. After our interventions on the variables B1, B5, D2, and D3, only D2 was considered as not characterized by normal distribution.

Secondly, to avoid collinearity issues, Pearson correlations among variables (Table 2) were performed in the total sample for all variables of the UCLiQ-DE scale. As a result, six variables with a very high correlation level (greater than 0.6) were excluded for excessive overloading, namely: C4, D1, E2, E4, C10, and H1.

Finally, a complex of three exploratory factor analyses was conducted using the principal component analysis (Di Franco & Marradi, 2003), and excluding the UCLiQ-DE variables that had been removed through previous analyses. For the purpose of this study, a rotated orthogonal and oblique factor analysis (varimax

and promax) loading over 0.29 – which accounted for approximately over 9% of the variance – was taken as large enough to indicate that the loading was salient (Rovai, 2002, p. 201).

Factor Analysis 1 (FA1) – The first factor analysis was conducted over the total sample. Both the Kaiser-Meyer-Olkin measure of sampling adequacy, with a value of .806, and Bartlett's sphericity test [$\chi^2(300) = 1288.394, p < .000$] indicated the suitability of the data. Three criteria were used to determine the number of factors to extract: the scree plot, the Kaiser-Gutman Rule, and the interpretability of the solution. Both the scree plot and the Kaiser-Gutman Rule confirmed that the null hypothesis of one-dimensionality was not supported.

Factors were rotated using the orthogonal varimax method. The factorial solution (Table 3) identified six factors that accounted for 65.2% of the total explained variance: the first factor (*the perception of the social interactions among peers*) accounted for 31.3% of the item variance; the second factor (*the sense of belonging to the academic community*) accounted for 9.3% of the item variance; the third factor (*the initial expectations regarding the climate*) accounted for 7.8% of the item variance; the fourth factor (*the perception of the social interactions between students and teachers*) accounted for 6.4% of the item variance; the fifth factor (*the awareness of the potential limits that online interactions have*) accounted for 5.4% of the item variance; and the sixth factor, consisting of only one item (C11), accounted for 5.1% of the item variance.

Factor Analysis 2 (FA2) – The second factor analysis was also conducted over the total sample. The same three criteria as in FA1 were used to determine the number of factors to extract. Both the scree plot and the Kaiser-Gutman Rule confirmed that the null hypothesis of one-dimensionality was not supported. This time, however, factors were rotated using the oblique promax method to consider correlation between the factors and to confirm the factorial structure. The factorial solution (Table 4) identified six factors that accounted for the same 65.2% of the total explained variance and, in general terms, the factorial structure was confirmed: no variables loaded on different factors than they did in FA1.

Factor Analysis 3 (FA3) – In order to confirm the previous results about the factorial structure, the last and final factor analysis was conducted by adopting the cross-validation method. The total sample was split randomly in two equal parts, and factors were rotated using the varimax method on the first subsample and the promax method on the second subsample, with the goal of validating the performed factorial solution on different samples (Barbaranelli, 2003, p. 146).

Factor Analysis 3, part 1 (FA3.1) – The first factor analysis was conducted over the first subsample, and the factors were rotated using the orthogonal varimax method. Both the Kaiser-Meyer-Olkin measure of

sampling adequacy, with a value of .770, and Bartlett’s sphericity test [$\chi^2(300) = 844.621, p < .000$] indicated the suitability of the data also for the subsample. Both the scree plot and the Kaiser-Gutman Rule confirmed that the null hypothesis of one-dimensionality was not

supported. The factorial solution (Table 5) identified six factors that accounted for 69.4% of the total explained variance: the first factor (*the perception of the social interactions among peers*) accounted for

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
B1	165	4	10	8,45	1,639	-,941	,189	,202	,376
B2	173	1	10	5,73	2,335	-,195	,185	-,505	,367
B3	173	1	10	6,76	2,233	-,504	,185	-,369	,367
B4	173	1	10	6,87	2,769	-,639	,185	-,653	,367
B5	168	2	10	7,87	2,058	-,853	,187	-,169	,373
C1	173	2	10	6,37	2,267	-,040	,185	-,802	,367
C2	173	1	10	6,04	2,368	-,543	,185	-,499	,367
C3	173	1	10	6,09	2,031	-,186	,185	-,531	,367
C4	173	1	10	5,87	2,423	-,207	,185	-,693	,367
C5	173	1	10	6,58	2,197	-,539	,185	-,201	,367
C6	173	1	10	6,23	2,080	-,305	,185	-,186	,367
C7	173	1	10	5,76	2,432	-,422	,185	-,638	,367
C8	173	2	10	7,57	1,750	-,771	,185	,649	,367
D1	173	1	10	6,17	2,550	-,462	,185	-,565	,367
D2	167	6	10	9,07	1,195	-,976	,188	-,236	,374
D3	173	1	10	6,96	2,410	-,676	,185	-,221	,367
D4	173	4	10	9,18	1,281	-1,797	,185	2,929	,367
E1	173	1	10	6,20	3,169	-,466	,185	-1,172	,367
E2	173	1	10	6,52	3,053	-,543	,185	-1,006	,367
E3	168	2	10	7,66	2,035	-,798	,187	-,103	,373
E4	173	1	10	7,18	2,348	-,915	,185	,339	,367
C9	173	1	10	5,26	2,432	-,060	,185	-,792	,367
C10	173	1	10	5,09	2,585	-,056	,185	-,967	,367
C11	173	1	10	6,06	2,358	-,244	,185	-,615	,367
C11	173	1	10	4,94	2,358	,244	,185	-,615	,367
C12	173	1	9	3,69	2,420	,429	,185	-1,147	,367
C13	173	1	10	6,21	2,629	-,416	,185	-,718	,367
C14	173	1	10	5,84	2,862	-,293	,185	-1,177	,367
C15	173	1	10	7,17	2,304	-,792	,185	-,006	,367
C17	173	1	10	6,24	2,088	-,389	,185	,003	,367
H1	173	1	10	6,60	2,515	-,587	,185	-,415	,367
H3	113	1	10	6,68	2,547	-,705	,227	-,276	,451
Valid N. (listwise)	106								

Table 1 - Descriptive statistics.

	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	C6	C7	C8	D1	D2	D3	D4	E1	E2	E3	E4	C9	C10	C11	C12	C13	C14	C15	C17	H1	H3
B1	--																														
B2	.266**	--																													
B3	.376**	.451**	--																												
B4	.294**	.197**	.369**	--																											
B5	.338**	.232**	.359**	.450**	--																										
C1	.201**	.155**	.215**	.263**	.178**	--																									
C2	-.117	-.054	-.114	-.209**	-.001	-.485**	--																								
C3	.165*	.140*	.206**	.301**	.081	.697**	-.386**	--																							
C4	.183**	.155**	.231**	.373**	.141*	.686**	-.429**	.801**	--																						
C5	.167*	.083	.253**	.312**	.174*	.585**	-.349**	.644**	.700**	--																					
C6	.205**	.209**	.351**	.159*	.238**	.394**	-.142*	.473**	.422**	.428**	--																				
C7	-.038	-.171*	-.288**	-.054	-.113	-.196**	.234**	-.216**	-.183**	-.197**	-.600**	--																			
C8	.257**	.196**	.346**	.263**	.401**	.341**	-.028	.287**	.278**	.395**	.583**	-.284**	--																		
D1	.290**	.154*	.332**	.438**	.372**	.554**	-.343**	.554**	.528**	.514**	.373**	-.166*	.361**	--																	
D2	.436**	.174*	.324**	.160*	.378**	.230**	-.125	.117	.182**	.248**	.313**	-.183**	.463**	.287**	--																
D3	.246**	.210**	.314**	.366**	.403**	.466**	-.318**	.416**	.445**	.466**	.338**	-.106	.408**	.764**	.367**	--															
D4	.378**	.203**	.280**	.189**	.461**	.150*	-.071	.054	.029	.061	.185**	-.053	.347**	.328**	.642**	.383**	--														
E1	-.062	-.002	-.013	-.015	.069	-.052	.002	.133*	.070	.070	.036	-.062	-.037	.008	-.155*	-.015	-.039	--													
E2	-.063	-.013	-.001	-.046	.088	-.021	-.013	.145*	.092	.113	.026	-.073	-.047	.020	-.127	.012	.008	.891**	--												
E3	.140*	.063	.198**	.122	.282**	.098	-.109	.176*	.185**	.230**	.098	.037	.101	.180**	-.009	.263**	.170*	.552**	.638**	--											
E4	-.061	-.034	.191**	.146*	.196**	.071	-.010	.221**	.141*	.226**	.278**	-.234**	.184**	.184**	.009	.170*	.139*	.623**	.652**	.666**	--										
C9	-.002	.226**	.104	.241**	.150*	.442**	-.316**	.425**	.452**	.447**	.404**	.304**	.270**	.440**	.170*	.458**	.210**	.149*	.163*	.122	.242**	--									
C10	.051	.202**	.096	.090	.070	.379**	-.186**	.331**	.333**	.359**	.374**	-.229**	.163*	.337**	.166*	.395**	.099	.060	.097	.062	.114	.770**	--								
C11	.042	-.016	-.112	-.046	.052	-.088	.220**	-.141*	-.096	-.264**	-.089	.153*	-.112	-.224**	-.145*	-.251**	-.092	-.004	-.010	.080	-.064	.230**	-.241**	--							
C12	.192**	.265**	.183**	.367**	.342**	.421**	-.203**	.485**	.495**	.422**	.335**	-.092	.302**	.568**	.200**	.496**	.199**	.067	.036	.162*	.168*	.405**	.288**	-.092	--						
C13	.043	.048	.050	.151*	.140*	.250**	.019	.208**	.212**	.179**	.116	.043	.115	.161*	.033	.168*	.047	.117	.120	.065	.037	.200**	.153*	.066	.125	--					
C14	.036	.122	.140*	.223**	.273**	.444**	-.232**	.433**	.427**	.437**	.322**	-.128*	.282**	.510**	.231**	.399**	.259**	-.018	.017	.148*	.167*	.453**	.328**	-.036	.497**	.321**	--				
C15	.101	-.048	.165*	.303**	.297**	.442**	-.218**	.478**	.532**	.618**	.285**	-.106	.336**	.531**	.113	.496**	.068	.058	.092	.229**	.118	.372**	.278**	.199**	.352**	.347**	.468**	--			
C17	.204**	.192**	.304**	.351**	.213**	.574**	-.379**	.584**	.575**	.560**	.412**	-.180**	.339**	.707**	.225**	.561**	.170*	.037	.051	.192**	.163*	.505**	.417**	-.176*	.491**	.287**	.437**	.503**	--		
H1	.281**	.176*	.276**	.472**	.383**	.461**	-.350**	.495**	.548**	.542**	.328**	-.115	.325**	.620**	.239**	.541**	.220**	.075	.140*	.288**	.213**	.444**	.372**	-.114	.563**	.199**	.477**	.535**	.621**	--	
H3	.351**	.258**	.339**	.481**	.434**	.499**	-.314**	.466**	.569**	.411**	.384**	-.132	.437**	.505**	.256**	.504**	.264**	-.083	-.069	.159*	.133	.428**	.283**	-.034	.574**	.260**	.441**	.539**	.538**	.808**	--

Table 2 - Pearson's correlations.

32.3% of the item variance; the second factor (*the sense of belonging to the academic community*) accounted for 11.3% of the item variance; the third factor (*the initial expectations regarding the climate*) accounted for 8.3% of the item variance; the fourth factor (*the perception of the social interactions between students and teachers*) accounted for 6.7% of the item variance; the fifth factor (*the awareness of the potential limits that online interactions have*) accounted for 5.9% of the item variance; and the sixth factor, consisting of two items (C11 and C13), accounted for 4.9% of the item variance. Overall, the factor structure was confirmed and only one item loaded on a different factor (C13 loaded on F6). We took these items into account for further considerations.

Factor Analysis 3, part 2 (FA3.2) – The second factor analysis was conducted over the second subsample, and factors were rotated using the oblique promax method. Both the Kaiser-Meyer-Olkin measure of sampling adequacy, with a value of .693, and Bartlett's sphericity test [$\chi^2(300) = 655.714, p < .000$] indicated the adequacy of the data, also for this subsample. However, values were less satisfactory than the previous ones. Both the scree plot and the Kaiser-Gutman Rule confirmed that the null hypothesis of one-dimensionality was not supported. The factorial solution (Table 6) identified eight factors that accounted for 76.1% of the total explained variance. In general, the factor structure was confirmed, but some items loaded on different factors, as follows. The first factor (*the sense of belonging to the academic community*), which accounted for 30.5% of the item variance, included items D2 and D4, but also items B1 and B5, which thus far loaded on the factor *Initial expectations regarding the climate*; the second factor

(*the perception of the social interactions between students and teachers*), which accounted for 11.6% of the item variance, included three items – C1, C2, and C3 – which thus far were included in the factor *Perception of the social interactions among peers*, and excluded one item – C8 – that until now was included in this factor; the third factor, which accounted for 7.8% of the item variance, included some items that do not replicate the previous factorial structure – D4, C8, B2, C12. The fourth and the fifth factors, which accounted for 6.4% and 6.0% of the item variance, respectively, included items that until now loaded on the same factor *Perception of the social interactions among peers* (C12, C13, C15, C17 loading on F4, and C9, C14, D3, H3 loading on F5); the sixth factor (*the initial expectations regarding the climate*), which accounted for 5.3% of the item variance, included only two items instead of four, as in the previous factorial structure; the seventh factor, consisting of only one item (C11), accounted for 5.3% of the item variance; and the eighth factor (*the awareness of the potential limits that online interactions have*), which accounted for 4.4% of the item variance, confirmed its items (E1 and E3).

Given that one of the factorial analyses (FA3.2) did not confirm the results of the others, several reliability studies were performed to exclude the possibility of building different scales than the five listed below. For example, variables B5, E1 and E3, which also loaded together on a different factor, had a poor Cronbach's coefficient $\alpha (= .553)$. Similar results were obtained for B2, C4, C6, C7, and C8 (Cronbach's coefficient $\alpha = .619$), and for C11 and C13 (Cronbach's coefficient $\alpha = .124$).

In conclusion, considering all factor analyses and reliability studies performed, the following scales were defined:

1. *The perception of the social interactions among peers (scale 1)* consists of 11 items, namely: C1, C2_r, C3, C5, C9, C12, C13, C14, C15, C17, and D3. Cronbach's coefficient $\alpha = .877$ indicates a good reliability.
2. *The sense of belonging to the academic community (scale 2)* consists of 3 items, namely: B5, D2, and D4. Cronbach's coefficient $\alpha = .669$ indicates a fair reliability.
3. *The initial expectations regarding the climate (scale 3)* consists of 5 items, namely: B1, B2, B3, B4, and H3. Cronbach's coefficient $\alpha = .708$ indicates a fair reliability.
4. *The perception of the social interactions between students and teachers (scale 4)* consists of 3 items, namely: C6, C7_r, and C8. Cronbach's coefficient $\alpha = .733$ indicates a fair reliability. Item C8 was included in this factor because of three factor analyses: only FA3.2 showed it in a different factor, but it is known that the oblique rotation should not be taken into account if the orthogonal one gives a simplified structure of the factor (De Lillo et al., 2007, pp. 118-119).
5. *The awareness of the potential limits that online interactions have (scale 5)* consists of 2 items, namely: E1 and E3. Cronbach's coefficient $\alpha = .674$ indicates an almost fair reliability.

6. Discussion

The study presents a conceptual framework for understanding the perception of the university climate, and the resulting effect on students' wellbeing and development. It also examines the validity and reliability of an instrument that can be used for assessing the university climate among students in distance education contexts. In the present study, UCLIQ-DE was developed, refined, and field-tested in a distance education context with 173 freshmen of an Italian bachelor program in Education Sciences.

As a result of Pearson's correlations, factor analyses and reliability studies performed, the UCLIQ-DE scale consists of 22 items, with five scales composing the questionnaire, as we had hypothesized.

The first scale, composed of eleven items (C1, C2_r, C3, C5, C9, C12, C13, C14, C15, C17, and D3), explains two different aspects of the *perception of the social interactions among peers*. The first one is related to the actual possibility that relationships among students can be created and maintained autonomously over time, or, on the contrary, are difficult to establish (items C1, C2_r, and C3). The second aspect is related to the quality of the relationships, and reports a component that is more connected with feelings, such as trust, support, empathy, and inclusion (items C5, C9,

C12, C13, C14, C15, and D3). Item C17, which asks respondents to assess the university climate as they perceive it, also loads in this first scale. According to our interpretation, this means that the overall perception of the university climate is significantly related to the *perception of the social interactions among students* (indeed, the factor analysis shows that the first factor accounts for most of the item variance). An explanation may be needed regarding two further items: C9 (sense of capability of expressing oneself online) and D3 (feeling comfortable within the freshmen group). The loading of item C9, which was initially placed in the dimension related to *awareness of the potential limits that online interactions have*, shows that it explains better the socio-relational component of communication, rather than the limits that online interactions have. The loading of item D3, which was initially placed in the dimension related to the *sense of belonging to the academic community*, shows that it better explains the aspect of feeling comfortable in a group of peers, rather than the sense of belonging to the academic institution.

The second scale, which consists of three items (B5, D2, and D4), explains two complementary aspects of the *sense of belonging to the academic community*. The first aspect is related to the importance attached by the students to belonging to the BA program in Education Sciences, and the pride of being members of this community. The second aspect is related to the students' disposition to be connected, open, and sociable with their classmates.

The third scale, which we named *initial expectations regarding the climate*, consists of four items (B1, B2, B3, B4, and H3) and relates to students' recollection of their expectations and attitudes regarding the university climate before the beginning of their university experience in a distance learning environment. The scale reports the initial attitudes regarding social relationships (B1 and B2) and the distance education settings students would have to deal with (B3 and B4), as well as the perceived benefit of current relationships on future academic tasks to be carried out through group study (H3). The hypothesis underlying this scale is that students' expectations and attitudes are a significant factor in their perception of the university climate.

The fourth scale, which consists of three items (C6, C7, and C8) explains two different sides of the *perception of the social interactions between students and teachers*. As for peer relationships, the first aspect relates to the actual possibility that relationships between students and teachers can be created, or, on the contrary, are difficult to establish. The second aspect is related to the quality of the relationships. Item C8, in fact, reports students' self-assessed feelings of trust towards, and of being supported by, their teachers.

Items	F1	F2	F3	F4	F5	F6
<i>The perception of the social interactions among peers (n=11)</i>						
C1	.738					
C2	-.433					
C3	.796					
C5	.727					
C9	.667					
C12	.758					
C13	.311					
C14	.660					
C15	.608					
C17	.766					
D3	.713					
<i>The sense of belonging to the academic community (n =3)</i>						
D2		.793				
D4		.861				
B5		.627				
<i>The initial expectations regarding the climate (n=5)</i>						
B1			.639			
B2			.614			
B3			.755			
B4			.527			
H3			.426			
<i>The perception of the social interactions between students and teachers (n = 3)</i>						
C6				.705		
C7				-.794		
C8				.424		
<i>The awareness of the potential limits that online interactions have (n = 2)</i>						
E1					.841	
E3					.838	
<i>Sixth factor</i>						
C11						.564

Table 3 - Factor analysis FA1.

Items	F1	F2	F3	F4	F5	F6
<i>The perception of the social interactions among peers (n=11)</i>						
C1	.734					
C2	-.436					
C3	.853					
C5	.705					
C9	.687					
C12	.758					
C13	.383					
C14	.744					
C15	.611					
C17	.767					
D3	.727					
<i>The sense of belonging to the academic community (n =3)</i>						
D2		.820				
D4		.912				
B5		.586				
<i>The initial expectations regarding the climate (n=5)</i>						
B1			.655			
B2			.656			
B3			.827			
B4			.494			
H3			.386			
<i>The perception of the social interactions between students and teachers (n = 3)</i>						
C6				.667		
C7				-.823		
C8				.386		
<i>The awareness of the potential limits that online interactions have (n = 2)</i>						
E1					.872	
E3					.837	
<i>Sixth factor</i>						
C11						.539

Table 4 - Factor analysis FA2.

Items	F1	F2	F3	F4	F5	F6
<i>The perception of the social interactions among peers (n=10)</i>						
C1	.812					
C2	-.602					
C3	.841					
C5	.743					
C9	.753					
C12	.790					
C14	.640					
C15	.512					
C17	.820					
D3	.801					
<i>The sense of belonging to the academic community (n =3)</i>						
D2		.791				
D4		.814				
B5		.626				
<i>The initial expectations regarding the climate (n=5)</i>						
B1			.678			
B2			.699			
B3			.710			
B4			.603			
H3			.440			
<i>The perception of the social interactions between students and teachers</i>						
C6				.719		
C7				-.771		
C8				.358		
<i>The awareness of the potential limits that online interactions</i>						
E1					.868	
E3					.735	
<i>Sixth factor</i>						
C11						.847
C13						.393

Table 5 - Factor analysis FA3.1.

Items	F1	F2	F3	F4	F5	F6	F7	F8
<i>First factor (n=4)</i>								
B1	.789							
B5	-.571							
D2	.812							
D4	.840							
<i>Second factor (n =5)</i>								
C1		.760						
C2		-.959						
C3		.605						
C6		.582						
C7		-.773						
<i>Third factor (n=3)</i>								
B2			1.017					
C8			.484					
C12			.697					
<i>Fourth factor (n = 4)</i>								
C5				.586				
C13				.903				
C15				.694				
C17				.317				
<i>Fifth factor (n = 4)</i>								
C9					.692			
C14					.567			
D3					.565			
H3					.319			
<i>Sixth factor (n=2)</i>								
B3						.402		
B4						.726		
<i>Seventh factor (n=1)</i>								
C11							.912	
<i>Eighth factor (n=2)</i>								
E1								.946
E3								.692

Table 6 - Factor analysis FA3.2.

Finally, the fifth scale, which consists of two items (E1 and E2) assesses the students' awareness of the potential limits that online interactions have. The hypothesis is that such awareness (or the lack thereof) is a significant factor influencing students' perceptions of the university climate in distance education contexts as it can prevent (or create) false expectations and/or beliefs regarding the online climate in the university classroom.

Therefore, and according to the data presented here, it is possible to conclude that the UCLiQ-DE instrument is valid and reliable, and that it assesses the complexity of factors composing students' perceptions of the university climate in contexts of distance education.

7. Conclusion

This article describes the development and validation of an assessment instrument. Data presented provide evidence of the validity and reliability of the UCLiQ-DE, composed of 22 items related to five factors. This instrument is now available to be used for future research, and we are going to complete analysis of the data collected among freshmen of the Educational Sciences program at the University of Parma. A provisional examination of these data reveals interesting dynamics still to be better understood. In addition, this instrument – developed during a pandemic where students and teachers unexpectedly found themselves in a situation that required them to attend/conduct educational activities exclusively online – can also be used in distance education universities, where online activities are the norm. In this latter case, students' expectations will most likely differ from those of students who enrolled in a presence university and were forced to attend virtual classes against their will and choice. As the UCLiQ-DE takes expectations into account, it can be useful to investigate not only the contrast between pandemic and normal times, but also the possible differences between the university climate in distance learning universities and traditional universities that occasionally use online tools.

Apart from the above benefits, the study also has some limitations. First, the sample consisted of a limited number of respondents, all from a single institution and program, and all users of the same e-Learning platforms (Microsoft Teams and Moodle). Therefore, caution should be used when generalizing results to students from other universities or programs, or to other forms or contexts of distance learning. In fact, researchers need to confirm scale reliability for any population or sample. Secondly, confirmatory factorial analysis could not be performed for this study because of the low number of cases. Thirdly, due to factorial analysis, some factors were assessed by only a small number of items: future revisions could improve the reliability of the tool.

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