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Analysing the classroom environment: instrument creation, validation, and implementation

Análisis del entorno del aula: creación, validación y aplicación de instrumentos

Analisando o ambiente da sala de aula: criação, validação e implementação de instrumentos

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Abstract

This scientific paper focuses on the creation of a new instrument to respond to the need to analyze the quality of the classroom environment of today's classrooms, and consequently, to be able to correct what is needed. Previous projects had some shortcomings due to the year they were published, such as the emergence of new technologies in the classroom, consequently a review and update seemed necessary. Therefore, a new instrument has been created that adapts to the current needs of students in the middle and upper cycle of primary school (8-12 years). All these characteristics that affect students have been assessed in five variables: interest and motivation, satisfaction, relationship between teacher and student, relationship among students and communication. After

being validated, the tool has been implemented in 46 classrooms of schools with different characteristics and context. The results obtained have been analyzed and statistically validated by IBM SPSS program through Cronbach's alpha, which has ensured that there is consistency in each of the answers.

Keywords

Pedagogy; school; healthcare; learning environment; school climate

Resumen

Este artículo científico se centra en la creación de un nuevo instrumento para dar respuesta a la necesidad de analizar la calidad del ambiente de las aulas actuales, y en consecuencia poder corregir lo oportuno. Los proyectos existentes analizados presentan algunas carencias debido a su antigüedad, por lo que nos pareció necesaria una revisión y actualización. Para ello hemos creado un instrumento, que se adapta a las necesidades actuales de los alumnos de ciclo medio y superior de primaria (8-12 años). Las influencias del entorno que afectan a los estudiantes han sido clasificadas y evaluadas a partir de cinco variables: interés y motivación, satisfacción, relación entre profesor y alumno, relación entre alumnos y comunicación. La herramienta ha sido implementada en 46 clases de escuelas con diferentes características y contextos. Los resultados obtenidos han sido analizados y validados estadísticamente con el programa IBM SPSS a través del alfa de Cronbach, lo que ha asegurado que haya consistencia en cada una de las respuestas.

Palabras clave

Pedagogía; escuela; cuidado de la salud; entornos de aprendizaje; clima escolar

Resumo

Este artigo científico se concentra na criação de um novo instrumento para analisar a qualidade do ambiente atual da sala de aula e poder corrigir quando necessário. Os projetos existentes que analisamos têm algumas deficiências devido à sua antiguidade, por isso consideramos necessário revisá-los e atualizá-los. Para isso, criamos um instrumento adaptado às necessidades atuais dos alunos do ensino fundamental II e superior (8 a 12 anos). As influências do ambiente que afetam os estudantes foram classificadas e avaliadas com base em cinco variáveis: interesse e motivação, satisfação, relação professor-aluno, relação entre alunos e comunicação. A ferramenta foi aplicada em 46 salas de aula de escolas com diferentes características e contextos. Os resultados foram analisados e validados estatisticamente utilizando o programa IBM SPSS, por meio do alfa de Cronbach, garantindo a consistência das respostas.

Palavras-chave

Pedagogia; escola; saúde; ambiente de aprendizagem; clima escolar

Introduction

The world is changing, and schools should keep pace because they are educating the future members of society. Therefore, it is essential to provide them with the skills they need to integrate into a society that is new to them and constantly changing.

In addition, new technologies play an important role in this process of change, because unlike years ago, students have access to all the concepts they have learned in subjects such as history, languages, natural sciences... with just one click. For this reason, some schools focus not only on teaching content suggested by the curriculum, but also on training people who are open-minded, self-confident, respectful, sustainable, cooperative, freethinking, among others.

However, very few of them care about analysing the context in the classroom. Are students satisfied with their lessons? Is there disrespect among peers? Are students afraid to intervene in class to express their opinions or ask questions? Do students trust the teacher to express how they feel? Is the social environment of the classroom promoting the learning process?

All these questions are difficult to assess through an observational method, as not all the situations are visible to everyone and there are things that slip from our grasp. For this reason, teachers and schools should be provided with a tool that gives students a voice, so that educators can get feedback on the quality of the environment, correct what is necessary and create spaces conductive to learning and safety.

In 1970, there were many experts who became interested in the topic of the social climate in the classroom and formulated a definition (Brandt & Weinert, 1981). It has been found that the classroom environment is one of the school variables that best predicts learning (Maldonado, 2016;

UNESCO, 2014).

By 2009, experts such as Pérez, Ramos and López (2009) and González, Touron and Tejedor (2012) created and validated the instrument due to an increasing demand from teachers. However, due to the publication year of the study, it does not consider the current characteristics that surround second and third cycle students in the classroom. In addition, it is not accessible to all teachers because of the difficulty in interpreting the results.

It is difficult to define the classroom environment, because it is a concept that encompasses many dimensions grouped into two main levels: the material part, including infrastructure and furniture; and the immaterial which includes people and the interactions between them in the classroom atmosphere (Arón & Milicic, 2004). Therefore, the most accurate definition is «the perception that each member of the classroom has about their internal and daily life. This perception promotes individual and collective behaviour (a way of relating to each other and with the teacher, a way of being ...) that at the same time influences the environment itself» (Pérez, Ramos & López, 2009, p.223). As can be seen in the definition, the student, the teacher, and the curriculum are the three of the elements that make up the classroom atmosphere and the balance between them positively affects the environment as well as the teaching and learning process (Vaello, 2011). It should be noted that within these three major groups, several factors surrounding the students in the classroom environment must be considered. For example, interest and motivation, relationships between students and them with the teacher, communication, physical space, among others. (Barreda, 2012; Moreno *et al.*, 2011; Villanueva, 2016; Rojas, 2013)

Firstly, it is important to consider that there is a low level of motivation among students, which has a negative impact on

social satisfaction, interpersonal relationships, social coexistence among others (Manzano y Valero-Valenzuela, 2019). According to Manzano-Sánchez (2021), this demotivation begins in the last years of primary school, increasing the possibility of school failure and continues in secondary school. For this reason, Manzano-Sanchez (2021) says that interventions are needed to improve motivation and thus strengthen a good classroom atmosphere.

Secondly, when creating a good environment, the teacher must also be motivated and interested in the students. In this way, they will not only show certain competencies, skills, and mastery of the content, but will also implement a motivating and varied methodology, a pleasant distribution of space and establish a respectful interaction by having a "pedagogical touch" (Baños et al., 2017; Biggs, 2005; Perrenoud, 2005; Arón y Milicic, 1999). Artavia, (2005), defines the concept of pedagogical touch as the ability to know how to interpret thoughts, feelings, and inner desires through facial expression and body language. For this reason, the relationship between teacher and student may be affected by the methodology applied, the distribution of space, among others (Barreda, 2012).

Following this line, it should be noted that there are some teaching styles that positively or negatively affect the existent relationships in the classroom (González, Conde, Díaz, García, & Ricoy, 2018). An authoritarian teacher is the one who pressures all students to do their homework following their perfectly established model, even if it is not the most suitable for their level. If the student decides to do the task using the established method, the teacher is pleasant, on the contrary, the professor shows a bad mood since the student does not obey (Marchesi & Hernández, 2000, as cited in Figueroa, 2012). In this way, a distance is created between the teacher and the student, making students afraid to ask questions or communicate social or emotional problems to the teacher. Therefore, according to Goleman (1999), the authoritarian

leadership style has a negative impact on the classroom environment.

On the other hand, there is the democratic style, which "encourages group members to determine their goals and make decisions, striving for everyone to participate. Responsibility is shared with all members of the group" (Cuadrado Reyes, 2009, p.3).

In addition, the teacher is empathetic, both inside and outside the classroom, caring about emotional and social issues; allows students to express their concerns and doubts that may arise; adapts the methodologies to the individual needs of each student and with the aim of achieving the common good, establishes equal rules for the whole class (Madrigal, 2004). In this way, a relationship of trust and empathy is developed, and as a result, according to Goleman (1999), the democratic leadership style has a positive impact on the classroom environment.

Following the idea mentioned above, the teaching style not only affects the relationship between teacher and student, but also the student's participation, level of attention and understanding of the lesson. If there is a relationship of trust and empathy between teacher and student, communication between the two will be more positive, open, and constructive (Vieira, 2007). Although communication style may be affected by gender, culture, and other individual characteristics (Camargo Uribe & Hederich Martínez, 2007).

In addition, it is very important to consider the interaction between teachers, because during the internships in the schools it was observed that communication between teachers positively affects the students and therefore the atmosphere of the classroom. For example, teachers from a school in the *Vallès Occidental* region, meet every week to distribute the weekly homework in a more equitable way. This has had a positive effect as students have time to complete their

homework without any anxiety due to the amount of work that has to be done outside school.

Finally, it is important to establish good communication between the school and the family, because if there is no good communication, the family context can become a problem and consequently have a negative effect on students (Estévez et al., 2005). Parental involvement in school is **very important, having a positive** effect on students and on parents who are more satisfied with the teachers and the school. In addition, teachers are more involved in activities, have more competence in their profession and have more empathy with students and families. As a result, the student has a positive attitude towards authority and a positive perception of the school, which promotes integration and improves academic performance. (Moreno et al., 2009).

In the last century, the classroom was already considered an artificial space where students are placed next to each other without prior ties, day after day, with structures of communication and authority (Quintana, 1980). This grouping of students without a free decision to join makes it a handicap because it can negatively affect the emotional perception of relationships between students (Biscarri, 2000).

This is one of the reasons why problematic situations, misunderstandings and disputes arise in the classroom, which can be visible to the eyes of the teachers so they generally act as mediators (Munne, 2015), or hidden from them, which may develop into school bullying. Bullying is not a new problem but has been present in schools since the 19th century and has been evolving to the present day. (López & Sabater, 2019). The victim suffers physical and psychological aggression, exclusion, their material is not respected among others. As a result, there are symptoms of stress, depression, and nervousness to participate in class leading to school failure. (Oñate & Piñuel, 2007)

As can be seen, the relationship between students is an issue that directly affects the classroom environment and therefore all the aspects mentioned above must be considered to evaluate it. Some factors that influence student satisfaction in the classroom, such as new technologies, class distribution, order and noise during theoretical explanations, and teacher competence.

On the one hand, according to Gámiz (2009), Dugarte y Guanipa (2009) y Marqués (2010) the digital world demands changes in education and teachers are responsible for applying information and communication technologies in their educational action to achieve a more student-centered and personalized paradigm. Information and communication technologies bring many advantages and improve the quality of teaching (Almenara, 2007), but they are not yet widely used in class due to the low training of primary school teachers (Martín, 2009).

On the other hand, the distribution, order, noise, and equipment of the physical classroom also have a positive or negative effect on the students who make it up (Gairín, 1995). For example, it is essential to allocate a space in the classroom to display the work done by students in the classroom, as it encourages and motivates them and at the same time makes the class a more personal and warm space which positively affects the classroom environment (Cela & Palou, 1997).

The **general objectives** of the paper are:

A. Create and validate a new instrument to assess the classroom environment, so that it adapts to the new characteristics that surround the students from the second and third cycle in the current classrooms.

B. Analyse samples from different classrooms to present in a practical way how the instrument works.

C. Validate and verify the effectiveness of the instrument

in schools with different contexts, such as private, semi-private, public, urban, and rural schools in Catalonia and one in Helsinki, Finland.

Methods

Creation of the instrument

The instrument was created by the researcher of this paper but was mainly inspired by the journal article of Perez, Ramos & Lopez (2009), which is a previous tool that assesses the classroom environment. However, this tool developed in 2009 has some shortcomings due to the year it was published, such as the emergence of new technologies in the classroom. Therefore, the instrument created in this paper considers three other articles.

The first one is a journal article by González, Touron and Tejedor (2012) from which some ideas of questions related to the physical classroom were extracted. Second, this tool was also inspired by the journal article from Vásquez, Zuluaga and Fernández (2012) in which there is a tool to detect bullying and cyberbullying. Finally, to assess the impact of technologies on the classroom environment, the article by Mousavi, Mohammadi, Mojtahedzadeh, Shirazi and Rashidi (2020) was considered.

After analysing the above articles, two questionnaires of 37 questions each were created as a final product, one for the middle cycle (8-10 years old) and the other for the upper cycle (10-12 years old) (Appendix 1).

These two questionnaires differ only in question number 36, which in the upper cycle deals with cyberbullying, while in the middle cycle it focuses on bullying. It was decided to change this question in the middle cycle, since in the interview prior to the administration of the questionnaire, some teachers commented that middle school students do not communicate

via the Internet because they do not have a cell phone or other devices.

The questionnaire was designed to measure the following variables: interest and motivation, satisfaction, teacher-student relationship, peers' relationship, and communication; considering new technologies, student fear, bullying, among others, all the characteristics that currently surround students and affect the atmosphere (Appendix 2).

It should be noted that some accommodation has been made to help all students with different learning diversities, disorders, and languages, and consequently ensuring that everyone understands what is being asked. For example, the audio of the questionnaire (Rovira-Mañé, 2022) was made to facilitate comprehension, and it was printed in large size to accommodate students with dyslexia and other disorders. Moreover, the survey was translated into Catalan, English, Finnish, Russian, Korean, among others, in order to attend to all those newcomer students who do not yet speak the official language of the school. Finally, teachers were able to choose whether to complete the questionnaire online through the Google Forms application or with printed paper depending on the general characteristics and needs of the students in the class.

Validation of the instrument

To create a rigorous instrument, first before implementing the questionnaire a qualitative validation of the questions was done, asking for the opinion of different experts.

Secondly, after the application of the questionnaires in different classrooms, a statistical validation of the results obtained was made, both answers obtained in the whole class by means of the variables Cronbach's alpha statistics, and individually through repeated questions formulated differently.

After the validations, if the answers were consistent, the final report of the environment of each classroom was elaborated, taking into account the 5 dimensions analysed. The validations carried out are explained in detail below.

On the one hand, before the implementation of the questionnaire in the classroom, the questions of this tool were validated by education professionals and by members of the Fundació de Moviments de Renovació Pedagògica de Catalunya (FMRPC), which is a Catalan entity created in 1981 with the aim of having a quality Catalan public school. It should be noted that appropriate corrections were made based on this expert validation (Appendix 2). These experts have considered the validity of the content where it is verified that the questions include all aspects of the different variables studied and the validity of construct to know if the questions represent all the characteristics that affect the classroom environment. In addition, they also analysed the criterion validity, that is, whether the questions of each variable are related and meaningful.

On the other hand, after the implementation the answers obtained in each of the classes were validated from a statistical point of view through the IBM SPSS program.

Firstly, the value of the Cronbach's alpha is checked, which indicates the consistency and homogeneity of the data, so it is necessary to validate the answers before making any interpretation. To calculate it, the program uses the following formula, where Si^2 is the variance of the answers to a question, St^2 is the variance of the total values observed, and k is the number of questions.

Figure 1

$$\alpha = \frac{K}{K-1}\left[1-\frac{\sum S_i^2}{S_T^2}\right]$$

According to a group of workers from the American Psychological Association (Wilkinson & APA Task Force on Statistical Inference, 1999), Cronbach's alpha is the most widely used coefficient in the social sciences and health articles. This idea is supported by a study stating that 75% of publications are based on Cronbach's alpha. (Hogan et al., as cited in Frías, 2021)

TABLE 1: CRONBACH'S ALPHA RESULTS

Alpha coefficient	Result
>.9 - .95	Excellent
>.8	Good
>.7	Acceptable
>.6	Questionable
>.5	Poor
<.5	Unacceptable

Therefore, to evaluate and represent the reliability of the answers, Cronbach's alpha gives a value from 0 to 1 for each question in the tool, where the closer to 1 the greater the consistency of the responses analysed within a class. In other

words, if the answers provided by students of the same class were identical, they would be perfectly correlated and therefore the result would be equal to 1. Otherwise, if there is no relationship among the answers of the participants the value of alpha would be equal to 0. To determine the consistency of the data, George and Mallery (2003, p.231) recommend using the following table to evaluate the results according to Cronbach's alpha coefficient.

For this reason, in this project, it was determined that the Cronbach's alpha variable must be above 70% (> = 0.7) to be considered a reliable questionnaire.

If the analysis of the answers shows a result of the Cronbach's variable below 60%, the evaluation is done by eliminating any of the questions that may have affected the lack of coherence, which could be a misunderstanding of the question. At this point, this answer would be removed, and the analysis would be continued, but if after deleting any of the questions, we still have the variable result below 60%, then it would be unreasonable to continue the study of that class.

In addition, extra control was added in this study, foreign to Cronbach's alpha. It consists in adding to the questionnaire repeated questions but formulated differently (Appendix 3), to be able to detect and exclude any student who has answered the questions randomly and that therefore has contradictory answers. To detect them, the correlation value was checked between those repeated questions, if it comes out above, 700 individual questionnaires will be analysed to see if there are any students who have contradicted in more than one repeated question. If so, the answers from that survey are removed and the class information will be re-processed in the program. Conversely, if it is observed that a student only contradicts one of the repeated questions, the questionnaire will be considered because it may have been a misunderstanding. The correlation means similarity, so if you

get 1 it means that the results of the two questions are the same, while with a 0 they don't look alike. In summary, this study also tries to contrast and ensure that there are no contradictions between the answers of the same individual questionnaire. In this way, inconsistencies can be detected, and the participant can be excluded.

Once it has been ensured that all the data entered in the program for each questionnaire is valid, the information is analysed in detail in a global way considering the variance of the different questions, that is, the dispersion of questions regarding the average. If the variance is equal to 0, it means that all the students have answered the question in the same way; on the contrary, if it increases, it indicates that more students think differently. Nevertheless, a detailed analysis of the answers will only be done if the value is high, as it may reveal that there are responses contrary to the mean value, which, in some key questions (Appendix 4), may be relevant but not detected in the mean values of the global class. However, a high value in other questions such as "The class is tidy, so I'm comfortable", may simply indicate that a class may have different criteria for a topic.

Once the two checks have been made, both for the individual and group responses, the data is used to obtain and evaluate the classroom atmosphere. To obtain a value that represents the environment, each question has four answers: always, usually, sometimes, and never where the most positive is given 4 points and the most negative 0. The sum of all the individual scores of each of the answers allows the researcher to obtain the total value of the class to form a scale. In addition, the questions are grouped into 5 variables; this will allow the researcher to see which are the weaknesses in each of the classes analysed and therefore should be improved. This process is repeated for each of the classrooms, as it may be reliable for one sample of students but not reliable for another.

Piloting the instrument

To conduct the investigation, principals and primary school coordinators of the different schools were contacted via e-mail. These professionals arranged a pre-face-to-face meeting with the researcher at the school, so that they could check the questionnaire and talk about the day, time, and courses where the implementation would take place. In this meeting, it was also discussed in which courses the questionnaire would be administered through *Google Forms* using the schools' devices and in which courses the printed questionnaire would be used.

On the day the study was conducted at the school, the researcher went from class to class explaining the instructions of the questionnaire and solving questions to children who needed it, while the class teacher, who had received instructions in advance, directed the application of the questionnaire. It should be noted that the questionnaire was administered in Catalan or English, depending on the school's official language, but as mentioned in the «creation of the instrument» section, if a student did not yet speak the official language of the school, the child was allowed to complete the questionnaire in his or her mother tongue to ensure that all students understood what was being asked. In terms of time, the students took an average of 15-20 minutes to complete all the questions.

Participants

The study was carried out in 24 middle cycle classrooms (8-10 years old) and 22 of the upper cycle (10-12 years old) coming from private, semi-private, public, urban, and rural schools from different areas of Catalonia, as shown in the table below. In addition, the instrument has also been applied to a semi-private school in Helsinki to evaluate the effectiveness of the tool in other contexts. All students in these schools will have to answer all the questions individually, avoiding

interaction between classmates to ensure that everyone answers what they think without being influenced. As can be seen in the table below, the names of the schools have been replaced by the letters A to G in order to maintain the anonymity of the schools participating in the study.

TABLE 2: PARTICIPANTS' INFORMATION

School	Location	Type	Social class	Analysed classrooms	Participants
School A	Vallès Occidental	Semi-private /urban	Upper	12	245
School B	Baix Penedès	Private / urban	Upper	8	185
School C	Baix Penedès	Public / urban	Lower-Middle	6	93
School D	Alt Camp	Public / rural	Middle	4	22
School E	Tarragonès	Public / rural	Middle	4	15
School F	Alt Camp	Public / rural	Middle	4	27
School G	Helsinki	Private / urban	Upper	8	137
Total				**46**	**724**

Results

The main result of this research is the questionnaire explained in the «Methods» section. Therefore, this part will show the validation results and examples on how to apply and analyse the instrument information, to present in a practical way how the instrument works.

TABLE 3: VALIDATION RESULTS

School	Cronbach coefficient	Average scale	Standard deviation	Scale variance	Average of the elements	Number of elements	Number of students
A [3rd A]	0,836	120,1	10,83	117,29	3,246	37	21
A [3rd B]	0,664	105,3	9,815	96,326	2,846	37	20
A [3rd C]	0,838	115,82	13,044	170,154	3,13	37	17
A [3rd D]	0,606	116,9	8,485	71,99	3,16	37	21
A [4th A]	0,781	119,73	9,161	83,922	3,236	37	22
A [4th B]	0,785	118,8	10,116	102,33	3,211	37	26
A [4th C]	0,886	118,24	14,23	202,49	3,196	37	21
A [4th D]	0,747	117,14	9,057	82,028	3,166	37	22
A [5th C]	0,837	109,61	11,952	142,84	2,962	37	18
A [6th A]	0,918	107,2	14,986	224,589	2,897	37	20
A [6th B]	0,924	110,37	15,428	238,023	2,983	37	19
A [6th D]	0,682	111,61	8,24	67,889	3,017	37	18
B [3rd A]	0,869	120,11	11,717	137,281	3,336	37	18
B [3rd B]	0,683	119,81	8,245	68,003	3,238	37	27
B [4th A]	0,821	116,21	9,427	88,868	3,141	37	24
B [4th B]	0,745	120,4	7,885	62,167	3,344	37	25
B [5th A]	0,919	111,48	15,114	228,443	3,013	37	23
B [5th B]	0,914	103,43	17,141	293,802	2,796	37	23
B [6th A]	0,788	118,23	9,107	82,946	3,195	37	22
B [6th B]	0,878	113,04	11,78	138,771	3,055	37	23
C [4th A]	0,882	78,18	12,139	147,36	3,237	37	17
C [4th B]	0,749	119,94	9,066	82,184	3,242	37	17
C [5th A]	0,856	118,4	11,076	122,656	3,383	37	15
C [5th B]	0,804	108,93	10,714	114,781	3,112	37	15
C [6th A]	0,897	114,88	15,153	229,81	3,191	37	17
C [6th B]	0,736	113,33	9,471	89,697	3,148	37	12
D [3rd]	0,009	-	-	-	-	-	-
D [4th]	0,387	-	-	-	-	-	-
D [5th]	0,387	-	-	-	-	-	-
D [6th]	0,963	113,71	24,452	597,905	3,073	37	7
E [3rd]	0,763	99	8,679	75,333	3,094	37	4
E [4th]	0,012	-	-	-	-	-	-
E [5th]	0,702	100,75	7,365	54,25	3,358	37	4
E [6th]	0,729	94,67	8,021	64,333	3,156	37	3
F [3rd]	0,798	109,43	8,344	69,619	3,218	37	7
F [4th]	0,813	111	10,607	112,5	3	37	5
F [5th]	0,814	117,29	8,2	67,238	3,351	37	7
F [6th]	0,916	121,5	12,972	168,286	3,284	37	8
G [3rd A]	0,795	116,86	10,06	101,209	3,246	37	14
G [3rd B]	0,845	128,87	10,35	107,124	3,483	37	15
G [4th A]	0,832	111	11,799	139,222	3	37	19
G [4th B]	0,9	113,33	13,767	189,529	3,063	37	18
G [5th A]	0,654	115,95	7,11	50,682	3,134	37	20
G [5th B]	0,86	119,56	10,013	100,261	3,231	37	18
G [6th A]	0,857	107,5	11,787	138,93	2,905	37	16
G [6th B]	0,946	99,82	19,514	380,779	2,698	37	17

Before interpreting the validation results, it is worth considering that the consistency and reliability of the data had to be analysed through four checks. Firstly, if the students answered all the questions, secondly, the correlation of the repeated questions, which should be around 1, then the correlation of the similar and opposite questions, and finally the Cronbach's alpha. The facts in a sample are considered very reliable if the Cronbach alpha is above 0.7 and unreliable if it is below 0.5. Therefore, all the classes that did not exceed this value, and consequently are not considered reliable, have been marked in red and the next step, which is to interpret the data, was not carried out.

Once the researcher was sure the information is reliable, the interpretation of the data is carried out (table 3), where the following values are analysed: the arithmetic mean of all the questions, the standard deviation and the variance, which indicate how much the answers vary with respect to the mean, the value of the key questions where low values should appear and, finally, the number of students, since one student in a class of 25 students is equivalent to 4% while one student in a class of 4 students represents 25% of the class. As the table shows, the values obtained in 42 out of 46 classrooms are consistent, so the tool is validated.

Before starting with the analysis of the results, it is necessary to check the reliability of the data, as mentioned in the «validation of the instrument» section. Once it has been verified that all the data provides information, the researcher proceeds to represent the average values of the class classified in the 5 variables through a graph to facilitate understanding. Some samples from different schools have been analysed to show in a practical way how the tool works.

Discussion

The result of the study, which is the creation of a new tool for assessing the climate in the classroom, shows that the first objective has been achieved. The results of several authors who had already studied and created previous questionnaires but with different objectives in mind, were considered to implement this instrument. Therefore, these results will be discussed in the light of the literature review below.

As stated by Perez, Ramos & Lopez (2009) in the journal article, the following variables are essential to evaluate the classroom environment: interest, satisfaction, relationship, and communication. For this reason, the same dimensions have been included in this study, but separating the questions related to teacher-student relationships and student-student relationships. These two variables must be evaluated separately because they reveal different information. One may be well appreciated by the students, while the other may not, and to improve each of them different measures should be applied. In terms of the questions, this study has also been inspired by those of Perez, Ramos & Lopez (2009), but as mentioned in previous sections, due to the year of research it does not cover all the characteristics that surround the current classrooms such as new technologies and disadvantages of this area, for example, cyberbullying. It also does not include other key aspects such as physical education or bullying, so the following authors have also been considered in the creation of the new tool.

As stated in the journal article by González, Touron and Tejedor (2012), when assessing the classroom environment, one must also consider how students feel about the distribution of the class, orderliness, and noise. For this reason, questions related to this area have been included in the results of this new tool which has enriched the results of this study.

Moreover, in the final product of this study, questions have been added to detect bullying, since the study by Vásquez, Zuluaga and Fernández (2012) ensures that bullying is a social reality which is present in many of the classrooms affecting peer relationships.

Finally, the last instrument includes questions about new technologies that affect students in almost all variables, which is why the article by Mousavi, Mohammadi, Mojtahedzadeh, Shirazi and Rashidi (2020) has been considered.

The tool for evaluating the classroom environment is a questionnaire that translates the answers; always, sometimes, several times and never into numbers; 1, 2, 3, 4, to be able to process them through a program that draws statistics from the data obtained. The questionnaire gathers 37 questions to evaluate 5 variables; interest and motivation, satisfaction, teacher-student relationship, peers' relationship, and communication; considering new technologies, student fear, bullying...

Before being analysed, a series of checks are carried out to ensure that all the data are reliable and finally the average of each variable is plotted on a graph. This tool has been validated through the evaluation of 6 Catalan schools with different characteristics and one in Helsinki to check the effectiveness of the instrument in different contexts.

Returning to the objectives established in the introduction, each of them has been fulfilled in this article. As objective A "create and validate a new instrument to assess the classroom atmosphere so that it adapts to the new characteristics that surround the students of the second and third cycle in the current classrooms" indicates, in this study, a tool that assesses classroom environment has been created and statistics were run to validate it. This program has allowed the researcher to know that all the results obtained and analysed in this academic paper are coherent and, as a result, announces

that no question should be discarded from the tool. It should be noted that the data from four rural school classrooms were not interpreted due to the low Cronbach's alpha value obtained.

In addition, considering objective B “analyse samples from a school to present in a practical way how the instrument works”, six samples from different schools have been analysed, the results of each class have been represented through a graph to make it easier to understand. In each class, the results of each of the variables obtained are higher than the minimum acceptable, therefore, it could be said that all the samples evaluated can have a good classroom environment.

Finally, as the last objective indicates «validate and check the effectiveness of the instrument in schools with different contexts, such as private, semi-private, public and rural schools in Catalonia and one Finnish school», to validate the instrument, 46 samples of schools with different characteristics and contexts were analysed. In this way, this study has represented a real sample of all the varieties of schools in society, segregated by gender, mixed, private, semi-private, public, rural, and international. For this reason, it could be said that diverse and significant data were obtained for statistical validation.

In conclusion, it could be stated that the instrument works well because it has identified the different strengths and weaknesses of each classroom. It should be noted that a more detailed analysis of the less valued variables allows us to know which of the questions lowers the average, and as a result, the teacher could apply corrective measures to continuously improve all the variables. To see the evolution, this tool should be implemented from time to time to ensure that there is a good environment in a classroom. It is noteworthy that this article has gone beyond the objectives set out in the introduction because, as observed in the analysis of the four schools, the high values of variance of the key questions (Appendix 4) could

detect cases of discomfort, insecurity or even bullying. To check which student is or to detect if it coincides that the same student evaluates negatively more than a dangerous question, an individual evaluation of each questionnaire is carried out. However, this could be considered as a future extension of this work because it should be confirmed again by visiting the school to see if it has been a specific issue that affected the student in deciding the answer, or even the tool can be re-executed if necessary to see if the student answers the same.

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Appendix 1-A: Questions grouped in the variables studied. Prior to expert validation

Variable	QUESTIONS
Interest and motivation	1. Teachers are personally interested in each of us when we have doubts or any problems, both inside and outside the class hours.
	6. Teachers show respect for our feelings.
	11. Teachers use different methods to encourage group activities, motivate us and get involved in our learning process
	16. Teachers send homework short, fun, varied and meaningful, which helps to increase my motivation to learn.
	21. Teachers send us repetitive assignments and they are boring.
	26. It is easy for me to study and do my homework and online activities suggested by the teacher.
	31. It is noticeable that the teachers do not prepare the classes because it does not give them time to finish them and that is why they make us finish it at home. 36. The teacher explains the theory to us very well and makes sure that we understand it, in the negative case he explains it to us as many times as necessary.
	36. The teacher explains the theory to us very well and makes sure that we understand it, in the negative case he explain it to us many times as necessary.
Satisfaction	2. Students are happy with the class group.
	7. The students are proud of the layout, order, learning materials of the class and as a result allow us to work comfortably in the classroom.
	12. My classmates don't respect the class, there's always clutter in the classroom and that makes me uncomfortable in this space.
	17. I think my class is a nice place (I like being in my class).
	22. The teachers know how to answer all the doubts of the syllabus without hesitation, it is noticeable that they master what they tell us and they transmit knowledge to us.
	27. Teachers master new technologies (digital competence) and use them correctly for activities inside and outside the classroom.
	32. There are class interruptions and/or classroom noises, which prevent me from following them.
Teacher-student relationship	3. The relationship between teachers and students is cordial.
	8. The relationship between us and the teachers is pleasant.
	13. My teachers appreciate me
	18. Teachers don't listen to me when I have to tell them something
	23. There is a lot of pressure from teachers as they demand more of us than we can do and as a result we get stressed out.
	28. The relationship with the teacher is very distant, and therefore it makes me respectful to ask all the doubts I have.
Student-student relationship	4. In this class, students have a good relationship with each other.
	9. The students collaborate very well with each other.
	14. My classmates don't let me participate and tell others not to be with me or not to talk to me and consequently make me feel inferior (exclude me).
	19. My classmates don't respect my stuff (they break it, they hide it from me...)
	24. My classmates physically or psychologically assault me (beat me or insult me)
	29. The students appreciate me and are my friends.
	34. I feel discriminated against by my peers for some reason (race, religion, gender, social status...) 39. When I come to school I feel fear or anguish over my relationship with my classmates.
	39. When I come to school, I feel fear or anguish over my relationship with my classmates.
	44. My classmates send me offensive messages or drawings on the internet and/or mobile.

Communication	5. In this class, the students have very good communication with the teachers.
	10. In this class, students have very good communication with each other.
	15. Teachers have good communication with each other, and this benefits us because we do not accumulate exams and homework on the same day but are well distributed.
	20. I get nervous or anxious when I attend class.
	25. During online classes, my ability to interact with others has increased because I feel comfortable and safe in asking my questions in online classes.
	30. My parents' relationship with the school and the teachers is good.
	35. My parents are angry with the school.

Appendix 1-B: Questions grouped in the variables studied. After expert validation

Variable	QUESTIONS
Interest and motivation	1. Teachers pay attention to me when I have a problem or want to report that I have seen a conflict between classmates, both inside and outside of class hours.
	6. Teachers care about how I am.
	11. I like the different activities we do in class.
	16. I like the homework that teachers send us.
	21. Our homework is boring.
	26. It is easy for me to hand in my homework online.
	30. We have time to finish the activities in class.
	34. I understand what the teachers explain me in class.
Satisfaction	2. I am happy with my classmates.
	7. I like the different spaces in the class, because they allow me to work at ease.
	12. The class is tidy, so I'm comfortable.
	17. I think my class is a nice place and I have everything I need.
	22. The teachers answer all my questions.
	27. Teachers know how to use new technologies to do activities.
	31. I find it hard to concentrate with the noises of my classmates, of class or out of class.
Teacher-student relationship	3. I am comfortable with the teachers.
	8. Teachers tell us what we do and how we feel.
	13. Teachers listen to me when I have to tell them something.
	18. Teachers demand more of me than I can do.
	23. I'm ashamed to ask teachers questions.
	37. I dare tell teachers if I see a classmate hitting, insulting, or breaking another classmate's material.
Student-student relationship	4. All our colleagues are very friendly with each other.
	9. We help each other among classmates.
	14. My classmates want to play with me.
	19. My classmates break or hide my classroom material.
	24. My classmates hit me or insult me.
	28. I have fun with my classmates.
	32. There are conflicts between peers.
	35. I feel safe coming to the school.
	36. Classmates write me bad things on paper, on the table...

Communication	5. I can communicate well with teachers.
	10. I can communicate well with classmates.
	15. Teachers talk to each other in order not to have a lot of homework or exams in the same week.
	20. I get nervous when I participate in class.
	25. I enjoy talking to my classmates in online classes.
	29. My parents are happy with the school and the teachers.
	33. My parents are angry with the school and/or teachers.

Appendix 2: Repeated questions to detect inconsistency.

1. Teachers pay attention to me when I have a problem or want to report that I have seen a conflict between classmates,both in and out of class.	13. Teachers listen to me when I have totell them something.
16. I like the homework that teacherssend us.	21. Homework is boring.
2. I am happy with my classmates.	4. All colleagues are very friendly witheach other.
14. My classmates want to play with me.	33. My parents are angry with the schooland / or the teachers.

Appendix 3: Key questions

KEY QUESTIONS TO REVIEW		VARIANCE
INTEREST AND MOTIVATION	1. Teachers pay attention to me when I have a problem or want to report that I have seen a conflictbetween classmates, both in and out of class.	>700
SATISFACTION	2. I am happy with my classmates.	>700
STUDENT-TEACHER RELATIONSHIP	3. I am comfortable with the teachers.	>700
STUDENT-STUDENT RELATIONSHIP	19. My classmates break or hide material from me. 24. My classmates beat or insult me. 35. I feel safe coming to school. 36. My classmates tell me bad things on the internetand / or mobile.	>500
COMMUNICATION	20. I am nervous when I participate in the class.	>700

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