Revista ELectrónica de Investigación y EValuación Educativa

RELIEVE

ISSN: 1134-4032

e-Journal of Educational Research, Assessment and Evaluation

Design and validation of a Scale Designed to Gather Student Perceptions of the Culture of Assessment as Learning

Diseño y validación de una escala de percepción de los estudiantes sobre la cultura de evaluación como aprendizaje

Conceção e validação de uma escala de perceção dos estudantes da cultura de avaliação como aprendizagem

对评估即学习这一文化的学生感知量表的设计与验证

Turra Marín, Yanire[1], Villagra Bravo, Carolina Pilar[2], Mellado-Hernández, Mª Elena[1], Aravena Kenigs, Omar Andrés[3]

[1] Catholic University of Temuco, Chile
[2] Catholic University Silva Henríquez, Chile

Abstract

Overseeing educational transformation demands a rethink of pedagogical practice according to a more in-depth understanding of learning and assessment as a single formative process. The aim of the present article is to describe the elaboration and validation an instrument that seeks to investigate student perceptions of the culture of assessment as learning. The study is exploratory and descriptive in nature and comprises 505 primary and secondary school students from the region of La Araucanía, Chile. Content validity of the instrument was examined by an expert panel. Further, reliability was determined according to Cronbach's Alpha coefficient and MacDonald's Omega indicator, whilst construct analysis included the development of exploratory and confirmatory factor analysis and structural equation models. Findings revealed a scale made up of three factors: culture of self-assessment, culture of collaboration and technological culture of learning. The instrument meets requisites for statistical rigour required for its application in the school system. It can be concluded that this instrument contributes to the discussion on the integration of assessment and learning as a single construct. The instrument also contributes redefining assessment practices by providing a reference that encourages self-assessment and reflection on the profound learning opportunities that are provided by schools in the 21st century.

Keywords: learning processes, assessment, student-teacher relationship, instrument.

Resumen

Liderar la transformación educativa desafía a repensar la práctica pedagógica desde la comprensión profunda de aprendizaje y evaluación como un solo proceso formativo. El objetivo del artículo es describir el proceso de construcción y validación de un instrumento que busca indagar en la percepción que tienen los estudiantes sobre la cultura de evaluación como aprendizaje. Es un estudio de carácter exploratorio y descriptivo, participan del proceso de validación 505 estudiantes de educación primaria y secundaria de la región de La Araucanía, Chile. La validez de contenido del instrumento se desarrolló mediante el juicio de expertos. Por otro lado, la confiabilidad se determinó con el coeficiente Alfa de Cronbach y el indicador Omega de McDonald, mientras que el análisis de constructo contempló la aplicación de modelos de análisis factorial exploratorio, confirmatorio y de ecuaciones estructurales. Los resultados permitieron definir una escala constituida por tres factores: cultura de autoevaluación, cultura de colaboración y cultura tecnológica de aprendizaje. El instrumento demostró cumplir con las garantías y rigurosidad estadística para su aplicación en el sistema escolar. Se concluye que este instrumento aporta a la discusión sobre la integración de la evaluación y el aprendizaje como un solo constructo. El instrumento contribuye a la resignificación de las prácticas evaluativas, al ofrecer un referente que propicia la autoevaluación y reflexión sobre las oportunidades de aprendizaje profundo que se promueven en las escuelas del siglo XXI.

Palabras clave: proceso de aprendizaje, evaluación, relación profesor-alumno, instrumento.

Received/*Recibido*	Jun 24, 2022	**Approved /*Aprobado***	Nov 28, 2022	**Published/*Publicado***	Dec 28, 2022

Corresponding author / Autor de contacto: Carolina Pilar Villagra Bravo. Universidad Católica Silva Henríquez. General Jofré 462, Santiago, Chile. correo-e: cvillagrab@ucsh.cl

Resumo

Liderar a transformação educacional desafia a repensar a prática pedagógica a partir de uma compreensão profunda de aprendizagem e avaliação como um processo formativo único. O objetivo do artigo é descrever o processo de construção e validação de um instrumento que procura investigar a perceção dos estudantes sobre a cultura de avaliação e de aprendizagem. É um estudo de caráter exploratório e descritivo, em cujo processo de validação participam 505 estudantes do ensino primário e secundário da região de La Araucanía, no Chile. A validade do conteúdo do instrumento foi desenvolvida através do julgamento de peritos. Por outro lado, a fiabilidade foi determinada com o coeficiente Alfa de Cronbach e o indicador Ómega de McDonald, enquanto a análise de construção contemplou a aplicação de modelos de análise fatorial exploratória, confirmatória e de equações estruturais. Os resultados permitiram definir uma escala constituída por três fatores: cultura de autoavaliação, cultura de colaboração e cultura tecnológica de aprendizagem. O instrumento demonstrou cumprir as garantias e o rigor estatístico para a sua aplicação no sistema escolar. Conclui-se que este instrumento contribui para a discussão sobre a integração da avaliação e da aprendizagem como uma construção única. O instrumento contribui para a ressignificação das práticas de avaliação, ao oferecer uma referência que propicia a autoavaliação e a reflexão sobre as oportunidades de aprendizagem profunda promovidas nas escolas do século XXI.

Palavras-chave: *processo de aprendizagem, avaliação, relação professor-aluno, instrumento.*

摘要

引领教育转型为我们提出了新的挑战，让我们对将学习和评估看作为同一个教育过程这个想法有了更深入的理解，以此促使我们重新思考教学实践。该研究的主要目的是对用来测量学生对于评估即学习这一观念想法的工具进行建设和验证。这是一项探索性和描述性的研究，对来自智利阿劳卡尼亚大区的505名中小学教育阶段的学生进行验证。由专家对工具内容的效度进行评判，通过克隆巴赫系数和麦克唐纳的欧米伽指标确定工具的信度，同时使用探索性和验证性因子模型以及结构方程模型进行建构分析。结果验证得到量表的三个构成元素：自我评估文化、协作文化和学习的技术文化。工具在学校系统应用中满足了数据的质量和严格性所提出的要求。同时该工具在关于将评估与学习融合为一体这个议题上给出了支持。另一方面该研究也引出了我们对教育实践的思考。最后该工具给我们提出了一个参考，这个参考推动着我们对二十一世纪校园提倡的深入学习机会进行自我评估和反思。

关键词: 学习过程、评估、师生关系、工具

Introduction

Current educational approaches indicate the need to transform traditional schools in order to foster learning in an organization that learns and assesses to develop useful knowledge for solving real problems of individual and collective well-being (International Commission on the Futures of Education, 2021; Robinson and Aronica, 2015). To this end, it is necessary to redefine relational dynamics within educational institutions and move from a kind of teaching that is obsessed with academic outcomes to one that offers better opportunities for a comprehensive kind of learning that genuinely considers the voice of children and youth (Aravena et al., 2019; Coll et al., 2022; Fullan, 2021; United Nations Children's Fund, UNICEF, 2013). In other words, students need to take the lead in their learning by getting involved authentically and genuinely.

New pedagogies establish horizontal learning relationships between students and teachers as "partners" who can collaboratively build diverse kinds of knowledge to face the challenges of the 21st century as lifelong learners (Fullan & Langworthy, 2014; Quinn et al., 2021). This new pedagogical assessment is understood as learning and is conceptually distanced from traditional rating systems. Thus, traditional assessment, which is restricted to an instrumental conception that only pursues the measurement and confirmation of learning, should be questioned regarding its educational sense and purpose (Santos-Guerra, 2017). Taking on the challenge of transforming assessment practice entails redefining power relations rooted in the process of learning in order to overcome teacher protagonism.

The present article aims to propose an instrument to investigate student perceptions of the culture of assessment as learning. In this sense, the research questions that guide the present study are the following: How are assessment and learning linked in school? What is the perception of students regarding the culture of assessment as learning? What self-assessment opportunities do students have during the learning process? How can technologies contribute to building deep learning? What collaborative practices do students develop during the learning and assessment process?

Taking the lead in deep learning

Deep learning is the process and outcome of giving meaning to the issues that interest us. It is holistic in nature and entails a liberating function that directly involves the emotional and cognitive capacities of individuals (Rincón-Gallardo, 2019). This approach assumes that learning is an authentic and appealing process for students and seeks to turn them into committed citizens and agents of change (Ríos-Muñoz & Herrera-Araya, 2021). The culture of deep learning also provides conditions for students and teachers to learn and assess together as part of a classroom learning community.

According to Rincón-Gallardo (2020a), six interrelated conditions lead to the development of deep learning. These conditions promote autonomy, mastery and connection with others and are as follows: a) interest in learning; b) constant exposure to expert practice; c) consistent practice; d) constant feedback; e) constant reflection and f) collaboration. In this vein, Mehta and Fine (2019) propose that deep learning arises from the concurrence of three virtues; mastery, identity and creativity. That is, it provides opportunities to develop skills and knowledge (mastery), connect with what is being learned and done (identity) and apply learning to produce something (creativity) instead of simply providing knowledge. Thus, the deep learning approach could be relevant to guide the transformation of pedagogical practice because it aims to uncover the purpose of what is learned at school and how it is learned.

From this perspective, new pedagogies are based on a learning partnership between students and teachers that equally appeals to the intrinsic motivation of both (Fullan & Langworthy, 2014; Quinn et al., 2021). This new relationship in the classroom allows creating challenging, democratic and transformative assessment spaces that equitably empower teachers and students. This calls into question the concept of learning as an individual construction, posing it as a collaborative process instead (Barba-Martín & Hortigüela-Alcalá, 2022; Ríos-Muñoz and Herrera-Araya, 2021; Torshizi and Bahman, 2019). In this way, individuals can reach their potential as both learners and leaders who can address their issues and take control of their learning.

Fullan et al. (2018) describe consensual global competencies such as character, citizenship, collaboration, communication, creativity and critical thinking. These are developed individually and collectively to face the challenges of today's world. This set of different kinds of knowledge is fostered in authentic environments where students and teachers jointly define their objectives and assessment criteria, critically examine their work, and incorporate feedback from their peers and other actors from the local, national and international community with the aim of "transforming the world" (Quinn et al., 2021). According to Rincón-Gallardo (2020a). Achieving this goal requires moving towards educational systems where attitudes such as "knowing oneself and others", "learning to learn", helping others "learn to learn" and improving the world together are effectively cultivated. The development of life skills requires school cultures that are highly integrated with deep learning and a transformation of the pedagogical core.

In this sense, the pedagogical core is the centre of any attempt to improve the relationship between teachers and students regarding content being delivered (Elmore, 2010). Unfortunately, relations within the core are traditionally based on the power of the teacher over the student. This is evidenced by the exclusive role of teachers during the assessment process (Moreno-Olivos, 2021). Thus, it is desirable to overcome hierarchical practice in which teachers determine, according to their own beliefs, what is learned and how it is assessed. This limits the role of the student to that of someone who receives and repeats information.

Conventional school culture dissociates assessment from learning by conceiving the latter as a final activity of measuring achievement, thus rendering it invisible throughout the educational process (Jara et al., 2022; Prats et al., 2020). In order to adopt the "assessment as learning" approach, both activities must be understood as a single process. It will also be necessary to decrease the emphasis and consequences of result certification (Sanmartí, 2020). In other words, assessment is what drives learning, because when students learn, they are assessing and regulating themselves, whilst also becoming aware of what needs to be learned via peer and teacher feedback.

The challenges of learning and assessment practice from a more democratic perspective require students and teachers to become aware of how to learn and evaluate in the context of new pedagogies. Thus, there is a need to reconfigure the learning culture via self-assessment, collaboration and the use of technologies.

Culture of self-assessment of learning

Learning involves delving into questions or issues that are important and challenging for the apprentice who aims to solve problems with greater autonomy (Rincón-Gallardo, 2019). For many children and young people, learning is an uncertain process, which requires relationships of trust between students and teachers as students make mistakes, ask for help and repetitively try to succeed (Hattie & Yates, 2018). Transforming the learning culture redefines the role of the student and the teacher with authentic classroom project designs, which enable the student to manage and assess the objectives that will guide their learning process.

Through assessment, students can take control of their learning by identifying achievements and mistakes that allow them to find ways to overcome the difficulties that hinder their understanding (Muriel et al., 2020; Pascual). In this sense, the self-assessment process helps one to recognize their own ideas, understand the reasons behind them and make decisions aimed at improving lifelong learning beyond the school setting (Sanmartí, 2020). In short, the practice of self-assessment is essential in a deep learning process, because it offers constant and timely feedback to learn.

Consistently with self-assessment, the approach of assessment as learning helps learners to reflect on the knowledge they build and have greater control of their learning through regulatory metacognitive skills (Emore, 2019; González et al., 2018; González-Cabañes et al., 2022; González-Palacio et al., 2021; Villagra et al., 2022). Self-assessment is a practice that promotes self-regulation. This is necessary for fostering the global competencies needed to thrive in contemporary society and contribute to the creation of cultural, social and/or economic value (Sala et al., 2020). Thus, the learner creates a learning awareness that redefines errors as a resource that inspires and motivates learning from an integral perspective.

Culture of collaborative learning

Developing collaborative citizens requires learning environments that cultivate collaboration in a reciprocal relationship between students and teachers (Quinn et al., 2021). These educational experiences are built from designs that go beyond the closed space of the classroom since they take place in the real context of the student (Ferreiro & Domínguez, 2020). In this way, learning designs are shared because the student actively participates in decision-making, based on their experiences and motivations to define the learning path together with the teacher.

Hattie (2017) points out that the greatest effects on student learning occur when teachers become apprentices of their own way of teaching and students become their own teachers. New roles in the classroom encourage the protagonism of students and, in turn, require rebranding of the teaching role (Blanchard & Muzás, 2020). In this context, students and teachers achieve deeper learning when they assume challenging and authentic roles built on democratic relationships and dialogic processes.

The dialogic process of learning between teachers and students is enhanced through so-called "shared assessment", which includes integrated processes of self-assessment, co-assessment and hetero-assessment as a means to making collective decisions (López-Pastor, 2017). Self-assessment and co-assessment are relevant practices for promoting a democratic and transformative approach towards learning. Self-assessment requires self-appraisal from the individuals themselves to assess their own performance, while co-assessment is an examination of student performance (Ríos-Muñoz and Herrera-Araya, 2021). In fact, assessment fosters a shared vision of learning, as long as important decisions are made about what to learn and how to continue learning together.

From a formative assessment perspective, the apprentice must feel safe to take risks and make mistakes while learning (Rincón-Gallardo, 2020b). When students feel safe, they can create favourable learning environments and ask for help when they have difficulties or require feedback (Casado et al., 2017). In order to ensure an environment of trust that encourages the connection of students with other agents of the local and global surroundings, it is essential that the teacher relinquishes the leading role and adopts the role of co-learner in the educational process.

Technological culture of learning

Technologies are strategically used for deep learning to build knowledge among peers, investigate and solve problems, give and receive feedback, and facilitate collaboration with experts and others around the world, beyond the classroom (García-Chitiva & Suárez-Guerrero, 2019; Fullan and Langworthy, 2014). In this way, technology has been incorporated into assessment processes, generating innovative dynamics and, in some cases, novel approaches in the education system (Vega et al., 2021). In other words, technology offers the possibility of learning to learn individually and in collaboration with others, provided that its use is mediated by a pedagogical practice that allows the student to take control of their learning.

Within a technological learning culture, the teacher must ensure that students develop 21st century competencies to critically assess, discover and create new knowledge using technology on a permanent basis and become intrinsically involved with their learning (Quinn et al., 2021). In this regard, technological advances have enabled the emergence of open and flexible environments that favour the commitment of students to their learning (Becerra et al., 2020). In other words, the continued use of technology for learning contributes to creative and divergent thinking because it links students to diverse learning scenarios.

In today's society, being flexible means being able to promote and improve digital skills and take advantage of the new development possibilities generated by the diffusion of technology (Sala et al., 2020). With regards to collaborative and self-regulatory assessment, technological tools allow students and teachers to leave their mark on the learning process through the systematization and reflective analysis of evidence (Ibáñez, 2021; Prats et al., 2020). In short, the intentional use of technology favours the assessment as learning approach because it offers various opportunities to learn and add feedback to the pedagogical process without the need for being in the same place at the same time.

Method

Design

In order to examine validity of an instrument denominated "Student perception of the culture of assessment as learning", an exploratory and descriptive study was proposed based on the application of exploratory and confirmatory factor analysis and structural equation models.

Sample

The study population was composed of all the students from a subsidized private school in the Araucana Region, Chile. A non-probabilistic sampling approach recruited 505 students (257 women, 235 men, and 13 of non-binary gender) to the study aged 10 to 19. Inclusion criteria were as follows: a) willingness to fill out the "perception of the culture of assessment as learning scale"; b) enrolled on an academic course between the 5th year of primary school and the 4th year of secondary school (Chilean system). The sample size complied with general rules for obtaining statistical power in confirmatory and exploratory factor analyses (Kyriazos, 2018). Table 1 presents participant characteristics regarding age and educational level.

Table 1. Sample description

Educational level (Chile)	Average age	Gender	N = 505
5th grade (primary school)	10.3	F=39; M=36	75 (15%)
6th grade (primary school)	11.5	F=41; M=34	75 (15%)
7th grade (primary school)	12.2	F=37; M=37	74 (15%)
8th grade (primary school)	13.4	F=30; M=42; NB=3	72 (14%)
1st grade (secondary school)	14.7	F=29; M=38; NB=2	67 (13%)
2nd grade (secondary school)	15.6	F=31; M=18; NB=2	49 (9.7%)
3rd grade (secondary school)	16.8	F=27; M=22; NB=2	49 (9.7%)
4th grade (secondary school)	18.1	F=23; M=21; NB=4	44 (8.7%)

Instrument design and validation

The instrument aims to investigate student perceptions of the culture of assessment as learning. For its design, several theoretical and empirical studies from the past five years on deep learning, assessment as learning and collaboration, and the use of ICTs for learning were reviewed. Studies conducted by López-Pastor (2017), Rincon-Gallardo (2019), Sanmartí, (2020) and Quinn et al. (2021) stood out. In consideration of these studies, 42 items, expressed as statements, were defined. These were distributed according to three theoretical dimensions: (a) Culture of learning self-assessment; (b) Culture of collaborative learning; and (c) Technological learning culture (Table 2).

Table 2. Dimensions of the instrument

Dimension	Theoretical definition
Culture of learning self-assessment (SAS)	Learning environments in which students feel confident about taking risks and leading their own educational development. Teachers intentionally create frameworks for deep learning where students immerse themselves with autonomy in the development of life skills.
Culture of collaborative learning (COLL)	Environments where students and teachers partner to learn, take on new roles and build democratic learning relationships with others (in and out of school) based on communication, trust, support and empathy.
Culture of technological learning (TECH)	Continuous use of digital resources throughout the learning process to facilitate the creation of deep learning conditions and partnerships with families, community members and experts, regardless of geographical location, favouring the ability of students to take control of their own learning inside and outside the classroom.

Content validity of the instrument was determined using an expert panel. Four academic assessment specialists were contacted, with the task of ensuring that items were representative of the construct and fulfilled their evaluation purpose (Ding and Hershberger, 2002). To do this, expert judges awarded a numerical score between 0 and 5 to each item of the questionnaire. Scores were awared according to the criteria of sufficiency, clarity and relevance (Escobar-Pérez & Cuervo-Martínez, 2008). The judges were also tasked with adjusting the wording of items to facilitate understanding. This process resulted in the elimination of 12 items, leaving a final table of 30 response items to be rated along a Likert scale (from 1 to 4, where 1= always; 2= sometimes; 3= never and 4= I do not understand the statement).

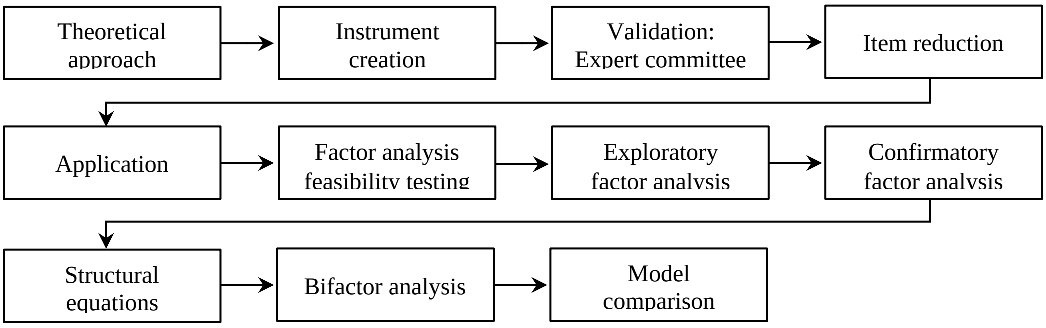
Table 3. Instrument items

Dimension	Items
Culture of learning self-assessment (SAS)	I find better solutions to face my difficulties when I assess my learning
	I acknowledge that I learn when I ask myself questions during the activities or tasks that I carry out
	I detect strengths and weaknesses to improve my learning
	I understand what causes my errors when I assess myself
	I ask questions to other people when I work individually, and I am having difficulties to learn
	I ask my classmates and the teacher to comment on my performance and send feedback so I can learn
	I participate in the elaboration of assessment criteria that guide my learning and my peer’s learning
	I use my errors as an opportunity to learn when we make a mistake, or my teacher makes a mistake
	I can self-assess myself better when I compare my work with the work of my peers
	I learn to dialogue and put myself in the place of others when I assess my peers and they assess me

Culture of collaborative learning (COLL)	We define with the teacher the activities, tasks, or projects that we will carry out to learn
	Along with the teacher, we elaborate questions to challenge ourselves to keep learning
	We plan with the teacher learning projects involving other people inside and outside the school
	Along with the teacher we research topics that help us solve everyday problems relevant to the local and global context
	With the teacher, we integrate people who can share experiences related to what we are learning
	Along with the teacher, we develop different activities at the same time during a class
	We talk about the learning we are building and receive feedback from our peers and teachers
	We define with the teacher how we will show what we are learning in school
	We communicate our learnings built in school to different people and organizations
	In order to learn, we carry out collaborative work with other colleagues while respecting each other's views
Culture of technological learning (TECH)	We communicate with other people through learning technologies
	We use technologies for working and learning along with parents and teachers
	We plan with the teacher our learning and assessment activities with the support of technologies
	We use technologies to collect opinions and comments when assessing our peers
	We promote issues of global relevance using technologies to generate awareness in people
	We use technologies to access different types of information that help us learn
	We use technologies to provide and receive timely peer and teacher feedback
	We use school platforms to present the evidence of our learning
	We use technologies to share learning and assessment experiences
	We use different technologies to creatively represent what we are learning

In order to determine construct validity, a two-stage process was implemented. The first involved analysis of the items and was subdivided into correlation analysis, suitability testing and reliability testing. The second stage corresponded to analysis of the factorial structure and was subdivided into exploratory factor analysis, confirmatory factor analysis, structural equation modelling, bifactor modelling and goodness of fit testing to compare the generated models. Figure 1 summarizes the flow of the instrument validation and consolidation process.

Figure 1. Process of validation and consolidation



Note: The theoretical approach guiding selection of the preliminary dimensions to build the initial instrument for its validation with the expert panel. Following this, items were reduced and tested. Once data was collected, feasibility tests were performed for factor analysis and, in the case of satisfactory outcome, exploratory factor analysis was performed followed by confirmatory factor analysis, structural equation modelling and, finally, bifactor analysis. The resultant four models were then compared via goodness of fit tests to determine the most appropriate model.

Procedure

School management teams were contacted to request authorization for instrument administration and discuss the return of results. Subsequently, informed consent forms were given to each student to be signed by their parents-guardians. A week later, questionnaire was administered to students in their classrooms. Students voluntarily signed a consent form in which they were informed of the purpose of the study and the implications of participation. The research team supported scale administration, addressed student doubts and ensured the correct completion of the instrument.

Ethical considerations

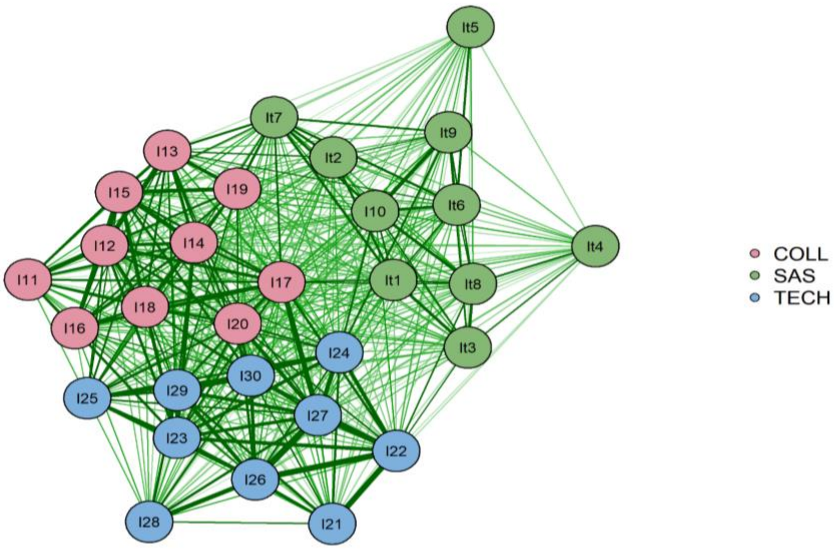
The present study forms part of a postgraduate thesis from a Chilean university written by the first author of the article. She was also responsible for maintaining contact with schools. In addition, a project researcher fully ensured compliance with the ethical considerations of the research. All participants gave written informed consent, in which the purpose of the investigation was described, alongside assurances of confidentiality and anonymity. Likewise, students' parents-guardians gave written informed consent, in which they were informed of the purpose of the study, that participation did not involve any risks and that no financial rewards or academic consequences would result. Finally, the return of results to the educational institution was to be performed at a presentation organized by the research team.

Results

Analysis of Items

In order to elaborate robust dimensions, the first step was to analyse the correlation between items and the suitability of factor analysis. Figure 2 represents the polychoric correlation matrix (Holgado-Tello et al., 2010), in which it can be observed that items tended to correlate with the theoretically defined dimensions. It was not necessary to remove items due to redundancy, meaning that they were not conceptually unique. Correlations were lower than 0.60 (Le et al., 2010).

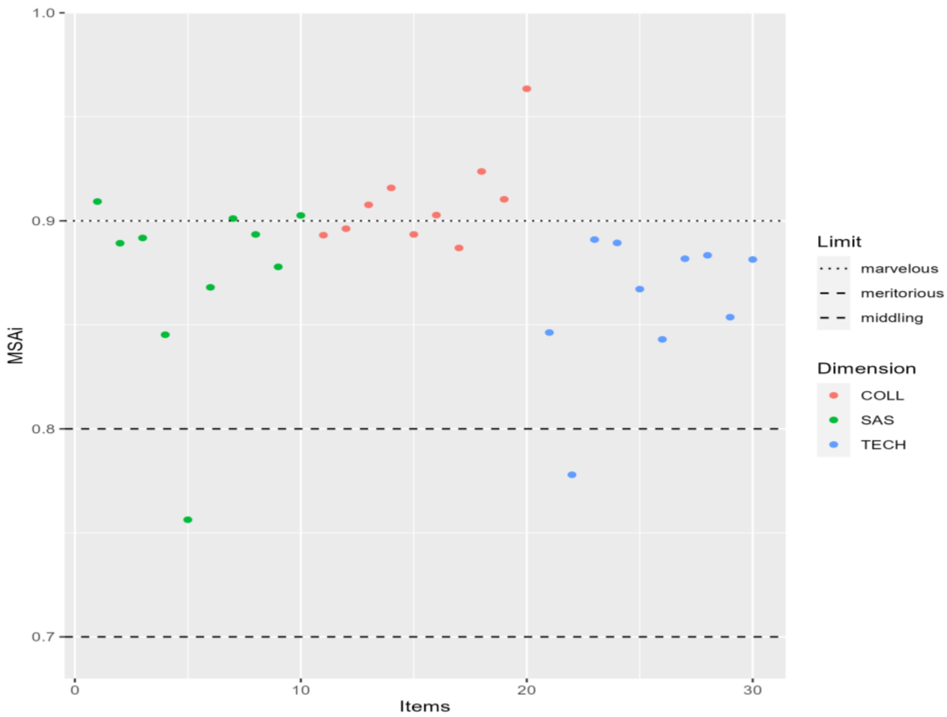
Figure 2. Polychoric correlation matrix



Note: Associations between items as estimated through the polychoric correlation method, which is appropriate for ordinal latent variables. The vertices represent items and the edges represent the strength of association, according to dimension. Associations with coefficients greater than 0.3 are shown, with no item having a correlation greater than 0.58.

Bartlett's sphericity test supported the factor analysis: Chi-square (435) = 3545.51, p < . 001. The Kaiser-Meyer-Olkin (KMO) measure of sample adequacy, with a value of 0.88, suggested that data were appropriate for factor analysis as the KMO value was greater than 0.70 (Figure 3).

Figure 3. *Factor analysis suitability*



Factor Structure

When executing exploratory factor analysis, it was observed that, depending on the method used (principal components or maximum likelihood), 3 or 5 factors emerged. Figure 4 shows the sedimentation graph generated from the principal component method (Bro & Smilde, 2014). This method is used to obtain an initial factor solution and, in this case, identified 3 dimensions in line with the theoretical approach. Figure 5 shows the sedimentation graph generated from the maximum likelihood factor extraction method (Tucker & Lewis, 1973). This uses an iterative algorithm (500 in this case) and suggested the existence of 5 dimensions.

Figure 4. Sedimentation graph based on the principal component method

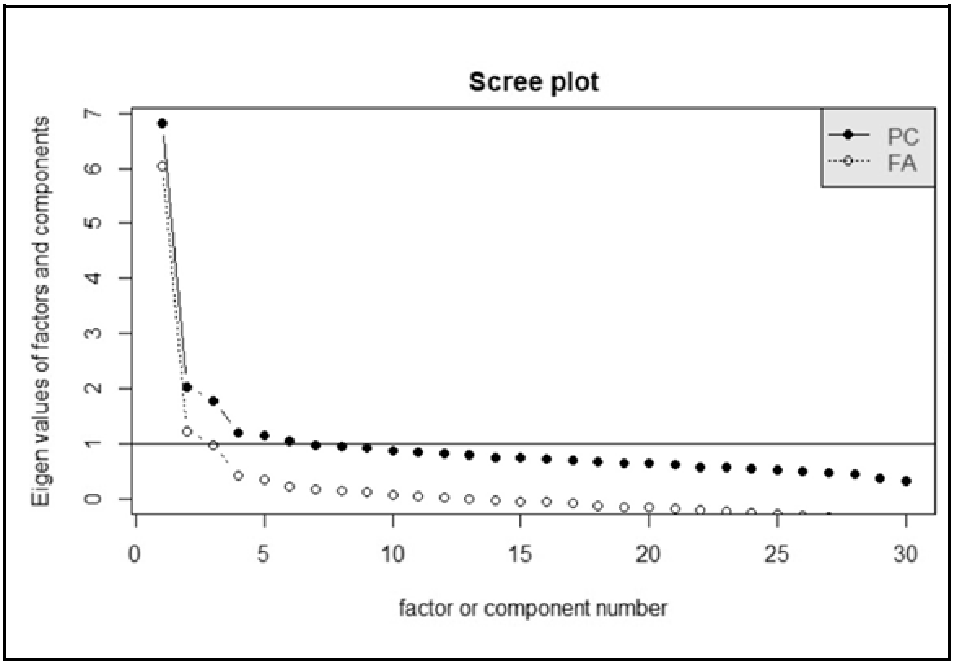
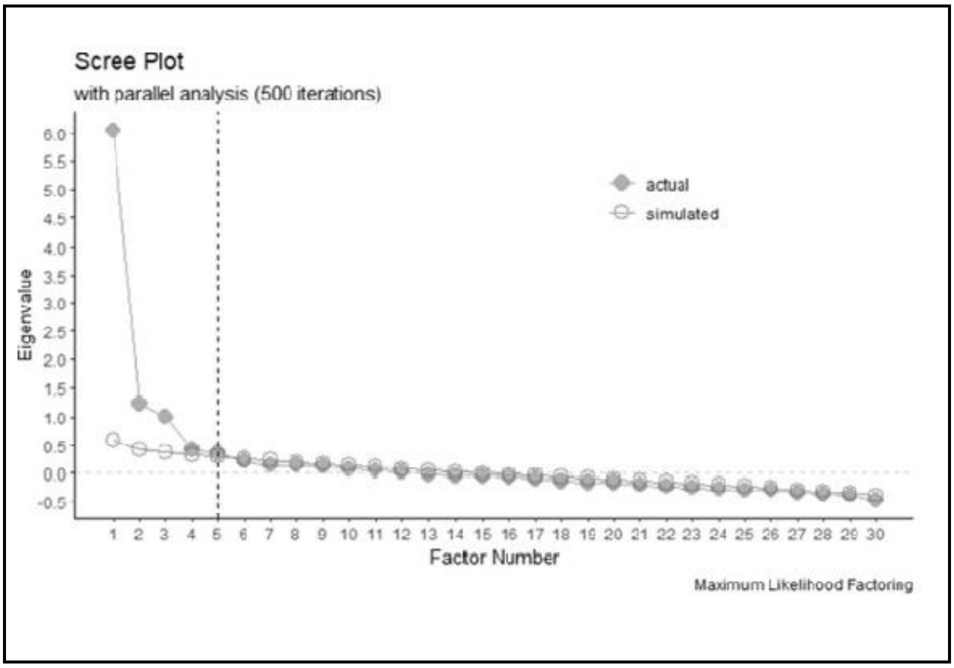
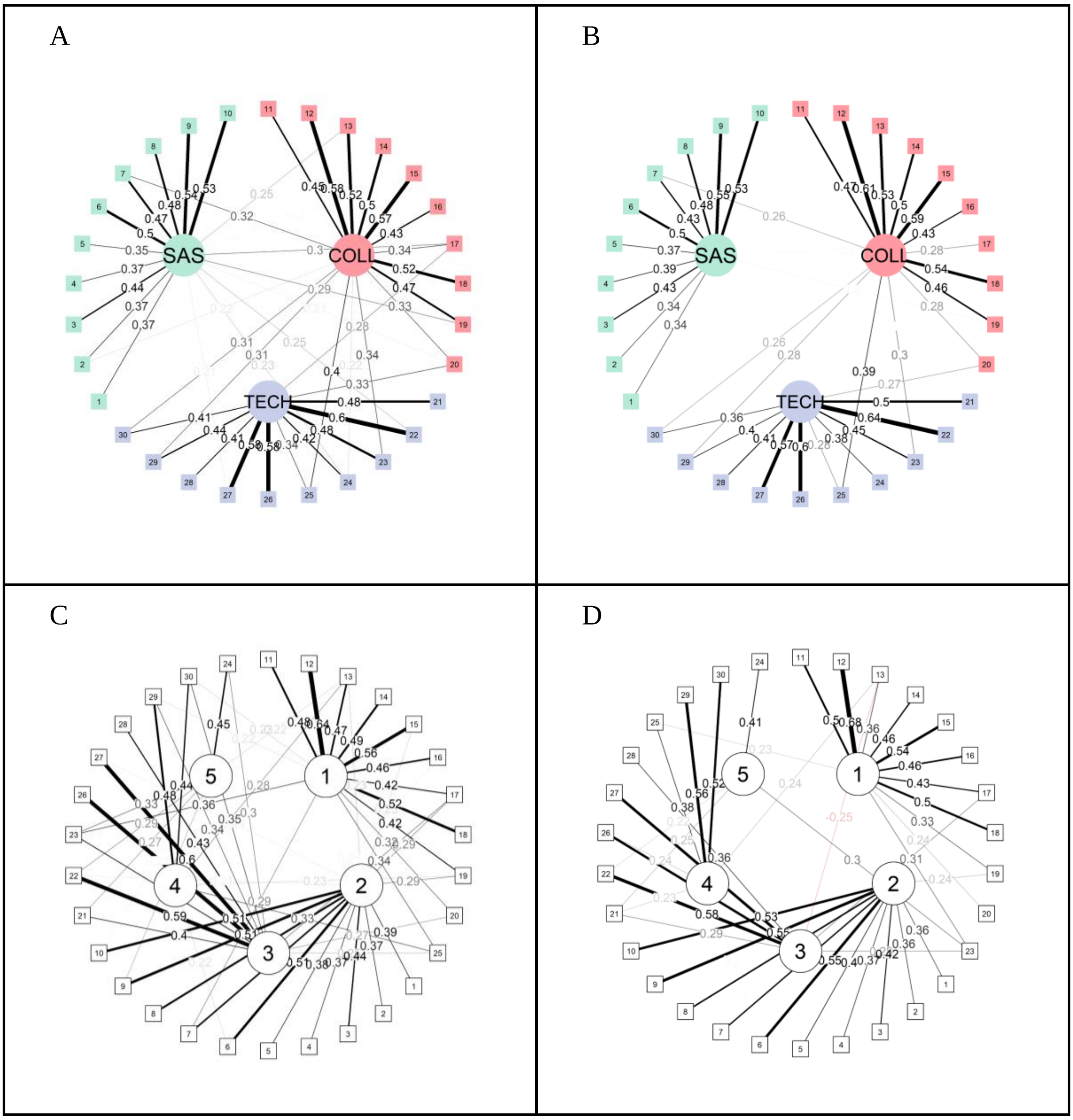


Figura 5. Gráfico de Sedimentación a partir del método de extracción factorial



In order to perform more robust comparisons, exploratory factor analysis was performed with 3 and 5 factors in parallel. Figure 6 shows the grouping of items according to the factor loadings associated with a given factor. Images A and C show the grouping generated with the varimax method. This is an orthogonal rotation method that minimizes the number of variables with high loads in each factor, simplifying the interpretation of factors. Images B and D show the grouping generated using the Oblimin criterion.

Figure 6. Exploratory factor analysis



Note: In the 3-factor model using varimax and oblimin rotation, no significant differences in item groupings on the respective factors were observed. A correlation exists between the collaboration and technology dimensions. In the 5-factor models, factors 1, 2, and 3 group together the most items, whilst groups 4 and 5 include 2 items and 1 item, respectively.

Tables 4 and 5 present Cronbach's alphas, variance and the alphas associated with the 3 and 5-factor models using varimax and oblimin rotations.

For the 3-factor model, the explained variance does not differ greatly depending on the rotation method used. Thus, factor 1 explains 37% (varimax) and 39% (oblimin) of variance, whilst factor 2 explains 33% (varimax) and 32% (oblimin) of variance, respectively. Finally, factor 3 explains 31% (varimax) and 29% (oblimin) of variance, respectively. As for accumulated variance, factor 1 explains about 40% of variance, factor 1 + factor 2 explain about 70% and the 3 factors explain 100%.

Cronbach's alpha for factors 1, 2 and 3 were 0.75, 0.8 and 0.79, respectively, indicating "high consistency" (Quero, 2010). McDonald's omega (1999) is used as an indicator of reliability to complement Cronbach's alpha. It is for Likert scales, since it is based on the commonalities of factor loadings. In the case of the 3-factor exploratory analysis, the omega indicator was observed to be adequate since it was between 0.70 and 0.90 (Ventura-León & Caycho-Rodríguez, 2017).

Table 4. Exploratory factor analysis outcomes – Explained variance

	PA1		**PA2**		**PA3**	
	Varimax	Oblimin	Varimax	Oblimin	Varimax	Oblimin
SS loadings	3.14	3.34	2.79	2.74	2.62	2.47
Proportion Var	0.10	0.11	0.09	0.09	0.09	0.08
Cumulative Var	0.10	0.11	0.20	0.20	0.29	0.29
Proportion Explained	0.37	0.39	0.33	0.32	0.31	0.29
Cumulative Proportion	0.37	0.39	0.69	0.71	1.00	1.00
Alpha	0.75 (0.71; 0.78)		0.80 (0.77; 0.82)		0.79 (0.76; 0.81)	
Omega Bollen	0.7505637		0.8043120		0.7935121	
Omega Bentler	0.7505637		0.8043120		0.7935121	
Omega McDonald	0.7496884		0.8061207		0.7944259	

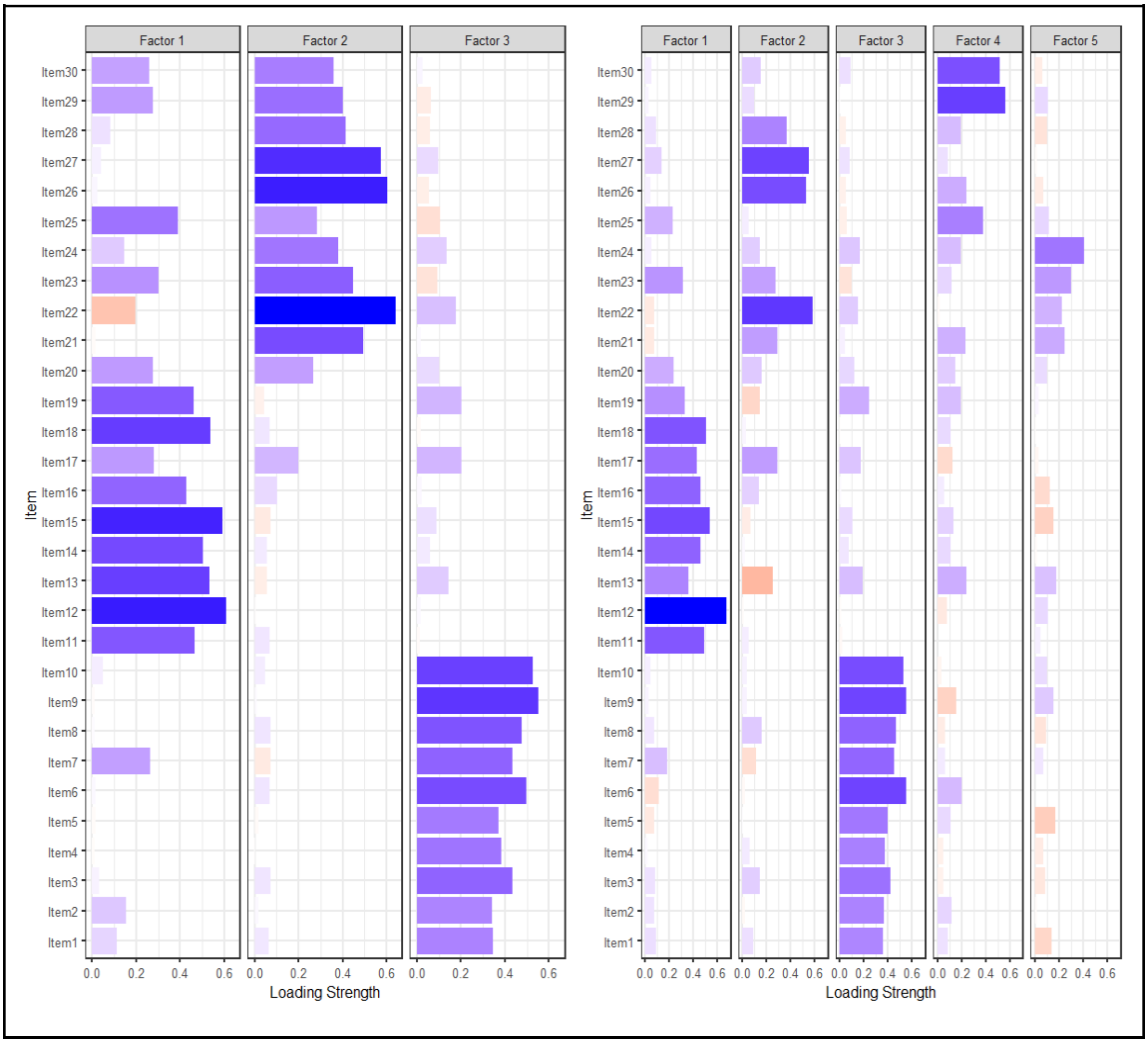
Table 5. Exploratory factor analysis outcomes – Explained variance

	PA1		**PA2**		**PA3**		**PA4**		**PA5**	
	Varimax	Oblimin	Varimax	Oblimin	Varimax	Oblimin	Varimax	Oblimin	VariMax	Oblimin
SS loadings	3.02	2.93	2.59	2.60	2.33	1.84	0.99	1.64	0.80	0.73
Proportion Var	0.10	0.10	0.09	0.09	0.08	0.06	0.03	0.05	0.03	0.02
Cumulative Var	0.10	0.10	0.19	0.18	0.26	0.25	0.30	0.30	0.32	0.32
Proportion Explained	0.31	0.30	0.27	0.27	0.24	0.19	0.10	0.17	0.08	0.07
Cumulative Proportion	0.31	0.30	0.58	0.57	0.82	0.76	0.92	0.93	1.00	1.00

For the 5-factor model, explained variance also did not differ greatly according to the rotation method used. Factor 1 explains 31% (varimax) and 30% (oblimin) of the variance, factor 2 explains 27% (varimax) and 24% (oblimin), respectively, factor 3, 24% (varimax) and 19% (oblimin), respectively, factor 4, 10% (varimax) and 17% (oblimin), respectively, and factor 5, 8% (varimax) and 7% (oblimin), respectively. As for accumulated variance, factor 1 explains about 30% of variance, factor 1 + factor 2 explains about 58%, factor 1 + factor 2 + factor 3 explains about 80%, factor 1 + factor 2 + factor 3 + factor 4, over 90%, and the 5 factors, 100%.

Figure 7 presents the factor loadings. These indicate the strength of correlation linking items to each of the factors, whether within the 3- or 5-factor model.

Figure 7. Factor loadings



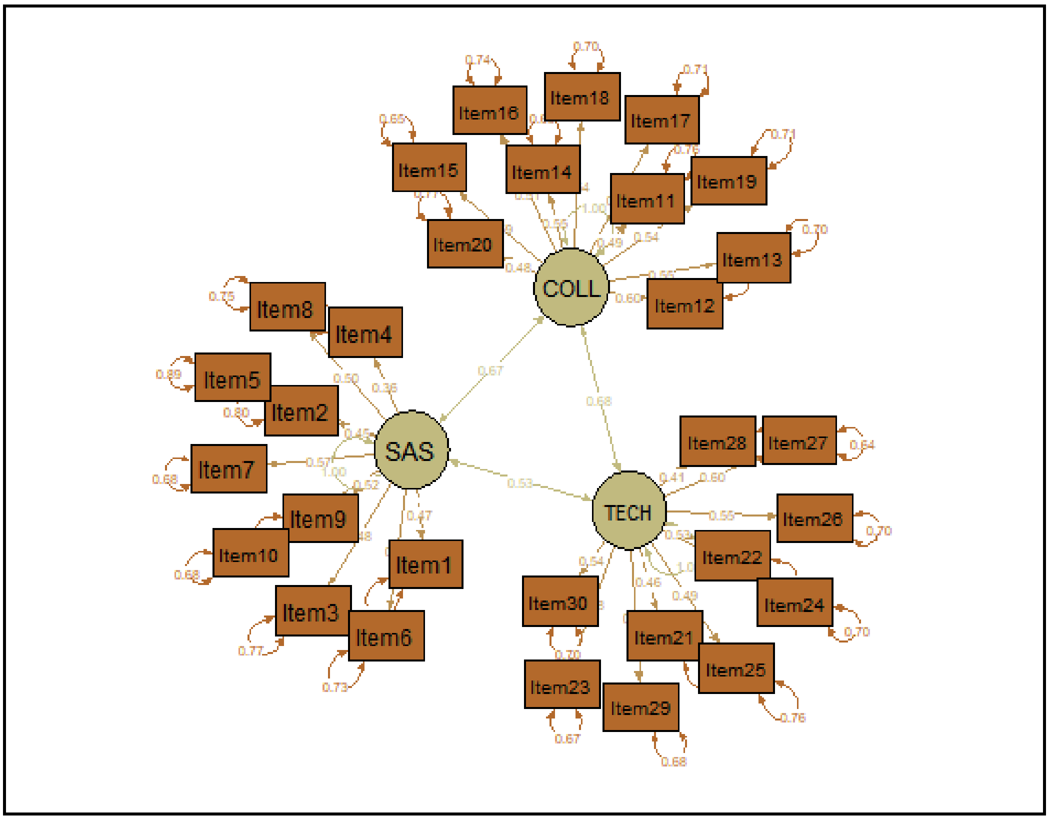
Nota: For the 3-factor model, the grouping of items agrees with the theoretical proposition. Items 1-10 are associated with factor 3, 11-20 are associated with factor 1, and 21-30 to factor 2. For the 5-factor model, items 1-10 are grouped in factor 3, 11-20 in factor 1, and the rest are divided between factors 2, 4, and 5.

Although factor loadings, in some cases, are below 0.5, the proposed solution is considered to be close to the simple structure principle (Thurstone, 1935). This describes a factor loading matrix with three characteristics: (1) each factor has few high weights, with the rest being close to zero; (2) each variable is saturated by only one factor; (3) there are no factors with the same distribution. The 3-factor model is consistent with what was initially proposed based on this theory, whilst the 5-factor model seems to generate 2 factors that do not group many items. This may suggest that a separate review is required for each. Based on the comparisons of the proposed models, confirmatory factor analysis was conducted for both cases in order to further validate the instrument.

Confirmatory Factor Analysis

In consideration of exploratory factor analysis outcomes, two confirmatory factor analyses with 3 and 5 factors were performed in parallel. Figure 8 shows that, in the 3-factor model, the grouping of items coincides with the theoretical definitions for the collaboration, self-assessment and technology dimensions.

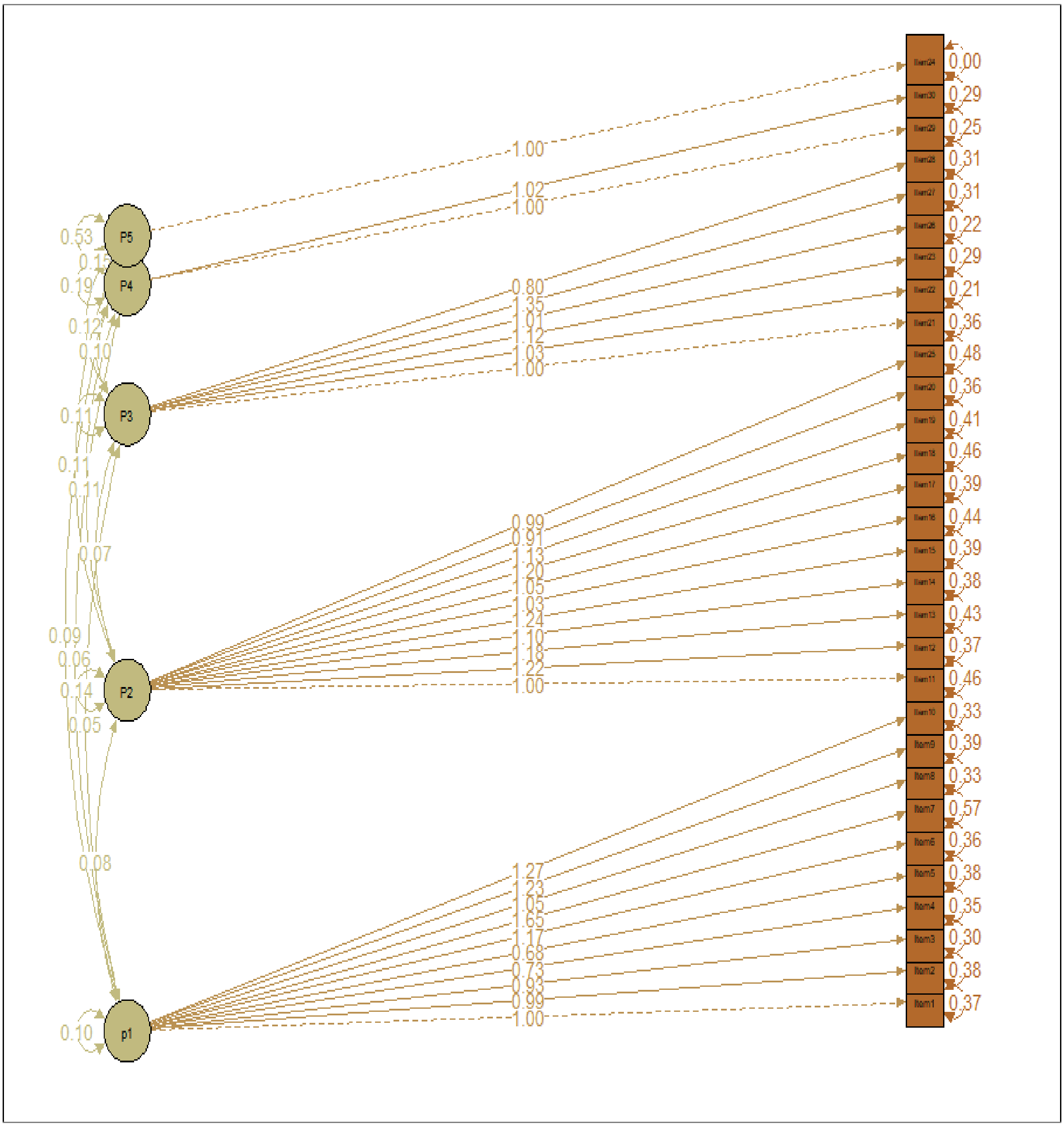
Figure 8. Confirmatory factor analysis models according to the 3-factor model



Note: The 3-factor model groups items correctly based on theory. This means that items 1 to 10 are grouped in the "Self-assessment" factor, items 11 to 20 are grouped in the "Collaboration" factor, and items 21 to 30 are grouped in the "Technology" factor.

Figure 9, on the other hand, represents the 5-factor model which generates 3 large dimensions that group most of the items, and 2 factors (4 and 5) that gather 2 items and 1 item, respectively.

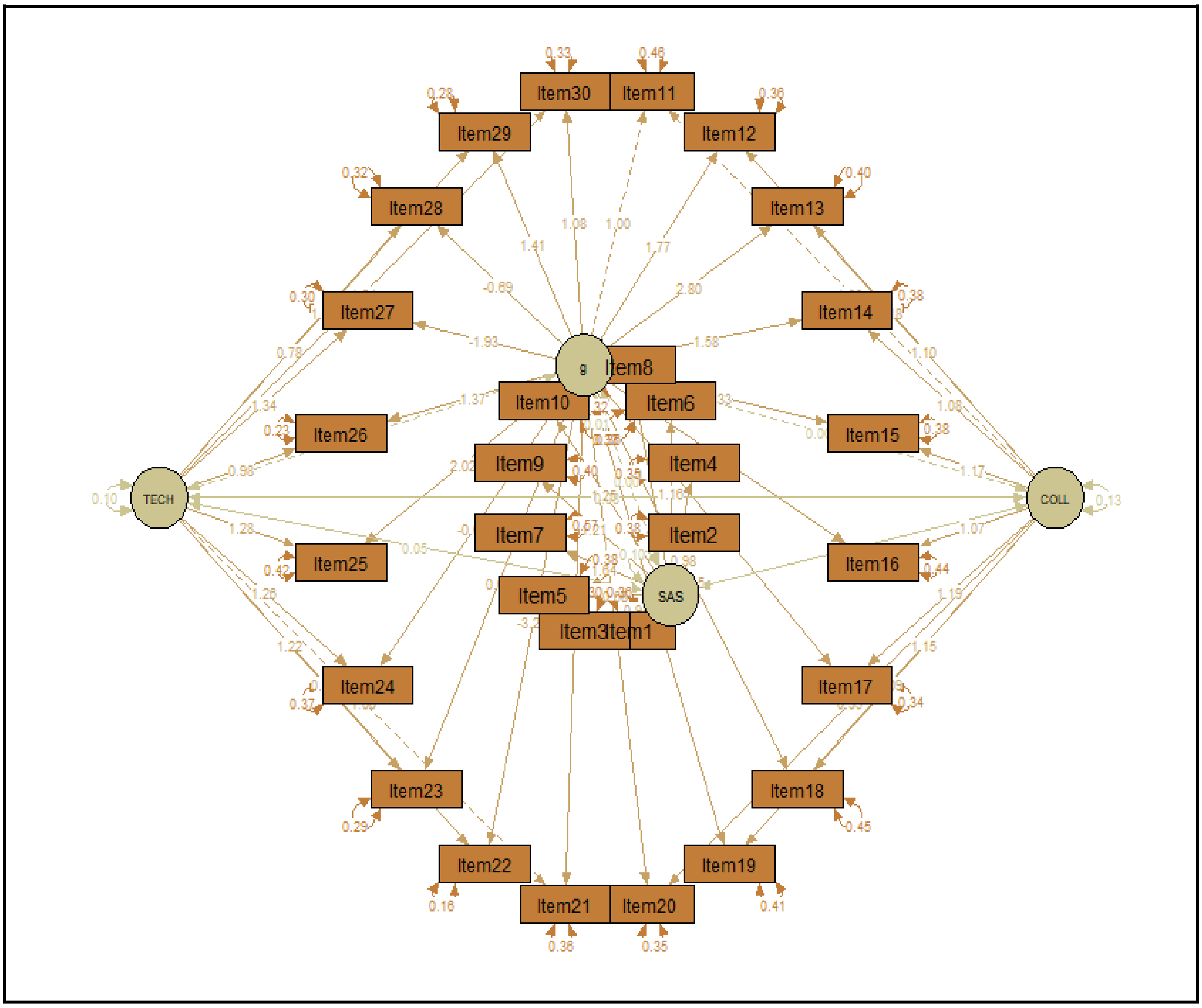
Figure 9. Confirmatory factor analysis models according to the 5-factor model



Note: The 5-factor model slightly modifies this structure, with the following disposition: P1: items 1 to 10; P2: items 11 to 20 + item 25; P3: items 21, 22, 23, 26, 27 and 28; P4: items 29 and 30; and finally factor P5: item 24.

Exploratory factor loadings and polychoric correlation matrix outcomes show that there may be another underlying structure that might link the technology and collaboration dimensions, given the notorious interaction between the two constructs. Thus, two additional models were constructed. Specifically, a bifactor model (Holzinger & Swineford, 1937; Reise, 2012) (Figure 10) and a structural equation model (Figure 11).

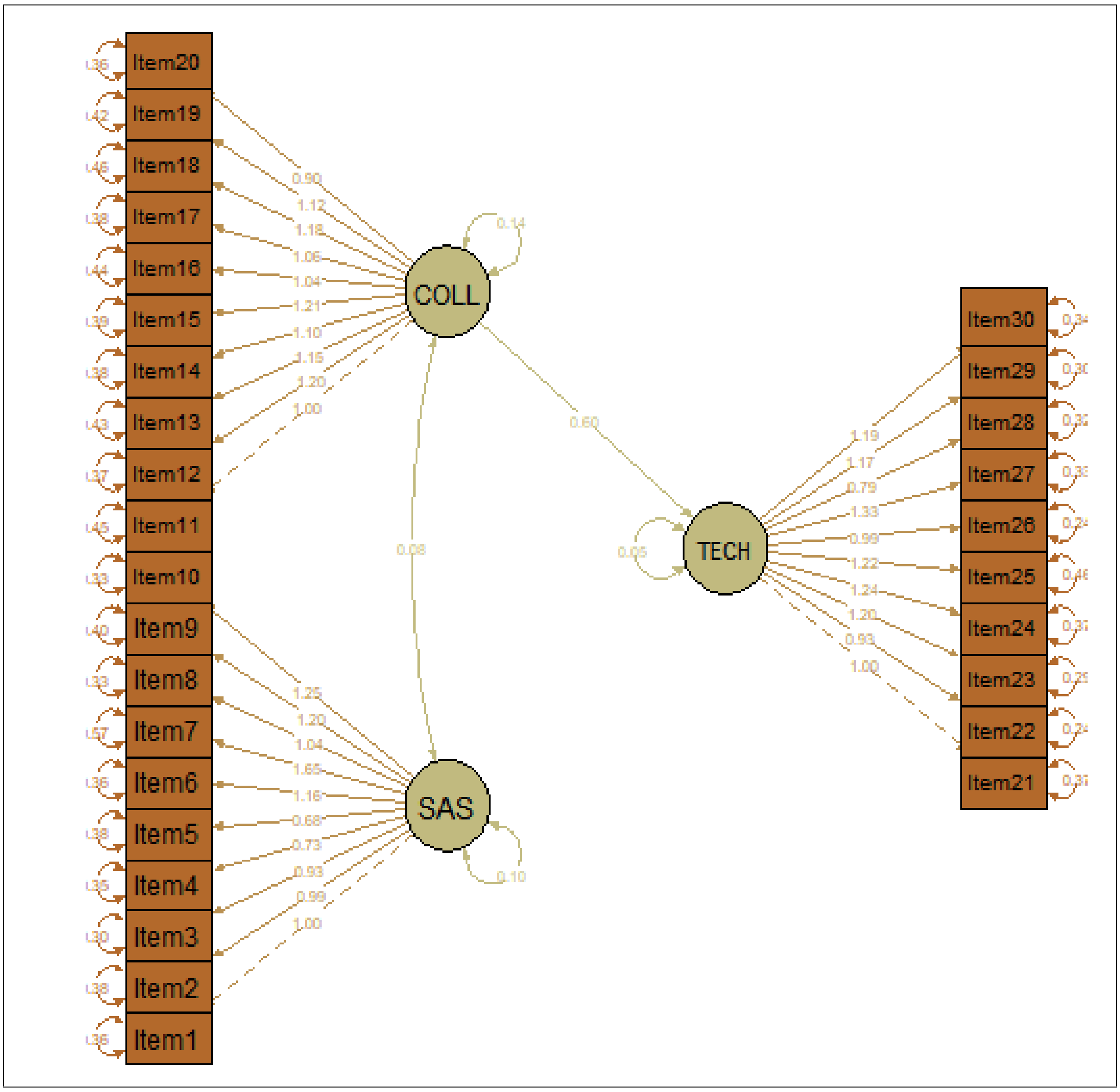
Figure 10. Bifactor model



Note: The underlying dimension is considered the "g factor". This may enable better understanding of the relationship between the technology and collaboration factors.

The bifactor model poses the existence of a latent dimension underlying previously defined factors. In this case, the factors of technology and collaboration converge in a "general factor", which would operate at another hierarchical level. The structural equation model also supports this theory since it confirms the existence of a correlation between these two factors.

Figure 11. Structural equation model



Nota: El modelo de ecuaciones estructurales confirma la relación entre colaboración y tecnología.

Model Comparison

When comparing the models proposed in confirmatory analysis, adjustment indicators (RMSEA, SRMR, CFI and TLI) were within the parameters suggested by existing literature. This suggests that the former values should be below 0.05, whilst the latter two should be as close to 1 as possible. It is interesting to see that assessment metrics are the same for both models. This indicates that no significant differences exist in this regard (Table 6).

Table 6. Model fit indicators

Model comparison	**CFA All Data**	**SEM All Data**
RMSEA	0.047	0.047
SRMR	0.050	0.050
Comparative Fit Index (CFI)	0.862	0.862
Tucker-Lewis Index (TU)	0.851	0.851
Akaike (AIC)	29829.472	29829.472
Bayesian (BIC)	30095.744	30095.744
Sample-size adjusted Bayesian (BIC)	29895.775	29895.775

Table 7 suggests that the bifactor model is the most adequate for understanding the underlying dimensions of the instrument. Although in line with the theoretical proposal of the existence of 3 factors, this model acknowledges a latent factor that could explain certain inter-correlations.

Table 7. Comparison between the analysed models

3CFA VS 5 CFA								
Chi-Squared Difference Test								
	Df	AIC	BIC	Chisq	Chisq diff	Df diff	Pr(>Chisq)	
fit5cfa	396	29805	30097	806.33				
fit_mod3f	402	29830	30096	842.96	36.636	6	2,07E-03	***

Sig. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1								
3CFA VS BI FACTOR								
Chi-Squared Difference Test								
	Df	AIC	BIC	Chisq	Chisq diff	Df diff	Pr(>Chisq)	
fit3bicfa	382	29719	30070	692.48				
fit_mod3f	402	29830	30096	842.96	150.48	20<	2.2e-16	***

Sig. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1								
5 CFA VS BI FACTOR								
Chi-Squared Difference Test								
	Df	AIC	BIC	Chisq	Chisq diff	Df diff	Pr(>Chisq)	
fit3bicfa	382	29719	30070	692.48				
fit5cfa	396	29805	30097	806.33	113.84	14<	2.2e-16	***

Sig. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1								

SEM VS BI FACTOR

Chi-Squared Difference Test

	Df	AIC	BIC	Chisq	Chisq diff	Df diff	Pr(>Chisq)	
fit3bicfa	382	29719	30070	692.48				
fit3sem_en	403	29831	30093	846.45	153.97	21<	2.2e-16	***

Sig. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

SEM VS 3 CFA

Chi-Squared Difference Test

	Df	AIC	BIC	Chisq	Chisq diff	Df diff	Pr(>Chisq)	
fit_mod3f	402	29830	30096	842.96				
fit3sem_en	403	29831	30093	846.45	34.877	1	0.06183	.

Sig. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Discussion and conclusions

The present article seeks to contribute to discussion on the construct of assessment and learning in school, as a means to rediscovering the role of students as apprentices. From this perspective, the instrument has utility regarding what would be expected from a pedagogical process that fosters deep learning in 21st-century schools, surpassing the conventional idea of measuring or verifying data (Santos-Guerra, 2017). In other words, the validation process allowed analysis of the integrated construct of assessment as learning as a single process (Sanmartí, 2020). To this extent, the designed scale differs from other instruments that specifically explore dimensions of assessment or learning, such as feedback, self-regulation and metacognition (e.g., González et al., 2018; González-Cabañes et al., 2022; González-Palacio et al., 2021; Panadero et al, 2021), which are mainly focused on higher education.

Validation of the scale aimed to contribute towards a school learning culture that focuses on the student as a holder of rights. This idea is consistent with a study conducted by Pascual-Arias et al. (2019) that confirms the ability of children to make decisions about their own learning. From this perspective, the instrument invites teachers to democratize assessment practices using technologies to build new knowledge under the principle of collaboration. The first dimension, culture of learning self-assessment, and its items, obtained high consistency throughout the validation process. This consolidates the need to orient authentic tasks where the apprentice assumes control of the process, judges their performance and makes decisions to achieve educational goals (López-Pastor, 2017; Sanmartí, 2020).

The validation process allowed determination of the existence of a latent dimension that underlies the dimensions of Collaborative Learning Culture and Technological Learning Culture. Presumably, the factors of Technology and Collaboration are intertwined, while many forms of collaboration take place on digital technological platforms. Collaboration and the use of technologies are determining factors in the learning process and, consequently, key elements for the educational process and the quality of the school system.

The instrument is useful to the extent that it investigates the forms of collaborative work associated with a virtual space and, therefore, is capable of exploring learning and assessment practices that involve the use of technologies with a pedagogical meaning and the creation of scenarios for deep learning. Present findings show that the culture of collaboration and the technological culture reinforce each other when technology is used with a pedagogical sense to learn (Ibáñez, 2021). This requires a learning design that fosters collaboration to ensure its development (García-Chitiva & Suárez-Guerrero, 2019).

Moreover, the present study highlights the need to listen to and fully consider student perspectives on their learning process, as a means to understanding what they think as holders of rights (UNICEF, 2013). Student who feel involved, positions themselves as active subjects who are responsible for their learning (Aravena et al., 2019). In this regard, the scale works as a means to understanding what students think about the real opportunities they have to control their learning. It provides relevant background data, which is different from the data traditionally collected by schools and opens up opportunities to redefine pedagogy in support of practice, as proposed by Rincón-Gallardo (2019). Consequently, instrument administration must consider the particularities of educational contexts since conventional pedagogical cultures can influence student perceptions, as proposed by Coll et al. (2022) in the validation of a scale on learning personalization.

With regards to the contexts in which the instrument can be applied, the study is limited by the sampling used. Thus, future studies are urged to use a probabilistic selection method that favours the generalization of outcomes. Given validation outcomes, it is also recommended to explore the way in which assessment is expressed as a learning practice and not as an isolated event in future investigations. Similarly, it would be interesting to address other educational levels, especially initial teacher training, where the contributions of this and other studies can be leveraged to reflect on assessment as learning to deconstruct traditional pedagogical models and practices rooted in a school culture that hinders deep learning.

Finally, the instrument can help to redefine practice, offering a reference that encourages self-assessment and reflection on the learning opportunities provided by schools. From this perspective, the scale represents a proposal to observe and analyse concrete evidence of a highly challenging learning assessment culture, in which technology is used to connect students to the world and help improve it.

Funding

This research has been carried out within the project Fondecyt de Iniciación N°11200738 funded by the National Research and Development Agency (ANID), Chile.

Acknowledgments

Thanks to Dr.© Patricio Carvajal Paredes and Dr.© Joselina Davyt-Colo from the Doctorate in Social Complexity Sciences, Universidad del Desarrollo, for her collaboration in the analysis of data.

References

Aravena, F., y Escare, K. y Ramírez, J. (2019). *La participación democrática y la voz de los estudiantes: ¿Qué pueden hacer los líderes escolares ?* LÍDERES EDUCATIVOS, Centro de Liderazgo para la Mejora Escolar. https://www.lidereseducativos.cl/wp-content/uploads/2019/06/NT2_L1_F.A._LA-PARTICIPACION-DEMOCRATICA-Y-LA-VOZ-DE-LOS-ESTUDIANTES_26-06-19.pdf

Barba-Martín. R. y Hortigüela-Alcalá, D. (2022). Si la evaluación es aprendizaje, he de formar parte de la misma. Razones que justifican la implicación del alumnado. *Revista Iberoamericana de Evaluación Educativa*, *15*(1), 9-22. https://doi.org/10.15366/riee2022.15.1.001

Blanchard, M. y Muzás, M. (2020). *Cómo trabajar proyectos de aprendizaje en Educación Infantil.* Narcea.

Becerra, D., Lopez, I., Gómez P., Fernández, F., y Barbera, E. (2020). EduZinc: A tool for the creation and assessment of student learning activities in complex open, online and flexible learning environments. *Distance Education*, *41*(1), 86–105.

https://doi.org/10.1080/01587919.2020.1724769

Bro, R. & Smilde, A. (2014). Principal component analysis. *Analytical methods*, *6*(9), 2812-2831. https://doi.org/10.1039/C3AY41907J

Casado-Berrocal, Ó., Pérez-Pueyo, Á. y Casado-Berrocal, P. (2017). La autorregulación en educación primaria: una propuesta para favorecer la autonomía del alumno. En V. López-Pastor y A. Pérez-Pueyo (Coords.), *Buenas prácticas docentes* (pp. 208-237). Universidad de León. https://buleria.unileon.es/bitstream/handle/10612/7057/cap.%2012.pdf?sequence=1&isAllowed=y

Coll, C., Fauré, J. y Arriazu, R. (2022). Posicionamiento del alumnado de Educación Primaria y Secundaria ante la personalización del aprendizaje: construcción y validación de una escala. *Revista de Educación*, 395, 265-290. https://doi.org/10.4438/1988-592X-RE-2022-395-514

Comisión Internacional sobre los Futuros de la Educación (2021). *Reimaginar juntos nuestros futuros: un nuevo contrato social para la educación.* Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura, UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000379381_spa

Ding, C. & Hershberger, S. (2002). Assessing content validity and content equivalence using structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal*, *9*(2), 283-297. https://doi.org/10.1207/S15328007SEM0902_7

Escobar-Pérez, J. y Cuervo-Martínez, Á. (2008). Validez De Contenido Y Juicio De Expertos: Una Aproximación a Su Utilización. *Avances en Medición*, *6*(1), 27–36. https://doi.org/10.32870/ap.v9n2.993

Elmore, R. (2010). *Mejorando la escuela desde la sala de clases.* Fundación Chile. http://psicopedagogia.weebly.com/uploads/6/8/2/3/6823046/libro_elmore.pdf

Ferreiro, F. & Domínguez, D. (2020). Design learning and practice applied in functional diversity contexts: An open-method based approach. *Arte, Individuo y Sociedad*, *33*(1), 259–281. https://doi.org/10.5209/ARIS.68151

Fullan, M. y Langworthy, M. (2014). *Una Rica Veta: cómo las nuevas pedagogías logran el aprendizaje en profundidad.* Pearson.

Fullan, M., Quinn, J. & McEachen, J. (2018). *Deep Learning. Engage the World Change the World.* Corwin.

Fullan, M. (2021). *Los impulsores correctos para el éxito de todo el sistema.* Centre for Strategic Education. https://michaelfullan.ca/wp-content/uploads/2021/03/21_Right-Drivers-Spanish-comp.pdf

Fondo de las Naciones Unidas para la Infancia, UNICEF (2013). *Superando el adultocentrismo.* Autor. https://www.imageneseducativas.com/wp-content/uploads/2019/02/Superando-el-Adultocentrismo.pdf

García-Chitiva, M. y Suárez-Guerrero, C. (2019). Estado de la investigación sobre la colaboración en Entornos Virtuales de Aprendizaje. *Revista de Medios y Educación*, (56), 169-191. https://doi.org/10.12795/pixelbit.2019.i56.09

Gómez, Á. (2019). Ser docente en tiempos de incertidumbre y perplejidad. *Márgenes, Revista de Educación de La Universidad de Málaga*, *0*, 3–17. https://doi.org/10.24310/mgnmar.v0i0.6497

González, R., Otondo, M. y Aravena, A. (2018). Escala de medición del impacto de la retroalimentación en el aprendizaje. *Revista Espacios*, *39*(49), 1-35. http://www.revistaespacios.com/a18v39n49/a18v39n49p35.pdf

González-Cabañes, E., García, T., Álvarez-García, D., Fernández, E., & Rodríguez, C. (2022). Validation of the Shortened Version of the Metacognitive Awareness Inventory in Spanish Uiversity Students. *Psicothema*, *34*(3), 454–462. https://doi.org/10.7334/psicothema2022.75

González-Palacio, E., Chaverra-Fernández, B., Bustamante-Castaño, S. y Toro-Suaza, C. (2021). Diseño y validación de un cuestionario sobre las concepciones y percepción de los estudiantes sobre la evaluación en Educación Física. *Retos*, *40*, 317–325. https://doi.org/10.47197/retos.v1i40.80914

Hattie, J. (2017). *Aprendizaje visible para profesores*. Paraninfo.

Hattie, J. y Yates, G. (2018). *El aprendizaje visible y el estudio de sus procesos*. Paraninfo.

Holgado-Tello, F., Chacón-Moscoso, S., Barbero-García, I. & Vila-Abad, E. (2010). Polychoric versus Pearson correlations in exploratory and confirmatory factor analysis of ordinal variables. *Quality & Quantity*, *44*(1), 153-166. https://doi.org/10.1007/s11135-008-9190-y

Holzinger, K. & Swineford, F. (1937). The bi-factor method. *Psychometrika*, *2*(1), 41-54. https://doi.org/10.1007/BF02287965

Ibáñez, A. (2021). Tecnología con propósito para una ciudadanía global. *Revista Padres y Maestros*, (386), 55-61. https://doi.org/10.14422/pym.i386.y2021.009

Jara, N., Cáceres, D., León, V. y Villagra, C. (2022). Transitar hacia la evaluación como aprendizaje. *Revista de Educación Mendive*, *20*(4), 1219-1236. https://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/3037

Kyriazos, T. (2018). Applied psychometrics: sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in general. *Psychology*, *9*(08), 2207-2230. https://doi.org/10.4236/psych.2018.98126

Le, H., Schmidt, F., Harter, J. & Lauver, K. (2010). The problem of empirical redundancy of constructs in organizational research: An empirical investigation. *Organizational Behavior and Human Decision Processes*, *112*(2), 112-125. https://doi.org/10.1016/j.obhdp.2010.02.003

López-Pastor, V. (2017). Evaluación formativa y compartida: evaluar para aprender y la implicación del alumnado en los procesos de evaluación y aprendizaje. En V. López-Pastor y A. Pérez-Pueyo (Coords.), *Buenas prácticas docentes* (pp. 34-68). Universidad de León. https://buleria.unileon.es/handle/10612/5999

Mehta, J. y Fine, S. (2019). *In Search of Deeper Learning: The Quest to Remake the American High School*. Harvard University Press.

McDonald, R. (1999). *Test theory: A unified treatment*. Erlbaum.

Moreno-Olivos, T. (2021). Cambiar la evaluación: Un imperativo en tiempos de incertidumbre. *Alteridad Revista de Educación*, *16*(2), 223-234. https://doi.org/10.17163/alt.v16n2.2021.05

Muriel, L., Gómez, L. y Londoño-Vásquez, D. (2020). La riqueza de la evaluación en la escuela, un tesoro no oculto. *Praxis & Saber*, *11*(25), 111–130. https://doi.org/10.19053/22160159.v11.n25.2020.9359

Pascual-Arias, C; García-Herranz, S. y López-Pastor, V. (2019). What do preschool students want? The role of formative and shared assessment in their right to decide. *Culture and Education*, *31*(4), 865-880, https://doi.org/10.1080/11356405.2019.1656486

Prats, M., Sanmartí, N. y Oró, I. (2020). Evaluar para aprender con el apoyo de herramientas y recursos digitales. *Aloma*, *38*(2), 9–20. https://doi.org/10.51698/aloma.2020.38.2.9-20

Quero, M. (2010). Confiabilidad y coeficiente Alpha de Cronbach. *Telos*, *12*(2), 248-252. https://www.redalyc.org/pdf/993/99315569010.pdf

Quinn, J., Mceachen, J., Fullan, M., Gardner, M., y Grummy, M. (2021). *Sumergirse en el* *aprendizaje profundo*. Morata.

Reise, S. (2012). The rediscovery of bifactor measurement models. Multivariate behavioral research, 47(5), 667-696. https://doi.org/10.1080/00273171.2012.715555

Rincón-Gallardo, S. (2019). *Liberar el Aprendizaje el cambio educativo como movimiento social*. Grano de Sal.

Rincón-Gallardo, S. (2020a). De-schooling Well-being: Toward a Learning-Oriented Definition. *ECNU Review of Education*, *3*(3), 452–469. https://doi.org/10.1177/2096531120935472

Rincón-Gallardo, S. (2020b). ¿Dónde está ahora la esperanza? Aprendizaje y trazos a futuro para la investigación educativa en México. *Revista Latinoamericana de Estudios Educativos*, *50*(2), 31–54. https://doi.org/10.48102/rlee.2020.50.2.58

Ríos-Muñoz, D. y Herrera-Araya, D. (2021). Contribución de la evaluación educativa para la formación democrática y transformadora de estudiantes. *Educare*, *25*(3), 1–15. http://doi.org/10.15359/ree.25-3.40

Robinson, K. y Aronica, L. (2015). *Escuelas creativas. La revolución que está transformando la educación*. Penguin Random House.

Sala, A., Punie, Y., Garkov, V. & Cabrera, M. (2020). *Life-Comp: The European Framework for Personal, Social and Learning to Learn Key Competence*. Publications Office of the European Union. https://doi.org/10.2760/302967

Santos-Guerra, M. (2017). *Evaluar con el corazón*. Homo Sapiens.

Sanmartí, N. (2020). *Evaluar y aprender: un único proceso*. Octaedro.

Thurstone, L. (1935). *The Vectors of the Mind*. University of Chicago Press.

Torshizi, M. y Bahman, M. (2019). I explain, therefore I learn: Improving students' assessment literacy and deep T learning by teaching. *Studies in Educational Evaluation*, *61*, 66-73. https://doi.org/10.1016/j.stueduc.2019.03.002

Tucker, L. & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. Psychometrika, 38(1), 1-10. https://doi.org/10.1007/BF02291170

Vega, H., Rozo, H., y Dávila, J. (2021). Evaluation strategies mediated by ICT: A literature review. Educare, 25(2), 1–22. https://doi.org/10.15359/ree.25-2.16

Ventura-León, J. y Caycho-Rodríguez, T. (2017). El coeficiente Omega: un método alternativo para la estimación de la confiabilidad. *Revista Latinoamericana de Ciencias Sociales, niñez y juventud*, *15*(1), 625-627. https://www.redalyc.org/pdf/773/77349627039.pdf

Villagra, C., Mellado, M., Leiva, M. y Sepúlveda, S. (2022). Prácticas evaluativas en la formación inicial de docentes : un estudio self study colaborativo. *Revista Sophia Austral*, *28*, 1-23. https://doi.org/10.22352/SAUSTRAL20222803

Authors / Autores

Turra Marín, Yanire (yeturra@uc.cl) 0000-0003-0588-4119

Primary Education Teacher from Pontificia Universidad Católica de Villarrica, Chile; Master in School Management from Universidad Católica de Temuco, Chile. She is the Headmaster of the School Alberto Córdova Latorre, in Lanco, Chile. Her lines of research are educational assessment and pedagogical leadership. He has taught at the Faculty of Education of the Universidad Católica de Temuco and has participated in various research projects funded by national organizations.

Villagra Bravo, Carolina Pilar (cvillagrab@ucsh.cl) 0000-0002-5428-2555

Primary Education Teacher from Universidad Católica de Temuco, Chile; Master in education with a specialization in Educational Assessment from Universidad de La Frontera, Chile, and Doctor of Innovation on Teacher Training from Universidad de Extremadura, Spain. She is an Associate Academic in the Primary Education Pedagogy career at Universidad Católica Silva Henríquez. Her lines of research are educational assessment, leadership, and learning management.

Mellado Hernández, Mª Elena (mmellado@uct.cl) 0000-0003-2039-5145

Primary Education Teacher from Pontificia Universidad Católica de Chile; Master in Educational Informatics from Universidad de La Frontera, Chile; Doctor in Teacher Formation and Research innovation for Education from Universidad de Extremadura, Spain. She is an Associate Academic in the Department of Childhood and Primary Education at the Faculty of Education, Universidad Católica de Temuco. She is also the director of the Master in School Management program at Universidad Católica de Temuco. Her lines of research are pedagogical leadership; teacher training; educational assessment and school improvement.

Aravena Kenigs, Omar Andrés (oaravena@uct.cl) 0000-0002-0896-6657

Secondary Education Teacher with a specialization in Physical Education from Universidad de Los Lagos, Chile; Master in School Management from Universidad Católica de Temuco, Chile, and Doctor of Innovation on Teacher Training from Universidad de Extremadura, Spain. He is an Assistant academic and Director of the Education Sciences department at Universidad Católica de Temuco. He is the academic coordinator of the School Management Master program at Universidad Católica de Temuco. His lines of research are pedagogical leadership, professional teacher development, and educational practice.

RELIEVE

Revista **EL**ectrónica de **I**nvestigación y **EV**aluación **E**ducativa

E-Journal of Educational Research, Assessment and Evaluation

[ISSN: 1134-4032]