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Levels of teacher performance in formative assessment in multigrade and single-grade classrooms

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ABSTRACT

Formative assessment is an evaluative practice developed in the classroom for the improvement of learning using evidence on student progression. The objective of this research is to compare sample groups from multigrade and single-grade classrooms on the theme of formative assessment based on the students' opinion of the teacher's performance. The method used was a comparative quantitative method. The sample type is a probability sample of 683 students from 5th to 8th grade from urban and rural schools in the commune of Longaví, located in the Maule Region of Chile. A validated Likert scale questionnaire with a high level of reliability ($\alpha = 0.93$) was used. The results of the research showed that, in the six dimensions, the best teacher performance concerning formative assessment is found in multi-grade schools and not in single-grade schools. This can be explained on the basis of several reasons, among them the level of adaptability that teachers have in this type of classroom, the heterogeneous characteristics of the classroom (different ages and learning goals) and the need for teachers to monitor the learning progression of students with different classroom characteristics.

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1. INTRODUCTION

The concept of formative assessment was consolidated during the 1980s and new ideas about its definition were coined and used in the literature. Nitko [1] established the existence of important differences between the measurement as an external evaluation of the classroom, applied by the central power, and internal evaluations, controlled by the teachers themselves. Meanwhile, Sadler [2] contributed with a clearer idea, distanced from grading, which allowed the author to define formative assessment and to incorporate feedback more strongly as a mechanism totally linked to this type of assessment. At the beginning of the 1990s, new studies on formative assessment started [3]–[7]. Bangert-Drowns *et al.* [3] strengthened the concept and defined it as a type of evaluation that aims to improve the learning process and focuses on errors and strategies to solve problems autonomously. At the end of the 1990s, Cowie and Bell [8] and Wiliam [9] adopted a more restrictive definition of formative assessment by limiting the term to an evaluative pedagogical action that takes place while learning is being constructed, that has dialogic characteristics and is based on evidence whose purpose is to improve learning, during that process. Within this scenario, the concept of formative assessment was acquiring a level of greater complexity that allowed establishing this unique and useful concept in the learning process, since formative assessment ends up contributing not only to the cognitive dimension but also to the metacognitive one, which was both novel and integrating. It didn´t deal only with evaluating the students' answers, but also the mental processes and the reason for the answer, rather than arbitrary correctness.

Recently, authors such as Black and Wiliam [7], and Brookhart [10], have consolidated the idea that formative assessment is effective in eliciting and communicating cognitive ideas, as well as playing an important motivational role for the student. This is because of the fact that this type of assessment, detached from its punitive value, is able to effectively engage students to continue learning. Wiliam *et al.* [11] went much further and argued that assessment for learning should "(...) assist learning if it provides information that teachers and their students can use as feedback when evaluating themselves or others and to modify the teaching and learning activities in which they are involved" (p. 10).

Formative assessment allows teachers to adjust instruction based on the evidence collected, providing students with feedback that allows them to improve their learning. Black and Wiliam [12], based on their research, define formative assessment as a way of collecting evidence about progress in learning. This information can be interpreted and used by teachers and students, allowing them to make decisions about the next steps to follow in the teaching and learning process. Here the use of the evidence collected not only serves to inform but also to transform pedagogical practice.

2. LITERATURE REVIEW

In the school system, a grade is defined as the organization of the group of students according to their age, originally based on the similarity of physical, mental and social characteristics of the students. This organization into grades, according to a chronological criterion, establishes the curriculum approach, determining the knowledge and skills to be attained by each level or grade, particularly in urban environments, mostly populated and geographically non-isolated areas. On the other hand, schools with multigrade classrooms, because of a smaller number of students, differ from this organization, distributing students in groups that may incorporate 2 or more grades in the same room. Multigrade classrooms are realities that can be found in different areas but are observed as a form of education mostly in rural areas, sparsely populated regions or in urban areas with adverse social conditions. Multigrade classes are typically seen in areas where schools are scattered and inaccessible because of the low population density in the region [13]. Regarding the curriculum, it involves an implementation of the established national framework adjusted to the reality diagnosed by the teaching group. Jiménez [14], [15] highlights how this scenario converges in the teacher's task, having to design teaching for students of different ages, grades, needs and abilities in the same group.

The organization of a school with multigrade classrooms requires a greater degree of innovation. This type of school needs to modify traditional teaching practices and develop a more child-centred learning process [16]. The teaching and learning process within multigrade schools involves structural variations that make it possible to cover what is established in the curriculum. In this sense, some variations involve the distribution of curricular content in 2 or 3 grades, as well as a differentiated approach to the curriculum with a central theme that is worked on with all students. According to Arboleda [16], a teacher who manages several courses at the same time, due to different learning paces and the heterogeneity present in classrooms, finds it necessary to organize students in small groups, introduce cooperative learning and develop personalized and flexible strategies. These teaching strategies demand materials specially designed for independent learning and cooperative work. In Chile, one of the strategies implemented by the ministry of education is the work based on didactic modules that are aligned to the basic education curricular bases. They cover subjects like language and communication, mathematics, natural sciences and history, geography and social sciences, taking into account that curricular implementation must be adjusted to the heterogeneity of the rural and multigrade reality.

In this sense, the multigrade context can be an opportunity for the teaching and learning process as it promotes work among peers. In this sense, the younger students seek to imitate the behaviours of the older ones, cooperation and understanding are mutual, and the younger ones have the opportunity to listen to more advanced learning strategies. The spirit of cooperation arising from teamwork leads them to have fewer intergroup and intragroup conflicts, resulting in fewer disagreements and fights [17]. The structure of blended courses poses a major curricular and pedagogical challenge for the teacher, who in many cases must manage and teach all courses simultaneously. The necessary tools and required supports pose the challenge of teaching all subjects of the curriculum to various groups and grades in the same time and space. Besides, multi-grade schools with low enrolment add the responsibility of managing the educational unit to the teaching task, maintaining relationships with the family and community, and administrative management, among other demands. These demands expand the role of the teacher from a pedagogical leader to a leader of the community in which he or she is inserted.

In Chile, in the case of multigrade schools, teachers work in relative professional isolation and do not have a traditional management team; there are even schools with only one teacher in charge of managing and teaching all grades simultaneously. For this reason, microcenters are constituted as technical-pedagogical units of mutual support for the planning of teaching and deciding on classroom teaching strategies. The microcenter is the pedagogical instance, where nearby rural schools (multigrade or not) meet, once a month, to safeguard

space for pedagogical reflection among teachers [18]. The pedagogical exercise in multigrade classrooms is not acquired spontaneously based on what was received in the initial training; therefore, it is imperative to provide support to teachers who work in multigrade classrooms. According to González and Molina [19], the teacher as a subject of knowledge must be prepared to understand the particularities of rural culture and, consequently, integrate his or her practices from a position of respect and dialogue of knowledge.

Keeping these discussions in mind, the objective of this research is to compare sample groups from multigrade and single-grade classrooms on the theme of formative assessment based on the student's opinion of the teacher's performance. The current research study attempts to respond to the following research questions.

- What kind of classroom practices do teachers develop concerning formative assessment and learning feedback?
- Are there statistically significant differences in the performance of teachers working in multigrade and single-grade classrooms in relation to formative assessment?

3. METHOD

The methodological design is quantitative, descriptive and comparative. The total population consisted of 1800 students. The sample design corresponds to a probabilistic sample by clusters. The sample size obtained is 37.9% and a confidence interval (CI): 95%, being a sample of 683 students from urban and rural schools in the district of Longaví (Talca, Chile). In order to compare groups by type of classroom (multigrade and single grade) in relation to the level of performance regarding the type of formative evaluative practice developed by teachers, a validated questionnaire with Likert scale was used.

3.1. Sample

The participants of the study were in the age range of 10 to 13 years and were attending 5th, 6th, 7th, and 8th grade in municipal schools in 2019. They belonged to both urban and rural schools. The study included students who attended the day of the assessment and those who were in the established age range. Students who did not complete the questionnaires and those who had failed the course for the second time were excluded. The entire protocol was conducted in accordance with the Declaration of Helsinki by World Medical Association [20] for research on human subjects taking into account all the ethical considerations.

3.2. Instrument

The survey technique was used to measure the variable teaching performance in evaluative practices. The questionnaire proposed by Urzua *et al.* [21] was used. This questionnaire has been validated through confirmatory factor analysis (CFA) using structural equation modeling (SEM) and the results demonstrated the effectiveness of the model (comparative fit index (CIF) 0.967; root mean square residual (RMR) 0.04; root mean square error of approximation (RMSEA) 0.041) and proved to be highly reliable (Cronbach's alpha $\alpha = 0.93$). This instrument has six dimensions as a whole as shown in Table 1. It consists of 21 questions. The participants were asked to respond to each item on a Likert scale of five, where 1 indicates never, 2 rarely, 3 occasionally, 4 frequently and 5 very frequently. The purpose of this instrument is to determine the teachers' performance in relation to formative assessment, establishing three levels of performance: unsatisfactory, basic and competent, which were obtained from groupings by percentage ranges.

Table 1. Six evaluative dimensions of the instrument [21]

No	Dimensions	Purpose
1	Formative assessment associated with grading	To provide feedback after grading, using the results.
2	Proactive formative assessment	To anticipate and avoid errors.
3	Interactive formative assessment	An assessment characterized by the accompaniment and monitoring of the student's work during the production of knowledge.
4	Metacognitive formative assessment (related to self-regulation)	To provide criteria and reflective instances for students to evaluate their own process.
5	Retroactive formative assessment	To provide feedback on the results and products at the end of a process.
6	Adjusted formative assessment	Associated with inclusive practices that attempt to respond to the specific needs of students based on adjustments in educational action.

4. RESULTS

4.1. Differences classroom type (multigrade and single grade) and performance dimensions

Hypotheses for data processing: there are two hypothesis (null and alternative) formulated for this work:

- H0: there are no statistically significant differences between multigrade and single-grade classrooms in relation to the dimensions and total performance level of teachers regarding formative assessment.
- H1: there are statistically significant differences between multigrade and single-grade classrooms in relation to the dimensions and total performance level of teachers regarding formative assessment.

From Table 2, it is possible to observe that there were statistically significant differences between the types of classrooms (multigrade-single grade) in relation to the six dimensions. The same occurred with the total performance level of the teachers. Since the p-value was favourable to the researcher's hypothesis in the six dimensions indicated and in the total performance level of the teachers in relation to formative assessment (p= 0.01), the null hypothesis was rejected. The CI corresponded to 99%, which indicated that there are very certain differences among the groups.

Table 2. Mann-Whitney U-test: multigrade vs single-grade

	Formative evaluation associated with the grade	Proactive formative assessment	Interactive formative assessment	Metacognitive formative assessment	Retroactive formative assessment	Adjusted formative assessment	Total performance level
Mann-Whitney U	44992.500	44506.000	43126.500	46153.000	43176.000	44378.000	42038.500
Sig. asymptotic	0.000	0.000	0.000	0.000	0.000	0.000	0.000

a. Grouping variable: course modality: single grade and multigrade

4.2. Multigrade group-single grade and performance levels by dimensions

4.2.1. Dimension: formative assessment associated with the grading

Regarding the performance related to formative assessment, associated with grading, it was identified, as shown in Figure 1, that the multigrade classroom has shown better performance than the single-grade classroom teachers, since 58% of the total number of multigrade teachers showed satisfactory performance, versus the single-grade teachers, who obtained 42%. Regarding low performance, it was observed that these occur more frequently in the single-grade classroom, corresponding to 58% of the total number of teachers of this grade, compared to 42% of multi-grade teachers.

4.2.2. Dimension: proactive formative assessment

Concerning performance levels associated with proactive formative assessment, it was identified, as shown in Figure 2, that the most satisfactory levels were found in the multigrade classroom since high-performance levels corresponded to 69% of the total number of multigrade teachers compared to single grade classroom teachers that only reached 49%. In this sense, multigrade teachers performed better than single-grade teachers. As it is evident in Figure 2, the levels of performance in this dimension were more deficient in the single-grade classrooms, since these teachers obtained low performances, corresponding to 51%, as opposed to the multigrade classroom, which obtained only 31%, which places multigrade teachers with a better performance. In addition, within the six dimensions, the dimension associated with proactive formative assessment has been one of the highest performances of the six dimensions by the multigrade classroom.

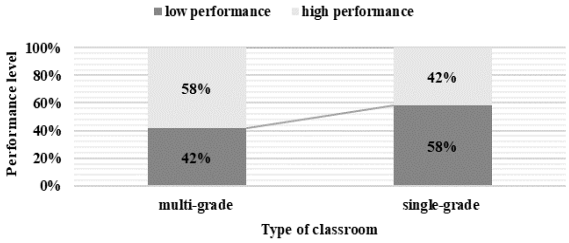

Figure 1. Multigrade-single grade differences: formative assessment associated with grading

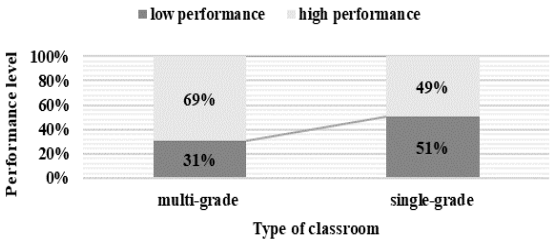

Figure 2. Multigrade-single grade differences: proactive formative assessment

4.2.3. Dimension: interactive formative assessment

As shown in Figure 3, the performances associated with interactive formative assessment were more effective in multigrade classrooms than in single-grade classrooms. Multigrade teachers obtained more satisfactory performances than single-grade teachers, with 63% in the case of multigrade teachers. In contrast, single-grade teachers achieved only 42% at the same level of performance. On the other hand, the low performance of multigrade teachers was lower than that of single-grade teachers, as multigrade teachers reached 37%, while single-grade teachers exceeded the same performance with 58%.

4.2.4. Dimension: metacognitive formative assessment

Regarding the performance associated with the metacognitive formative assessment. Figure 4 shows that there were significant differences between multigrade and single-grade teachers, as multigrade teachers showed better performance levels, with 63%, versus single-grade teachers whose percentage reached only 42%. With respect to the lowest levels of performance, single-grade classroom teachers obtained 58% as opposed to multigrade teachers who achieved only 37%.

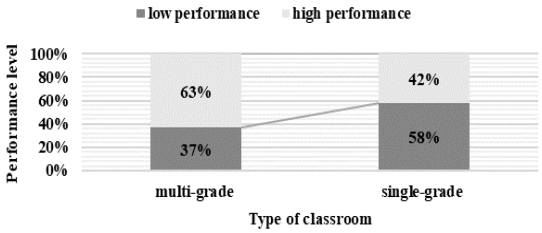

Figure 3. Multigrade-single grade differences: interactive formative assessment

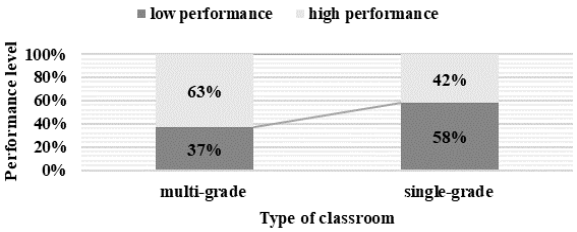

Figure 4. Multigrade-single grade differences: metacognitive formative assessment

4.2.5. Dimension: formative retroactive assessment

As can be seen in Figure 5, multigrade classroom teachers presented better performances than single-grade teachers concerning the retroactive formative assessment. Multigrade teachers had a 69% high performance in relation to the total number of multigrade teachers, in contrast to single-grade teachers who only reached 47%. Meanwhile, for the lowest levels of performance, single-grade classroom teachers reached 53% of the total number of teachers, compared to multigrade teachers whose percentage reached only 31% of the total number of multigrade teachers. In this dimension, 69% of high performance was also obtained on the part of multigrade teachers. This dimension and the proactive formative assessment together were the ones that showed the best performance amongst the six dimensions (69%).

4.2.6. Dimension: adjusted formative assessment

In relation to the adjusted formative assessment, it is possible to say that, as evident in Figure 6, the performance of multigrade teachers, as in the other dimensions, has been better than that of single-grade teachers, since multigrade teachers performed favourably with 63% of the total number of multigrade teachers, compared to single grade teachers who only reached 47%. Regarding the lowest performance levels, single-grade teachers had performances corresponding to 53% of the total number of single-grade teachers, while multigrade teachers obtained only 31%.

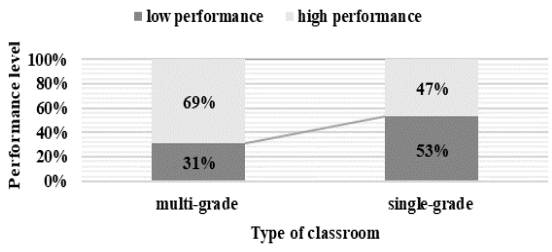

Figure 5. Multigrade-single grade differences: retroactive formative assessment

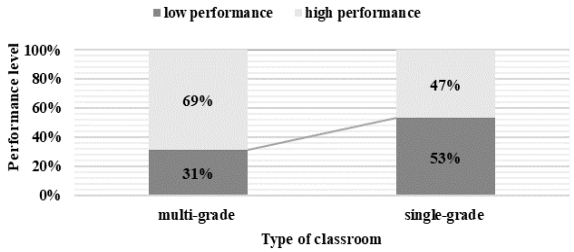

Figure 6. Multigrade-single grade differences: adjusted formative assessment

4.2.7. Multigrade group-single grade and total performance level

Regarding the total performance level of the teachers, in relation to the formative assessment, it is possible to observe that the same pattern is repeated (Figure 7). In this case too, the multigrade teachers obtained better performance than the single-grade teachers. According to the Figure 7, it is possible to recognize that multigrade teachers have a 65% high performance as opposed to single-grade teachers who only reached 43%. In case of low performance, it can be identified that single-grade teachers obtained 57% of negative performances, while multigrade teachers accounted for only 35%.

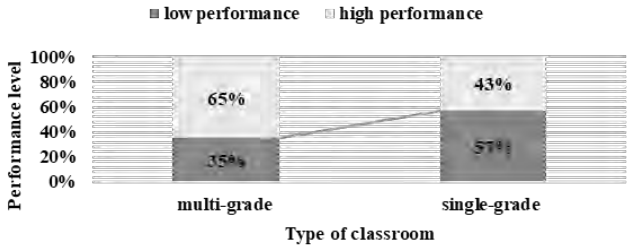

Figure 7. Multigrade-single grade differences: level of overall teacher performance on formative assessment

5. DISCUSSION

The results of the current study show that there are statistically significant differences between the two types of classrooms, multigrade and single-grade, in relation to the six dimensions of formative assessment and the general performance level of teachers. In relation to the type of classroom, it can be identified that teachers' performance in formative assessment is much better in multigrade classrooms than in single-grade classrooms. Within this context, in multigrade classrooms that are formed by a teacher teaching a small group of students with different educational levels in the same room, is much more complex, diverse and heterogeneous which favours the teacher's level of adaptation [22]. This heterogeneity represents a greater challenge and therefore a contextual situation that strengthens it since the teacher must adjust not only to the learning pace but also to the different levels of teaching that exist in the same classroom, designing teaching, learning and assessment actions that rescue the integral and balanced development during the process [23].

From this scenario, the complexity of the multigrade classroom becomes an opportunity for improvement that allows adjusting the instructional design and implementation of the class, thus responding better to the heterogeneity of the classroom and the multiplicity of curricular programs, which favours classroom practice and teacher performance. On the other hand, the same homogeneity of the classroom according to Galán [24] makes multigrade classrooms a learning community that enhances collaborative learning and pedagogical interaction between the teacher and the students and among the students themselves, which promotes better formative evaluative practices. In this sense, younger students learn concepts from other levels and older students acquire greater co-responsibility within the group class, becoming advanced students and tutors of their peers. This benefits formative assessment as a use and resource for learning since it develops co-evaluation as a strategy for data collection and feedback based on evidence from peers, as well as opening dialogue and reflection.

The above, understood as classroom heterogeneity, which favours formative evaluative practices, also goes hand in hand with a change in teacher training associated with the last 30 years. In some Latin American countries such as Chile, Mexico and Colombia, they have managed exceptionally to align teacher training with the development of necessary and unique competencies to the rural and multigrade context, strengthening the pedagogical competencies of teachers [25]. In the specific case of Chile, there is still much to be achieved in terms of equity, but it should be noted that during the last decade, rural communities have been experiencing profound changes as a result of the social and economic development of the country. This goes hand in hand with the implementation of policies to improve the quality of education and equal opportunities for all students, which has been able to ensure results and improve the conditions of rural and multigrade schools, with the purpose of equating realities with the city [26].

In the case of multigrade classrooms, for Tomàs and Jiménez [27] the teacher's practice in the classroom is adjusted to the management of heterogeneity, favoured by the presence of a student body that needs to learn in accordance with the learning requirements to which they are officially attached. This phenomenon conditions favourably the methodological processes that occur in this type of classroom, since, according to the characteristics of the classroom and therefore of its students, the planning and teaching performance are adjusted to the diverse and heterogeneous needs, making the evaluative pedagogical practice

more enriching. The latter may explain the results of the research and allow us to understand the reason why teachers in multigrade classrooms perform better in formative assessment than teachers in single-grade classrooms, who have less experience in heterogeneous classrooms and tend to standardize their practice due to the homogeneity of the classroom. In this sense, the characteristics of the classroom are reflected in the teacher's pedagogical model [28], so the didactic adjustment of multigrade implies the assumption that this organizational model enjoys the appropriate specificities, which favours pedagogical interaction and therefore formative assessment and learning feedback. In this sense, the characteristics of the type of classroom end up favouring positively the teaching practice, conditioning the instructional design, the didactics and also the formative assessment, which favours the performance of a teacher who is doubly required to monitor the progression of the student's learning through a continuous accompaniment in the classroom, collecting evidence and providing timely feedback.

From this perspective, it is possible to propose that within multigrade classrooms not only the heterogeneity of the classroom is planned, but also the autonomy of the students is developed [27], which facilitates the self-regulation processes associated with formative assessment. In this sense, one of the greatest complexities of multigrade classrooms is the homogeneity of achievements that must be covered at each level and that must be monitored and provided feedback. This complexity also provides greater pedagogical value to the practices developed by the teacher in multigrade classrooms. For Martinic [29], the most diverse educational spaces tend to enhance the learning process. Therefore, this reality is a determining factor in the instructional design of the class and the teacher's evaluative practice, which must be guided by the use of specific pedagogical strategies. These teaching strategies should contemplate the organization of space and time, as well as the mobilization of the most appropriate curricular resources to address the diversity of needs that arise in the classroom [27]. This tackling of diversity is directly related to formative assessment since this type of practice allows to accompany and provide feedback to students according to their progress, which favours the verification of learning. This undoubtedly in a classroom setting, with more than one grade level in the classroom requires greater control of student learning.

On the other hand, another particularity that could explain the good performance of teachers in multigrade classrooms is that in some of them, there is a territorial organization oriented and directed by the Chilean Ministry of Education that favours collaborative work between schools and teachers through the organization of establishments called microcenters. The microcenters bring together several schools within the same territory with the purpose of generating common spaces for teachers' work, where they can plan together and reflect on pedagogical practice. Leyton [30] mentions that rural microcenters are professional groups of teachers from nearby schools that meet periodically to exchange teaching experiences, formulate improvement projects and design their curricular practices related to the learning needs of their students, which undoubtedly improves the conditions for the design and implementation of teaching, reflection and improvement.

6. CONCLUSION

The objective of the current research to compare the two groups from multigrade and single-grade classrooms on the theme of formative assessment based on the students' opinion of the teacher's performance was achieved. The results showed that there were statistically significant differences between the types of classrooms (multigrade and single grade) in relation to the six dimensions of formative evaluation and the general performance level of teachers.The current study has some methodological limitations. This research study is a quantitative analysis of the participant´s response to measure the variable teaching performance in evaluative practices but perhaps a more rigorous qualitative analysis (in the form of semi-structured interviews) could have strengthened this study, to get a profound understanding, and to elucidate their responses on the evaluative practices. It is recommended to continue researching the types of practices and performances of multigrade classroom teachers since it is a space that has different characteristics and a faculty with its own identity, which conditions the type of teaching practices.

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