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More time to learn: Evidences to contribute to the discussion about equity, inclusion and free higher education based on outcomes of mathematics updating mechanisms

Más tiempo para aprender: Evidencias para aportar al debate sobre equidad, inclusión y gratuidad de la Educación Superior a partir de resultados de dispositivos de nivelación matemática.

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Abstract

Based on the outcomes of a mathematics updating mechanisms, this research seeks to contribute to the public discussion about equity, inclusion and free higher education. Also, it aims to show that updating mechanisms that offer more and better quality time to learn, contributes positively to equity and inclusion. From this, it argues that state funding for free higher education should be longer for those students who need updating their knowledge and skills, in order to complete successfully their transition from high school to university. The research used a mixed method approach. The qualitative and quantitative data have are used equally. Research results confirm the assumption that students that require mathematics updating belong to lower income groups and that updating improves their academic performance. The students' perceptions also confirm the positive effects of updating in terms of inclusion and development of learning potential of those students.

Keywords: mathematics updating, educational equity, inclusive education

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Resumen

En base a los resultados de dispositivos de nivelación matemáticas del Programa Académico de Bachillerato de la Universidad de Chile, este estudio busca aportar evidencias para la discusión acerca de equidad, inclusión y Gratuidad en la Educación Superior. Se busca evidenciar la contribución a la equidad y la inclusión de dispositivos de nivelación que implican brindar más tiempo de calidad para el aprendizaje. Se busca, además, discutir el hecho de que la cobertura de la Gratuidad se aplique solo a la duración formal de las carreras, para el caso de estudiantes que requieren nivelar sus conocimientos en su tránsito a la Educación Superior. Los resultados fueron determinados mediante un estudio de método mixto, secuencial, en el que la información cualitativa y cuantitativa tiene igual estatus. Los resultados confirman el supuesto de que los estudiantes que requieren nivelación provienen de sectores de menores recursos y que la nivelación contribuye significativamente a mejorar su rendimiento en Matemáticas. Las percepciones de los estudiantes confirman la efectividad de la nivelación, en términos de favorecer su inclusión y desarrollar su potencial de aprendizaje.

Palabras clave: nivelación matemática, equidad educativa, inclusión educativa

In December 2015 the so-called 2016 Short Law on Free Education was passed, which was described by government officials as "the first point and the first step, because the President has always said that the aim is to move towards universal free education" (Díaz, 2015). In the Presidential Statement that accompanied the bill, it was explained that the foundation of this conviction is that it should be "merit, not economic capacity that defines the opportunities of young people in our country" (Cámara de Diputados, 2016a, p. 2), appealing to the need for higher education in Chile to be more inclusive.

This proposition was later endorsed by the Higher Education Reform Bill submitted for consideration in July of this year, which states that "the country demands the construction of a more inclusive society, which recognizes that talents are distributed among the whole population and which calls for greater equity and participation in the higher education system" (Cámara de Diputados, 2016a, p. 2).

The demand for greater equity and inclusion in higher education, which took center stage in the public debate after the student demonstrations in 2011, is not only backed by government initiatives, but also attracts a broad social consensus and increasingly abundant theoretical and empirical evidence to support it, which makes it possible for the different aspects of equity and inclusion in higher education to be more clearly defined every day (Universidad de Chile, 2014).

This study seeks to add to this process in two regards: First, it is part of the line of study opened by other researchers who, for several years, have been seeking to look at the institutional policies and mechanisms at work in universities of the Council of Rectors in order to increase opportunities for students to study at those establishments despite having been historically excluded from them for socioeconomic reasons. Paying heed to the critical vocation inherent in scientific work, these studies identify the tensions and blind spots of these policies and mechanisms, providing evidence to support their adjustment or reformulation. In this regard, we acknowledge the outstanding value of these studies, some of which have paved the way for this research.

As regards the issue of equity and inclusion, the intention is not to provide substantially different conclusions to those already present in these studies, but rather to supply evidence that contributes to them. The fact that it comes from a different context than the studies conducted thus far (the implementation of a device to address the remedial mathematics needs of first-year students) is, in itself, a modest contribution to extending our knowledge of these issues. Given that knowledge in education is of a localized nature, the alignment of findings from multiple contexts is what allows, over time, the proposition of more general theories that account for the regularities present in the varied arena of educational phenomena.

Secondly, based on evaluation of a device for remedial mathematics, whose central feature is to provide greater learning opportunities for students by giving them more time to learn, this study seeks to discuss the relevance of the free financing of studies solely for the official duration of degree courses. The results

of the study show that providing more time and higher quality time for students to learn is an effective measure to facilitate their academic performance and thus contribute to allowing them to feel part of the university community. It should be noted that the effectiveness of the device has been verified in this study for students who mostly come from lower income households compared to their cohort peers.

Equity and Inclusion: A Horizon for Higher Education in the Country

Considering that higher education operates as a factor of social mobility, the tendency to exclude lower income sectors from universities of excellence contributes to the perpetuation of the existing social inequalities in Chilean society (OECD, 2004; OEI, 2013; Redondo, Descouvieres & Rojas, 2004; Universidad de Chile, 2014). Concern about addressing this situation has resulted in actions of various kinds, both in universities and the Ministry of Education (MINEDUC), whose main objective is to reverse this trend (Larroucau, Ríos & Mizala, 2013; OECD, 2004; Universidad de Chile, 2014).

As a consequence, universities are faced with the challenge of taking in people who do not fit the student profile on which they have historically operated and whom have new educational needs. Empirical evidence indicates that the current challenge is, once mechanisms of equity in admissions have taken effect, to provide effective possibilities for those students to remain and complete their education as they encounter significant difficulties to integrate into university communities, both academically and culturally (Canales & De los Ríos, 2009; Gallardo, Lorca, Morrás & Vergara, 2014; Sobrero, Lara-Quinteros, Méndez & Suazo, 2014).

In this sense, equity viewed as a matter of social justice continues to be a pending topic that involves revising cultures, policies, and institutional practices in light of the inclusive perspective (Booth & Ainscow, 2002).

Equity and Inclusion: Views Based on Research

Research that has focused on the experience of students entering selective universities through special admission channels or "equity quotas" has shed light on the existence of so-called barriers to learning and participation (Booth & Ainscow, 2002) expressed in institutional cultures that operate based on an ideal view of the university student that does not correspond to the experience and characteristics of real students (Gallardo et al., 2014, Sobrero et al., 2014). According to the evidence, these are most acutely manifested during the first year of university and involve mismatches between the characteristics and expectations of the students, both in terms of their academic performance and their relationship with the curriculum and teachers, in addition to their social integration.

The study by Sobrero et al. (2014), conducted based on interviews of students earning special admissions to health degrees, concludes that:

> The accounts of interviewees allow us to visualize the gap between the traditional practices that characterize the institution ... and the needs and expectations of an increasing number of students who enter the university with a different cultural capital ... The problem is that this discrepancy constitutes an obstacle that prevents successful compliance with the principles of equity and inclusion that inspire the policy, with profound consequences of an ethical nature (p. 162).

Based on the experience of transition to university of special admissions students from another institution, Gallardo et al. (2014) identify the existence of a "period of strangeness" in the first year of university for these students, which is characterized by the sensation of not fitting in to the new environment, compounded by the confirmed ineffectiveness of previously effective strategies for social integration and academic performance. Comparing the demands of their transition processes with the experiences of certain peers who, in the opinion of the interviewees, may experience this period with less pressure and difficulty, could promote the feeling of strangeness among the interviewees.

As Booth & Ainscow (2002) proposed, "barriers to learning and participation arise through an interaction between students and their contexts: the people, policies, institutions, cultures, and social and economic circumstances that affect their lives" and do not represent deficiencies or a lack of ability of the

subjects. From this perspective it is possible to overcome the "deficit perspective of the deficit minority students" (López & Pérez, 2013) and consider institutional policies, practices, and cultures as a subject for reflection and transformation.

One of the aspects that the institutions are called to review is the quantity and quality of opportunities for learning and participation in the university community offered to students with potential but with gaps in their school education. The fact that these students fail to overcome the difficulties of academic and social integration and eventually leave university must be assumed as a problem to solve with a focus on equity, since the relationship between socioeconomic level and quality of school education has been verified (OEI-UCH, 2013; Redondo et al., 2004).

This problem is being addressed at both ministerial level and in universities through various remedial devices, both in terms of subjects (mainly basic sciences) and in personal development and learning strategies (López & Pérez, 2013). Systematizing evidence regarding the effectiveness of the remedial devices that are being implemented is an essential contribution to reflection on inclusion and equity in Chilean universities and an invaluable resource to inform public debate regarding the Reform of Higher Education and the implementation of free education.

Devices to Address the Remedial Mathematics Needs of Students in the Baccalaureate Academic Program of the Universidad de Chile

In the Mathematics area, various institutions are implementing remedial devices with different scopes and attributes[1]. In this vein, in 2014 the Baccalaureate Academic Program (PAB by the Spanish acronym) created a version of the first-year Mathematics 1 course oriented towards remedial studies and learning for students admitted with lower PSU Mathematics scores. The defined reference parameter was 650 points, since the results of previous years showed that students with those scores tended to fail the subject (Cifuentes & Mella, 2015)[2]. As the PAB is a highly demanding academic program, it has been assumed institutionally that students admitted with PSU scores lower than 650 points in Mathematics require additional support, provided in remedial opportunities in the area.

Due to its position in the alphabetically denominated order of the subject sections, this new section was called course G. This course has had three editions since it was created, including 2016. This study will include information from the first two versions of the course (2014 and 2015).

Course G has the same learning results as the other subject courses (hereinafter referred to as regular Mathematics 1 courses), addressing them with the inclusion of additional hours in extra classes during the semester and the continuation of classes beyond their official end. In 2014, course G was 18 hours longer than the regular courses and was 30 hours longer in 2015. In teaching terms, exercises are favored, along with collaborative learning and feedback expressed in didactic materials, workshops, and diversification of assessments.

The assumption underlying this device is that students entering university with lower PSU scores in the area require more time than is available on regular courses to acquire knowledge and skills, and fully develop their learning potential, due to the gap they bring with them from school. However, it is also understood that this additional time should have a particular quality: it should focus on learning. This is why the extra time is devoted primarily to individual and collective exercises. Finally, it is expected that course G will be an opportunity to test innovations that can be transferred to remedial devices in other disciplines and also to regular courses, adapting them to address diversity.

It should be explained that course G, which "separates to integrate" (Cifuentes & Mella, 2015), has been implemented in the knowledge that it is an initiative that goes against the scientific evidence regarding social and cognitive benefits that the experience of a diverse classroom provides for students (Gurin,

[1] See for example the website of *Jornadas de Inserción Universitaria*: *Hacia una Matemáticas más Inclusiva* organized by Pontificia Universidad Católica de Chile in November 2015. https://nivelacionmatematica.cl/

[2] Consider that, for the period of this study (2012, 2013, 2014 and 2015), the average PSU Mathematics scores of the cohorts were respectively 684, 682, 675, and 676. Although there is a downward trend, a student admitted with 650 points in those years is an average of 29 points below the average of their cohort.

Dey, Hurtado & Gurin, 2002). In this respect, it should be considered that, given the complexity of the processes of profound change in educational institutions, course G is a process initiative that is paving the way for more substantial changes in the culture, policies, and practices of the PAB in an inclusive sense.

The equivalence in content and degrees of difficulty between course G and the other regular courses has been ensured with the supervision of a coordinator and by assisting the teaching support unit, in addition to the inclusion of common items in certain assessments. This allows course G to be equivalent to the other sections of Mathematics 1 of the PAB in the curriculum.

Starting in 2015, the Mathematics 1 repetition course started off based on the same assumptions as course G, maintaining the same number of teaching hours, but transferring the methodological innovations. The Mathematics 1 repetition course caters to students who fail the subject at the first opportunity and who historically have high failure rates and low final grade averages. The course is thus added to the remedial devices implemented in the PAB. Because it is a recent initiative, this study does not consider its academic results, but it does take into account the perceptions of the students who participated in it.

Research Questions

Considering the academic results and the perceptions of the course G students in 2014 and 2015, and the students on the Mathematics 1 repetition course in 2015, in what way do these PAB remedial mathematical devices contribute to equity, inclusion, and improvement of the academic performance of students who have remedial needs in this area?

Based on this approach, the following questions arise:

- In terms of equity, what are the characteristics of students who enter the Program with remedial Mathematics needs? And, based on these characteristics, is it possible to state that course G for Mathematics 1 benefits students who, in addition to having these needs, have a profile that is different from the traditional university student? What other needs do these students have besides the remedial requirements?
- In terms of performance, does course G benefit the performance of students who have remedial mathematics needs? And, if so, to what degree?
- In terms of educational inclusion, what is the perception of remedial devices on the part of the students who participate in it? Do they believe that they provide equal opportunities to learn and feel part of the university community?

Methodology

The research problem was addressed with a mixed method study, with the aim of complementing qualitative and quantitative information to increase the validity of the findings and to deepen understanding of the phenomenon (Pereira, 2011; Rocco, Bliss, Gallagher & Pérez-Prado, 2003). Both types of information have equal status in the study, operating from a QUAL → QUAN sequential logic (Pereira, 2011; Onwuegbuzie & Leech, 2006).

Qualitative techniques were applied first, in parallel with the implementation of course G, in accordance with the sequence described below:

- As a first exploratory approach, in 2014 a focus group was created with students from the first version of course G for Mathematics 1. The invitation was open to all members of the course on a voluntary basis and reinforced by the teacher in charge of the subject. There were eight students on the course (four women, four men). On this occasion, the following dimensions were explored: self-concept as a student in Secondary Education, experience of admission to higher education, perception of ability to face academic tasks in the Mathematics area, assessment of course G. For the analysis, open coding was used assisted by the ATLAS.ti 5.0 software.
- The same year, based on the analysis of the focus group, a structured response survey (Likert scale) was

prepared, which was applied to all of the students on the course, with participation reaching 78%. The survey investigated the same dimensions explored in the focus group.
- In 2015, the survey was applied again during the first semester, with a participation rate of 69%. Due to the student strike that year, it was not possible to hold the focus group during the first semester and instead it was done the following semester. It included the participation of five students on course G (two women, three men). Although these circumstances were fortuitous, they allowed the perceptions of the students to be collected after having passed the course, which was an opportunity to time-weight its characteristics.
- That year, following the innovation of the Mathematics 1 repetition course, a focus group was established, inviting the students who took part in that course. It was possible to call upon five students (two women, three men). Four of them had failed course G for Mathematics 1 on the first occasion and one of them had failed the regular version.

The quantitative techniques were applied after finding out the final results of the 2015 version of the G course and they were the following:

- Descriptive analysis of the characterization of students admitted with lower PSU Mathematics scores (Group 1 < 650 points) between 2012 and 2015, comparing them with students with higher scores (Group 2 > 650 points). The following socio-demographic variables were considered: gender, region of origin, funding type of educational establishment of origin, method of admission to the university (PSU or special equitable admission[3]). The databases were created from the information provided by DEMRE, Secretariat of Studies and Analysis Unit of the PAB.
- Descriptive analysis of the final performance in Mathematics 1 for students admitted with PSU Mathematics scores lower than 650 points for the 2012 to 2015 cohorts, distinguishing the Non-Intervened Group (cohorts 2012 and 2013, prior to the creation of the G course) and the Intervened Group (2014 and 2015 cohorts).
- Based on the above analysis, to determine whether the relationship between the intervention and the final performance in Mathematics 1 is statistically significant, the means comparison was performed for independent samples (Student T-test).
- Lastly, the magnitude of the effect of the intervention was determined using Cohen's d.

Results

Equity: Characteristics of students who have remedial mathematics needs

For the 2012 to 2015 cohorts and using the criterion of 650 points as a cut-off point, a comparison was made between two groups of students: Group 1, comprised by students with a PSU Mathematics score of less than 650 points (N=239), and Group 2, formed by students with scores above the cut-off point (N=804). As has been stated, the institutional assumption is that the students in Group 1 have remedial needs in the Mathematics area.

[3] For this study, the following special equitable admissions are considered: Priority Access System for Educational Equity (SIPEE, by the Spanish acronym), Escuela de Desarrollo de Talentos (EDT), both internal initiatives of the Universidad de Chile, as well as the Academic Excellence Scholarship (BEA), which is granted by MINEDUC.

Table 1
Comparison of column proportions between Group 1 and Group 2

		PSU Mathematics			
		Group 1<650 (N=239)		Group 2> 650 (N=804)	
		Count	% of column N	Count	% of column N
Gender	Female	149_a	62.3%	335_b	41.7%
	Male	90_a	37.7%	469_b	58.3%
Special admission	No	189_a	79.1%	783_b	97.4%
	Yes	50_a	20.9%	21_b	2.6%
Does not belong to the Metropolitan region	No	190_a	79.8%	700_b	87.1%
	Yes	48_a	20.2%	104_b	12.9%
School type of origin	Municipal	78_a	34.2%	211_b	27.1%
	Subsidized	112_a	49.1%	315_b	40.4%
	Private fee-paying	38_a	16.7%	254_b	32.6%

NB: the values of the same row and sub-table that do not share the same sub-index are significantly different by p< .05 in the two-sided test of equality for column proportions. The boxes without sub-indices are not included in the test. Tests assume equal variances

1. The tests are adjusted for all paired comparisons within a row of each innermost sub-table using the Bonferroni correction.

Missing cases: For some variables, information is not available for the total number of cases considered. The variable related to the region of origin of the students has 1 missing case in Group 1. For the variable School Type of Origin, Group 1 has 11 missing cases and Group 2 has 24. Missing cases are excluded from the Table.

As can be seen in Table 1, the results of the comparison show that Group 1 has:

- A larger proportion of women: Group 1, 63% and Group 2, 41%.
- A larger proportion of students from municipal and private subsidized establishments: Group 1, 34% municipal, 49% private subsidized, while in Group 2 the percentages are 27% and 40%, respectively.
- A larger proportion of special equitable admissions students: Group, 21% and Group 2 just 2.6%.
- A larger proportion of students from regions other than the Metropolitan region: Group 1, 20% and Group 2, 13%.

In terms of gender, these data are in line with the results of the PISA test in Mathematics, which for 2000-2009 show differences in the results obtained by men and women, with lower scores for the latter. It is noteworthy that, in 2009, for example, Chile ranks second in terms of the highest difference in scores between men and women in the assessment: an average of 21 points (Colombia was ranked first with 32 points) (Villalpando, Gutiérrez, Lara, & Aguiar, 2011).

As regards the reasons underlying this difference in the academic performance of men and women, contemporary evidence points strongly to the socio-cultural determination and gender bias present in the teaching of the subject, thus overcoming the views that this is a natural difference attributed to biological or other factors (Martínez, Martínez&Mizala, 2014; Villapando et al., 2011).

In relation to the establishment of origin, although the difference between the two groups is smaller than for the previous variable, it is still possible to establish a relationship between the establishment of origin and the score obtained, and indirectly with the socioeconomic level of the students. It is also important to stress that the presence of this variable among students with PAB remedial mathematics needs is also greater than in the total enrollment of the university for 2014 (28% municipal, 37.7 private subsidized) and 2015 (29% and 37.8%, respectively) (Universidad de Chile, 2016).

If we add to this evidence the difference in the presence of special equitable admission students –in which the difference between the two groups reaches 16 percentage points– it can be stated that, for the

case under study, a larger proportion of the students that have remedial needs in mathematics come from socioeconomic groups with lower income.[4]

As argued previously in this paper, it is widely documented both theoretically and empirically that, for students from lower-income households and sociocultural contexts "distant from the university world", the university appears "as a discontinuous space of tension and challenge" (Gallardo et al., 2014, p.137).

But not only this, considering the aforementioned requirements of the SIPEE and BEA, and those of the EDT, we also have evidence that, among the students with remedial Mathematics needs, there is a group with an outstanding school trajectory (SIPEE) and/or which have demonstrated the capacity to persist in actions that tend to improve their opportunities to gain admission to the university (EDT). These factors are complemented with the testimonies of the students, which will be analyzed later and show the potential of these students, whose full development will depend on the opportunities provided to them by the context.

Likewise, the reality of students from other regions, who are present to a greater proportion in the group of students with remedial mathematics needs, involves non-academic factors, particularly regarding the feeling of loneliness and the lack of support networks, which will be discussed in detail in the analysis of the focus groups.

In summary, the students with remedial Mathematics needs have a comparatively different profile to students that have traditionally gained admission to the universities of excellence in the country and, as a consequence, have needs that are not solely academic (such as remedial mathematics), but also in terms of educational inclusion.

Performance: effect of course G

For the 2012 to 2015 cohorts, a comparison was made between two groups: the Non-Intervened Group of 104 students (PSU Mathematics score < 650, years 2012-13, prior to the creation of course G) and the Intervened Group of 129 students (course G students for 2014 and 2015). In both groups only those students who finished the subject were considered.

Firstly, a descriptive analysis was carried out at the level of socio-demographic variables. It was verified that both groups behave similarly (Table 2), except regarding the admission route, because in 2015 the EDT students were included (N=9).

[4] As a reference, consider that, for 2015, taking into account the whole university, the proportion of students enrolled via SIPEE is only 4.9%; via BEA, 3.7%; and via EDT, less than 1% (Universidad de Chile, 2016).

Table 2
Comparison of column proportions between intervened group and non-intervened group.

		Intervention			
		No (N=104)		Yes (N=129)	
		Count	% of column N	Count	% of column N
Gender	Female	71_a	68.3%	78_a	60.5%
	Male	33_a	31.7%	51_a	39.5%
Special admission	No	90_a	86.5%	93_b	72.1%
	Yes	14_a	13.5%	36_b	27.9%
Does not belong to the Metropolitan region	Yes	23_a	22.1%	25_a	19.4%
	No	81_a	77.9%	104_a	80.6%
School type of origin	Municipal	21_a	22.1%	54_b	42.5%
	Subsidized	57_a	60.0%	53_b	41.7%
	Private fee-paying	17_a	17.9%	20_a	15.7%

NB: the values of the same row and sub-table that do not share the same sub-index are significantly different by p< .05 in the two-sided test of equality for column proportions. The boxes without sub-indices are not included in the test. Tests assume equal variances

1. The tests are adjusted for all paired comparisons within a row of each innermost sub-table using the Bonferroni correction.

Missing cases: For the variable School Type of Origin, the Non-Intervened Group has 9 missing cases and the Intervened Group has 2. Missing cases are excluded from the Table.

For the performance effects, the final grade in Mathematics 1 was considered. As shown in Figure 1, the Intervened Group had a better average (M = 3.88, SD = 1.0), the range between the minimum and the maximum is increased (Min. = 1.1, Max = 6.5), and the concentration of students' scores is higher than in the Non-Intervened Group (M = 3.19, SD = 1.2, Min. 1.0, Max. 6.0)[5]. Finally, it should be noted that in the Intervened Group there is a greater pass rate of the students, as shown by the red line at a grade parameter of 4.0.

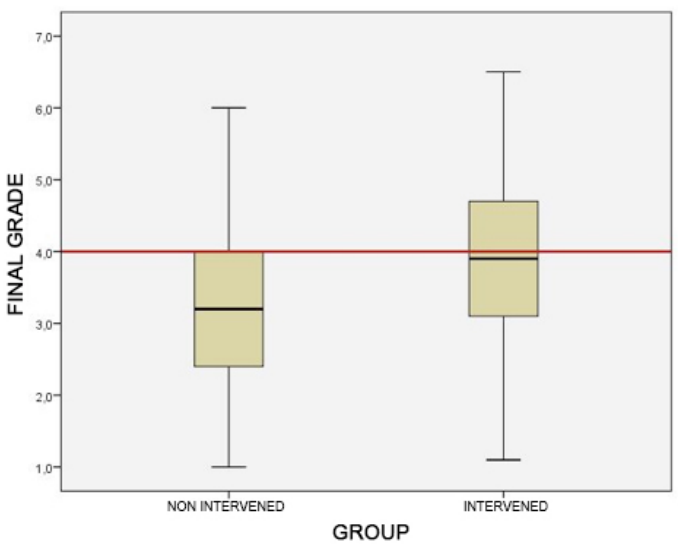

Figure 1. Box-Plot, Final grade Mathematics 1 according to intervention group

[5] There are no atypical cases, so the average is an optimal estimator of the central tendency.

On the other hand, and as shown in Figures 2 and 3, the distribution of the final grade of the Non-Intervened Group has positive asymmetry (data are concentrated to the left of the curve), but in the Intervened Group the distribution is closer to zero, that is, closer to a normal distribution. Therefore, it can be stated that the final grade improves in the students in this group.

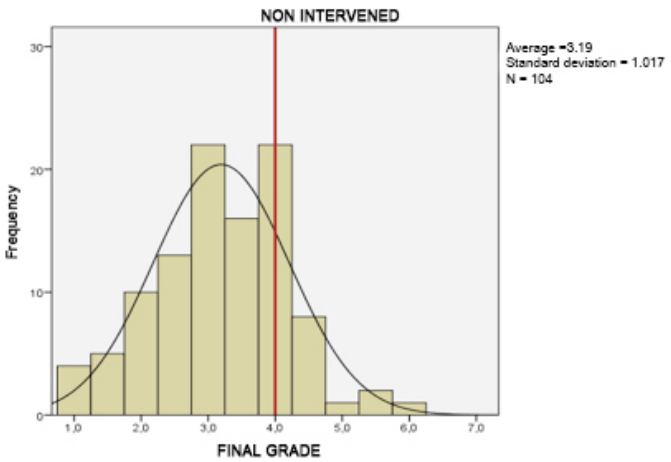

Figure 2. Histogram of final grade for Mathematics 1 Non-Intervened Group

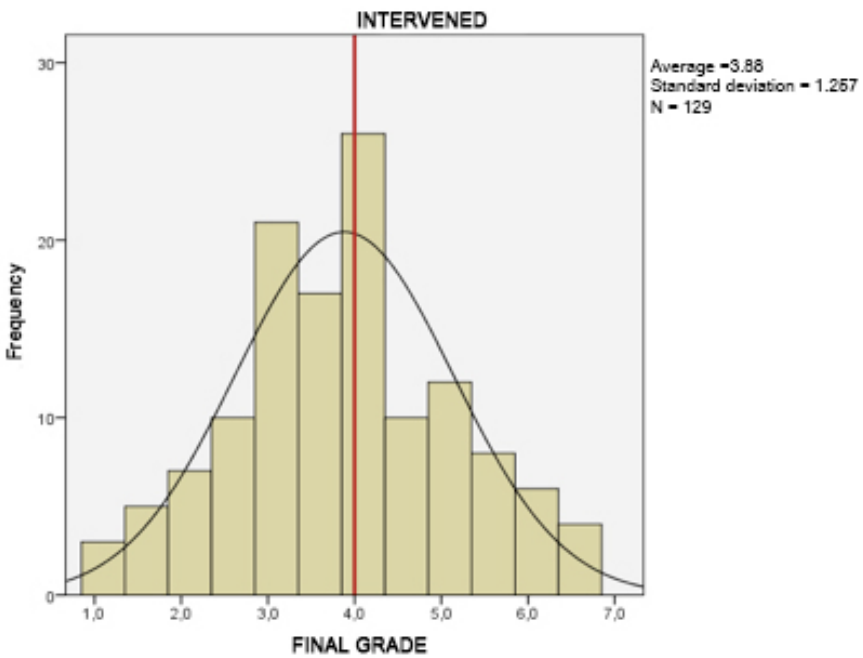

Figure 3. Histogram of final grade for Mathematics 1 Intervened Group

In order to assess the intervention regarding its relationship to the final grade for Mathematics 1, with independent observations between two groups greater than 30 cases (N1=104, N2=129), a comparison of mean was done for independent samples, Student T test.

This test has three assumptions. The first is the normality of the dependent variable for each sample, for which the Kolmogorov-Smirnov normality test was used (samples greater than 30 cases). The Non-Intervened Group sample did not have normal distribution P=.008), while the Intervened Group did (p=.20). Nevertheless, the Student T test is robust and therefore maintains the validity of type I and type II errors. The second assumption is that the level of measurement of the dependent variable is by interval, which is fulfilled in this case. Finally, there should be homogeneous variance between the groups, so the Levene test is applied for equality of variances. This condition is also met (F=3.86, P=.051).

The T test shows that, with 95% confidence, between the Non-Intervened Group (N=104, M=3.19, SD=1.0) and the Intervened Group (N=129, M=3.88, SD=1.25) there is a significant difference in the final grade on the Mathematics 1 course (t (231)=-4.49, p=.001). That is, the course G students have a significantly better performance than the students in the previous cohorts.

Then, in order to determine the magnitude of the effect of the intervention, Cohen's d was used (Cohen's d = .59), which yielded an average effect of the course G intervention on the final grade, which is a significant result considering that this is the first intervention made on this course.

Educational inclusion

To find out the perception of course G of the students who took part in it, the results of the perception survey were analyzed along with the codification of the focus groups created in 2014 and 2015.

As the characterization indicates, most G course students in both years report having performed well at school in Mathematics. However the image that they themselves had created thanks to their school experience is strongly questioned by the experience in mathematics classes at university because "you came from knowing almost everything at your high school and you didn't know anything here" (Course G student, 2014). This highlights the difference that the students perceive between the preparation that they received at school and the preparation received by some of their classmates who "go home [during classes of] Mathematics, because they already know to do derivatives because their schools taught them that" (Course G student, 2014).

The experience of a mismatch between the tools they feel they acquired at school and those required by the university leads them to look critically at the education received, which is judged to be insufficient in light of this mismatch, as a "poor base", which calls into question the academic achievements achieved at school: "I learned things from memory. I took a test and I got a seven [maximum grade]" (Course G student, 2015), "I always did well, because it was easier" (Course G student, 2014).

The testimonies presented agree with those collected in the studies by Sobrero et al. (2014) and Gallardo et al. (2014) in terms of accounting for this mismatch or gap between the demands of the new context and the previous characteristics and experiences of these students, which gives rise to the feeling of "strangeness."

Although the information was gathered from the perspective of the remedial academic needs of the students of course G, in the focus groups elements of a more general nature emerge that allow it to be stated that, in the case of these students, as in the case of the students quoted, the "mismatch" and "strangeness" are also experienced in non-academic dimensions, particularly in students from regions other than the Metropolitan region: "For us people who are from outside [the Metropolitan region] you learn to get used to the solitude. Even so, it's difficult" (Course G student, 2014). "I didn't know anyone then, I didn't know who to ask for help, and if I asked, there was the fear of rejection" (repetition course student, 2015).

The tension experienced becomes demotivation and the intention to abandon the studies: "The test came and it was a failure and I was discouraged; it was like I didn't understand anything" (Course G student, 2015). "The first month I was decided, like, I'm going. It was a decision that was taken, bye!" (Course G student, 2014).

In this dark initial scenario, course G appears to be an opportunity to remedy the "poor base" provided by the school. By 2014 and 2015 most of the students (89%) agree or strongly agree with the statement "Course G has covered the gaps in mathematics that I had from school," noting that, in the students' perception, the initiative fulfills its main purpose.

There are various attributes of course G that the students value. The first of them is that it is perceived as an effective remedial opportunity: "The fact of being in Math 1G, at least brought me up to speed, that is, Math 2 has been much easier for me" (Course G student, 2015). "The first semester I was really scared, I studied a lot, but now I feel more confident. I feel more certain about what I've learned" (Course G student, 2015).

In the experience of the students, the scope of the course goes beyond strictly the subject matter: "We aren't ashamed to ask. When I have a question, I ask all the time. Maybe in another class ... you might find my questions stupid, but here, as we're all in the same situation, I ask with more confidence" (Course G student 2015), "[Course G] is one of the ways the university has to be able to include the students and not segregate them" (Course G student, 2014).

Although other studies have analyzed problematic aspects of the inclusion of these students, particularly the relationship with their peers on regular courses (Cifuentes & Mella, 2015), from the perspective of educational inclusion, the testimonies of the students show that the G course contributes to the development of inclusive practices in which "teaching and support are integrated to 'orchestrate' learning and overcome barriers to learning and participation" (Booth & Ainscow, 2002, pp. 18).

Another of the attributes on which the perceptions of all the students consulted agree (course G 2014 and 2015, and Mathematics 1 repetition course, 2015) is the teaching factor. In first place, it is perceived that teachers start from the basis of the real characteristics and needs of students, not taking anything for granted: "The fact that the teacher is aware of our situation, that we're going more slowly, improves the integration of the class and it makes me want to learn from the teacher" (Course G student, 2014). In this perception there is no lack of comparisons with what they know about the regular subject course "because in [regular] mathematics they give them a guide and they have to do it, but instead ... they reinforce our exercises ... so we have the idea of how to do it. In contrast [on the regular course] they don't even give the idea of doing the exercise, they have to have that idea on their own" (Course G student, 2015). This agrees with the testimony of a student who, having failed the regular course, was included in the innovated repetition course in 2015:

> In the previous semester, the teacher taught in one way and that was the only way … while [the teacher on the repetition course] is like 'ok, if you don't understand it like that, do it this way, graph it, work it out that way' (…) they give you options and, in the end, you choose the best way, the way you learnt best or the one you find easiest.

In addition, the students on course G notice continuous support from the teachers and a diverse range of opportunities to learn and practice: "We've been supported by having classes on Saturdays and everything and the teacher is always showing us guides, showing us solutions" (Course G student, 2015). As part of this, we can also highlight instances of collaborative work, which are one of the innovations made on course G compared to the regular courses: "Those of us who work together in groups on Saturdays, we have to do the whole guide so we can compare it afterwards ... so we supplement ourselves more than in [individual] supervision" (Course G student, 2015).

Finally, one aspect that is widely recognized and appreciated by students is the fact that they have more time to learn, highlighting that course G "goes more slowly", giving them time to understand and develop their mathematics skills: "As it's all been slower, we've had time to process everything" (Course G student, 2015). The testimonies of the students from the 2015 repetition course are surprising in this sense, as they see the repetition as an opportunity to complete their remedial studies: "I've got a good base now, as I had a big deficit from my school. I came here and I started gradually, but the first semester wasn't enough, so I failed" (Repetition course student, 2015). "It was much better to have failed Math, although that wasn't the idea, but it was better; that is, I really learned like that" (Repetition course student, 2015).

In sum, from the perspective of the students with remedial needs, it makes sense to have more time to develop the learning set out in the curriculum. In line with the assumptions underlying the creation of

the G course, this assessment relates to the attributes of the course. That is, it makes sense for students to have more time, but rather quality time to learn. On the other hand, this perception is consistent with the academic results presented in the previous sections: more time for learning results in substantive improvements in the academic performance of students who, if they do not have this time, would probably find it more difficult to participate in the university community, both academically and socially.

Discussion and Conclusions

For the university community, the initiatives that are set up to favor equity and inclusion constitute an opportunity to open up spaces for deliberation and creation of shared meanings regarding what different stakeholders understand by building the university. This opportunity opens up the way for institutions with long traditions to be transformed in terms of inclusion, preserving the signs of identity that give it a sense of self. This way must be paved by processes of investigation and reflection within the universities, which implies guiding the critical capacity that they have and constantly apply in order to advance the knowledge of the world towards themselves. On a larger scale, the same challenge is faced by Chilean society, which is confronted with the need to transform education at all levels.

There is a general consensus regarding the horizon towards which advances should be made. As stated before, what studies like this can contribute is elements to build a comprehensive view of how to approach that.

As regards the contribution of remedial devices to equity and inclusion: The leveling of entry skills is a requirement and, at the same time, a way to promote equity, since students who require this come from contexts that are "distant" from the university, which represents a source of mismatch with their previous experience and the tools they possess. Although this mismatch can be verified in terms of both the subject area and social integration, providing remedial opportunities helps reduce the "strangeness" experienced at first and increases their possibilities of remaining, reversing the historical tendency to exclude them from education at universities of excellence.

In the case of the remedial devices for mathematics implemented in the PAB, this is first proved in the characteristics of the students who have such needs. They effectively have a profile that is different to that of their cohort peers, especially in socioeconomic terms: Most of them are women, they come from regions other than the Metropolitan region, they come from municipal and private subsidized educational establishments, and they enter the University by means of special equitable admissions.

Secondly, as a remedial mathematics device, course G has a statistically significant relationship and a mean effect on the improvement of these students' performance, in comparison with those with a similar profile in cohorts prior to the creation of this course. In this regard, the assumption of "providing more quality time to learn" is effective at the performance level.

This is also confirmed by the testimonies of students who value remedial devices as an opportunity to overcome "their poor school preparation" and "learn for real". The attributes of course G emphasized by the students specifically include the assertion that it "goes more slowly" and gives them more time, in addition to the relevance they attribute to the teaching factor. In the case of students who have failed and are participating in the innovative version of the repetition course –an innovation based on the suppositions of the G course– under these conditions, repetition is seen as an opportunity to continue being brought up to speed, because in their case "the first semester wasn't enough."

This enables us to reconsider whether the coverage of the free education, limited to the formal duration of degree courses, is relevant for students who require more quality time to transition from a secondary education with shortfalls to their full integration into the university.

Even though the tendency is rather to think about undergraduate education as being limited by time, we should consider articulation aimed at postgraduate training. With the System of Transferable Credits, the tendency is rather to rationalize study time (Council of Rectors of Chilean Universities, 2012). In light of this, it seems a contradiction to advocate spending more time on undergraduate studies.

However, the same tendencies are related to the idea of differentiated educational transitions that respond to the diversity of characteristics and interests of the students: Should financing be a limiting factor in the possibilities of addressing diversity in the curricula and in educational pathways? As explained in the message accompanying the Law on Free Education, resources are scarce. As a consequence, the challenge is to find a balance between innovative and efficient educational pathways and the specific needs of certain priority groups that require additional time during the process of their assimilation into the university to fully develop their potential.

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