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What Works in Education?

Using Evidence to Improve Education

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Multi-tiered interventions and forms of support for meeting educational needs: what works to improve learning and reduce school dropout levels?

Gerard Ferrer-Esteban

How do we maximize learning opportunities for all students in ordinary school contexts? This is the necessary question in light of the current political will to include all interventions to support diversity in an inclusive school system that responds to all students in Catalonia at all grade levels. A similar approach places interventions to diversify the curriculum front and center and forces us to rethink what actions are being carried out, which ones work, which ones do not and what should be done to make them work better.

It is the same question that has prompted the experimentation and evaluation of many different interventions and programs everywhere to offer a comprehensive and effective response to different learning paces and needs, in equitable conditions with equal opportunities. It is also the question that has motivated the present systematic review of empirical evidence and aims to contribute to the debate within the Catalan educational system on the effectiveness of these educational interventions and forms of support.

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What Works in Education?

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Multi-tiered interventions and forms of support for meeting educational needs: what works to improve learning and reduce school dropout levels?

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Motivation

The pedagogical tradition in **Catalonia** has historically claimed that the Catalan educational system is inclusive in nature. Whether in terms of methodological proposals, in the defense of Catalan as a vehicular language or through intercultural discourses, Catalan schools have often been aligned with the values found at the base of an inclusive and cohesive society. In fact, one of the fundamental principles of the education system in Catalonia is **social cohesion and inclusive education** and educational support is given to all students as a priority objective. The Catalan Law on Education includes an objective, which could be called a pedagogical model, according to which the *schools must consider curricular, methodological and organizational elements for the participation of all students in ordinary school settings, regardless of their conditions and capabilities.*

Attempts have recently been made to pinpoint this objective with structural, system-specific proposals, such as the **inclusive school system**, which further develop the classical proposal of the *inclusive school.* An important new feature of the latest legislative proposals is undoubtedly the will to **include all interventions and forms of support for meeting educational needs in a comprehensive system** that responds to all students at all grade levels. One of the natural implications of a system with these characteristics is that it provides a system where all students with special educational needs are taught in ordinary schools, with special education schools only being used in extraordinary circumstances.

It is a **system organized according to tiers of support for meeting educational needs** (*whether universal, targeted or intensive*) that is integrated into an ordinary school context. This system provides for **interventions for meeting educational needs that diversify, adapt or enrich the objectives and curricular content in order to maximize learning opportunities for all students**. There is a scientific basis to justify such a model. In fact, a good number of studies has focused on experimentally exploring the effects of a multi-tiered educational support model that is adapted to different learning styles, profiles and needs.

However, the application of this model in Catalonia has been based fundamentally on adapting existing programs of support within a new organizational structure according to the layer of intervention. It is difficult to assess the extent to which the design of existing projects, the time spent, the professionals' profile and training and other relevant factors rest on a sound scientific basis. Many questions remain about these systems to meet educational needs that research can help to solve. This report aims to contribute to this discussion, providing the main research evidence generated so far through a systematic review of reviews.

What do we mean by interventions to meet educational needs and which programs do we study?

Decree 150/2017, of 17 October, on educational support for students as part of an inclusive school system that regulates educational support for all the students, at all grade levels, until the transition to adulthood. This model stems from the political will to **include all interventions and forms of educational support in an integrated system that responds to all students at all levels of education**. In order to plan support for specific educational needs, this system is based on a model structured by interventions and multi-tiered systems of support.

This system is inspired by the American Response to Intervention model (RtI) [1] [2], which focuses essentially on the academic dimension of students' needs. The Response to Intervention model is part of the Multi-Tiered System of Support (MTSS), which also explicitly adds a behavioral and socio-emotional dimension. In any case, they are not specific intervention programs, but models that structure and host multiple intervention programs. They are **models designed to help to identify, treat, monitor and evaluate the academic and social progress of students with learning difficulties.**

Interventions of support give rise to different objectives according to the student's needs, age and grade level. The main objective, applicable throughout the school year, would be to **reduce the risk of failing in school and to level out the academic performance** of students with learning difficulties compared to the rest of their classmates. In other cases, basically in the final years of middle school, the objective is to **prevent the risk of early school leaving**, for example by teaching a series of basic skills through practical lessons linked to the student's environment.

As we said, this model provides **multi-tiered interventions** according to educational need, which in practice translates into interventions of curricular diversification, in which specific learning objectives are established and where multiple educational and methodological strategies may be provided for. We can talk about **three tiers of intervention**:

- First, we have **universal interventions**, which include programs aimed at all students. Inclusive teaching strategies are implemented in these programs, which help to make the learning environment more flexible and encourage meaningful learning, coexistence, well-being and commitment to school [3]. This includes programs such as cooperative groups [4], socio-emotional education programs [5] and programs based on metacognitive strategies [6]. These interventions are fundamental because of **both their preventative and diagnostic nature**, which enables us to identify cases that can be addressed by more intensive interventions.
- Second, we find **targeted interventions**, which cater to students who do not respond adequately to universal interventions because they experience difficulties in some aspects of the learning process. These are educational actions that are usually carried out in small groups. They allow us to **adjust the educational response flexibly and temporarily**, with an educational intervention focused on the most challenging aspects of the learning and development process.[1] Targeted interventions envisaged in Catalonia include *reception classrooms* in elementary and high schools, *personalized school support* in elementary schools and *intensive improvement programs* and *curricular diversification programs* in high schools.
- Finally, we have **intensive interventions**, where pupils with special education needs who do not respond adequately to targeted interventions are catered to. These interventions consist of **intensive and extraordinary educational interventions with regular frequency** and normally **without a time limit**. They are often posed individually to adapt to the uniqueness of students with special education needs [3]. In Catalonia, interventions that are considered intensive include intensive support for inclusive schooling in preschool and compulsory secondary education, *intensive hearing and language support* and shared education units in high school. In all cases, the schools are required to develop an *individualized support plan*.

1 Decree 150/2017, of 17 October, on educational support for students as part of an inclusive school system and the Catalan Ministry of Education (2015) [3]

The review of the evidence focuses on targeted and intensive interventions. Both interventions **translate into curricular diversification actions that provide for multiple educational and methodological strategies, but differ substantially in terms of intensity, design, the participants' profile and the supporting professionals**. Universal interventions are not included in this review because they usually do not include programs of diversification and specific support for special education needs. Some of these interventions have already been addressed in previous publications of "What works in education" [4] [5] [6].

Targeted interventions are usually implemented when universal actions are not enough for the student to progress at the same pace as other classmates. In terms of language, for example, these interventions include some aimed at students who do not dominate the vehicular language and who need specific support to continue universal instruction properly. In Catalonia, this intervention can be oriented for reception classroom tutors, hearing and language specialists, educational guidance counselors or special education teachers.

Furthermore, **the intensive interventions are implemented when the targeted interventions are not enough to support students with special education needs** due to very significant limitations, both in intellectual functioning and in adaptive behavior [3]. In Catalonia, intensive interventions involve extraordinary endowments of professionals that are incorporated into the school staff. Intensive interventions can be carried out by special education teachers, teachers providing intensive support to inclusive schools or teachers that offer intensive hearing and language support.

The main differences between both types of interventions, as regards the conditions of implementation and the evaluation and monitoring, are summarized in Table 1, based on the research evidence [7]:

Table 1.
Differences between targeted and intensive interventions

		Interventions in multi-tiered systems of support	
Areas		**Targeted interventions**	**Intensive interventions**
Students	Participants	No more than 15-20 % of students. Students with learning difficulties and/or disabilities, at risk of failing school	No more than 5 % of students. Students with severe learning difficulties and/or disabilities, at high risk of failing school
Organizational factors	Planned time	30 minutes, 3-5 weekdays	45-120 minutes, 5 weekdays
	Group	5-8 students	1-3 students
	Length of the intervention	Temporary actions: 8-15 weeks (<20 weeks)	Action with no time limit (20 weeks or more)
	Person in charge	Teacher, specialist	Specialist, special education teacher
Evaluation	Type of diagnostic evaluation	Group diagnostic evaluation	Individual diagnostic evaluation
	Monitoring of progress	Every two weeks or monthly	Once or twice per week
	Instruments of evaluation	Group evaluation protocols	Individual evaluation protocols
		The Response to Intervention model applies evaluation protocols such as the *RIOT/ICEL* matrix, which combines the *subject of evaluation* (educational strategies, curriculum, environment and student) with *tools for gathering information and analyzing data*, like the review of student records (file, portfolios, etc.), interviews with key informants of the students' environment, direct observation (academic skills, behavior, attention, etc.) and tests that cover different aspects of the students' academic, social and behavioral progress.	

Based on Harlacher et al. (2014) [7], Wright (2010) [8] and Burns et al. (2005) [9]

Questions driving the review

First, we ask questions about the **benefits for students**: What is the overall effectiveness of multi-tiered systems of support in the academic dimension? Do these interventions help to mitigate or override differences in academic competences? Does the effectiveness vary depending on the intensity of the interventions (targeted or intensive)? What effectiveness do they have in the behavioral, social and relational dimension? To what extent do they help to prevent students from dropping out of school?

Furthermore, we ask questions that refer to the effectiveness of the programs according to the **moderating factors**, meaning the factors that help to explain how and why there is a causal relationship between implementation of the program and the students' outcomes. We wonder if the effects vary according to the conditions and fields of implementation (grade level, duration and dosage, size of the group and computer-based support used).

Reviewing the evidence

To conduct this review, a total of 15 reviews and meta-analyses were selected that cover more than 700 studies on the effects of programs of support and curricular diversification. The effects refer to the impact that these programs may have on students' **cognitive and non-cognitive outcomes**, as well as on interventions related to prevention. Cognitive outcomes refer to students' academic skills and competences (reading and mathematics). Non-cognitive outcomes refer both **attitudes and behaviors**. Prevention-related outcomes refer to the **rates of staying in or leaving school** [9].

How effective are interventions in multi-tiered systems of support on academic skills and behavior?

Interventions have a positive effect on promoting academic skills. ↗

Interventions in multi-tiered systems of support have a positive effect on promoting the academic skills evaluated [9] (Table 2). This evidence is observed mainly in reading comprehension, a field to which the vast majority of studies on multi-tiered systems of support, but also in mathematical skills [10] [11]. Specifically, these interventions can have an effect on real word identification, phonological awareness and word attack [12].

The positive effect of the interventions does not tell us if we can mitigate or cancel out the differences between the at-risk students and the rest of the classmates. To what extent do interventions in multi-tiered systems of support effectively level differences in terms of academic skills? Some evidence indicates that when we compare children with learning difficulties and/or disabilities with other children of the same school year or age, differences may increase [13][12]. However, most of

the evidence indicates that programs that are part of multi-tiered systems of support are effective in closing the gap between students with learning difficulties and/or disabilities and students without difficulties, though they do not eliminate it. There are several experimental studies that have indicated trends to close the gap between the performance of students with learning difficulties and the expected performance in the respective grade level. In this sense, we find evidence in preschool [14], elementary school [15] and high school [16].

Programs that are part of multi-tiered systems of support are effective in closing the gap between students with learning difficulties and/or disabilities and students without difficulties, though they do not eliminate it.

Finally, we want to observe whether the positive effects that interventions in multi-tiered systems of support have on academic skills are also observed in non-cognitive outcomes related to the **behavioral, social and relational dimension**. First of all, we see that all three levels of support show a significant effect on reducing aggressive and disruptive behavior [17] [18].

Among these three levels of intensity, the most effective programs to reduce aggressive and disruptive behavior are targeted and universal ones. The most common targeted programs are cognitive-based, behavioral, centered on social skills and guidance. **Programs that also use behavioral strategies are those that most significantly reduce disruptive behavior** [17]. Meanwhile, intensive interventions tend to show a lesser, but significant, effect than targeted interventions [17].

The most effective programs to reduce aggressive and disruptive behavior are targeted and universal ones.

Table 2.
Effectiveness of multi-tiered interventions and forms of support: reviews and meta-analyses

Reference (country)	Number of studies included	Years of the studies	Design of primary studies	Grade/s	Length	Outcomes	Average effects (EM) and differential average effects (ED)	Magnitude of the effect*
Outcomes related to the students' academic dimension								
Shepley, Grisham-Brown (2019) [USA] [19]	16	2007-2017	Experimental and quasi-experimental	Preschool (3-5 years)	From 4 to 36 weeks – From 300 to 2400 minutes	Reading (multiple outcomes)	• EM: Expressive language • EM: Receptive language • EM: Letter recognition • EM: Listening comprehension • EM: Phonological awareness • EM: Print knowledge • EM: Rhyming	• g = 0.16 • g = n.s. • g = 0.79 • g = 0.50 • g = n.s. • g = 0.24 • g = 0.40
Burns *et al.* (2016) [USA] [20]	21	1999-2011	Experimental	Preschool, elementary school and middle school	Not specified	Cognitive function and reading (multiple outcomes)	• EM: Reading skill (average) • ED: Cognitive function. N = 8 • ED: Using data for screening. N = 30 / N = 4 • ED: Cognitive function. N = 8 • ED: Phonological/phonemic awareness. N = 13 • ED: Reading fluency. N = 11 • ED: Mixed measures. N = 2	• g = 0.41 • g = 0.17 • Screening = 0.41 • Design of interventions, g = 0.42 • g = 0.17 • g = 0.50 • g = 0.43 • g = 0.26
Tran, Sanchez, Arellano, Lee Swanson (2011) [USA] [12]	13	2000-2009	Experimental	Elementary school (6-10 years)	Not specified	Reading (multiple outcomes)	• EM: Global results • ED: Real word identification • ED: Phonological awareness • ED: Word attack • ED: Vocabulary • ED: Reading comprehension • ED: Phonological memory • ED: Reading fluency • ED: Length of sessions, number of sessions, type of intervention, criteria for defining responders	• d = 1.07 vs. 0.76** • d = 1.06 vs. 1.53 • d = 1.15 vs. 0.82 • d = 1.10 vs. 1.28 • d = 0.71 vs. 1.19 • d = 0.45 vs. 1.43 • d = 0.41 vs. 0.92 • d = 0.70 vs. 0.66 • d = n.s.
Burns, Appleton, Stehouwer (2005) [USA] [9]	21	1995-2005	Experimental and quasi-experimental	Elementary and high school	Not specified	Student (N = 11) and systemic outcomes (N = 13) ***	• EM: Global results • ED: Student outcomes • ED: Systemic outcomes	• d = 1.27 • d = 0.96 • d = 1.53
Students' behavioral, social and relational dimension								
Shepley, Grisham-Brown (2019) [19] [USA]	16	2007-2017	Experimental and quasi-experimental	Preschool (3-5 years)	From 4 to 36 weeks – From 300 to 2400 minutes	Social behavior and skills	• EM: Challenging behavior • EM: Engagement • EM: Social skills	• g = -0.51 • g = 0.59 • g = 0.55

Reference (country)	Number of studies included	Years of the studies	Design of primary studies	Grade/s	Length	Outcomes	Average effects (EM) and differential average effects (ED)	Magnitude of the effect*
Students' behavioral, social and relational dimension								
Wilson S. J., Lipsey, M. W. (2007) [17] [USA]	399	1960 until 2007	Experimental and quasi-experimental	Elementary and high school	From 1 to 38 weeks or more	Aggressive and disruptive behavior	• EM: Universal interventions • EM: Targeted interventions • EM: Intensive interventions	• g = 0.21 • g = 0.29 • g = 0.11

* Standardized mean difference: g = Hedges estimator [21]; d = Cohen estimator [22]. Statistically insignificant effect: n.s.; Small effect: 0.2; Average effect: 0.5; Large effect: 0.8.

** The magnitude of the ES between pretest and post-test among students with learning difficulties that respond and do not respond to the intervention.

*** Students' outcomes: assessments of academic skills, estimates of skill growth and observations of time on task and task completion. Systemic results: number of referrals to and/or placements in special education, student time in special education services and number of students retained in a grade.

Effectiveness of targeted interventions and forms of support

There are several targeted programs aimed at strengthening the cognitive outcomes of students with learning difficulties that have been left behind with regard to the progress of their class group. In the field of mathematics, we have several programs that have been evaluated experimentally and have proven effective, such as Numbers Count in elementary school [23] and Catch Up Numeracy [24], while the linguistic field has 'catch-up' interventions like Reading Recovery [25][26] and Reading Partners [27]. Box 1 shows two international examples of programs that have been subjected to experimental evaluations: Tutoring With Alphie (TWA) [28] and *Bilingual Cooperative Integrated Reading and Composition* (BCIRC) [29][30].

Targeted interventions have a high and positive impact on all assessed academic dimensions [31][32], whether we speak of standardized or non-standardized interventions (Table 3). Specifically, they have **significant effects on basic reading skills, such as phonological awareness, phonetics, word recognition and reading fluidity**. The most limited effects are observed in standardized reading comprehension interventions, though they are still significant. These positive results are confirmed in other meta-analytic reviews that have dealt with specific interventions for students with reading difficulties in high school [20][33][34]. This positive impact is also observed in the reading comprehension of students of English as a second language (English Language Learners, ELL). The overall effect is positive and is nearly considered high [35].

Targeted interventions have a high and positive impact on all assessed academic dimensions.

We have less evidence in the field of mathematics. However, experimental studies have been conducted on some programs and also indicate the positive effect of targeted interventions [36] [37].

Box 1.

An example of a multi-tiered system of support to foster academic skills: Success for All *(Schoolwide & Targeted)*

The Success for All program is an educational and curricular reform model that affects the organizational structure and the curriculum of the school where it is implemented.

This program provides for two types of interventions according to their intensity:

- Universal interventions: *Success for All Schoolwide*, a schoolwide program aimed at boosting the academic performance of all students.
- Targeted interventions: Success for *All Targeted Programs*, which are implemented after having identified areas where academic performance can be improved.

Although different learning objectives are raised, both interventions share things in common: they prioritize cooperative learning strategies, include instruction and a curriculum that motivates students, prompt professional development and employ teaching strategies supported by research-based evidence. This schoolwide program has been evaluated on an experimental basis and is one of the few American models of global school reform that have shown significant levels of effectiveness [38].

Some targeted programs have obtained positive results in experimental evaluations:

- *Tutoring With Alphie* (TWA): computer aided tutoring program implemented in small groups. It is aimed at students between 6 and 8 years of age with reading difficulties, which are grouped in pairs or in small groups of up to six students, and runs for about 30 minutes per day for a period of six weeks. The students follow a series of activities to improve their reading comprehension and fluency of expression. Students are supervised by a tutor, who is usually an assistant teacher. Experimental evaluations have attributed an average effect on reading skill (ES=0.40/0.46) [28].
- *Bilingual Cooperative Integrated Reading and Composition* (BCIRC): is an adaptation of the *Cooperative Integrated Reading and Composition* program (CIRC), but it is specifically addressed to Spanish-speaking students in the United States between 8 and 11 years old. This program encourages reading skills in Spanish in order to facilitate the subsequent transition towards reading in English.

Students work in small cooperative learning groups and engage in reading, writing and language activities, both in Spanish and in English. Although it is a moderate effect, research indicates positive effects on reading comprehension and language development in English [29][30].

For further information:

Website of the Success for All foundation [28] [29][30].

Publications on the results of the Success for All program:

Borman, G. D., Hewes, G. M., Overman, L. T., Brown, S. (2003). Comprehensive School Reform and Achievement: A Meta-Analysis. *Review of Educational Research*, 73 [2], 125-230.

Borman, G. D., Slavin, R. E., Cheung, A., Chamberlain, A., Madden, N. A., Chambers, B. (2007). Final Reading Outcomes of the National Randomized Field Trial of Success for All. *American Educational Research Journal*, 44 (3), 701-731.

Examples of experimental evaluations applied to tier 2 programs:

Madden, N. A. & Slavin, R. E. (2017) Evaluations of Technology-Assisted Small-Group Tutoring for Struggling Readers, *Reading & Writing Quarterly*, 33 [4], 327-334. [28]

What Works Clearinghouse. (2007). Bilingual Cooperative Integrated Reading and Composition. Institute of Education Sciences, WWC Intervention Report. https://ies.ed.gov/ncee/wwc/Docs/InterventionReports/WWC_BCIRC_021507.pdf [29]

Calderón, M., Hertz-Lazarowitz, R., & Slavin, R. (2000). Effects of Bilingual Cooperative Integrated Reading and Composition on students making the transition from Spanish to English reading. Elementary School Journal, 99(2), 153–165. [30]

Table 3.
Effectiveness of targeted intervention: reviews and meta-analyses

Reference (country)	Number of studies included	Years of the studies	Design of primary studies	Grade/s	Length	Outcomes	Average effects (EM) and differential average effects (ED)	Magnitude of the effect*
Wanzek *et al.* (2016) [31] [USA]	72	1995-2013	Experimental and quasi-experimental	Preschool until the third year of elementary education	1 hour - 40 hours or more	Reading (multiple outcomes)	• EM: Standardized foundational skills (phonological awareness, phonetics, real word identification, reading fluency) N = 63 • EM: Non-standardized foundational skills N = 33 • EM: Standardized language/comprehension measures N = 31 • EM: Non-standardized language/comprehension measures N = 6 • ED: Intervention type, instructional group size, grade level, intervention implementer, number of intervention hours	• g = 0.54 • g = 0.62 • g = 0.36 • g = 1.02 • g = n.s.
Burns *et al.* (2016) [USA] [20]	21	1999-2011	Experimental	Preschool, elementary and middle school	Not specified	Cognitive function and reading (multiple outcomes)	• ED: Targeted interventions (small group). N = 16	• g = 0.30
Scammacca *et al.* (2007) [33] [USA]	31	1980-2006	Experimental and quasi-experimental	Middle and high school	From 1 to 90 sessions	Reading (multiple outcomes)	• EM: Global outcomes • ED: Comprehension strategies •ED: Word attack • ED: Fluency • ED: Multicomponent • ED: Vocabulary • ED: Middle school • ED: High school • ED: Type of implementer: researcher • ED: Type of implementer: teacher • ED: All designated learning disabled • ED: Some designated learning disabled, some struggling	• g = 0.95 • g = 1.23 • g = 0.60 • g = 0.26 • g = 0.56 • g = 1.62 • g = 1.05 • g = 0.78 • g = 1.49 • g = 0.63 • g = 1.19 • g = 0.86

Reference (country)	Number of studies included	Years of the studies	Design of primary studies	Grade/s	Length	Outcomes	Average effects (EM) and differential average effects (ED)	Magnitude of the effect*
Scammacca *et al.* (2015) [32] [USA]	36	1980-2011	Experimental and quasi-experimental	From the fourth year of elementary school to high school	From 5 hours (or less) to 26 hours (or more)	Reading	• EM: Global outcomes • EM: All reading comprehension interventions • EM: Standardized reading comprehension outcome measures • ED: Hours provided • ED: Grade level	• g = 0.49 • g = 0.45 • g = 0.24 • 0-5 hours, g = 1.00 • 6-15 hours, g = 0.66 • 16-25 hours, g = 0.27 • >26 hours, g = 0.18 • g = n.s.
Edmonds *et al.* (2009) [34] [USA]	13	1994-2004	Experimental and quasi-experimental	Middle and high school	Average of 26 hours per intervention	Reading (multiple outcomes)	• EM: Global outcomes. N = 13 • EM: Global results (standardized interventions). N = 7 • EM: Researcher developed measures. N = 9 • ED: Fluency. N = 1 • ED: Word attack. N = 2 • ED: Multicomponent. N = 3 • ED: Comprehension. N = 7	• d = 0.89 • d = 0.47 • d = 1.19 • d = n.s • d = n.s • d = 0.72 • d = 1.23
Torres (2016) [35] [USA]	20	2005-2013	Experimental and quasi-experimental	Preschool, elementary and middle school	Not specified	Reading (multiple outcomes)	• EM: Global outcomes (Targeted interventions with English Language Learners) • EM: Mean gain analysis (pre-post studies treatment vs. control group)	• d = 0.67 • d (test group) = 1.24 • d (control group) = 1.07

* Standardized mean difference: g = Hedges estimator [21]; d = Cohen estimator [22]. Statistically insignificant effect: n.s.; Small effect: 0.2; Average effect: 0.5; Large effect: 0.8.

Effectiveness of intensive interventions and forms of support

There are several programs that provide for intensive interventions and have been evaluated experimentally. Many of these programs also apply as targeted interventions. The dosage and extension of the intervention is established according to the students' needs. In the field of reading skills, we find *Reading Recovery* [26][25], the *Reading Mastery* programs [39] and *Corrective Reading* [40]. These last two programs have been developed as part of the whole-school reform model called *Direct Instruction*.

The first meta-analyses indicate positive effects of the intensive interventions in reading skills, especially interventions in very small groups.

The first meta-analyses dedicated to early education levels (preschool and elementary school) indicate positive effects of the intensive interventions in reading skills, especially interventions in very small groups that are conducted in preschool and the first year of elementary school [41] (Table 4). Although this review did not provide an average effect from the set of revised studies, the update published 10 years later indicated a positive average effect [42]. **The positive effects are maintained in the final years of elementary school and high school**, even if they are still smaller [43]. In fact, the effects are much lower than those seen in other, less intense interventions with adolescents [34].

As shown in some social experiments, the intensive interventions will be effective to the extent that they are applied without a time limit, in keeping with a protocol of individualized intervention with regular daily sessions that are almost one hour long. **These sessions may help to reduce the gap with classmates** [16] **or prevent drops in skill levels** [44]. Their effectiveness will also depend on the severity of the students' learning difficulties or disabilities [45].

Intensive interventions will be effective to the extent that they are applied without a time limit, in keeping with a protocol of individualized intervention with regular daily sessions.

Table 4.
Effectiveness of intensive intervention: reviews and meta-analyses

Reference (country)	Number of studies included	Years of the studies	Design of primary studies	Grade/s	Length	Outcomes	Average effects (EM) and differential average effects (ED)	Magnitude of the effect*
Wanzek and Vaughn, 2007 [41] [USA]	18	1995-2005	Experimental and quasi-experimental	Preschool and elementary school (until the third year)	100 sessions or more (20 weeks of daily interventions)	Reading	• ED: Length of the intervention (five/seven months, eight/nine months, over one year) • ED: Instructional group size (one-on-one, small groups) • ED: Grade level (preschool and first three years of elementary school) • ED: Degree of standardization	• No average effects are reported • No average effects are reported • No average effects are reported • g = n.s.
Wanzek *et al.*, 2018 [42] [USA]	25	1997-2015	Experimental and quasi-experimental	Preschool and elementary school (until the third year)	100 sessions or more (10-70 weeks)	Different reading outcomes	• EM: Global outcomes • ED: Group size. N = 17 / N = 8 • ED: Hours of treatment. N = 12 • ED: Grade level, intervention individualization, year of publication, ability level of the sample based on pretest standardized reading test scores	• g = 0.39 • Small group. g = 0.33 • One-on-one. g = 0.59 • 63 or less. g = 0.333 • Over 63. g = 0.45 • Impossible to calculate due to the lack of variation between studies
Burns *et al.* (2016) [USA] [20]	21	1999-2011	Experimental	Preschool, elementary school and middle school	Not specified	Cognitive function and reading(multiple outcomes)	• ED: Intensive interventions (individual). N = 16	• g = 0.44
Wanzek *et al.*, 2013 [43] [USA]	13	1995-2005	Experimental and quasi-experimental	Elementary school (starting in the fourth year) and high school	75 sessions or more	Reading	• EM: Global outcomes (reading comprehension). N = 22 • ED: Reading fluency. N = 9 • ED: Word reading. N = 12 • ED: Word reading fluency. N = 11 • ED: Spelling. N = 5 • ED: Group size, duration, grade level. N=22	• g = 0.10 • g = 0.16 • g = 0.15 • g = 0.16 • g = 0.15 • g = n.s.

* Standardized mean difference: g = Hedges estimator [21]; d = Cohen estimator [22]. Statistically insignificant effect: n.s.; Small effect: 0.2; Average effect: 0.5; Large effect: 0.8.

How effective are multi-tiered interventions and forms of support in preventing students from dropping out of school?

Continuous and systematic programs that are sustained over time and that provide for multiple interventions and forms of support and various years to implement are those that promote school attendance and reduce dropout rates.

Multi-tiered systems of support may be a good framework to respond effectively and efficiently to students at risk of dropping out of school [46]. Specifically, continuous and systematic programs that are sustained over time and that provide for multiple interventions and forms of support and various years to implement are those that promote school attendance and reduce dropout rates [47]. However, **there is no conclusive evidence that these programs help to boost high school graduation rates** [47].

Programs aimed at reducing truancy and dropping out of school include a wide variety of intervention methods, such as individual counseling, peer counseling, family therapy, behavior management, mentoring and more (Table 5) [48]. Below, we look at interventions that are carried out in the academic curriculum at the same time and that therefore involve some type of curricular adaptation, as well as at interventions that entail additional academic training.

Programs that provide additional academic training regarding the curriculum or that offer vocational courses show a positive impact in reducing truancy and dropping out.

Programs that provide additional academic training regarding the curriculum or that offer vocational courses show a positive impact in reducing truancy and dropping out [48]. Specifically, vocational training courses indicate a high impact, while programs that provide additional academic training, mentoring and help with schoolwork show a moderate positive impact. Specifically, programs geared towards vocational training, mentorship and the provision of additional academic training were associated with a fall in dropout rates of between 9.6 % and 12 % [49].

One of the success factors of programs to keep students in school is early and preventive implementation.

Furthermore, **intensive interventions** aimed at students with especially severe educational and social needs and chronic truancy problems **may have a positive and significant impact on school attendance rates** [50][51]. One of the success factors of programs to keep students in school is early and preventive implementation [52]. The reduction of the dropout rate will therefore depend on whether the program has been implemented at ages when truancy is still not a relevant problem, just at the start of middle school [52]. However, significant differences in effectiveness have not been identified between different types of intervention, whether centered on the group, family, mentoring or alternative education.

These results are confirmed in primary studies specifically oriented to programs that explicitly use a multi-tiered system of support to keep students in school [47] [53] (Box 3).

Box 3.
An example of a multi-tiered system of support to keep students in school: *Check & Connect*

Check & Connect is a school dropout prevention program based on constant supervision of learning, mentoring, one-on-one monitoring and other supportive interventions. Students are referred to the program when they show signs of disengagement with the school, such as truancy, behavioral problems and poor grades.

The program has two main components: "check" and "connect"

- The "check" component refers to continuous evaluation of the students' involvement in the school (level of attention and interest) through detailed supervision of their academic performance and other indicators (absences, late arrivals, reports on behavior, grades).
- The "connect" component involves providing one-on-one attention to students by program mentors, who help them to solve problems, enhance their skills and so on. Mentors work in collaboration with the school staff, families and service providers in the neighborhood.

Both components are implemented by the Check & Connect monitor, who plays the role of mentor. Monitors provide basic interventions to the students in their charge as well as intensive interventions to the students that need them:

- *Basic interventions*: structured meetings between the mentor and the student about his or her academic progress in school, behavioral issues and other matters. Meetings are weekly for elementary and middle school students and bimonthly for high school students.
- *Intensive interventions*: these are adapted to the specific circumstances of the students and their families, as well as to the resources of the school and the program. They focus on problem-solving (including mediation and social skill development) academic support (through assistance at home, time management and mentoring), recreational activities and community service.

The program also focuses on family disclosure, with monitors who have frequent contact with family members. The monitors can be university students or members of the community with social service training. Program coordinators, who supervise the monitors, can be school teachers or psychologists.

The experimental research conducted has indicated that **participation in this program is associated with a lower probability of leaving school early and with a boost to school attendance**. This program's effect on the probability of staying in school increases over time. Although students who followed the program showed a lower probability of dropping out and a higher probability of graduating from the control group, this effect was contained and statistically insignificant.

One of the explanations why the program had no impact on graduation was the fact that it was implemented too late to have a significant effect. Although the students participating in the program responded positively to the interventions, graduation rates were too shaped by the truancy of previous years [52]. This is why several authors point to **the importance of data and monitoring systems in order to identify students at risk of dropping out and to implement programs early** [54].

For further information:

Website of the Check & Connect project [47] [53]

Examples of experimental evaluations applied to this program:

Sinclair, M. F, Christenson, S. L., & Thurlow, M. L. (2005). Promoting school completion of urban secondary youth with emotional or behavioral disabilities. *Exceptional Children*, 71, 465-482. [47]

What Works Clearinghouse. (2015). *Check & Connect (Dropout Prevention)*. Institute of Education Sciences, WWC Intervention Report.
https://ies.ed.gov/ncee/wwc/Docs/InterventionReports/wwc_checkconnect_050515.pdf [53]

Table 5.
Effectiveness of multi-tiered interventions and forms of support in keeping students in school: reviews and meta-analyses

Reference (country)	Number of studies included	Years of the studies	Design of primary studies	Grade/s	Length	Outcomes	Average effects (EM) and differential average effects (ED)	Magnitude of the effect*
Tanner-Smith and Wilson, 2013 [48] [USA]	12	1985-2009	Experimental	Elementary school, middle school and high school	53 days on average	School truancy	• EM: Global outcomes • ED: Experimental research designs • ED: Additional academic training, tutoring, homework assistance (N = 8) •ED: Vocational/employment oriented programs (N = 4)	• g = n.s. • g = 0.23 • g = 0.38 • g = 0.84
Maynard *et al.*, 2012 [50] [USA]	16	1990-2009	Experimental and quasi-experimental	Elementary school, middle school and high school	1 to 72 weeks, average of 18.8 weeks	School attendance	• EM: Global outcomes • ED: Experimental research design (N = 5) • ED: Quasi-experimental design (N = 11) • ED: Grade level. N = 2 / N = 5 / N = 5 / N = 4 • ED: Type of program. N = 12 / N = 1 •ED: Focus modality. N = 5 / N = 4 / N = 3 / N = 3 / N = 1 • ED: Treatment duration	• g = 0.46 • g = 0.57 • g = 0.43 • Elementary school, g = 0.16 • Middle school, g = 0.53 • High school, g = 0.53 • Mixed grades, g = 0.46 • School-based, g = 0.47 • Community-based, g = 0.27 • Group, g = 0.60 • Family, g = 0.46 • Mentoring, g = n.s. • Alternative education, g = 0.50 • Contracting, g = n.s. • g = n.s.

* Standardized mean difference: g = Hedges estimator [21]; d = Cohen estimator [22]. Statistically insignificant effect: n.s.; Small effect: 0.2; Average effect: 0.5; Large effect: 0.8.

Does the effectiveness of the programs vary depending on the conditions and areas of implementation?

Some of the reviews and studies include an analysis of *factors that moderate* the effects. The moderating factors help to explain how and why an association is given between the response variable and implementation of the program (mechanisms). Thus, some possible moderating variables that interest us are the grade level, the length of the intervention, the size of the group and the resources used.

Grade level where applicable

We find mixed results in terms of differential results according to the grade level where the multi-tiered systems of support are implemented. For instance, **these programs do not show any differential effect according to the grade level** [43][31] [32]. However, there is evidence that **interventions carried out in early grades may have a greater impact on reading comprehension outcomes** [32]. A systematic review of the literature, for example, finds that these programs have the most relevant effects on preschool and the first few years of elementary school [41].

In **preschool**, interventions in multi-tiered systems of support have between a medium and high effect on some key language skill abilities [19], like letter recognition, listening comprehension, print knowledge and others. We illustrate this by showing the percentage of students who get better grades due to their participation in these programs (Graph 1): the percentage of students who achieve higher grades ranges from 60 % to nearly 80 % in those skills where the programs have a significant effect.

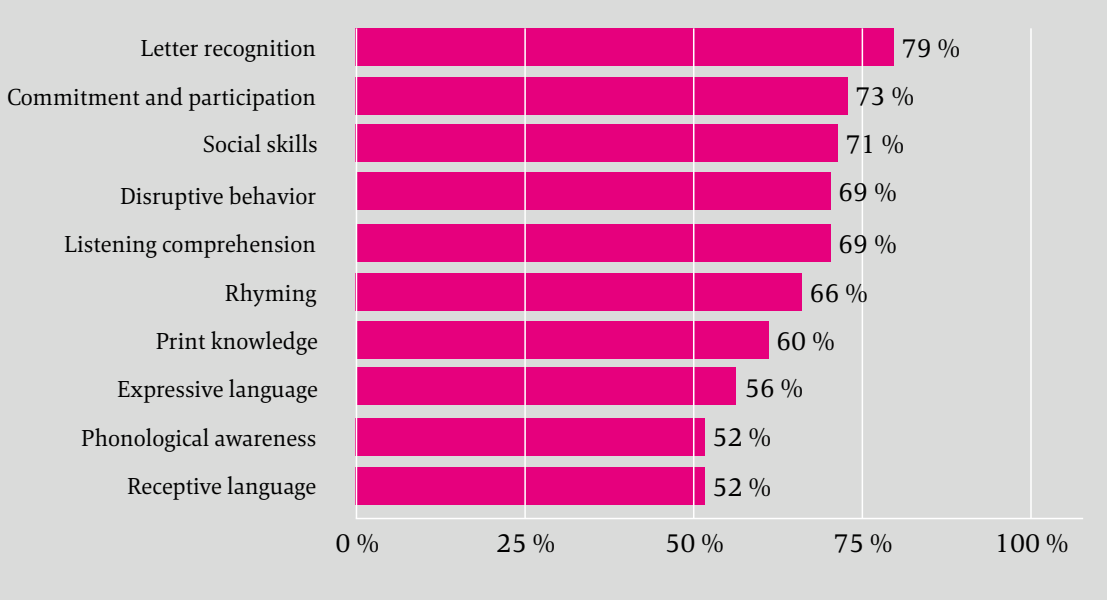
Tiered programs of support in preschool and elementary school have a significant impact on **closing the gaps in academic skills** between students with learning difficulties and the rest of the class.

- In **preschool**, interventions with children with reading difficulties can have positive effects in the short term and can even get participants in the program to perform better than other children without learning difficulties of the same age. Without continuity, however, this advantage can be reversed [14].
- In **elementary school**, interventions focused on the reading comprehension of children between the ages of 8 and 11 can close gaps, especially among younger students [15].
- In **high school**, programs addressed to adolescents with learning difficulties in middle school have a greater magnitude of effect than programs implemented with high school students [33]. To be successful, the programs must be preventive and sustained over time [16] [44].

Finally, effects are also observed in the **behavioral, social and relational dimension** according to the different levels of education:

- In **preschool**, a more significant impact is observed in engagement, but so is an increase in social skills and a reduction in challenging behaviors (Graph 1) [19].
- Targeted and universal interventions show more important effects in **elementary and high school** [17]. In **high school**, however, programs that plan for **multi-tiered interventions are those that show a positive impact on the reduction of cases with behavioral problems** [18].

Graph 1.
Interventions in multi-tiered systems of support in preschool: percentage of participating children who perform better than the average for non-participating children (academic and behavioral dimensions)



Source: based on data from Shepley & Grisham-Brown (2019) [19]

Length and dosage of the interventions

While there is some evidence that **shorter targeted programs have a more significant impact on promoting reading skills** [32], **we cannot say that the result is clear and unambiguous** [12][55][31][50]. Regarding their **dosage**, we can say that **it is better to conduct shorter sessions more frequently each week than longer sessions only once per week** [11].

Regular interventions sustained over time have a significant effect on learning and on school attendance rates.

Regarding intensive programs, there is a certain consensus that regular interventions sustained over time, which continue beyond the school year, have a significant effect on learning and on school attendance rates for students with special learning needs and social and behavioral problems [16][47]. **It is more important to extend the number of sessions than to extend the hours of intervention** [42].

Instructional group size: one-on-one attention vs. small groups

Although we see mixed results [55][43], **the size of the class group does seem to play a significant role in promoting some language skills,** such as receptive language or knowledge and the recognition of printed letters in preschool [19]. The support offered by these interventions improves significantly when it is planned

to work with small class groups combined with other methodologies, such as individual attention.

The research highlights the positive impact of working individually with students with learning disabilities.

There is also a great deal of research indicating the positive impact of working individually with students with learning disabilities [56]. While working in groups where the student-teacher ratio is higher (for example, 5:1) offers more opportunities for interaction with peers, research also tells us that students (in this case, in preschool) that are in groups with a ratio of 1:1 or 2:1 enjoy more frequent and better-quality opportunities to practice and receive one-on-one attention [57] [42].

In this regard, research on programs to promote reading comprehension or mathematical skills has important implications for multi-tiered systems of support [58]. Thus, **actions undertaken in a one-on-one manner are significantly effective in helping students to achieve the level of the rest of their classmates** who do not have learning difficulties. According to the summary of evidence published by the *Education Endowment Foundation*, the estimated impact would be equivalent to a five-month gain of average academic progress. However, research also tells us that 1:1 tutoring shows a moderate and high impact on the academic skills of students with learning difficulties [59].

Behavior is improved via targeted programs focused on individual attention rather than group attention.

The fact that interventions are conducted in small groups or individually not only benefits students cognitively, but also non-cognitively. Behavior, which includes students' disruptive and aggressive conduct, is improved via targeted programs focused on individual attention rather than group attention [17].

Computer-based support for the interventions

Computer-based support for interventions in multi-tiered systems of support contributes effectively to monitoring and tutoring students, as it provides information on student progress and helps to organize activities. Strategies that adopt technological means can be a form of educational support that enriches and complements the learning activities. It even helps us to rethink the importance of the teacher-student ratio that we addressed in the previous section.

In fact, some computer-assisted programs have shown positive effects on the academic skills of students with learning difficulties [28][60][61]. Thus, for example, one of the targeted programs implemented in the Success for All whole-school reform model has 1:1 tutoring in small groups using **computer support to organize the activities, ensure that all the reading material is introduced correctly and monitor progress in learning** [28]. Experimental research has indicated how **this program, implemented by non-specialized staff, achieves outcomes similar to 1:1 strategies** [58]. In addition, computer-supported activities allow tutors to conduct lessons with up to six students at a time, which increases the relationship between cost and effectiveness. This result is in line with studies carried out during the last 10 years [60][61].

Some computer-assisted programs have shown positive effects on the academic skills.

Furthermore, there are other **computer-supported programs that have a positive impact on promoting the skills of students with learning difficulties** and that can be used in targeted and intensive interventions. For example, there are computer-supported interventions to practice reading and help with reading comprehension [62], programs that **combine specialized support and computer assistance** to promote reading comprehension, phonemic awareness and decoding and naming speed [63][64], and programs that use **educational games to promote reading**, spelling and phonological skills [65]. Notably, this impact is also observed in computer-assisted programs focused **on mathematics** [37].

Summary

Interventions in multi-tiered systems of support show a significant effect on students' skills. This positive impact is observed in cognitive skills, both in reading comprehension and in mathematical skills. In addition, **this effectiveness is observed in both targeted and intensive interventions. Intensive ones will have a positive effect insofar as they are applied without a time limit, following an individualized intervention protocol, with regular daily sessions**.

These programs are also **effective in reducing gaps between students with learning difficulties and/or disabilities and students without them, although they do not cancel them out**. A more or less satisfactory response will depend on the severity of the students' learning difficulties or disabilities. Especially for the participants in the intensive interventions, the programs' effectiveness will be limited by preventing drops in skill levels.

In terms of prevention, **multi-tiered systems of support may also be a good framework to provide an effective and efficient response to students at risk of dropping out**. Specifically, we observe a positive impact on reducing truancy and school dropouts in curricular diversification programs that provide courses geared towards professions or additional academic training regarding the curriculum.

Interventions can also promote students' non-cognitive skills, like the social and behavioral dimension. Programs that provide for multi-tiered interventions (basic and intensive) may help to prevent and deal with disruptive behavior, social skills and engagement, especially when behavioral strategies are also used.

We can even talk about **intensive interventions' positive impact on students with chronic absenteeism**. In this case, however, **the programs must be preventive and implemented early**. They should be systematic and sustained over time and should provide for several years of implementation. This is why it is essential to have reliable data and monitoring systems in place to identify students at risk of dropping out early.

The effectiveness of these programs will depend on how they are implemented. Here are some favorable implementing conditions:

- **Early intervention:** although there are no clear differences between levels of education, there is evidence that the programs carried out in early grades would have a greater impact on academic skills. The probability of reducing dropout rates in high school increases when interventions are applied early.
- **Length and dosage:** targeted interventions are more successful when conducted in shorter sessions more frequently each week than longer sessions once per week. Regular interventions sustained over time, which extend beyond one academic year, have a positive effect on learning, school attendance rates and the social and behavioral dimension.

- **Group size:** actions carried out individually are significantly effective in helping students to catch up to the rest of their classmates. In both targeted and intensive interventions, individual attention also helps to deal with students' disruptive and aggressive behavior.
- **Computer-supported resources:** interventions that use computer support to manage the contents of the programs, but also to monitor and tutor students, have a significant impact on the promoting the skills of students with learning difficulties.

Table 6.
Arguments for and against multi-tiered systems of support

Multi-tiered systems of support	
Strengths	**Limitations**
Interventions in multi-tiered systems of support have a positive impact on students' cognitive skills (reading and mathematics).	Compared with reading skill, there is little evidence about the impact of these interventions on mathematics and no evidence regarding the rest.
Targeted and intensive interventions reduce the gaps between students with learning difficulties and/or disabilities and the rest, or they help to prevent drops in skill levels in cases of serious learning difficulties.	The interventions do not fully close the gap between students with educational support needs and the rest of their classmates.
Multi-tiered **interventions** help to boost attendance and reduce truancy levels.	There is no conclusive evidence that these interventions improve graduation rates in high school.
Programs that offer additional academic training regarding the curriculum, or that offer vocational courses, show a positive impact on reducing truancy and dropout rates.	Intensive interventions, for which individualized protocols and daily sessions without a time limit are advised, are very expensive.
Targeted and intensive interventions favor students' non-cognitive skills: they reduce disruptive behavior and improve social skills, engagement and participation.	The interventions have no impact if they are implemented with students who have already been truant for several years. To be effective, they must be implemented early and for several years.

Source: author's creation

Implications for practice

Addressing all educational multi-tiered interventions and forms of support in a comprehensive school system that responds to all students and covers all levels of education, and doing so effectively and efficiently, is one of the greatest challenges of the Catalan education system. A school system that is inclusive is a system where all students with special educational needs are taught in ordinary schools and where special education schools are only used in extraordinary circumstances. To a certain extent, the review carried out demonstrates that interventions in multi-tiered systems of support can make a positive contribution. This review allows us to outline some recommendations that could be useful for school and especially for education policy-makers.

- While it is true that targeted and intensive interventions have a positive impact, there is a need for **consistency in the way that universal interventions work**. Cooperative learning, socio-emotional education programs and metacognitive strategies are actions that effectively complement the objectives pursued by targeted and intensive programs.
- **Effective methods for diagnosing and monitoring the results of the interventions may be essential for using time and resources better**. To contribute to the effectiveness and efficiency of the interventions, it is necessary to improve and/or incorporate new methods of diagnosis, identification, follow-up and referral for targeted and/or intensive interventions of students with potential learning problems and for school attendance in high school.
- **Systems to continuously monitor educational progress are essential for closing the gap between participating students and to the rest of the class**. This involves monitoring the progress of students participating in targeted programs at least once per month and using the information to determine if they still require targeted interventions. For those who do not show enough progress, an intensive support plan must be designed.
- **Interventions of support must incorporate curricular enrichment programs as well as strategies for behavioral intervention**. Much of the positive impact of the multi-tiered interventions depends on specific, explicit, systematic and structured teaching programs that focus on different aspects of the curriculum (reading comprehension, mathematical skill) and on behavioral and relational management.
- Intensive programs are very expensive. **Investing in universal interventions and, to a certain extent, in targeted interventions**, may help to limit the number of students that need them. Obviously, this will depend on the severity of the learning difficulties and the degree of disability of the students that need intensive interventions.
- It is necessary to **provide enough specialized personnel to carry out the intensive programs**, whose success largely depends on the actions carried out individually. Support and monitoring must be performed by specialized staff who know how and where to act according to the students' educational needs.
- **Comprehensive intervention programs are required in compulsory secondary education to prevent students from dropping out**. Working frameworks should be created in collaboration with the families and local stakeholders and services,

in which there is continuous evaluation and supervision of the students' involvement in schools, including both academic and behavioral aspects, as well as a mentoring or support to solve problems and promote different skills among students at risk of dropping out.

None of the recommendations indicated will have too much to do without a **system of evaluation that focuses both on the process and the results of programs to support educational needs**:

- **Regarding the process**, the effectiveness and efficiency of the methods for diagnosing and monitoring educational needs must be evaluated. Information on how to make allocations to the programs will help to increase effectiveness, making for a better use of time and resources.
- **Regarding the results**, the effectiveness of the programs must be monitored, both in terms of promoting academic and social skills and preventing students from dropping out of school. This entails exploring the conditions of implementation (resources used, professionals, modalities and intervention methodologies) that favor the effectiveness of the programs.

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