

Tesis Doctoral

VALIDEZ DE LOS MODELOS
TRANSVERSALES CONTEXTUALIZADOS
COMO TÉCNICA DE DIAGNÓSTICO DE
LA EFICACIA ESCOLAR EN LOS CENTROS
ANDALUCES DE EDUCACIÓN PRIMARIA

Jesús García Jiménez

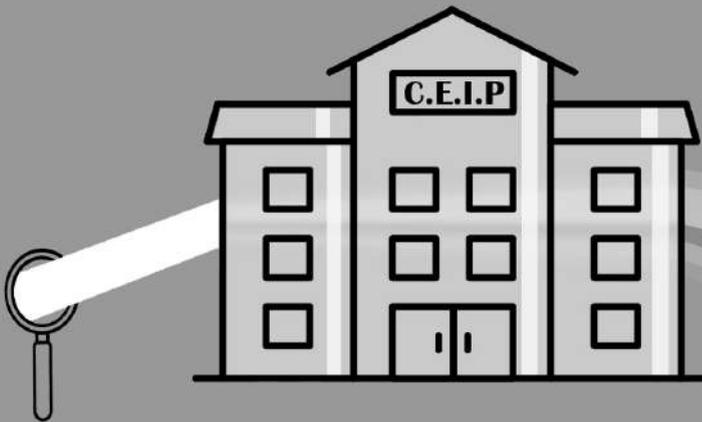


Directores: Juan Jesús Torres Gordillo y Javier Rodríguez Santero

Tesis Doctoral

VALIDITY OF CONTEXTUALISED
TRANSVERSAL MODELS AS A TECHNIQUE
FOR DIAGNOSING SCHOOL EFFECTIVENESS
IN ANDALUSIAN PRIMARY EDUCATION
CENTERS

Jesús García Jiménez



Directores: Juan Jesús Torres Gordillo y Javier Rodríguez Santero

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Normativa reguladora: Tesis por compendio de publicaciones

El formato de esta tesis por compendio de publicaciones se ajusta a lo establecido en el acuerdo (Acuerdo 6.1/CG 23-7-19) dentro del Capítulo 7, sección 1 (artículos 62-64) de la normativa de estudios de doctorado de la universidad de Sevilla (<https://doctorado.us.es/escuela/normativa/normativa-estudios-doctorado#art62>). La presente tesis la configuran 5 trabajos de relevancia científica publicados, siendo 3 de ellos artículos recogidos en revistas SJR y/o JCR, mientras los dos trabajos restantes son capítulos de libro de editoriales indexadas en SPI en el primer cuartil. Los trabajos incorporados por el doctorando Jesús García Jiménez están relacionados con el proyecto de tesis doctoral regulado por el RD 1393/2007 y el plan de investigación, que consta en el documento de actividades, regulado por el RD 99/2011.

La configuración de la presente tesis sigue los dictámenes marcados por la Universidad de Sevilla para la presentación de tesis por compendio de publicaciones, constando de: memoria donde se incluye una introducción que justifica la unidad temática de los trabajos presentados, los objetivos perseguidos, el resumen de los resultados, su discusión y conclusiones, incluyendo también los límites encontrados y la prospectiva y copia de todos los trabajos incluidos en la tesis.

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Abstract

The search for variables that influence school effectiveness and educational achievement is one of the priorities in educational science, since their detection could improve, in terms of quality and equity, the education received by students. Evaluation of large-scale educational systems has contributed to the study of school effectiveness, providing data for the implementation of advanced statistical techniques, and establishing comparative criteria at national and international levels.

The general objective of this thesis is to study the validity of multilevel hierarchical models to evaluate school effectiveness and to detect schools that operate at very high or very low performance. In this way, the evaluation results constitute a key element in improving the quality and equity of the educational system. For this purpose, data from the diagnostic evaluations (DE) of mathematical reasoning (MR) and linguistic communication (LC) competencies carried out by the Andalusian Agency for Educational Evaluation (AGAEVE) in the 2011-12, 2012-13, 2013-14, 2014-15 and 2016-17 academic years were used. This diagnosis is proposed as a preliminary step in a qualitative phase that aims to establish a catalog of good practices, through a comparative and in-depth study of the idiosyncrasies of centers of very high and very low efficiency.

The results corroborated that the multilevel hierarchical model is an appropriate technique for the detection of school effectiveness and the evaluation of educational performance. Among the characteristics of students associated with their performance, the Socioeconomic and Educational Index (SEI) of families stands out, improving results when it is high. Among the characteristics of schools, it can be mentioned that SEI, at the center level, was not significant, which could indicate that the Andalusian educational system is equitable for students in the second year of primary education. Furthermore, it was found that the criterion of extreme residual scores is optimal for the detection of efficacy, since its calculation is the result of the difference between the score expected by the predictor variables and the score actually obtained, which allows the incidence of contextual variables to be controlled.

In conclusion, multilevel models make it possible to diagnose the school effectiveness of educational centers, once the contextual variables have been controlled. This is extremely important because it could lay the foundation for making policy decisions in the field of education. In this sense, the results found point to the need to provide a greater number of resources to schools with lower performance, to pay for studies on the daily work of schools with very high or very low effectiveness in order to create contextualized improvement plans and to undertake concrete and precise improvements in the evaluation processes carried out by the educational inspectorate. Contextual variables, such as the SEI, are largely responsible for educational performance, it seems that, at the primary education level, it is not these variables that explain the greatest variance. This could mean that Andalusian schools at this educational level compensate in some way for the incidence of the context. Therefore, more research is needed on this phenomenon.

Resumen

La búsqueda de las variables que influyen en la eficacia escolar y el rendimiento educativo es una de las prioridades en las Ciencias de la Educación, ya que su detección podría mejorar, en términos de calidad y equidad, la educación que recibe el alumnado. La evaluación de los sistemas educativos a gran escala ha contribuido en el estudio de la eficacia escolar, facilitando datos para la implementación de técnicas estadísticas avanzadas y estableciendo criterios comparativos a nivel nacional e internacional.

La presente tesis plantea como objetivo general estudiar la validez de los modelos jerárquicos multinivel para evaluar la eficacia escolar y detectar los centros que operan a muy alto o muy bajo rendimiento. De esta forma, los resultados de evaluación constituyen una pieza clave para la mejora de la calidad y equidad del sistema educativo. Con dicho propósito se utilizaron los datos de las evaluaciones diagnóstica (ED) de las competencias de razonamiento matemático (RM) y comunicación lingüística (CL) realizadas por la extinta Agencia Andaluza de Evaluación Educativa (AGAEVE) en los cursos 2011-12, 2012-13, 2013-14, 2014-15 y 2016-17. Este diagnóstico se plantea como un paso previo a una fase cualitativa que tiene por objeto establecer un catálogo de buenas prácticas, a través del estudio comparativo y en profundidad de la idiosincrasia de los centros de muy alta y muy baja eficacia.

Los resultados han permitido corroborar que los modelos jerárquicos multinivel son técnicas adecuadas para la detección de la eficacia escolar y la evaluación del rendimiento educativo. Entre las características del alumnado que se asocian a su rendimiento destaca el Índice Socioeconómico y Cultural (ISEC) de las familias, mejorándose los resultados cuando es alto. Entre las características de las escuelas se podría mencionar que el ISEC, a nivel de centro, no fue significativo, lo que podría indicar que el sistema educativo andaluz es equitativo para el alumnado de segundo curso de Educación Primaria. Además, se comprobó que el criterio de las puntuaciones residuales extremas es óptimo para la detección de la eficacia, pues su cálculo es resultado de la diferencia entre la puntuación esperada por las variables predictoras y la realmente obtenida, lo que permite controlar la incidencia de variables contextuales.

En conclusión, los modelos multinivel permiten diagnosticar la eficacia escolar de los centros educativos, una vez controladas las variables contextuales. Este hecho resulta de suma importancia, porque podría sentar las bases para la toma de decisiones políticas en materia educativa. En este sentido, los resultados encontrados apuntan la necesidad de dotar de un mayor número de recursos a los centros de menor desempeño, sufragar estudios sobre el quehacer diario de los centros de muy alta o muy baja eficacia para crear planes de mejora contextualizados, y emprender mejoras concretas y precisas en los procesos de evaluación que realiza la inspección educativa. Si bien es cierto que existen variables contextuales, como el ISEC, responsables en gran medida del rendimiento educativo, parece ser que, a nivel de educación primaria, no son estas variables las que mayor varianza explican. Esto podría significar que los centros educativos andaluces en este nivel educativo compensan, de alguna manera, la incidencia del contexto. Por ello, es necesario mayor investigación sobre este fenómeno.

SECCIÓN 1: Memoria tesis doctoral



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Esta sección es la memoria de la tesis doctoral que consta de introducción que justifica la unidad temática de los trabajos presentados, los objetivos perseguidos, el resumen de los resultados, su discusión y conclusiones, incluyendo también los límites encontrados y la prospectiva.

1. INTRODUCCIÓN

Ofrecer una educación de calidad es uno de los objetivos consensuados en la sociedad, recogido dentro de la agenda 2030 (United Nations, 2017). Por ello, la búsqueda de las variables que influyen en el rendimiento educativo del alumnado y en la eficacia de los centros es una de las prioridades en el ámbito de las Ciencias de la Educación (Scheerens, 2015a, 2015b). Su detección permitiría mejorar la calidad y equidad de la educación que recibe el alumnado, favoreciendo el desarrollo social (OECD, 2017, 2018).

La evaluación del sistema educativo a gran escala ha supuesto un avance en el estudio de la eficacia escolar (OECD, 2013). Los resultados de estas evaluaciones repercuten también en la política y la sociedad, creando debates en torno a la calidad educativa y la eficacia de los sistemas educativos y sus escuelas (OECD, 2016a). Hay países que incluyen entre sus objetivos legislativos la mejora de los resultados en evaluaciones a gran escala, incorporando mecanismos para la evaluación del rendimiento y la eficacia de las escuelas (Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación; Ley Orgánica 8/2013, de 9 de diciembre, para la mejora de la calidad educativa). En el contexto andaluz se contaba con las evaluaciones ESCALA (EScritura, CALculo y Lectura en Andalucía), que eran realizadas por la AGAEVE (Agencia Andaluza de Evaluación Educativa). La AGAEVE contaba, entre sus funciones, con la evaluación del sistema educativo andaluz, favoreciendo una cultura de la evaluación escolar y persiguiendo la mejora del rendimiento del alumnado (Ley 17/2007, de 10 de diciembre, de Educación de Andalucía). Empero, la AGAEVE fue extinguida tras la ordenación de competencias de 2019, siendo sus funciones asumidas por la Dirección General de Ordenación y Evaluación Educativa (Decreto 525/2019, de 30 de julio, por el que se extingue la Agencia Andaluza de Evaluación Educativa).

Para la elaboración de la presente tesis se han utilizado los resultados de las evaluaciones ESCALA facilitados por la AGAEVE de los cursos 2011-12, 2012-13, 2013-14, 2014-15 y 2016-17. El acceso a estos datos fue posible gracias a la firma de un convenio entre la AGAEVE y el equipo de investigación que gestiona los proyectos en los que se enmarca la tesis: Diagnóstico del rendimiento educativo en educación primaria: un primer paso hacia la eficacia escolar (US-1263333) y Análisis de Centros Escolares Andaluces de muy Alta y muy Baja Eficacia: Pautas para la Mejora Escolar (EDU2017-84649-P). Tras valorar los datos y sus posibles aplicaciones, se propusieron las siguientes preguntas de investigación:

Tabla 1

Secuencia de preguntas de investigación

-
- | | |
|----|---|
| P1 | ¿Cuáles son las variables recogidas en las investigaciones indexadas en revistas JCR (Journal Citation Reports) y SJR (Scimago Journal Rank) que influyen en la eficacia escolar y qué diseños de investigación utilizan? |
| P2 | ¿Qué variables podrían influir en el rendimiento educativo del alumnado? |
| P3 | ¿Cuáles son las variables que se asocian con la eficacia de las escuelas? |
| P4 | ¿Es posible detectar los centros educativos de alta y baja eficacia, a través de los modelos jerárquicos lineales, así como evaluar la equidad y paridad de las escuelas? |
-

Partiendo de estas preguntas se elaboraron 3 artículos de investigación y dos capítulos de libro que conforman el compendio de la presente tesis. A continuación, se va a realizar un recorrido por los temas que incluye la tesis: evaluación educativa y su relación con la eficacia y mejora escolar, variables asociadas al rendimiento educativo del alumnado, los factores asociados a la eficacia escolar de las escuelas y el diagnóstico de la eficacia escolar. Tras ello, se expondrán los objetivos de investigación derivados de las preguntas expuestas y la relación con los trabajos de investigación que los desarrollan. Se continuará con un resumen de los principales hallazgos de investigación concretos de cada trabajo, para continuar con la discusión final donde se crea un diálogo entre ellos. Se incluyen también las limitaciones encontradas en la realización de la tesis doctoral, para finalizar con las conclusiones, destacando los hallazgos más importantes y la perspectiva, donde se abordan las posibles líneas de investigación futuras.

1.1. Evaluación educativa, eficacia y mejora escolar

La educación es una de las prioridades en la política educativa internacional (United Nations, 2017), ya que sus beneficios trascienden al ámbito escolar (Alhendi et al., 2021; Faruq & Taylor, 2011; OECD, 2021; Shi et al., 2014). Por ello, mejorar la calidad de la educación que recibe el alumnado es uno de los propósitos demandados desde la política educativa (Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación; Ley 17/2007, de 10 de diciembre, de Educación de Andalucía; OECD, 2021). Como herramienta indispensable para tal propósito se encuentra la evaluación educativa, al permitir el diagnóstico de los sistemas educativos, detectar los factores asociados al rendimiento educativo y, en consecuencia, optimizar la educación que recibe el alumnado (Ferrão, 2014; Johansson, 2016; Kauko et al., 2016; Kuhl et al., 2019; Kyriakides et al., 2018; OECD, 2013; Scheerens, 2015a, 2015b). Los resultados de estas evaluaciones actúan como referentes para decisiones en política educativa (LKauko et al., 2016; Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación; Martínez-Rizo & Silva-Guerrero, 2016), aunque en ocasiones también actúan como base empírica para legitimar agendas políticas con el riesgo de minusvalorar otras fuentes de información (Fischman et al., 2019). A gran escala, también han permitido la creación de estándares de referencia a nivel internacional (OECD, 2013).

La detección de factores asociados a la eficacia escolar y al rendimiento educativo se ha convertido en una de las aplicaciones más importantes de las evaluaciones a gran escala (Martínez-Abad et al., 2017; OECD, 2017; Rutledge et al., 2015). El conocimiento de estas variables permite establecer líneas de mejora para las escuelas; no obstante, la complejidad y la particularidad de los procesos educativos dificultan la generalización de los resultados (Reynolds & Neeleman, 2021). A pesar de estas limitaciones, hay una estrecha relación entre las investigaciones sobre eficacia escolar, que buscan los factores asociados al éxito educativo, y la mejora escolar, que persigue encontrar los procesos que optimizan la práctica educativa (Reynolds & Teddlie, 2002; Townsend, 2007).

El desarrollo de los estudios sobre eficacia escolar ha evolucionado a lo largo de los años. Su origen suele adjudicarse al Informe Coleman, tal y como se conoce al Equality of Educational

Opportunity Survey, que abrió la puerta al estudio de factores sociales asociados al rendimiento (Sotomayor & Cousinou, 2016). Este estudio se clasifica, según Reynolds & Teddlie (2002), en la primera etapa de las investigaciones sobre eficacia escolar. Según estos autores, esta se caracteriza por una concepción economista de la educación, donde se desarrollan estudios de entrada y salida utilizando pruebas estandarizadas como única referencia del éxito académico. Como réplica a este tipo de estudios aparece otra línea de investigación, que inicia la segunda etapa, en la que se incluyen variables relativas a los procesos educativos y amplían la concepción de éxito educativo, incorporando el buen comportamiento. En la tercera etapa se busca aplicar los resultados de los procesos educativos eficaces para crear escuelas de alta eficacia. En la cuarta etapa, gracias a los avances metodológicos, como los modelos multinivel, se incorporan las variables contextuales, permitiendo diferenciar la influencia de los factores en los diferentes contextos y priorizando la equidad frente a la eficacia.

En la actualidad, la aplicación de cuestionarios de contexto que acompañan a la evaluación del rendimiento, tanto a nivel internacional como nacional, ha posibilitado el uso de técnicas de análisis estadístico más complejas y fiables (Cordero & Manchón, 2014; Feldhoff et al., 2016; Gamazo et al., 2017; Jennings et al., 2015; Reynolds et al., 2014). El rendimiento educativo sigue considerándose como el principal criterio de eficacia escolar, considerando que las capacidades y contexto del alumnado influyen, pero también lo hace la práctica educativa que se recibe desde las escuelas (Reynolds et al., 2014). A continuación, se exponen las variables asociadas al rendimiento educativo del alumnado encontradas en las investigaciones educativas.

1.2. Variables del alumnado asociadas al rendimiento educativo

Hay factores contextuales y académicos que influyen en el desempeño del alumnado. En la literatura, se destacan variables como el ISEC (índice socioeconómico y cultural de las familias), el género, la condición de inmigrante y otras características académicas como la repetición, el rendimiento previo o la percepción de autoeficacia.

El ISEC es un índice que se calcula utilizando indicadores como el nivel educativo de los progenitores, los recursos disponibles en la familia o la renta, recabados normalmente por cuestionarios de contexto anexos a las evaluaciones (Gil-Flores, 2013; Willms & Tramonte, 2019). Estas variables son integradas en un mismo índice a partir de técnicas de análisis factorial (Gil-Flores, 2013; Willms & Tramonte, 2019). El ISEC es uno de los predictores más señalados en la literatura científica, asociándose con un mejor rendimiento cuando este es alto (Bokhove & Hampden-Thompson, 2022; Cordero & Manchón, 2014; Gamazo et al., 2017; Joaristi et al., 2014; Karakolidis et al., 2016; Kyriakides et al., 2019; Lizasoain et al., 2016; López-González et al., 2021; Murillo et al., 2014; Nagy et al., 2019; Ning et al., 2015; Perera, 2014; Scharenberg et al., 2019; Sortkær & Reimer, 2018; Sulis & Porcu, 2015; Tourón et al., 2019; van Hek et al., 2018; Wei, 2012; Wu et al., 2020). Otras variables señaladas por la literatura, aunque suelen ser consideradas para la construcción del ISEC (Gil-Flores, 2013), son la posesión de libros (Costa & Araújo, 2018; Evans et al., 2014), recursos familiares como disponer de mesa de estudio (Costa & Araújo, 2018; Sulis & Porcu, 2015; Troncoso et al.,

2016) o el nivel educativo completado por los progenitores (Yang et al., 2017). Además, existe una correlación entre el abandono escolar y el ISEC bajo (Mahuteau & Mavromaras, 2014), lo que limita la movilización social ascendente demandada en los Objetivos de Desarrollo Sostenible (United Nations, 2017). A ello, también se une que el estudiantado proveniente de familias con bajo ISEC tiene menos oportunidades de aprendizaje (Schmidt et al., 2015).

Otra de las variables más estudiadas en la literatura científica en relación con el rendimiento educativo es el género. Parece haber una relación entre peor desempeño de las alumnas en la competencia de razonamiento matemático y mejor en competencia comunicativa (Bokhove & Hampden-Thompson, 2022; Gamazo et al., 2017; Giambona & Porcu, 2018; Karakolidis et al., 2016; López-González et al., 2021; Muñoz-Chereau & Thomas, 2016; Ning et al., 2015; Özdemir, 2016; Perera, 2014; Scharenberg et al., 2019; Schmidt et al., 2015; Troncoso et al., 2016; van Hek et al., 2018; Wu et al., 2020). Sin embargo, en los primeros años de escolarización podría no tener ninguna asociación con el rendimiento (Muñoz-Chereau, 2019; Murillo et al., 2014) e incluso un mejor rendimiento en general de las alumnas (Kyriakides et al., 2019). Además, la influencia del género en el rendimiento podría variar en los distintos países debido a las concepciones sobre la mujer (Ning et al., 2015). Podría ser que los estereotipos asociados al género influyeran en la percepción de autoeficacia de las alumnas, al verse representadas en menor medida en los medios de comunicación o por otros mecanismos de origen cultural, y, por ello, disminuya su desempeño (Gentrup & Rjosk, 2018; Muñoz-Chereau, 2019).

La inmigración es un fenómeno complejo y sujeto a multitud de variables. No obstante, podría haber una relación entre inmigración y peor rendimiento (Bokhove & Hampden-Thompson, 2022; Gamazo et al., 2017; Heck & Reid, 2017; Joaristi et al., 2014; Lizasoain et al., 2016; Murillo et al., 2014; Perera, 2014; Scharenberg et al., 2019). Una posible explicación es la brecha en el lenguaje de las que parte el alumnado inmigrante cuando se incorpora al sistema educativo (Elosua, 2019; Karakolidis et al., 2016; Karssen et al., 2015). Además, podría ser que la mediación del ISEC y otras prácticas educativas en las familias, como la implicación en las escuelas, esté explicando este menor rendimiento (Elosua, 2019; Sakellariou, 2018).

En cuanto a otros factores de carácter académico, el rendimiento en las pruebas o en cursos anteriores es una de las variables que cuenta con mayor respaldo en la literatura científica (Giambona & Porcu, 2018; Joaristi et al., 2014; Kyriakides et al., 2019; Lizasoain et al., 2016). Podría estar relacionado con la autoeficacia percibida, es decir, el alumnado que ha recibido evaluaciones positivas se siente más confiado en tareas escolares posteriores (Karakolidis et al., 2016; Mohammadpour & Shekarchizadeh, 2015; Perera, 2014). En relación con esto, el peor rendimiento asociado a la repetición de curso (Cordero & Manchón, 2014; Gamazo et al., 2017) podría ser explicado por la autoeficacia percibida. La asistencia a la etapa preescolar, sobre todo para las familias con un ISEC más bajo, mejoraría los resultados (Cordero & Manchón, 2014; Karakolidis et al., 2016; OECD, 2017; Sulis & Porcu, 2015).

1.3. Factores asociados a la eficacia escolar N2

La influencia de los procesos educativos del centro escolar fue infravalorada en los primeros años de las investigaciones sobre eficacia escolar (Reynolds & Teddlie, 2002). No obstante, en la actualidad, las investigaciones certifican que las variables asociadas al centro educativo (N2) influyen en el desempeño académico (Costa & Araújo, 2018; Ferrão, 2014; Hofman et al., 2015; OECD, 2016a, 2016c, 2018, 2019a; Prior et al., 2021; Sortkær & Reimer, 2018; van Hek et al., 2018; Wu et al., 2020). Además, esta influencia se agudizaría cuando se avanza en el sistema educativo (Kyriakides et al., 2019; Spybrook et al., 2016). Los avances en la metodología de investigación sobre eficacia escolar han permitido la detección de las variables asociadas al centro educativo, al utilizar la perspectiva multinivel (OCDE, 2011; Scheerens, 2015a). Esta metodología aporta nuevas perspectivas sobre el comportamiento de las variables a nivel escolar (N2), al permitir agregar las variables de primer nivel e incluir variables específicas asociadas a los centros.

El estudio de las variables escolares ha revelado la brecha social y académica percibida por el alumnado, ya que podría haber una relación entre el ISEC promedio de los centros y la eficacia escolar (Gamazo et al., 2017; Karakolidis et al., 2016; Murillo & Martínez-Garrido, 2019; OECD, 2018, 2019a; Özdemir, 2016; Scharenberg et al., 2019; Sortkær & Reimer, 2018; van Hek et al., 2018). También, parece haber una relación entre el clima, la disciplina y el ISEC, repercutiendo negativamente en la eficacia de los centros con ISEC medio más bajo (Mohammadpour & Shekarchizadeh, 2015; Sortkær & Reimer, 2018). Para evitar esta desigualdad se recomienda hacer cambios en la matriculación en centros que evite la concentración de alumnado de bajo ISEC (OECD, 2019a), pues es una responsabilidad desde la política educativa el acceso a una educación equitativa y de calidad (Murillo & Martínez-Garrido, 2019). El uso de la perspectiva multinivel también permite controlar el efecto de las variables contextuales, como en este caso el ISEC, lo que facilita realizar una evaluación más precisa de la eficacia escolar. Una de las apreciaciones que, nuevamente, pone de manifiesto la inequidad del sistema educativo es que, una vez controlado el ISEC, el concierto educativo del centro no influye en la eficacia (Cordero & Manchón, 2014; Lizasoain et al., 2016; Wu et al., 2020).

El estudio de los agregados de género e inmigración también ha manifestado resultados de interés para la literatura científica. Podría haber una relación entre la mayor concentración entre alumnado inmigrante y peor eficacia (Gamazo et al., 2017; Heck & Reid, 2017; Joaristi et al., 2014), que manifiesta la desventaja a la que se somete el alumnado no nativo (Elosua, 2019). En cuanto al género, habría una relación entre mayor concentración de alumnas y mejores resultados académicos (Ning et al., 2015; van Hek et al., 2018), aunque otros autores señalan que no existe esta relación para la competencia matemática (Gamazo et al., 2017). Empero, también encontraríamos investigaciones que asociarían un mejor rendimiento a mayor proporción de alumnos en competencia lingüística (López-González et al., 2021).

Otra de las variables estudiadas en relación con el centro educativo ha sido la cantidad de alumnos en la escuela. Mientras algunos autores descartarían una relación entre el tamaño de la escuela con el rendimiento (Lizasoain et al., 2016), el resultado de algunas investigaciones sí asociaría un tamaño mayor al peor rendimiento (Cordero & Manchón, 2014; Egalite & Kisida, 2016). Hay otras variables cualitativas que influyen en la calidad de la enseñanza que ofrece el centro y que no están contempladas en los modelos multinivel. En el siguiente apartado, se ofrece una descripción de algunas de ellas, así como la metodología de investigación utilizada para su detección.

1.4. La detección de las escuelas eficaces e ineficaces: hacia la mejora escolar

En los años 70, los estudios sobre eficacia escolar se interesaron por conocer los procesos que hacían eficaces a las escuelas (Reynolds & Teddlie, 2002). Este interés, agregando avances metodológicos, ha llegado hasta nuestros días por las evidencias empíricas que ha constatado la asociación entre la eficacia escolar y los procesos educativos de las escuelas (Azpillaga et al., 2014; Gutiérrez-Ruiz et al., 2017; Intxausti et al., 2017; Joaristi et al., 2014; Lizasoain, 2020; Lizasoain et al., 2016; López-González et al., 2021; Martínez-Abad et al., 2017; OCDE, 2011; Tourón et al., 2019). Conocer las características de los procesos escolares contribuiría a mejorar la calidad y equidad que se ofrece desde los centros educativos (Kyriakides et al., 2018; Mahuteau & Mavromaras, 2014; OECD, 2017; Schmidt et al., 2015). Además, la detección de los centros educativos ineficaces permitiría la intervención desde la política educativa para su mejora (OECD, 2017).

En la detección de la eficacia de los centros, el control de las variables asociadas al contexto, como el ISEC, permite conocer el desempeño de estos sin tener en cuenta las limitaciones relacionadas con el contexto en que se encuentran (OCDE, 2011; OECD, 2018). Se parte de la consideración de que aquellos centros educativos situados en zonas más desfavorecidas encontrarían más limitaciones para alcanzar resultados académicos óptimos (Martínez-Abad et al., 2017). Los centros de muy alta eficacia (CAEF) o muy baja eficacia (CBEF) se podrían considerar de acuerdo con 4 criterios (Lizasoain, 2020):

- Tienen altas, o bajas, puntuaciones brutas en pruebas.
- Cuentan con una gran puntuación residual, es decir, obtienen puntuaciones muy distanciadas de lo que cabría esperar, a tenor de variables predictoras como el ISEC
- Crecimiento, o decrecimiento, de puntuaciones brutas en años determinados.
- Crecimiento, o decrecimiento, de puntuaciones residuales en diferentes cursos.

Además de la propia clasificación o detección de los centros de muy alta o muy baja eficacia, el estudio comparativo posibilita la detección de los procesos y prácticas educativas del quehacer diario de los centros que explicarían la eficacia asociada a los centros (Martínez-Abad et al., 2017). El control de estas variables mejoraría la equidad de los sistemas educativos, minimizando la brecha de desigualdad entre el estudiantado (OECD, 2017, 2019a; Schmidt et al., 2015; Valenzuela et al., 2016), objetivo que no están cumpliendo todos los

sistemas educativos en sus escuelas (Costa & Araújo, 2018; OECD, 2017, 2018, 2019a; Schmidt et al., 2015). Algunas de las prácticas educativas eficaces encontradas en la literatura científica son:

- Liderazgo: tendencia a un liderazgo democrático y compartido, con canales de comunicación eficaces (Day et al., 2016; Intxausti et al., 2017; Prasertcharoensuk & Tang, 2017; Tichnor-Wagner et al., 2016).
- Atención a la diversidad: planes sistematizados y adaptaciones curriculares, optimizando los recursos disponibles (Intxausti et al., 2017).
- Formación permanente: reciclaje constante del profesorado, con experiencias como la formación en cascada que facilita la incorporación a la práctica educativa (Lizasoain et al., 2016).
- Implicación emocional: en los centros eficaces existe un alto sentimiento de pertenencia y una alta implicación emocional con el alumnado y sus familias (Azpillaga et al., 2014; Rutledge et al., 2015).

Tras este repaso de la literatura, en la siguiente sección se presentan los objetivos de investigación, la relación de artículos que le corresponde a cada uno de ellos y una descripción de la metodología utilizada.

2. OBJETIVOS

Los resultados de España en evaluaciones internacionales, como PISA (Programme for International Student Assessment), están por debajo de la media europea y de los países que pertenecen a la OECD (Organisation for Economic Cooperation and Development) (OECD, 2019b). La preocupación por la mejora de estos resultados se manifestó en la anterior legislación educativa, en la LOMCE (Ley Orgánica para la Mejora de la Calidad Educativa), en la que se reflexionaba sobre este bajo desempeño y se coloca como una de las líneas de mejora (Gobierno de España, 2013). La nueva legislación, la LOMLOE (Ley Orgánica de Modificación de la Ley Orgánica de Educación), no hace referencia a los resultados de estas pruebas, pero sí coloca la evaluación educativa como uno de los pilares para el diagnóstico y la mejora escolar (Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación., 2020). Es, por ello, que el planteamiento de la presente tesis persigue lo dispuesto en la legislación estatal.

En el contexto andaluz, los resultados son aún más preocupantes, al estar por debajo de la media española (Consejería de Educación y Deporte, 2019). La información recogida de las evaluaciones, tanto nacionales como internacionales, debe utilizarse para la transformación y mejora del sistema educativo andaluz, persiguiendo, entre otros objetivos, el afianzamiento de la cultura de la evaluación [Acuerdo de 10 de noviembre de 2021, del Consejo de Gobierno, por el que se aprueba el Plan Estratégico de Evaluación Educativa de la Consejería de Educación y Deporte (2021-2027)]. El planteamiento de la presente tesis pretende utilizar los resultados de evaluación para la mejora de la calidad educativa, contemplando tanto el diagnóstico del rendimiento del alumnado como la eficacia de las escuelas. Se persigue

estudiar la validez de los modelos jerárquicos multinivel para la evaluación de la eficacia escolar y la detección de los centros que operan a muy alto o muy bajo rendimiento. Para ello, se analizarán los datos de las evaluaciones diagnósticas (ED) realizadas por la AGAEVE en los cursos 2011-12, 2012-13, 2013-14, 2014-15 y 2016-17. La detección se plantea como un paso previo para la comprensión en profundidad del trabajo cotidiano de los centros ineficaces y eficaces. Las conclusiones extraídas permitirían elaborar acciones y programas de mejora de la eficacia escolar contextualizados para mejorar los resultados de las escuelas. La investigación demanda que los resultados puedan incorporarse tanto al día a día de los centros educativos como a las políticas educativas (Hajisoteriou et al., 2018; Scheerens, 2015a, 2015b). Partiendo de las preguntas de investigación planteadas y las demandas de la literatura, se redactaron los objetivos de investigación para la tesis. La relación de las preguntas de investigación se presenta en la Tabla 2:

Tabla 2

Correspondencia entre preguntas de investigación (PI) y objetivos (O)

PI	Objetivos de investigación
P1: ¿Cuáles son las variables recogidas en las investigaciones indexadas en revistas JCR (Journal Citation Reports) y SJR (Scimago Journal Rank) que influyen en la eficacia escolar y qué diseños de investigación utilizan?	O1.1: Conocer las tendencias metodológicas de los artículos publicados sobre eficacia escolar en las revistas indexadas en JCR (WoS) y SJR (Scopus), en el periodo comprendido entre 2014 y 2018. O1.2: Describir los resultados que explican la eficacia escolar en los artículos de revistas indexadas en JCR (WoS) y SJR (Scopus), en el periodo comprendido entre 2014 y 2018.
P2: ¿Qué variables podrían influir en el rendimiento educativo del alumnado?	O2: Explorar las variables contextuales asociadas al rendimiento educativo del alumnado de las competencias en CL (comunicación lingüística) y RM (razonamiento matemático).
P3: ¿Cuáles son las variables que se asocian con la eficacia de las escuelas?	O3: Averiguar en qué medida las variables sociales, culturales y académicas del alumnado y del centro, percibidas por las familias, influyen en el rendimiento de las competencias de RM y CL, mediante modelos lineales jerárquicos.
P4: ¿Es posible detectar los centros educativos de alta y baja eficacia, a través de los modelos jerárquicos lineales, así como evaluar la equidad y paridad de las escuelas?	O4.1: Evaluar la relevancia de los criterios de alta puntuación residual y bruta en la selección de CAEF y CBEF. O4.2: Comprobar el nivel de equidad y paridad existente en los centros escolares andaluces en relación con el dominio de CL.

La tesis se ha realizado siguiendo el modelo de compendio que consiste en la agrupación de trabajos de investigación de relevancia científica, tal y como recoge la normativa de la Universidad de Sevilla (Acuerdo 6.1/CG 23-7-19) en el capítulo 7, sección 1. Se ha difundido la tesis a través de dos tipos de publicaciones de relevancia científica: artículos de revistas (AR) indexados en JCR y/o SJR y capítulos de libro (CAL) publicados en SPI (Scholarly Publisher Indicators) Q1. Los objetivos de investigación se han alcanzado siguiendo diferentes técnicas de recogida y análisis de datos (AD). En concreto, se han utilizado, principalmente, 3 metodologías diferentes:

- AD1. Revisión sistemática: permite profundizar en el estado de la cuestión sobre un tema, recopilando, sistematizando y relacionando los resultados de diferentes trabajos empíricos (Higgins et al., 2019; Manterola et al., 2013; Martimbianco et al., 2020; Prendes-Espinosa et al., 2020). Para su realización se utilizaron otras técnicas: el análisis temático, con el que se seleccionaron los temas de estudio (Braun & Clarke, 2006); la revisión conceptual sistemática, que consistió en un análisis descriptivo de los artículos seleccionados con base en criterios como el método empleado, el cuartil de impacto o la base de datos donde está indexado (Feldhoff et al., 2016; Hallinger, 2014); y la síntesis narrativa, con la que los resultados de las investigaciones fueron sintetizados, relacionados y enfrentados para extraer nuevas conclusiones (Kauffman, 2015).
- AD2. Árboles de segmentación jerárquica: es una técnica de investigación exploratoria que se encuadra dentro de la minería de datos, cuyo objetivo es la exploración, predicción y construcción de patrones de las variables asociadas, en este caso, a la eficacia escolar (Anwar & Ahmed, 2013; Martínez-Abad & Chaparro-Caso, 2017). Concretamente, los árboles de segmentación jerárquica facilitan la interpretación de datos, reduciendo el número de variables independientes y mostrando patrones, que podrían explicar un fenómeno, clasificando valores de las variables independientes para predecir los valores de una variable dependiente (Berlanga et al., 2013; Escobar, 2007; Gonzalez et al., 2018; Schumacher et al., 2010).
- AD3. Diseño jerárquico multinivel: es un tipo de análisis de regresión que permite la construcción de un modelo a distintos niveles. Es decir, permite considerar los datos anidados en grupos jerárquicos como alumnos dentro de escuelas (Gaviria & Morera, 2005; Raudenbush & Bryk, 2002). La complejidad de los sistemas educativos y su organización en niveles hacen recomendable el uso de estos modelos (Gaviria & Morera, 2005; Lizasoain, 2020).

La distribución de los artículos por sus objetivos específicos y técnica empleada se presenta en la Tabla 3:

Tabla 3

Distribución de objetivos específicos (OE) de la tesis por trabajos publicados y análisis de datos realizado (AD)

Publicación de relevancia científica	OE	AD
AR1: What is Published in Impact Journals on School Effectiveness? A Systematic Review of Research Results and Methods https://doi.org/10.15823/p.2020.138.1	O1.1 O1.2	AD1
AR2: Influence of Contextual Variables on Educational Performance: A Study Using Hierarchical Segmentation Trees https://doi.org/10.3390/su12239933	O2	AD2
CAL1: La exploración del rendimiento educativo a través de árboles de segmentación	O2	AD2
AR3: Factors Associated with School Effectiveness: Detection of High- and Low-Efficiency Schools through Hierarchical Linear Models https://doi.org/10.3390/educsci12010059	O3 O4.1	AD3
CAL2: Equidad y paridad en centros educativos andaluces: un análisis a través de la competencia lingüística de las pruebas escala	O4.2	AD3

3. RESUMEN DE RESULTADOS

A1: What is Published in Impact Journals on School Effectiveness? A Systematic Review of Research Results and Methods

García-Jiménez, J., Torres-Gordillo, J., & Rodríguez-Santero, J. (2020). What is Published in Impact Journals on School Effectiveness? A Systematic Review of Research Results and Methods. *Pedagogika*, 138(2), 5-24.
<https://doi.org/10.15823/p.2020.138.1>

Antecedentes teóricos:

- La eficacia y mejora escolar es un tópico de interés en la literatura científica.
- Hay variables contextuales externas al propio centro educativo que explicarían el rendimiento educativo del alumnado.
- Las escuelas pueden obtener resultados diferentes en cuanto a su eficacia, existiendo variables contextuales del propio centro educativo, que podrían explicar estas diferencias.

Contribución de esta publicación:

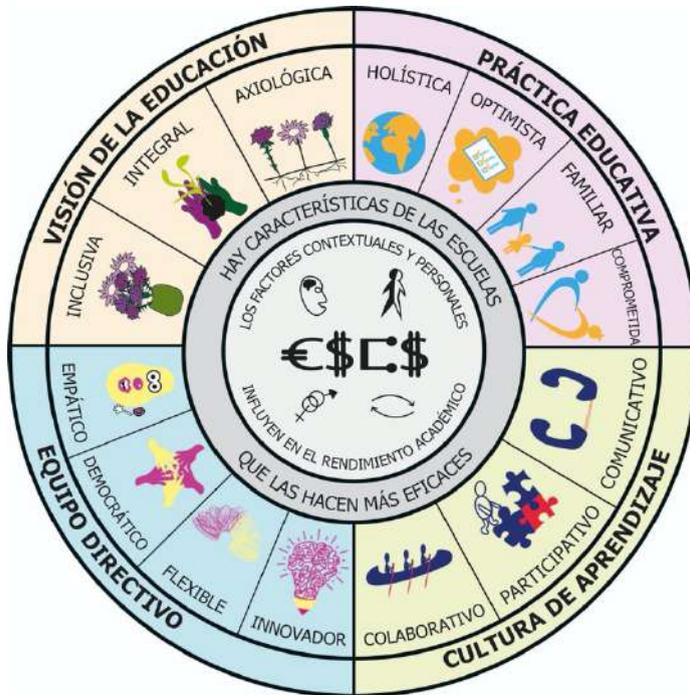
- La mayoría de las investigaciones encontradas son de carácter cuantitativo.
- La literatura señala que las variables ISEC, género, inmigración o la repetición podrían explicar la diferencia en el rendimiento educativo.
- Hay determinadas características de las escuelas que explicarían su diferencia de eficacia con respecto a otras (ver Figura 1).

Implicaciones prácticas de esta publicación:

- Las investigaciones cualitativas aportan otra visión que merece ser tomada en cuenta.
- La caracterización de las escuelas eficaces ayudaría a la creación de planes de mejora para las escuelas ineficaces.
- Reconocer las dificultades que se encuentran los centros educativos ineficaces contribuiría a su mejora con la intervención de la política educativa.

Figura 1

Resumen de las principales características detectadas en las escuelas eficaces, junto con los factores contextuales (adaptado de García-Jiménez et al., 2020a)



A2: Influence of Contextual Variables on Educational Performance: A Study Using Hierarchical Segmentation Trees

García-Jiménez, J., Rodríguez-Santero, J., & Torres-Gordillo, J. (2020). Influence of Contextual Variables on Educational Performance: A Study Using Hierarchical Segmentation Trees. *Sustainability*, 12(23), 9933. <https://doi.org/10.3390/su12239933>

Antecedentes teóricos:

- La minería de datos puede detectar patrones de eficacia escolar. Concretamente, el algoritmo CRT (Classification and Regression Trees) hace una clasificación binaria, incluyendo más niveles y permitiendo mayor facilidad de interpretación.
- Las evaluaciones a gran escala posibilitan el conocimiento de la realidad educativa a través del diagnóstico de las variables que influyen en el desempeño educativo, entre otras aplicaciones.
- Variables como un bajo ISEC, no acudir a la etapa de preescolar o la condición de inmigrante se asociarían con un peor rendimiento educativo.

Contribución de esta publicación:

- El ISEC es la variable seleccionada por el algoritmo como la que mejor clasifica el rendimiento educativo.
- Un tiempo de dedicación a las tareas mayor o nacer en los últimos 6 meses del año se asociaría con peores resultados.
- Los alumnos tienen peor desempeño en CL que las alumnas.

Implicaciones prácticas de esta publicación:

- Detectar las variables asociadas al rendimiento contribuiría a la detección de patrones de alumnado en riesgo de fracaso escolar. Esto permitiría su caracterización para su posterior intervención.
- Las variables contextuales seleccionadas, al nivel de segundo de Educación Primaria, no serían determinantes para el logro académico, por lo que se podría inferir que son las características personales y de la escuela las que tendrían mayor relevancia.
- Los resultados invitan a reflexionar sobre el menor desempeño de los alumnos, frente a las alumnas, en la competencia de CL, ya que sería necesario una mayor atención para solventar brechas entre géneros.

CAL1: La exploración del rendimiento educativo a través de árboles de segmentación

García-Jiménez, J., Torres-Gordillo, J., & Rodríguez-Santero, J. (2021). La exploración del rendimiento educativo a través de árboles de segmentación. In I. Aznar-Díaz, J. López-Nuñez, M. Cáceres-Reche, C. De Berros-Camargo & F. Hinojo-Lucena (Eds.), *Desempeño docente y formación en competencia digital en la era SARS COV 2* (pp. 797-806). Dykinson.

Antecedentes teóricos:

- Los resultados de las evaluaciones diagnósticas suelen utilizarse para realizar cambios en materia de política educativa. Las evaluaciones a gran escala constituyen un estándar de referencia para inferir las tendencias educativas en diferentes países.
- La minería de datos puede detectar patrones de eficacia escolar. Concretamente, el algoritmo CHAID (CHi-square Automatic Interaction Detector) permite la clasificación en

más de dos ramas, por lo que presenta un árbol de más ramas y menos niveles, con una apariencia más horizontal.

- Las variables contextuales influyen en el rendimiento educativo.

Contribución de esta publicación:

- La variable seleccionada por el algoritmo que mejor clasifica el rendimiento educativo sería expectativas familiares.
- Las expectativas familiares explicarían el rendimiento educativo del alumnado y protegería al alumnado de bajo ISEC de su influencia.
- El alumnado nacido en los últimos seis meses del año tendría peor desempeño en ambas competencias.

Implicaciones prácticas de esta publicación:

- La detección de las variables que limitan el rendimiento educativo contribuiría a la mejora de la calidad educativa que recibe el alumnado.
- Los modelos explican solo un 9 % de la varianza, por lo que es necesario la ampliación del estudio de las variables que influyen en el rendimiento educativo para construir modelos más certeros.
- Este resultado también indicaría que los centros educativos andaluces paliarían, de alguna forma, la incidencia del ISEC del alumnado.

A3: Factors Associated with School Effectiveness: Detection of High- and Low-Efficiency Schools through Hierarchical Linear Models

García-Jiménez, J., Torres-Gordillo, J., & Rodríguez-Santero, J. (2022). Factors Associated with School Effectiveness: Detection of High- and Low-Efficiency Schools through Hierarchical Linear Models. *Education Sciences*, 12(1), 59. <https://doi.org/10.3390/educsci12010059>

Antecedentes teóricos:

- Es posible clasificar las escuelas en eficaces e ineficaces atendiendo a sus puntuaciones brutas y puntuaciones residuales.
- Los modelos jerárquicos multinivel permiten conocer el comportamiento de las variables a distintos niveles, por tanto, en Educación, respetan la estructura anidada de los datos.
- Hay características a nivel escolar que influyen en la eficacia de las escuelas.

Contribución de esta publicación:

- La puntuación residual es un criterio válido para la valoración de la eficacia de los centros, ya que permite controlar la incidencia de variables contextuales, mientras que las puntuaciones brutas no lo permiten.

- Hay variables, tanto a nivel individual como a nivel de centro, que influyen en la eficacia escolar.
- Hay variables con diferencias estadísticamente significativas, con un efecto moderado, como las expectativas familiares o el compromiso lector, que presentarían un mayor nivel en los CAEF.

Implicaciones prácticas de esta publicación:

- La clasificación de la eficacia de los centros es una herramienta de diagnóstico que valdría para la orientación de la intervención educativa de los centros menos eficaces y promover la equidad del sistema educativo andaluz.
- La caracterización de los CAEF y CBEF puede contribuir a la creación de planes de mejora que permitan la optimización de los centros, así como la detección de las características que limitan su eficacia.
- Los resultados podrían indicar una brecha de género, con un menor desempeño de los alumnos respecto a ellas, que merece un estudio y revisión en mayor profundidad.

CAL2: Equidad y paridad en centros educativos andaluces: un análisis a través de la competencia lingüística de las pruebas ESCALA

García-Jiménez, J., Lucas-Oliva, I., Torres-Gordillo, J., & Rodríguez-Santero, J. (2021). Equidad y paridad en centros educativos andaluces: un análisis a través de la competencia lingüística de las pruebas ESCALA. In I. Aznar-Díaz, C. Rodríguez-Jiménez, M. Ramos & G. Gómez-García (Eds.), *Desafíos de la investigación y la innovación educativa ante la sociedad inclusiva* (pp. 371-380). Dykinson.

Antecedentes teóricos:

- Los modelos jerárquicos multinivel pueden servir para evaluar la paridad y equidad de los centros escolares.
- No todas las escuelas son igual de equitativas y paritarias.
- La escolarización ha sido de vital importancia para la democratización de la sociedad y la consecución de una equidad educativa.

Contribución de esta publicación:

- La diferencia en las intersecciones indica que hay centros más eficaces que otros.
- Los centros educativos con mejores resultados podrían ser más equitativos en cuanto al sexo.
- Los centros educativos con mejores resultados serían más inequitativos, tomando como referencia el ISEC.

Implicaciones prácticas de esta publicación:

- El diagnóstico de la paridad y equidad del sistema educativo puede ser una herramienta, al servicio de las políticas educativas, para la toma de decisiones más adecuadas en materia de intervención educativa.
- La existencia de centros más eficaces que otros pone de manifiesto que el sistema educativo tiene una brecha de equidad.
- La diferencia entre pendientes indica que no todos los centros son igual de equitativos o paritarios, por lo uno de los objetivos de la política educativa debería ser acabar con esta diferenciación que limita la función democratizadora de la escolarización.

4. DISCUSIÓN

El desarrollo de la presente tesis ha constituido una aportación al corpus de conocimiento sobre eficacia escolar y rendimiento educativo. Algunos resultados son consistentes con la literatura previa y otros han servido de punto de partida para nuevas reflexiones. A continuación, se ofrece la discusión de los resultados por objetivos de investigación, con objeto de ampliar y comparar lo obtenido con la literatura científica actual.

Para los objetivos O1.1 y O1.2 se realizó una revisión sistemática de artículos sobre la temática indexados en SJR y JCR durante el periodo 2014-2018. La metodología cuantitativa tuvo mayor prevalencia que la mixta y la cualitativa. Aunque la propia búsqueda de los artículos pudo ser un sesgo, también podría ser que las revistas son más reticentes a la publicación de estudios cualitativos de evaluación educativa (Fernández-Navas & Postigo-Fuentes, 2020) y muestran una preferencia por los artículos positivistas (Fernández-Navas & Postigo-Fuentes, 2020; Fielding, 2020; Maxwell, 2020). Además, la diversidad de evaluaciones diagnósticas a nivel nacional e internacional facilitan e, incluso, promueven, la investigación cuantitativa (Cordero & Manchón, 2014; Feldhoff et al., 2016; Gamazo et al., 2017; Jennings et al., 2015; Reynolds et al., 2014). Sin embargo, la aportación del paradigma cualitativo puede enriquecer la temática (Rutledge et al., 2015), teniendo en cuenta que el fenómeno educativo es complejo, multivariante y multinivel (Gaviria & Morera, 2005; López-González et al., 2021). En cuanto al O1.2, los estudios sobre eficacia escolar ilustran que hay determinados factores contextuales, especialmente el ISEC, que influyen en el rendimiento educativo (Kyriakides et al., 2019; Nagy et al., 2019; Scharenberg et al., 2019; Schmidt et al., 2015). Empero, también hay determinadas características de las escuelas que las hacen diferir en eficacia (Azpillaga et al., 2014; García-Jiménez et al., 2020; Joaristi et al., 2014; Lizasoain, 2020; Lizasoain et al., 2016; López-González et al., 2021; Tourón et al., 2019), y, por tanto, compensarían las diferencias individuales del alumnado (García-Jiménez et al., 2022). Algunas de estas características son (García-Jiménez et al., 2020): la visión de la educación, con arraigo de valores compartido y visión de la educación como proceso integral e inclusivo; la práctica educativa, que contempla el fenómeno educativo de forma holística y en su complejidad; el equipo directivo se caracterizaría por ser democrático y empático en la toma de decisiones y gestión del centro, adaptándose con flexibilidad a las demandas planteadas; por último, la cultura de aprendizaje estaría caracterizada por el establecimiento de buenos canales de comunicación que promueven la participación y colaboración de toda la comunidad educativa.

Con objeto de conocer la influencia de las variables contextuales, se planteó el objetivo O2, realizando sendos árboles de segmentación. El ISEC fue una de las variables más importantes en la explicación del rendimiento, tal y como ya se indicaba en la literatura (OECD, 2016a, 2016b). Las expectativas familiares fue otro factor priorizado por ambos algoritmos, e incluso sería un factor protector para el alumnado de ISEC más desfavorecido. Ello podría deberse a que las familias con alumnado de mayor rendimiento también percibirían una permanencia en el sistema educativo mayor, aunque también se debería a que hay alumnado que cuenta con mayor capital social y apoyo de sus familias. Además de las otras variables indicadas en los árboles de segmentación, el resultado que se destacaría es que los árboles de segmentación solo explicaron entre un 9 y 10 % de la varianza. Ello indicaría que los centros educativos andaluces son equitativos y compensan la influencia de las características contextuales del alumnado. También podría ser porque en estas edades escolares sean otras características individuales las que tendrían mayor peso en el rendimiento (Demetriou et al., 2020; Finders et al., 2021; Nelson et al., 2017; Watts et al., 2018). No obstante, la escolarización y la estimulación desde edades tempranas se ha demostrado como una de las herramientas democratizadoras y promotoras de la equidad en la sociedad (Kulic et al., 2019; OECD, 2017; Roos et al., 2019).

En cuanto al O3, referido a los niveles de alumnado y de centro, realizado a través de modelos jerárquicos multinivel, volvemos a encontrar el ISEC como la variable de mayor influencia a nivel individual, pero no al nivel de centro, donde solo fue significativa un año y para la competencia de CL. De nuevo, los resultados indicarían que los centros educativos andaluces son equitativos. Entre algunas variables destacadas a nivel individual se destacaría el sexo, el tiempo de pantallas o el compromiso con el estudiante. Las alumnas obtendrían mejores resultados en ambas competencias, en contra de algunos estudios que señalarían un mejor desempeño de los alumnos en RM (Gamazo et al., 2017; Giambona & Porcu, 2018; Joaristi et al., 2014; Muñoz-Chereau & Thomas, 2016; Ning et al., 2015; Özdemir, 2016; Perera, 2014; Scharenberg et al., 2019; Schmidt et al., 2015; Troncoso et al., 2016; van Hek et al., 2018; Wu et al., 2020), indicando una posible brecha de género entre el estudiantado. Cuando el compromiso con el estudiante o el tiempo de tareas son altos, se registró una tendencia a la obtención de un peor rendimiento educativo (López-González et al., 2021; Wei, 2012). Podría inferirse que el alumnado de peor rendimiento necesitaría más tiempo para la realización de tareas y mayor atención familiar. El tiempo de pantallas, cuando fue alto, se asoció con mayor rendimiento. Este resultado requiere una mayor reflexión y profundización, pues otros estudios apuntan que un alto consumo de tecnología a edades tempranas sería desfavorable para el rendimiento y el desarrollo (Dempsey et al., 2019; Gómez-Gonzalvo et al., 2020; Madigan et al., 2019), especialmente en las familias más desfavorecidas, que serían menos conscientes de su uso (Bonal & González, 2020; Camerini et al., 2018).

En cuanto al nivel dos, aparte del ISEC, cabe señalar que se asoció un peor rendimiento a los centros concertados. Esto podría ser debido, nuevamente, a que los centros escolares andaluces, concretamente los públicos, compensen de alguna forma las desigualdades o que se trata de un ajuste del modelo. A tenor de los resultados, sería recomendable que las clases fueran heterogéneas en cuanto al sexo (López-González et al., 2021). En cuanto al consumo

de pantallas, hubo un cambio de dirección a nivel de centro, es decir, mayor consumo de pantallas se relacionó con peor rendimiento, que es más coherente con lo expuesto anteriormente (Dempsey et al., 2019; Gómez-Gonzalvo et al., 2020; Madigan et al., 2019). Por lo tanto, son necesarios más estudios que investiguen la cuestión. Los centros que demandan menos deberes serían más eficaces, quizás debido a una mejor gestión del tiempo (Gutiérrez-Ruiz et al., 2017). Igualmente, es necesario mayor profundización sobre esta variable.

El objetivo O4.1 perseguía la evaluación de las puntuaciones brutas y residuales como criterio de diagnóstico de la eficacia de los centros y el O4.2 la comprobación del nivel de equidad y paridad en los centros educativos andaluces. Ambos se realizaron utilizando modelos jerárquicos lineales. El uso de puntuaciones residuales fue valorado como una medida más adecuada para el diagnóstico de la eficacia, ya que permitía controlar la influencia del ISEC, existiendo una alta correlación entre este criterio y el de puntuaciones brutas que finalmente se descartó. Como se expuso en el O1.2, hay características de los centros que los hacen más eficaces que otros. Por ello, la detección y evaluación de la eficacia de los centros es una herramienta necesaria, tanto para su diagnóstico y posterior intervención, como para su caracterización, con objeto de generalizar prácticas educativas eficaces (Joaristi et al., 2014; Lizasoain, 2020; Lizasoain et al., 2016; López-González et al., 2021; Martínez-Abad et al., 2017; OCDE, 2011; OECD, 2018). Por otro lado, también es posible el diagnóstico de la equidad y paridad de los centros a través de los modelos jerárquicos lineales, permitiendo así la evaluación de la eficacia desde sendos criterios (Lizasoain, 2020). Sin olvidar la complejidad del sistema educativo (López-González et al., 2021; Scheerens, 2015a), la aplicación práctica de los análisis contribuiría a la mejora de la eficacia, paridad y equidad de los centros educativos andaluces. Por ello, la aportación desde la evaluación educativa a la función democratizadora de la escuela y la movilidad social ascendente propuesta desde la agenda 2030, podría ser tanto el diagnóstico de la eficacia, equidad y paridad, como la detección de patrones y variables que promueven o dificultan la eficacia escolar como punto de partida para intervenciones en materia de mejora y política educativa.

5. CONCLUSIONES

O1.1: To know the methodological trends of articles published on school effectiveness in journals indexed in JCR (WoS) and SJR (Scopus), in the period 2014 to 2018.

- Quantitative studies were the most widely used in this area, particularly multilevel hierarchical designs. However, qualitative and mixed studies are underrepresented in the subject. The complexity of research in education invites the integration of all available paradigms, with the possibility that journals indexed in JCR and SJR show a preference for quantitative studies, traditionally associated with science.

O1.2: To describe the results explaining scholarly efficacy in journal articles indexed in JCR (WoS) and SJR (Scopus), in the period 2014 to 2018.

- There are contextual and personal characteristics of the student body that would explain performance, such as ISEC, gender, grade repetition or immigration. However, there are also characteristics of schools that would make them more effective. The study of effective and ineffective schools can serve as a reference for the detection of patterns in the daily work of schools that would improve their performance. Some of the characteristics detected would be: shared leadership, the establishment of good communication channels, a holistic vision of education and the comprehensive development of students.

O2: To explore the contextual variables associated with students' educational performance in CL (linguistic communication) and MR (mathematical reasoning) competencies.

- The contextual variables used in the study explain between 9-10% of the differences in educational performance. Other variables could be more influential at these ages. Another possibility would be that Andalusian schools are able to compensate for equity. However, this result could be assessed positively since, at early ages, the context of the student body would not condemn. In this sense, every effort should be made to ensure that the educational system guarantees equity and equal opportunities.

O3: To find out to what extent the social, cultural and academic variables of the student and the school, as perceived by the families, influence the performance of the RM and CL competencies, using hierarchical linear models.

- Linear hierarchical models allow for the study of variables at the school level, and it is possible to check their behavior at another grouping level. It is highlighted that the ISEC at the center level was not significant for the MR competence and only for the 2016-2017 course in CL, which would be due to the fact that the Andalusian educational centers are equitable in the second primary. Therefore, schooling is configured as a democratizing tool for society.

O4.1: To evaluate the relevance of high residual and raw score criteria in the selection of CAEF and CBEF.

- The high correlation between the raw and residual scores suggests that centers that are more effective are also more equitable, with the residual score being more interesting for the diagnosis of CAEF (very high-efficiency centers) and CBEF (very low-efficiency centers), as it controls the influence of contextual variables. In conclusion, it is a measure that makes it possible to evaluate the effectiveness of centers by controlling for the influence of contextual characteristics, which is a criterion sensitive to circumstances outside the center that can determine their effectiveness. Nevertheless, the ideal of the educational system is that there should be no difference in intersections, i.e. between the effectiveness of the centers, as this would ensure equity and that all educational centers operate at the same level.

O4.2: To verify the level of equity and parity existing in Andalusian schools in relation to the CL domain.

- Linear hierarchical models are valid to diagnose school equity and parity. The existence of differences in intersections indicates that Andalusian schools operate with unequal efficiency. Moreover, schools with higher efficiency are more parity in CL, but less equitable, which would indicate that other variables would explain the differences at the primary education level or that schools with higher efficiency would tend to reward the best performing students. Therefore, more research is needed to deepen our understanding of the educational complexity faced by students, families, teachers, researchers, politicians and all professionals involved in education.

6. LIMITACIONES

La presente tesis de investigación, realizada a partir de la recopilación de trabajos de investigación, no está exenta de limitaciones. El fenómeno educativo, como se ha reiterado, es complejo y sujeto a numerosas variables, entre las que existe una alta colinealidad, y diferentes niveles de influencias desde el contexto más próximo a la política global. Por ello, los resultados deben aceptarse con cautela, como una aportación más al corpus de conocimiento.

Para los objetivos O1.1 y O1.2 se realizó una revisión sistemática de la literatura. Las limitaciones temporales, los criterios de selección y las palabras clave para la búsqueda pudieron limitar el acceso a otros artículos, y, por tanto, resultados distintos. Para el resto de los objetivos se utilizaron las pruebas ESCALA y los cuestionarios de contexto anexos a las mismas. Las variables incluidas para los análisis venían limitadas por las preguntas del cuestionario de contexto. Otros estudios podrían considerar la posibilidad de ampliarlas, destacando variables como la condición de inmigrante o la asistencia a preescolar. Además, no dejan de ser percepciones de las familias que lo rellenan, por lo que la medición de estas es indirecta. Por otro lado, en cuanto a los análisis, se deben interpretar como asociaciones y correlaciones entre variables y no como estudios causales de corte experimental.

7. PROSPECTIVA

La presente tesis de investigación no debe entenderse como un final, sino como un proceso que comienza. Como se ha explicado, el estudio cuantitativo utilizando los resultados de las pruebas ESCALA, en conjunción con los cuestionarios de contexto, ha permitido la identificación de CAEF y CBEF. No obstante, la identificación es el primer paso para su caracterización. Como futura línea de investigación, la caracterización de los centros, como está planteado en sendos proyectos financiados, es el siguiente paso para perseguir el fin último de la mejora escolar. Además, como se concluyó con el O1, es necesario, dada la

complejidad del sistema educativo, estudios que desde otros paradigmas y enfoques aporten nuevos resultados a la temática.

En los límites se reconocía que los resultados no pueden considerarse como resultados causales, sino correlacionales. En futuras investigaciones, se debe considerar la utilización de estudios experimentales que permitan la demostración o rechazo de hipótesis causales. Sin embargo, hay que ser conscientes, de nuevo, de la gran complejidad a la que están sujetas las investigaciones en educación, siendo difícil el establecimiento de relaciones causa-efecto por la cantidad de variables y la alta colinealidad que envuelve el fenómeno educativo.

Además, la relación entre investigación y política educativa debe ser más estrecha y abrir espacios para la comunicación. La política educativa debería fomentar la evaluación educativa con fines formativos, atendiendo a los resultados generados de la misma. Por ejemplo, un límite planteado fue la restricción de las variables a las recogidas en el cuestionario de contexto. Nuevas variables deben incluirse para seguir ahondando en la realidad educativa. Empero, tiene que ser una relación bidireccional, donde la investigación también busque que sus resultados lleguen y se contemplen en la política educativa.

Otra línea de investigación futura puede ser la identificación de los centros más o menos paritarios. Los modelos jerárquicos multinivel permiten la identificación de los centros más y menos paritarios, por lo que su identificación y caracterización podría arrojar resultados que permitan comprender la eficacia de los centros. La equidad puede ser otro criterio unido a la eficacia, aunque esté contemplado en parte dentro de las puntuaciones residuales. Sendos criterios pueden ser puntos de partida de investigaciones futuras.

Por último, la presente tesis se presenta como un inicio en la carrera investigadora. La realización de los trabajos de investigación anexados y otros trabajos publicados han permitido un primer paso en la formación en investigación. Es necesario perseguir una mayor formación en diferentes paradigmas y enfoques de investigación, con la ambición de seguir aprendiendo de nuevas investigaciones y colegas para desarrollar las competencias que, hoy en día, son propias de un profesional que se encuentra en el inicio de su carrera. Por lo tanto, todas las líneas de investigación que se puedan incorporar serán bienvenidas para cumplir dicho objetivo.

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SECCIÓN 2: copia de las publicaciones



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En esta sección se encuentran las publicaciones que componen la tesis doctoral. Se presentan en el orden establecido en la Tabla 3 de la sección 1, es decir, siguiendo la secuencia de objetivos. El orden resultante es el siguiente: artículo 1, artículo 2, capítulo de libro 1, artículo 3 y capítulo de libro 2. Las tablas y figuras presentadas se encuentran numeradas en cada publicación por separado.

Nombre y adscripción de autor y coautores

Las publicaciones presentadas en la tesis están firmadas como primer autor por el doctorando, Jesús García Jiménez, figurando como coautores sus directores de tesis: Juan Jesús Torres Gordillo y Javier Rodríguez Santero. Solo en el capítulo de libro 2 se contó con otra investigadora, Inés Lucas Oliva, de los proyectos financiados en los que se enmarca la tesis: Diagnóstico del rendimiento educativo en educación primaria: un primer paso hacia la eficacia escolar (US-1263333) y Análisis de Centros Escolares Andaluces de muy Alta y muy Baja Eficacia: Pautas para la Mejora Escolar (EDU2017-84649-P).

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1. Artículo 1

García-Jiménez, J., Torres-Gordillo, J., & Rodríguez-Santero, J. (2020). What is Published in Impact Journals on School Effectiveness? A Systematic Review of Research Results and Methods. *Pedagogika*, 138(2), 5-24.
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What is Published in Impact Journals on School Effectiveness? A Systematic Review of Research Results and Methods

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Abstract. A systematic review of 45 articles on school effectiveness (SE) indexed in SJR and JCR (2014–2018) has been conducted. The results obtained show that the quantitative methodology catalyses the greatest number of researches. The articles are mainly published in Q1-Q2 journals with impact factor. The content of the articles reviewed found that, although exist contextual factors that affect the SE, the variables at the school level also have an impact.

Keywords: *educational efficiency, educational quality, educational output, school student relationship.*

Introduction

The study of school effectiveness is a popular theme in educational science. In the scientific panorama, forums that analyse school effectiveness have been created, such as the International Congress for School Effectiveness and Improvement (ICSEI) and journals that focus on this subject, such as the School Effectiveness and School Improvement (SESI) (Reynolds et al., 2014). School effectiveness is a concept that has evolved throughout history. The Coleman Report (Coleman et al., 1967) opens the door to the study of school effectiveness and large-scale research. It concludes that the socioeconomic characteristics of the student body explain the greater variance in the results. However,

the characteristics of schools also affect academic achievement (Azpillaga, Intxausti & Joaristi, 2014; Cohodes, 2016; Fuller & Hollingworth, 2014; Hofman, Hofman & Gray, 2015; Karakolidis, Pitsia & Emvalotis, 2016; Martínez-Abad, Lizasoain, Castro-Morera & Joaristi, 2017; Murillo, 2007; Page, Martín, Orellana & González, 2016; Ranjan, 2014; Schmidt, Burroughs, Zoido & Houang, 2015; Tichnor-Wagner, Harrison & Cohen-Vogel, 2016; Weber, 1971), although the variance explained varies from country to country (Costa & Araújo, 2018; OECD, 2019; Schmidt et al., 2015). For this reason, school effectiveness is currently defined as the impact that the school has on the academic performance and social development of the students (Fuller & Hollingworth, 2014; Murillo, 2007; Reynolds et al., 2014; Scheerens, 2000). On the other hand, effective schools are those that develop students in a comprehensive manner, both in basic instrumental skills and in emotional skills, beyond what would be expected in light of their context, personal characteristics and previous results (Murillo, 2005; Stoll & Fink, 1996).

Education systems must guarantee the effectiveness of their schools, because the benefits go beyond training in basic skills (OECD, 2017a). However, not all schools guarantee quality education (OECD, 2017b). Some countries have translated the concern to optimise their country's education into institutions that seek to improve school efficiency (Childs & Russell, 2017). In the Spanish and Latin-American contexts, large-scale educational performance assessments such as the Programme for International Student Assessment (PISA) have had an impact on educational policies (Kauko, Centeno, Candido, Shiroma & Klutas, 2016; LOMCE, 2013).

Standardised tests have not been exempt from criticism. Limitations of assessments, economic focus or loss of humanism are arguments detrimental to standardised assessments (Deng & Gopinathan, 2016; Méndez, 2014; Parra, 2018). Nevertheless, evaluations of education systems allow for their progress (Ferrão, 2014). The availability of standardised test results and questionnaires on the socio-familiar context allow to establish advanced statistical models (Cordero & Manchón, 2014; Feldhoff, Radisch & Bischof, 2016; Gamazo, Martínez-Abad, Olmos-Migueláñez & Rodríguez-Conde, 2017; Jennings, Deming, Jencks, Lopuch & Schueler, 2015; Reynolds et al., 2014). Value-added statistical models make it possible to find schools with a high residual value (Gamazo, et al., 2017; Iyer & Moore, 2017). The residual gain consists of the difference in score expected for its socioeconomic context and that actually obtained. This parameter makes it possible to locate both high or low-efficiency schools, when exceeding the expected score, and low efficiency schools (Martínez-Abad et al., 2017). The OECD (2017b) recommends helping disadvantaged schools by optimizing their personal and financial resources. Schools can be optimised by knowing the variables at the school level that differentiate effective schools (Martínez-Abad et al., 2017; Rutledge, Cohen-Vogel, Osborne-Lampkin & Roberts, 2015). To detect the educational patterns that characterise high and low efficiency schools, some authors start from diagnostic evaluations to identify high or low residue centres (Azpillaga et al., 2014; Intxausti, Etxeberria & Bartau, 2017; Intxausti,

Joaristi & Lizasoain, 2016; Joaristi, Lizasoain & Azpillaga, 2014; Lizasoain, Bereziartua & Bartau, 2016). In a first phase, by means of multilevel hierarchical models and taking as a reference the residual gain or the growth of scores, a classification of the centres according to the level of school efficiency achieved over the years is carried out. In other words, a longitudinal perspective (Pedroza-Zúñiga, Cetzal, Surema & Lizasoain, 2018) is taken into account. This diagnostic phase is followed by a second phase in which the centres with the highest and lowest residual gain are studied qualitatively. As a result of this study, the educational guidelines that explain the effectiveness (or ineffectiveness) of the schools are established. This type of methodological design is closer to the reality and complexity of education systems (Feldhoff et al., 2016) because they consider both the personal and contextual characteristics of the students and the schools, as well as the processes that take place in the schools (Scheerens, Luyten & van Ravens, 2011) that could explain their added value (Martínez-Abad et al., 2017).

Therefore, the following research questions are posed: 1) What research methodologies do journals catalyse for school effectiveness? 2) What are the variables that explain school effectiveness? In order to answer the first question, the aim was to find out the methodological trends of articles published on school effectiveness in journals indexed in JCR (WoS) and SJR (Scopus), in the period between 2014 and 2018. Furthermore, in order to answer the second question, the objective of describing the results that explain school effectiveness in these articles was proposed. This objective is addressed as a response to the demand raised in recent research on school effectiveness (Hajisoteriou, Karousiou & Angelides, 2018; Scheerens, 2014; 2015).

Materials and methods

The method used in the research was the systematic review, which allows deepening the study of a subject through gathering, systematizing and relating the results of research conducted (Higgins & Wells, 2011; Manterola, Astudillo, Arias, Claros & Mincir, 2013; Martimbianco et al., 2020; Prendes-Espinosa, García-Tudela & Solano-Fernández, 2020). The methodology was adapted to the present investigation using the following techniques: thematic analysis (Braun & Clarke, 2006), systematic conceptual review (Feldhoff et al., 2016; Hallinger, 2014) and narrative synthesis (Kauffman, 2015). The criteria used for the selection of articles that form part of the systematic review were:

- The work should focus on school effectiveness.
- High-impact articles: high-impact articles were defined as those published in journals indexed in the JCR (WoS) and SJR (Scopus) databases. This requirement was to ensure the scientific quality of the articles.
 - The period studied was limited to 2014–2018.
 - The key search words were School Effectiveness, School Improvement, Educational Multilevel Analysis, PISA and School Value-added.

The systematic review process began with a search of ERIC, WoS and Scopus as the main sources of work collection. High-impact articles were situated in the period 2014–2018. The initial result was 67 selected articles. After a first exploratory analysis, those that did not meet all the established selection criteria were discarded. An inductive thematic analysis of the studies was used with the selected articles (Braun & Clarke, 2006). Two themes that influence school effectiveness were identified: both contextual and school variables. Again, those that did not respond to the selected topics were discarded. The final result of the articles to be analysed was 45 (dx.doi.org/10.17504/protocols.io/bf34jqw).

After this filter, a systemic conceptual review (Feldhoff et al., 2016; Hallinger, 2014) that allowed us to carry out a descriptive analysis of the research was performed. The variables studied were the approach (qualitative, quantitative or mixed), the impact quartile to which they belong and the data analysis techniques used in this research.

In addition, a narrative synthesis (Kauffman, 2015) of the research results was carried out. These were synthesised and pooled in order to draw new conclusions and expose the literature review. In order to guarantee the quality of the systematic review, the indications on the PRISMA checklist were considered (Moher, Liberati, Tetzlaff & Altman, 2009).

Results

Systematic conceptual review of articles on school effectiveness

Figure 1 shows the percentages over the total number of articles, organised by methodological approach according to impact quartile. The impact quartile was divided into Q1-Q2 and Q3-Q4 for this analysis.

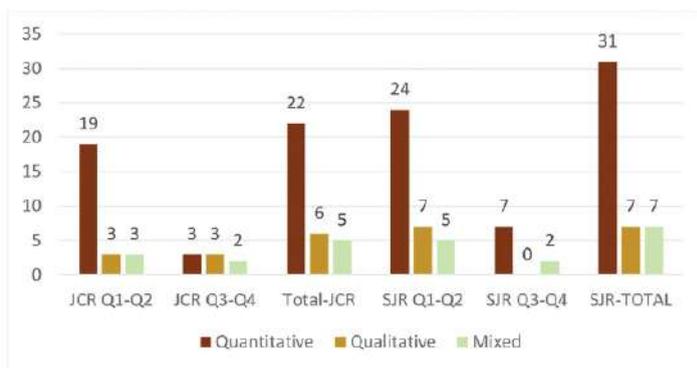


Figure 1. Results (F) of articles according to methodological approach and impact quartile

The total results in Figure 1 should be interpreted taking into account that the articles indexed in JCR also belong to SJR. These results revealed that quantitative research was more present in impact journals with a prevalence greater than four times. Easy access to the results of large-scale evaluations may have been one of the reasons (Cordero & Manchón, 2014; Feldhoff et al., 2016; Gamazo et al., 2017; Jennings et al., 2015; Reynolds et al., 2014; Scheerens, 2014).

On the other hand, in both JCR (25) and SJR (36), the impact factor of the journals was mainly distributed in Q1-Q2, with a prevalence of three and four times respectively, as opposed to Q3-Q4. From this, it could be inferred that the subject of school effectiveness was of interest and impact in educational research in the period studied.

Table 1 distinguishes data analysis techniques in the case of quantitative methodologies and data collection in qualitative designs. Quantitative analysis techniques were divided into multilevel design (when considering the nested structure of the data), value-added designs (without considering the nested structure of the data), descriptive designs and hypothesis contrast, structural equations, regression analysis and others.

Table 1

Results (F) of the Data Analysis Techniques Used in Each Methodological Design

Method	Data analysis	Indexed database				Total techniques	
		JCR		SJR			
		Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4		
Quantitative	Multilevel design	12	3	17	7	24	44
	VA Design	3	0	3	0	3	
	Descriptive-contrast of hypotheses	1	0	1	2	3	
	Structural equations	1	1	2	0	2	
	Regression	6	1	7	0	7	
	Other	5	0	5	0	5	
Qualitative	Content analysis	2	0	2	0	2	14
	Category analysis	1	2	3	2	5	
	Meta-analysis	2	2	5	0	5	
	Others-not specified	2	0	2	0	2	

The most commonly used quantitative data analysis technique was a multilevel design. Multilevel designs respect the nested structure of the data. In education, student results are nested in classrooms, schools and countries. Multilevel designs make it possible to evaluate the added value of schools by taking into account the nested structure of the education system (Gamazo et al., 2017). Depending on the research objective, it was

used with different nuances. More traditional value-added models underestimate the effect of the centre on school effectiveness (Troncoso, Pampaka & Olsen, 2016). Descriptive-contrast of hypotheses was considered when it was the main tool of the article, not as a complement to other techniques, finding the use of ANOVA (Gaertner, Wurster & Pant, 2014) or the “t” value (Ranjan, 2014). In the regressions, specificities such as quartile regression (Li & Konstantopoulos, 2017) or ordinary squares regression (Hobbs, 2016; Schmidt et al., 2015) could be highlighted as examples. In other quantitative analysis techniques, there were decision trees, quantile value-added case, and the free model according to Page (2017), CLASS-S (an observational instrument), agent-based model and econometric analysis techniques (index of school performance).

In qualitative techniques, meta-analysis, and category analysis were the most used. The specific analysis technique used was not always mentioned. Only a few of the authors cited it: a systematic conceptual review (Feldhoff et al., 2016) and realistic synthesis (Ehren, Eddy-Spicer, Bangpan & Reid, 2017). In other techniques, although the process is very detailed by Rutledge et al. (2015), he does not specify the name of the technique although it could be catalogued as content analysis. On the other hand, mapping was used in combination with the critical incident technique (Day, Gu & Sammons, 2016).

Narrative synthesis of research results on school effectiveness

The results of the narrative synthesis of the 45 papers analysed are presented below. The results were organised into inputs and processes (Scheerens et al., 2011). The inputs describe the results that could explain the effectiveness of the personal and contextual characteristics associated with the students. The processes develop the results that the different authors indicated improved the effectiveness of the schools.

Contextual factors associated with school effectiveness

The economy, social and cultural status (ESCS) of the family influenced academic results (Karakolidis et al., 2016). Academic performance was unfavorable in families with a low socioeconomic level (Gamazo et al., 2017; Karakolidis et al., 2016; Martínez et al., 2017; Martínez-Abad & Chaparro-Caso, 2017; Murillo, Martínez-Garrido & Hidalgo, 2014; Özdemir, 2016; Perry, 2017; Salgado, Marchione & Gilbert, 2014; Sulis & Porcu, 2014; Troncoso et al., 2016; Tsai, Smith & Hauser, 2017; Van Hek, Kraaykamp & Pelzer, 2018; Valenzuela, Bellei & Allende, 2016). The influence may vary depending on cultural mechanisms given the greater influence of the number of books in some Western countries than in others in the East (Tsai et al., 2017).

The location of the school was a predictor of educational performance (Cordero & Manchón, 2014; Kelcey & Shen, 2016; Sulis & Porcu 2014) and of the probabilities of entering university (Jennings et al., 2015). This was probably no more than a spurious correlation determined by socioeconomic level (Gamazo et al., 2017; Karakolidis et al., 2016; Özdemir, 2016; Troncoso et al., 2016). For the same reason, the social networks of

students and school efficiency were related (Hobbs, 2016; Salgado et al., 2014). Likewise, the greater efficiency of private schools would be explained by the socioeconomic level of the students who attend these schools (Hobbs, 2016; Hofman et al., 2015; Joaristi et al., 2014; Troncoso et al., 2016). Families with a high ESCS will be offered greater learning opportunities to their children (Hobbs, 2016; Schmidt et al., 2015), which would explain that greater book ownership has a positive influence on performance (Evans, Kelley & Sikora, 2014). This could be interpreted as really being the cultural level of the family, rather than the economic level, which would explain a higher percentage of variance with respect to educational performance.

Gender was controversial. There were studies that argued that it does not influence performance (Salgado et al., 2014) and others that do. The female gender negatively affected performance in mathematics in adolescence (Gamazo et al., 2017; Hofman et al., 2015; Karakolidis et al., 2016; Özdemir, 2016; Troncoso et al., 2016) and positively influenced, although with less intensity, reading (Gamazo et al., 2017). Female students benefited more from attending schools with a high socioeconomic level (Van Hek et al., 2018). Again, the socioeconomic context could explain the differences between educational opportunities among both genders.

The repetition condition of the student body, or if the student has changed schools many times, impaired educational performance (Gamazo et al., 2017). Likewise, others personal characteristics of the student, such as self-esteem, learning strategies or perception of drug use, were another factor to consider (Martinez-Abad & Chaparro-Caso, 2017).

Although contextual and personal factors associated with the pupils influenced performance, there are school characteristics that influenced academic outcomes (Azpillaga et al., 2014; Intxausti et al., 2016, 2017; Joaristi et al., 2014; Lizasoain et al., 2016). In addition, learning opportunities would explain 37% of the inequalities associated with ESCS (Schmidt et al., 2015) so those schools that are more effective will be able to reduce the inequality gap in the students (Valenzuela et al., 2016).

School factors associated with school effectiveness

The variables associated with the school itself and the processes that take place in it significantly affect the achievements of the learners (Hofman et al., 2015; Schmidt et al., 2015). The school influences the performance of its students from the first years of schooling (Ferrão, 2014). There are centres that have a high added value, regardless of the socioeconomic context in which they are inserted (Azpillaga et al., 2014; Cohodes, 2014; Ferrão, 2014; Gamazo et al., 2017; Intxausti et al., 2016, 2017; Jennings et al., 2015; Joaristi et al., 2014; Lizasoain et al., 2016; Martínez et al., 2017; Rutledge et al., 2015). Therefore, educational research should focus its efforts on studying the school variables that affect educational performance (Ferrão, 2014; Joaristi et al., 2014) which cannot always be done in a quantitative way (Fuller & Hollingworth, 2014). The influence of the school could explain 20% of the variance in educational performance (Hofman et al., 2015; Kelcey

& Shen, 2016); therefore, the control of these variables would make it possible to optimise the teaching-learning processes and move towards more equitable education. The characteristics are presented in 4 categories: educational approach, educational practice, management team and learning culture.

Educational practice

In terms of educational practice, teachers in effective schools had a greater social and emotional involvement with students and their families. Teachers externalised it as high expectations for students and greater involvement in extracurricular activities (Rutledge et al., 2015). Teachers optimised the use of resources, whether external or internal and systematically help students through extracurricular support or volunteer systems to improve education (Intxausti et al., 2017). There was also greater involvement with student assessments (Ranjan, 2014). These were more frequent and regular in the review of homework and tasks, which was related to better results (Murillo et al., 2014). The highly efficient schools showed a more holistic perspective, attending to the academic and emotional development of the students (Rutledge et al., 2015). In addition, teachers showed more planning and closeness skills (Ranjan, 2014).

The involvement of families in the school seemed to be a defining characteristic of centres with high efficiency (Azpillaga et al., 2014; Hajisoteriou et al., 2018), with mothers having a great leading role in education (Cordero & Manchón, 2014). In centres with high efficiency, greater sensitivity was observed towards the families of the students, as well as greater connection with them (Rutledge et al., 2015).

There was a discrepancy in the number of students per class, as there was research stating that it did not influence results (Li & Konstantopoulos, 2017). In contrast, Egalite and Kisida (2016) stated that the results worsen as the ratio and educational level increased. However, high-performing schools may be more responsive to challenges because they have better resource planning (Intxausti et al., 2017).

Management team

The school inspections did not appear to identify processes for improving the effectiveness of schools (Gaertner et al., 2014). However, management, in determining different processes, has an influence on school activity (Prasertcharoensuk & Tang, 2017). The management of high-efficiency schools was sensitive to the needs of the students, flexible to change, open to innovation, and exercises democratic leadership (Day et al., 2016; Intxausti et al., 2016). Principals did not reduce school effectiveness to performance on standardised tests. Management used these tests for school improvement (Intxausti et al., 2016). In addition, the management team was involved with the values of the school community, encouraged the desire of the entire educational community to learn and, when they belonged to schools in disadvantaged contexts, carried out greater involvement and saw difficulties as a challenge to be overcome (Day et al., 2016).

Learning culture

The culture of learning in high-efficiency schools had its particularities: there were more opportunities for participation, formal communication structures, collaborative decision-making processes, shared leadership and high expectations among students and teachers (Intxausti et al., 2016; Maroufkhani, Nourani & Boerhannoeddin, 2015; Tichnor-Wagner et al., 2016). In them, beyond the desire to raise scores on standardised assessment tests, there was an intrinsic motivation for improving education in general. The levels of effort and involvement in achieving this purpose were significantly higher in this type of school (Intxausti et al., 2016).

The permanent training of teachers was optimal in high efficiency schools (Lizasoain et al., 2016). On the other hand, low efficiency centres justified low results by pointing to external factors and ineffective processes of training and innovation (Lizasoain et al., 2016). Permanent training in high efficiency schools was characterised by (Lizasoain et al., 2016) systematic implementation, a high degree of involvement located in the school itself (e.g. cascade training) and transfer to practice, which was facilitated by the school and always evaluated. On the other hand, research training of teachers and recurrent reflection on their own practice benefited schools (Mincu, 2015). These skills could make teachers the drivers of change in educational institutions.

Educational approach

The comprehensive education of the human being was the commitment of the teaching staff and was a key element in the improvement of schools with cultural diversity (Hajisoteriou et al., 2018). There were no discriminatory practices in high-efficiency schools. Awareness among students with special educational needs was higher. Any student who needs support in his or her education was considered to have special educational needs. Primitive definitions of this aspect, which focus more on disability, were not contemplated. Furthermore, the teaching staff had deeply rooted values, based on strong religious or social beliefs (Intxausti et al., 2017). It was clear that teachers in highly effective schools had a proactive attitude towards education, with empathy towards other educational agents and a vision of knowledge that was flexible and under constant review (Hajisoteriou et al., 2018; Intxausti et al., 2017).

The composition of the school's pupils also affected school efficiency. The diversity of genders is positive for effectiveness, perhaps because they had better behaviour (Ning, Van Damme, Van Den Noortgate, Yang & Pant, 2015; Van Hek et al., 2018). The classroom climate was one of the factors affecting performance when perceived positively, along with autonomy in the use of technologies or the adaptation of teaching (Gamazo et al., 2017). Classroom discipline would explain 11% of the variance between schools in reading achievement (Ning et al., 2015). More discipline was associated with better outcomes, although these levels varied from country to country. This could be explained,

according to Ning et al. (2015), by a positive relationship between socioeconomic level, discipline and results. However, Rutledge et al. (2016) noted that shared values and personal connections affected effectiveness more than educational instruction.

Discussion and Conclusions

The main objective of this research was to understand the methodological trends and describe the results that explain the school effectiveness of the articles published on school effectiveness in the journals indexed in JCR (WoS) and SJR (Scopus), in the period between 2014 and 2018. For this purpose, a systematic review was conducted.

During the period 2014–2018, quantitative studies (69%) captured the bulk of research on school effectiveness. Multilevel designs were the most used in quantitative research. Availability of large-scale assessment results combined with contextual questionnaires (Cordero & Manchón, 2014; Feldhoff, et al., 2016; Gamazo et al., 2017; Jennings et al., 2015; Reynolds et al., 2014) facilitated quantitative studies with advanced statistical techniques. Qualitative and mixed designs were under-represented (16% in both) in JCR and SJR. This could be because high-impact journals would have biases in accepting these paradigms (Fernández-Navas & Postigo-Fuentes, 2020). Some authors suggest that the positivist paradigm is better valued (Fernández-Navas & Postigo-Fuentes, 2020; Fielding, 2020; Maxwell, 2019). However, in the area of school effectiveness, qualitative contributions would make it possible to go deeper into axiological and cultural issues of schools (Rutledge et al., 2015). These cultural and axiological factors could have a greater impact on school effectiveness than other instructional variables (Rutledge et al., 2015), so their knowledge would serve as a basis for the creation of improvement plans (Intxausti et al., 2017; Lizasoain & Angulo, 2014 OECD, 2017b, 2019). Therefore, the contribution of qualitative and mixed approaches could be beneficial for educational evaluation (Maxwell, 2019; Parra, 2018).

As for the second research objective, the contribution of the 45 articles made it possible to describe and integrate the different results. These were consistent with the previous literature, because although individual and contextual characteristics had an impact on effectiveness, there were also characteristics of the schools that made them more effective (Azpillaga et al., 2014; Day et al., 2016; Hanushek, & Woessmann, 2017; Intxausti et al., 2016, 2017; Joaristi et al., 2014; Lizasoain et al., 2014, 2016; Rutledge et al., 2015; Tichnor-Wagner et al., 2016). These contributions are summarised in Figure 2.

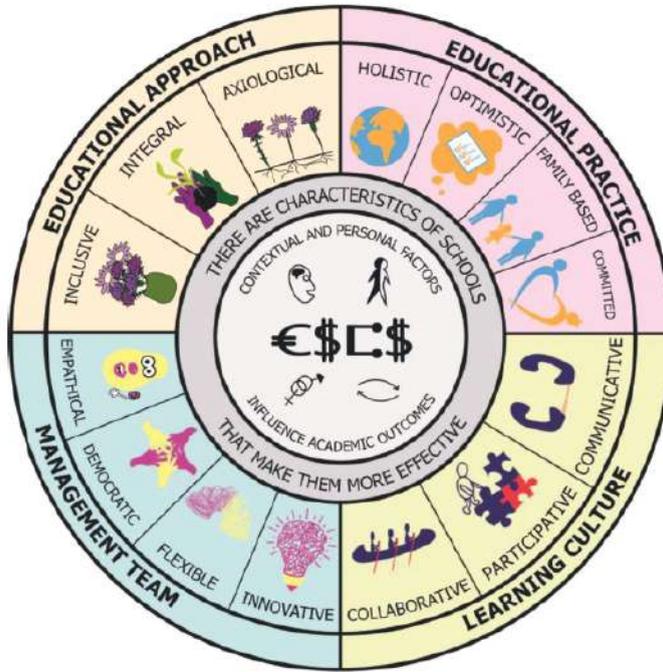


Figure 2. Summarises the main characteristics detected in effective schools, together with contextual factors

The educational approach was characterised by its inclusiveness, because it optimally addressed diversity; its comprehensiveness, because it considered education as a process of teaching social, emotional and instrumental skills; and its axiology, because values were shared and deeply rooted. The management team made decisions in a democratic way, counting on the opinions of the people involved. It was empathetic, because it sought to understand all solutions; flexible with its decisions and sought educational innovation as a way of improvement. Learning culture was considered participatory, promoting opportunities for participation; with effective communication between members allowing collaborative processes. Educational practice considered the intervention in a holistic and global way, taking into account all the contexts. In particular, it considered the family context, which encouraged its participation in the school. It was also characterised by having high expectations of the students and committing to the educational work of the school.

The characterization of high effectiveness schools can contribute to improving effective schools through the creation of improvement plans based on these results (Intxausti et al., 2017; OECD, 2017b, 2019; Rutledge et al., 2015). Therefore, those approaches that

contemplate the selection of high or low value-added schools with their subsequent characterization (Azpillaga et al., 2014; Day et al., 2016; Intxausti et al., 2016, 2017; Joaristi et al., 2014; Lizasoain et al., 2014, 2016; Rutledge et al., 2015; Tichnor-Wagner et al., 2016), would integrate school effectiveness studies with those of school improvement. In this way, diagnostic assessments could serve both to identify schools with high added value and those that need intervention. However, the results of educational research have little impact on educational policies (Damiani, 2016; Fischman, Topper, Silova, Goebel & Holloway, 2018; Tobin, Nugroho & Lietz, 2016) and on some occasions, the purpose of diagnostic evaluations is not clear (Thessin, 2015), which makes it necessary to put into value the results of educational science for school improvement, given that their consequences have an impact on society (Hanushek & Woessmann, 2020).

Limitation and further perspectives of research

The variables used for the systematic conceptual review were conceptually very open. The complexity and diversity of techniques did not allow a more concrete systematization of the analysis techniques used. It would be convenient to compare in depth the techniques of analysis of current school effectiveness. Certain techniques, such as multilevel hierarchical analysis, were used with particularities present in each one. The information available would make it possible to research the analysis techniques, the samples used and the data collection techniques.

The use of articles indexed in JCR and SJR in a specific period could be a limit to the research and results, as other scientific work was excluded. Therefore, it might be interesting to broaden the perspective in future work. The inclusion of OECD reports could be enriching for future studies.

Finally, the topic was limited to school effectiveness and it was interesting to look more closely at other related topics such as the effectiveness of instruction or the effectiveness of teacher characteristics.

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Conflict of interests

No conflicts of interest have been declared.

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Kas publikuojama cituojamo indekso žurnaluose apie mokyklos efektyvumą? Sistemine tyrimo rezultatų ir metodų apžvalga

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Santrauka

Švietimo efektyvumas mokslo ir socialiniu lygmeniu yra viena iš dominuojančių temų, nagrinėjamų daugelyje mokslinio poveikio straipsnių su aukštu citavimo indeksu (angl. *Impact*

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Esminiai žodžiai: *švietimo efektyvumas, švietimo kokybė, švietimo rezultatai, mokyklos mokinių santykiai.*

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2. Artículo 2

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Article

Influence of Contextual Variables on Educational Performance: A Study Using Hierarchical Segmentation Trees

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Abstract: The general objective of this study is to explore the relationship between students' contextual characteristics and their performance in mathematical reasoning (MR) and linguistic comprehension (LC) skills. The census data from the ESCALA (Escriura, CAlculo y Lectura en Andalucía) tests developed by Agencia Andaluza de Evaluación Educativa (AGAEVE) in 2017 were used. These tests are carried out in the second year of primary school in the Autonomous Community of Andalusia (Spain). These data have been analysed through the data mining technique known as segmentation trees, using the CRT (Classification and regression trees) algorithm for each of the skills. This has allowed the detection of the high influence of social and cultural status (ESCS) and familial expectations regarding academic performance in both tests. In addition, it allows us to point out that there are different interactions between contextual characteristics and their relationship to performance in MR and LC. These results have made it possible to establish groups of students who may be at risk of not reaching the minimum required levels. Some characteristics of at-risk students are low ESCS, low family expectations or being born in the last six months of the year. The detection of at-risk profiles could contribute to the optimisation of the performance of these groups by creating specific plans.

Keywords: educational efficiency; educational evaluation; educational quality; academic achievement; student evaluation

1. Introduction

Large-scale educational evaluations allow us to thoroughly understand educational reality [1], improve educational systems [2,3] and optimise the education received by students [3,4]. Their results are often used to establish changes in educational policies [3,5] or as an empirical basis on which to justify established educational reforms [6]. They also make it possible to establish reference standards for current educational trends [3].

In the particular area of school effectiveness, large-scale evaluations have made it possible to detect variables that influence student performance [7]. Economic, social and cultural status (ESCS), gender, migrant status or ethnic minority status have been topics of interest in numerous research studies on school effectiveness and educational performance.

Numerous studies indicate that the ESCS [2,7–15], the location of the centre [13,16], the parents' attendance at university [11] and the number of books at home [17] have a decisive influence on the level of performance achieved by students in large-scale assessments. It is likely that the cultural level of the families influences the value of the education and educational opportunities offered [14,18,19]. Preschool education attendance seems to benefit the low ESCS student body more [20], which could indicate that it provides compensatory educational opportunities for the most disadvantaged families.

In addition, the influence of the ESCS interacts with variables such as the gender of the student, girls being the most sensitive to its influence [21]. Therefore, the ESCS would influence student performance mediated by its interaction with other educational and contextual variables.

Some studies [14,22] present results that show that immigrant students achieve worse academic results and that the greater the presence of ethnic minorities in the school, the lower the performance [14]. Again, the cultural level of the families may be the variable that is truly driving these results, in addition to other cultural mechanisms that could limit access to resources by these families [23].

Although in primary education, there seems to be no difference between boys' and girls' results [24], in secondary education, girls tend to perform worse in mathematics and better in reading and writing [13,25]. This could be explained by the influence of gender stereotypes still present in today's society [26].

Students repeating a year [16] and a high level of religiosity in the school [27] seem to negatively influence educational performance. On the other hand, attendance, high levels of motivation [7] and discipline [28] have a positive effect.

Data Mining in Educational Research

Data mining (DM) is part of exploratory research techniques. DM allows the exploration of patterns that explain the educational phenomenon in order to improve it [29,30]. In other words, these predictive analyses help to detect characteristics that put academic achievement at risk. This valuable information should be used by educational institutions to prevent low levels of achievement [31–33]. In the achievement of this objective, as stated by Anwar and Ahmed [29], appropriate modifications of the curriculum and performance assessment systems can have a very positive impact.

In the educational field, DM is mainly used in distance education [34,35] because e-learning platforms generate a large amount of data that can be analysed using the big data technique. The qualification of the students is used as a dependent variable, while the characteristics of the students [30], their context [36] and the interaction with the teaching platform in the case of e-learning are usually used as independent variables.

Some studies on school effectiveness that use these techniques indicate that adolescents who are in a relationship achieve worse educational performance, although this may be due to a lower level of dedication to study [37]. By contrast, higher levels of achievement are associated with students who are more aware of the seriousness of drug use and have parents with low rates of alcohol consumption and higher levels of education [30,37].

Within hierarchical segmentation, segmentation trees is a technique that provides results that are simple to interpret and allows non-linear effects and higher-order interactions to be automatically found [38,39]. Segmentation trees are appropriate for the study of large amounts of data and the detection of patterns. They allow the classification of independent variables to forecast values of a dependent variable, reduce the number of independent variables and facilitate the explanation of a phenomenon [40]. In this sense, this study has the following objectives:

- To explore the influence of contextual variables and their interaction on academic achievement obtained in mathematical reasoning (MR) and linguistic communication (LC) skills;
- To detect profiles of students at risk of school failure.

2. Materials and Methods

2.1. Research Sample

To carry out the study, census data from the ESCALA (diagnostic test EScritura, CÁlculo y Lectura en Andalucía [Writing, Calculating and Reading in Andalusia]) tests, administered by the Agencia Andaluza de Evaluación Educativa (AGAEVE), during the academic year 2016–2017 in Spain, were used. Once the sample was refined, the results of 75,820 students were used (50.9% male and 49.1% female). The purpose of these tests is to objectively and rigorously evaluate the competencies in LC and MR of students in the 2nd grade of primary education (7–8-year-old students). In addition, it is

complemented with a context questionnaire, administered to families, which provides information on contextual and cultural factors. Andalusia is one of the areas with the least social and educational development in Europe [41], so it is necessary to know what factors could be influencing it from an educational point of view. This region is located in the south of Spain and is the autonomous community with the largest population in the country (8,427,000). The results in mathematics of the last Programme for International Student Assessment (PISA) (2018) placed the region almost 30 points below the OECD (Organisation for Economic Cooperation and Development) average [42] The region’s proximity to Morocco means that there is an immigrant population of around 20% in some provinces such as Málaga and Almería, and the foreign population accounts for 7.77% in Andalusia (see <http://www.juntadeandalucia.es/justiciaeinterior/opam/es/node/90>).

Table 1 shows a description of the contextual variables extracted from the context questionnaire [43], as well as the debugging treatment used and the categorisation made.

Table 1. Description of the Contextual Factors Used.

Variable Name	Description	Treatment	Categories
Gender	Unique dichotomous choice (boy or girl)		0 = boy 1 = girl
ESCS	Amount of resources available in the house, work and studies of both parents, attendance of cultural activities and number of books.	Factorial analysis	
Hora_acuesta (Bedtime)	Unique polytomous choice of the time students go to bed during the week with 4 options (before 21:00, 09:00–21:30, 9:30–22:00 and after 22:00).	It is grouped into 3 categories, instead of 4, by recoding on the same variables.	1 = before 9 pm 2 = between 9 pm and 10 pm 3 = after 10 pm
Cantidad_tareas (Amount of homework)	Unique polytomous choice in which they have to evaluate the number of tasks (4 options).		1 = few 2 = justified 3 = less 4 = none
Tiempo_tareas (Time spent on homework)	Unique polytomous choice in which they have to evaluate the time that the student dedicates to the accomplishment of school tasks (5 options).	It is grouped into 3 categories.	1 = up to 15 min 2 = 15 to 60 min 3 = more than one hour
Compromiso_lector (Commitment to reading)	Nominal scale (nothing, little, enough and a lot) for 5 questions (I read with the student, we usually read at home, shared reading or commenting on the reading) that evaluate the commitment to reading.	Average of the scores assigned by the parents and dichotomisation of the variable.	1 = nothing–little 2 = very much–enough
N_extraescolares (Number of extracurriculars)	Unique dichotomous choice (yes or no) for 4 types of extracurricular activities (sports, musical, language or other)	Summary of the scores obtained.	1 = none 2 = from 1 to 2 3 = 3 or more
Horas_pantallas (Screen consumption hours)	Nominal scale (no time, up to one hour, 1 to 2 h or more than two hours) for two different questions (watching TV or playing on a console)	Average of the scores reached in both questions and dichotomisation of the variable	1 = up to 1 h 2 = 1–2 h 3 = more than two hours

Table 1. *Cont.*

Variable Name	Description	Treatment	Categories
Expectativas_FAM (Family expectations)	Unique polytomous choice in which they have to evaluate the degree of studies they think the student will finish from 5 options. Both parents answer.	Average of the scores assigned by the parents and dichotomisation of the variable.	1 = obligatory education or middle studies 2 = higher education
ImplifAM_estudiante (Family involvement with the student)	Nominal scale (never, some days, almost every day, every day) of 5 questions (encourage to study, ask for homework, check homework, ask how the class went and help with homework) that assess their involvement with the student.	Average of the scores reached in the questions and dichotomisation of the variable.	1 = never–some days 2 = almost every day
ImplifAM_colégio (Involvement of families with the school)	Nominal scale (nothing, little, quite and a lot) for 5 questions (attendance at tutorials, participation in school activities, relationship with the school's parents' association, relationship with the parent delegates and relationship with the school council) that assess their involvement with the school.	Average of the scores reached in the questions and dichotomisation of the variable.	1 = nothing–little 2 = very much–enough
MES_nacimiento (Month of birth)	Open question about the month of birth.	Grouping in two categories.	1 = first six months 2 = last six months

2.2. Analysis

The analysis was carried out using the Statistical Package for the Social Sciences (SPSS) [44]. The independent variable was LC or MR, while the dependent variables were the contextual factors of the students. The analysis was initially carried out with the CHAID (Chi-square automatic interaction detector) and CRT (Classification and regression trees) algorithms. The CHAID algorithm was finally discarded, because it generated a high number of nodes that made interpretation difficult.

Therefore, the algorithm ultimately used was CRT, which is suitable for weighing the importance of contextual factors in the explanation of school performance [45] and facilitates the interpretation of the data by dividing the variables in a binary way. For this same reason, pruning has been used, using SPSS commands, which avoids over-adjustments and simplifies the results.

3. Results

As can be seen in Table 2, according to the means (M) and standard deviations (SD), the results in MR and LC do not present large differences, although it is noteworthy that the minimum score in MR reaches lower values than in LC. On the other hand, the variable family involvement with the student presents a low SD, which could be interpreted as a small intra-group difference. This has led us to discard it for the segmentation technique. The independent variable with the greatest intra-group variance seems to be the ESCS, if we consider the difference between the mean, the maximum and the minimum. In this case, as it is a standardised variable, SD is close to 1.

Table 2. Descriptive Statistics of the Dependent and Independent Variables.

	Variables	Minimum	Maximum	M	SD
Dependent	LCN1	129.568	613.459	507.632	94.817
	MRN1	77.0237	600.067	506.376	94.733
Independent	ESCS	-2.86954	3.06001	0.0836802	0.9875545
	Hora_acuesta (Bedtime)	1	3	2.17	0.452
	Cantidad_tareas (Amount of homework)	1	4	2.13	0.635
	Tiempo_tareas (Time spent on homework)	1	3	2.03	0.503
	Compromiso_lector (Commitment to reading)	1.00	2.00	1.4172	0.49310
	Número_extraescolares (Number of extracurriculars)	1.00	3.00	1.9802	0.48646
	Horas_pantallas (Screen consumption hours)	1.00	3.00	1.3561	0.54900
	Expectativas_familiares (Family expectations)	1.00	2.00	1.6857	0.46425
	ImplicacionFAM_estudiante (Family involvement with the student)	1.00	2.00	1.9918	0.09042
	ImplicacionFAM_colegio (Involvement of families with the school)	1.00	2.00	1.6926	0.46143
	MES_nacimiento (Month of birth)	1.00	2.00	1.5046	0.49998

The annex [46] presents the results of the CRT algorithm for MR. The tree contains 63 nodes (32 of them terminals) distributed over 5 levels. The dependent variables selected by the algorithm for the construction of the segmentation tree were ESCS, Expectativas_familiares, Tiempo_tareas, MES_nacimiento, Cantidad_tareas and gender.

The variable that best predicts achievement in MR is the ESCS (nodes 1 and 2), as already pointed out in the scientific literature. It is remarkable that the two different groups that are constituted based on the ESCS interact in different ways with the contextual variables. While students with low ESCS are influenced by the expectations that the family places on them (nodes 3 and 4), those with high ESCS are affected by the time they spend on tasks (nodes 5 and 6). Students from families who expect higher education obtain the highest scores. It could be understood, therefore, that family expectations act as a protective factor in the face of unfavourable socioeconomic situations, probably because they are associated with a more positive evaluation of education and its importance.

It seems that students are negatively affected when they spend more than one hour on schoolwork (see nodes 6 and 10), while spending up to one hour seems to be beneficial (see nodes 5 and 9). This may be because students with higher needs and lower academic achievement generally need more time to complete assignments. On the other hand, being born in the last six months of the year seems to decrease MR performance (see nodes 15 and 16). The amount of homework, when families believe that they should have less (see nodes 55 and 56), is positive for performance.

The segmentation tree for the case of LC is shown in the annex [47]. It is composed of 61 nodes, 31 of them terminals, distributed over 5 levels. The variables included by the algorithm were ESCS, Expectativas_familiares, Tiempo_tareas, gender and MES_nacimiento.

In the case of LC, the variables mentioned above act in the same way as in MR. However, in this case, gender does seem to influence students negatively and positively (see nodes 7 to 14). Regarding the number of tasks in the case of LC, their absence may be worse for performance than their presence (nodes 59 and 60). It is noteworthy that commitment to reading is not among the variables selected

by the algorithm, which could be due to the fact that the ESCS would catalyse, in some way, cultural commitment in general.

Taking as a reference the results presented to respond to the second objective of the research, both in LC (see node 31) and MR (see node 32), the student body that presents one or more of the following characteristics could be catalogued as an at-risk group: low ESCS, low family expectations, born in the last six months of the year. In the case of LC, we can also add being a male student. By contrast, having high family expectations seems to protect students with low ESCS, in both tests.

4. Discussion

The findings are consistent with the existing scientific literature in the field of school effectiveness and educational performance, as they confirm that the ESCS is the variable that best predicts academic success. The influence of ESCS has been confirmed in studies carried out with large-scale evaluations, such as PISA, both in a national context [10,16] and at the international level [2,7,9,11–15,19]. However, this contribution to the existing body of knowledge has demonstrated that high expectations of families may be a protective factor for students with low ESCS. This could be explained by the fact that these same students are also likely to have greater social capital and support from their families [18,48]. However, it could also be due to the reciprocity of expectations, i.e., higher expectations for students who perform well.

On the other hand, spending too much time on homework does not seem to be beneficial for elementary school students. This is probably because, as Valle et al. [49] stated, it is the students with the greatest difficulties who spend the most time on homework. However, at the secondary school level, it is the students who spend more time on homework that perform better [12,50]. This could be a consequence, once again, of ESCS, since students with a more comfortable socioeconomic position are also the ones who generally receive more support from their parents and more learning opportunities [19].

The issue of gender also deserves to be highlighted. While no interaction was found in mathematical reasoning, it was recorded in linguistic understanding, with male students being disadvantaged. This partially confirms the evidence provided by the scientific literature of the better performance of female students in communication skills and higher performance of male students in MR [13,19,24,51]. Educational systems should undertake appropriate changes in educational programmes to overcome this shortcoming and achieve, at early ages, gender equity in these two basic competencies.

As some of the previous studies have shown [6,52], the results derived from educational research are not usually used to promote educational changes at the centre or teaching methodology level, even in countries with a long tradition of educational evaluation [9]. They are usually used more for political than educational purposes [6]. Even so, taking as a reference the profiles detected for students at risk of academic failure, we consider that it could be beneficial to develop workshops in schools, aimed at raising awareness among families about the importance of family expectations in student achievement. It would also be helpful for schools to offer extracurricular activities of a cultural nature for low-ESCS students. Book-lending services could also help to narrow the gap between students, as families with fewer resources have more difficulty acquiring books [53].

Educational systems must guarantee equality of opportunity, overcoming the segregation of students by contextual characteristics [54] that may have been aggravated by the coronavirus crisis [55,56]. The results of this study managed to explain about 10% of the variance in performance in LC and MR among 7- and 8-year-old schoolchildren according to their contextual factors, which is close to the results of previous studies [57]. This makes us reconsider the moment at which the influence of the ESCS begins to determine results in school effectiveness [2,7–15]. Performance at these ages could be explained more by individual characteristics, such as differences in executive functions [57–62] than by context. Although these results could be evaluated as positive, since it is not contextual factors that determine performance at early ages of schooling, they do invite reflection on the factors that could affect performance at these ages and when contextual factors begin to gain importance. Some

studies suggest that students from families with lower ESCS may have lesser development of certain cognitive skills [62]. However, early interventions aimed at stimulating these skills could mitigate these inequalities [63,64]. Therefore, it is necessary to detect vulnerable students and promote actions that allow for equitable and sustainable educational systems within today's society. This also raises questions for future research. For example, at what point are the ESCS and other contextual factors decisive for school effectiveness? Could the ESCS effects be avoided with early stimulation of variables associated with executive function? What role do teachers and teaching–learning methodologies play in this effectiveness? Would the effectiveness of the educational centre have an influence in the early years of schooling? To do this, progress must be made on the early detection of students at risk, using large-scale evaluations for educational purposes and integrating them into the daily work of educational centres. This progress should also aim to connect the information coming from the large-scale evaluation with the dialogue between different paradigms and more everyday realities [65]. Only the synergy between the different perspectives on educational research will allow progress in the identification of at-risk student profiles. According to the results of the study, in the early ages of schooling, contextual factors still do not explain to a great extent the variance in student performance.

As for the limitations of the study, variables that could be relevant to the explanation of academic performance have been left out of the research. Specifically, we are referring to immigrant status, pre-school attendance and bilingualism. These types of variables were not included in the context questionnaire administered by AGAEVE, so it was impossible to access this information. Resolving this situation would require collaboration between institutions and researchers, which, given the complex bureaucratic framework, is not always easy to achieve. In this sense, for educational science to advance, research must open its doors to both institutions and schools themselves.

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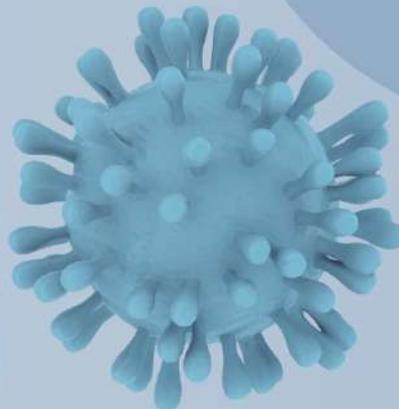
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Desempeño docente y formación en competencia digital en la era SARS COV 2



Dykinson, S.L.

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Dykinson, S.L.

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CAPÍTULO 66

LA EXPLORACIÓN DEL RENDIMIENTO EDUCATIVO A TRAVÉS DE ÁRBOLES DE SEGMENTACIÓN

Jesús García-Jiménez, Juan-Jesús Torres-Gordillo y Javier Rodríguez-Santero

1. INTRODUCCIÓN

La evaluación educativa contempla entre sus objetivos el conocimiento de la realidad educativa con rigor y objetividad, con objeto de optimizar los sistemas educativos (Ferrão, 2016; Johansson, 2016; Kauko et al., 2016; Means et al., 2019; OECD, 2013). Los resultados de sus investigaciones suelen utilizarse para realizar cambios en la política educativa (Childs & Russell, 2017; Kauko et al., 2016; Martínez-Rizo & Silva-Guerrero, 2016; OECD, 2013, 2016). Entre sus dimensiones de estudio se podría destacar el rendimiento educativo, es decir, conocer las variables que influyen en la consecución de los estándares de aprendizaje, siendo frecuente el uso de evaluaciones a gran escala (OECD, 2017). Además, también constituyen un estándar de referencia que permite inferir las tendencias educativas de los diferentes países (OECD, 2013). Los resultados de las investigaciones han encontrado variables que influyen en la eficacia y rendimiento educativo, como el estatus socioeconómico y cultural de las familias, el género o la condición de inmigrante.

El estatus socioeconómico suele estudiarse a través del cálculo de índices mediante análisis factoriales (Gil-Flores, 2013). Hay numerosos trabajos que encuentran una relación entre un mayor estatus socioeconómico y cultural y un mejor rendimiento educativo (Gamazo et al., 2017; OECD, 2016; Valenzuela et al., 2016).

En cuanto al género, en la educación secundaria las alumnas presentan mejor rendimiento en competencias comunicativas, mientras que los alumnos muestran mayor rendimiento en competencias de razonamiento matemático (Özdemir, 2016; Stoet & Geary, 2015; Troncoso et al., 2016). No obstante, en niveles educativos inferiores no parece haber diferencias entre alumnos y alumnas con relación al rendimiento (Muñoz-Chereau, 2016). Por otro lado, el alumnado inmigrante podría tener peor rendimiento (Williams-Klotz & Gansemer-Topf, 2018).

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Otras variables que podrían explicar el rendimiento académico son la repetición (Cordero & Manchón, 2014), la asistencia regular a clases (Martínez et al., 2017) o la disciplina (Ñing et al., 2015).

Una de las técnicas de análisis de datos utilizadas en la investigación de la eficacia escolar es la minería de datos (MD). La MD se enmarca en las técnicas de análisis exploratorio y son utilizadas para buscar patrones explicativos a los fenómenos educativos (Martínez & Chaparro, 2017). Dentro de estas técnicas encontramos los árboles de segmentación, que facilitan resultados de interpretación sencilla y patrones de clasificación en función a una variable dependiente (Berlanga-Silvente et al., 2013; Gonzalez et al., 2018). Por ello, el presente trabajo persigue un doble objetivo:

- Clasificar al alumnado en función de su rendimiento en las competencias de razonamiento matemático (RM) y comunicación lingüística (CL) para encontrar perfiles de riesgo.
- Explorar las variables contextuales que se relacionan con el rendimiento educativo en ambas competencias.

2. MÉTODO

El diseño de investigación fue una metodología no experimental o ex post facto que ha seguido un diseño correlacional-predictivo, concretamente, con la técnica de árboles de segmentación.

2.1. Muestra

El estudio se realizó utilizando los datos censales de las pruebas ESCALA desarrolladas por la Agencia Andaluza de Evaluación Educativa (AGAEVE) en el curso 2016-2017 en Andalucía (España). Estas pruebas tienen como objetivo el diagnóstico del rendimiento educativo del alumnado de 2º de Primaria (7-8 años) en las competencias de RM y CL. La prueba se administra con un cuestionario de contexto dirigido a las familias, con objeto de conocer las características socioeconómicas de las mismas. El número de participantes totales, tras depurar los valores perdidos, ascendió a 75820, de los cuales el 50,9% eran alumnos y el 49,1% eran alumnas.

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2.2. Análisis

Se realizó un árbol de segmentación para cada una de las competencias, RM o CL, que se utilizaron como variables dependientes. El algoritmo utilizado fue CHAID, que permite clasificar los grupos en más de dos ramas y explora rápida y eficazmente la muestra (Berlanga-Silvente et al., 2013). Las variables independientes fueron tomadas del cuestionario de contexto, realizando un tratamiento de depuración y categorización de estas cuando fue necesario. Las variables seleccionadas para el análisis fueron:

- Índice socioeconómico y cultural de las familias (ISEC): se realizó un análisis factorial de las preguntas relacionadas con el estatus socioeconómico y cultural de las familias, como la formación parental, recursos, número de libros y asistencia a actividades culturales.
- Género: variable dicotómica (masculino o femenino).
- Expectativas familiares (Expectativas_FAM): en el cuestionario de contexto cada uno de los progenitores estimaba el máximo nivel educativo que cursaría el alumno. Se realizó el promedio de las puntuaciones concedidas por los progenitores y se procedió a su dicotomización, distinguiendo dos categorías (1 = obligatorios-medios; 2 = superiores).
- Tiempo de dedicación a las tareas (Tiempo_tareas): las familias elegían el tiempo que consideraban de dedicación a las tareas escolares entre 5 opciones que fueron categorizadas en tres (1=hasta 15 minutos; 2= de 15 a 60 minutos; 3= más de una hora).
- Horas de consumo de pantallas (Horas_pantallas): los progenitores contestaban sobre el número de consumo de televisión y consolas en una escala nominal. Se calculó el promedio y se clasificó en tres categorías (1= hasta 1 hora; 2= 1-2 horas; 3= más de dos horas).
- Mes de nacimiento (Mes_nacimiento): las familias contestaban el mes de nacimiento. Se dicotomizó la variable para el estudio (1= 6 primeros meses; 2= 6 últimos meses).

3. RESULTADOS

En primer lugar, se presentan los análisis descriptivos (medias, desviaciones típicas, máximos y mínimos) de las variables consideradas en el estudio (véase Tabla 1).

Tabla 1.
Estadísticos descriptivos de las variables

	Mínimo	Máximo	Media	Desv. Desviación
CL	129,568	613,459	507,631	94,817
RM	77,023	600,067	506,376	94,733
Género	0	1	,49	,500
ISEC	- 2,86954	3,06001	,0836802	,98755453
Tiempo_tareas	1	3	2,03	,503
Horas_pantallas	1,00	3,00	1,3561	,54900
Expectativas_familiares	1,00	2,00	1,6857	,46425
MES_nacimiento	1,00	2,00	1,5046	,49998

Las puntuaciones mínimas y máximas en CL fueron sensiblemente más altas que las puntuaciones en RM. Sin embargo, tanto las medias como las desviaciones típicas de ambas competencias fueron parecidas. La desviación típica del ISEC es cercana a 1 al ser una puntuación estandarizada. No obstante, se podría destacar que la diferencia entre el valor mínimo y máximo es de casi 6 puntos.

En cuanto a los árboles de segmentación, en primer lugar, se muestra el resultado del árbol utilizando CL como variable dependiente. Se produjo un árbol de tres niveles de profundidad, con 48 nodos de los que 34 fueron terminales. Dicho árbol puede verse en el documento anexo (véase <https://doi.org/10.6084/m9.figshare.13234997.v1>).

La primera variable seleccionada por el árbol de segmentación fue Expectativas_familiares. Aquellas familias que consideraban que el alumno terminaría estudios superiores alcanzaron una puntuación mayor. En el segundo nivel, la variable seleccionada para las familias que consideraban como máximo la obtención de estudios obligatorios-medios fue el ISEC. Un menor ISEC se asociaba con menor rendimiento en la competencia. Por otro lado, la variable seleccionada para las familias que consideraban que el alumnado acabaría los estudios superiores fue Tiempo_tareas. Una mayor dedicación de tiempo a las tareas repercutía negativamente en el rendimiento de la competencia. Por último, en el tercer nivel de profundidad del árbol, las variables

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seleccionadas fueron género, obteniendo mayor rendimiento las alumnas, Tiempo_tareas, donde una dedicación superior a la hora fue contraproducente, o ISEC, siendo menor el rendimiento para las familias con peor estatus socioeconómico y cultural.

En segundo lugar, se presenta el árbol de segmentación utilizando los resultados en RM como variable dependiente. En este caso, el árbol generado tuvo una profundidad de tres niveles, en los que se calculó 57 nodos totales, siendo 39 de ellos terminales. La visualización del árbol está disponible en el archivo adjunto (véase <https://doi.org/10.6084/m9.figshare.13235084.v1>).

En el primer nivel de profundidad, la variable seleccionada por el árbol fue Expectativas_familiares. El alumnado de familias que esperaban la consecución de estudios superiores obtenía mayores puntuaciones en la competencia de RM. En el segundo nivel de profundidad, el algoritmo seleccionó la variable ISEC, siendo el alumnado de mayor estatus el que percibía mayor rendimiento, mientras que puntuaciones menores en ISEC se relacionaba con peor rendimiento. Por último, en tercer nivel, las variables seleccionadas fueron Mes_nacimiento, que asociaba mayor rendimiento al alumnado nacido en los 6 primeros meses del año y Tiempo_tareas, siendo una dedicación superior a la hora en tareas escolares contraproducente para el rendimiento.

Las variables comunes en sendos árboles, ISEC, Expectativas_familiares y Tiempo_tareas, se comportaron de forma similar. Sin embargo, la variable género no fue seleccionada por el algoritmo en la competencia de RM, mientras que sí en CL. Igualmente, la variable Mes_nacimiento fue seleccionada para la competencia de RM, mientras no lo fue para CL. Por lo tanto, el alumnado que peor rendimiento tendría sería aquel cuyas familias tuvieran un ISEC menor, estimaban que cursaría hasta niveles obligatorios-medios y dedicaba mayor tiempo a la realización de tareas escolares.

4. DISCUSIÓN

Los resultados generados por los árboles de segmentación fueron coherentes con la literatura científica previa. El ISEC fue una de las variables seleccionadas, repercutiendo negativamente al alumnado en desventaja (Gamazo et al., 2017; OECD, 2016; Valenzuela et al., 2016). Las alumnas obtenían un mayor rendimiento en CL, si bien los alumnos no fueron clasificados para el árbol de RM, como cabría esperar (Özdemir, 2016; Stoet & Geary, 2015; Troncoso et al., 2016). Esto podría ser debido a que las puntuaciones en niveles superiores podrían estar influidas por estereotipos de género (Wach et al., 2015).

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En este caso, sería interesante conocer si la estimulación que reciben las alumnas en la competencia de comunicación lingüística es mayor.

Las expectativas familiares, cuando eran altas, podrían proteger al alumnado de bajo ISEC. No obstante, estas expectativas podrían ser consecuencia del rendimiento presente del alumnado. También, podría explicarse por la mejor valoración de la educación por parte de las familias y, por lo tanto, mayor apoyo por parte de estas (Li, 2017). Los centros escolares podrían fomentar las expectativas favorables para todo el alumnado y trabajarlo con las familias.

En cuanto a las tareas escolares, un mayor tiempo de dedicación también podría ser consecuencia de mayores dificultades en su realización (Valle et al., 2015), por lo que el alumnado que tuviera mayores dificultades dedicaría mayor tiempo a su realización.

Por último, cabe destacar que los árboles de segmentación explicarían en torno a un 9% de la varianza, como sugerían estudios previos con edades similares (Demetriou et al., 2020). Este resultado cuestiona el momento en el que la influencia del ISEC gana protagonismo en la explicación del rendimiento (Gamazo et al., 2017; OECD, 2016; Valenzuela et al., 2016. A estas edades, las características individuales podrían ser más determinantes (Finders et al., 2020; Demetriou, 2020) y una estimulación adecuada podría disminuir la brecha de desigualdad entre el alumnado a razón de su estatus socioeconómico. Esto podría explicar que el alumnado que asiste a la educación infantil tendría mejor rendimiento en etapas posteriores, especialmente, cuando proviene de familias menos favorecidas (OECD, 2018). Los resultados de las investigaciones cuantitativas de evaluación educativa también deberían complementarse con otros enfoques para poder explicar la complejidad de los fenómenos educativos (García-Jiménez et al., 2020). En este sentido, uno de los límites de la investigación fue la disponibilidad de variables por el cuestionario de contexto a las familias que determinó los análisis. Sería necesario la colaboración entre las instituciones de evaluación para incluir otras variables, como la condición de inmigrante o la asistencia a la etapa de infantil, para mejorar los modelos estadísticos.

5. CONCLUSIONES

Los árboles de segmentación permiten clasificar las variables independientes en función de una variable dependiente. Esto permite encontrar posibles perfiles de riesgo que, en el caso de esta investigación, serían alumnos de bajo rendimiento en las

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competencias de CL y RM. Tener un bajo estatus socioeconómico, percibir menores expectativas familiares o dedicar mayor tiempo a las tareas escolares podrían ser características de alumnado de bajo rendimiento, por lo que su detección debería ir acompañada de planes educativos que mejoren su situación para prevenir el fracaso académico en etapas superiores.

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4. Artículo 3

García-Jiménez, J., Torres-Gordillo, J., & Rodríguez-Santero, J. (2022). Factors Associated with School Effectiveness: Detection of High- and Low-Efficiency Schools through Hierarchical Linear Models. *Education Sciences*, 12(1), 59. <https://doi.org/10.3390/educsci12010059>

Article

Factors Associated with School Effectiveness: Detection of High- and Low-Efficiency Schools through Hierarchical Linear Models

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Abstract: School effectiveness is a topic of interest addressed by numerous research projects focused on clarifying which variables contribute to the explanation of educational performance. This research aims to find out to what extent social, cultural, and academic variables at the student and school levels, as perceived by families, influence performance, and to evaluate the relevance of high residual and gross score criteria in the selection of effective or ineffective schools. Census data from diagnostic evaluations of the Mathematical Reasoning and Linguistic Communication of students in a certain Spanish region, over five academic years, have been used. The multilevel hierarchical analyses carried out have enabled the detection of centers of high and low efficiency, as well as the identification of which factors, related to the idiosyncrasy of the students and the educational center they attend, significantly influence the performance of the students. It was concluded that the socioeconomic and cultural level of the families, the family expectations, the commitment to reading and the educational agreement were significant variables in the explanation of the students' educational performance, and that the residual score of the educational centers was a valid criterion to estimate their level of effectiveness once the socio-cultural factors have been controlled.

Keywords: educational efficiency; educational evaluation; educational quality; academic achievement; student evaluation



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1. Introduction

The general purpose of studies on school effectiveness is to contribute to the improvement of school processes in order to optimize educational results and equity. To achieve this purpose, educational evaluation is indispensable [1–5], especially to identify factors that influence educational performance [6–9].

International assessments of educational performance have allowed us to use the results as reference standards [1] that have led to changes in educational policy [1,3,10,11]. The contextualization of these results, obtained through the data provided by the context questionnaires that accompany the assessment of performance in core skills, has enabled the development of more accurate and reliable statistical analysis techniques, such as hierarchical linear models [12–17]. The main contribution of these multilevel designs is that they consider the nested structure of the data inherent to the educational system [6,18] and allow us to find out the factors responsible for performance that are attributed to the personal characteristics of the students (level 1: N1) and those that have an effect from higher levels of clustering, such as classrooms and centers (level 2: N2). Below are some research results grouped according to the level of affiliation of the factors that affect performance. Contextual factors, understood as those sociocultural factors of the individual and their families, and student characteristics, with reference to the student's attitudes and aptitudes, affect academic results, and unlike school-level factors, they tend to be relatively similar in different countries [19–21], with some variations of cultural origin [22,23].

In the present article, a multilevel analysis was employed using the results of second-grade students (7–8 years old) from a Spanish region. This age range is less used in the international literature because it mainly uses data from the PISA (Programme for International Student Assessment) or TIMSS (Trends in International Mathematics and Science Study) assessments, among others [24], which use populations of students aged 15 years or in the fourth or eighth grade of compulsory education, respectively.

1.1. Factors Associated with School Effectiveness NI

This section provides findings from the literature that affect performance distinguished by economic, social, and cultural status (ESCS); immigration and native language; gender; and academic factors specified as prior performance, perceived self-efficacy, preschool attendance, center evaluations, and family support.

1.1.1. Economic, Social, and Cultural Status

ESCS is one of the factors most highlighted for its influence on academic performance in the scientific literature [5,12,14,25–38]. The influence is found in all educational stages: early childhood [5], primary [12,25,27,28,32,34,37] and secondary education [14,25–27,29–31,33,35,36,38], with the secondary stage being more represented in the literature due to studies originating from the PISA results [14,26,29–31,33,35,36,38]. It is calculated from the components associated with the socioeconomic and cultural level of the families, understood as economic resources, and the level of schooling or consumption of cultural goods. Some of the components used for its calculation are as follows: the number of family resources (e.g., owning a computer or study table) [19,34,39], the level of parental education (level of education attained) [40], or the number of books owned by the family [19,41]. These components are usually collected through context questionnaires and synthesized into a numerical index obtained, generally, through factor analysis techniques, such as Principal Component Analysis [42,43]. A negative ESCS would increase the likelihood of dropping out of school [44] and would decrease students' learning opportunities [45].

1.1.2. Immigration and Native Language

The immigrant status of the students seems to have a negative impact on their school performance [14,25,27,28,31,32,46]. Not having the same native language in which assessments are conducted [12,22,34,36,45,47] and in which the classes are taught could be one of the variables related to this lower performance. However, immigration is a complex phenomenon that would require further review and determination of the influence of other factors, such as family involvement in education or the influence of ESCS.

1.1.3. Gender

A student's gender is another factor studied in relation to school effectiveness. In the early years of schooling, the influence of gender is the object of controversy. There is research that does not support its influence [28,48] and, on the contrary, there are other studies that claim better performance in general for girls [5]. However, from secondary education, there seems to be a clearer relationship. Girls would show better levels than boys in reading and communication skills, while boys would show better levels than girls in mathematics and science [14,26,30–32,36,38,39,45,49–51]. This could be due to the stereotypes associated with gender roles, cultural mechanisms and values that could negatively impact girls' self-confidence in mathematics and could be due to extracurricular factors such as being underrepresented in the media [48]. These cultural mechanisms could lead to biases in the expectations of female students in mathematics, which would give more importance to negative expectations than positive ones [52].

1.1.4. Academic Factors

There are other factors of an academic nature that would influence the results at the student level. Performance in previous courses or tests is positioned as one of the most

supported factors for the prediction of subsequent performance [5,25,27,49]. Students' perceived self-efficacy also could influence outcomes [26,31,53], perhaps as a reciprocal consequence of previous performance. The perception of low self-efficacy and poor prior performance would explain the association between repetition (re-performing the same school grade, a characteristic of the Spanish educational system, among others) and poor performance [12,14]. Preschool attendance may be a factor in improving academic outcomes, especially for families with low ESCS [12,26,34,54]. Apart from the relationships mentioned, it seems that students who receive more evaluations of their learning process, either with tests after each topic or with corrections and reviews of all the activities performed, could have better results [28], perhaps by training metacognition. In contrast, receiving more family support does not seem to correlate significantly with student performance [37].

1.2. Factors Associated with School Effectiveness N2

The influence of the variables associated with the educational center on the academic results achieved by the students is a reality verified in many studies [2,19,20,33,36,38,55–57]. This influence seems to increase as the education system progresses [5,58]. The use of the multilevel perspective allows for the aggregation of data from the first level (gender, ESCS, immigrants, etc.) at the school level. This helps to understand how these variables work at other levels of the educational system, providing new insights into them. In addition, it also allows the study of specific N2 variables, such as Subsidized Education (in Spain, “centros concertados” are schools that operate through both public funding and fees paid by parents, and therefore have slightly more freedom in their management than public schools) or educational leadership. For this reason, we provide results from the literature that have used data from the evaluation of schools. We begin with the relationships found between educational performance and the socioeconomic composition of the school and continue with the correlations originating from the different gender configurations of the schools and the size of the class. This section concludes by arguing for the importance of detecting the variables that influence educational performance for the promotion of educational equity, and the concreteness of the approach used and its possibilities, presenting the research objectives.

1.2.1. ESCS, Gender, and Size of Schools

Segregating students according to their socioeconomic characteristics would widen the social and academic gap between students [26,56,57,59]. This is a complex phenomenon, which seems to be determined by contextual characteristics such as location or school choice policies [59]. Segregation would worsen the results of schools where the concentration of students with a lower ESCS is higher [14,20,32,33,36,51,60] and influences the climate and discipline, positively impacting the effectiveness of schools with a higher ESCS [33,53]. The status of schools as Subsidized Education would have no effect when ESCS is controlled [12,27,38].

According to some research [30], schools with more female students would achieve better academic results. In contrast, research such as that of Gamazo et al. [14] would not support this hypothesis. There could also be evidence that centers with a high proportion of immigrants and repeaters have low levels of school effectiveness [14,25,46].

The influence of school size on student educational performance is unclear [49]. Nevertheless, some authors [27] maintain that it would not significantly affect performance. The greatest controversy is found in the size of the class group. Some research indicates that an increase in the ratio would worsen the results [12,61]. Other researchers do not believe that reducing the ratio would contribute to reducing the academic performance gap between students [62].

1.2.2. Evaluation of the Effectiveness of the Centers and Detection of Good Educational Practices

Knowledge of school characteristics that may contribute to improving academic results allows for the optimization of the work of educational centers in terms of quality and equity [44,45,54,63]. The proportion of variance difference between high-efficiency centers could be greater than between low-efficiency centers [53], which would indicate that in the latter, the level of performance tends to be more associated with the characteristics of the students who attend them, while in high-efficiency centers, the variables associated with the school have a greater impact on academic performance.

Therefore, it is especially important to detect and be aware of centers of very high or very low efficiency. Those with high effectiveness are those who achieve a high residual gain; that is, they obtain scores far above what would be expected, taking the levels they present in predictive variables, such as ESCS, as a reference [25,27,47,64,65]. The comparative study of this type of centers with those that present a low residual gain allows us to detect which variables give rise to processes and educational practices with a high level of achievement. This justifies the evaluation of the criteria relevance in the selection of high value-added centers, as well as the selection itself, which enables finding centers that do or do not stand out, in terms of good educational performance, in order to diagnose their potentials and weaknesses. The selection of centers would make it possible to address the educational reality from different approaches or paradigms, whether quantitative, qualitative or critical, in coherence with the demands of the complexity of the educational reality [25,27,47,64,65].

The combination of the detection of value-added centers and their subsequent in-depth study from different paradigms have found variables that could explain this added value:

- Shared leadership, characterized by shared responsibility and goal setting, the encouragement of individual responsibility and participation in decisions, and the establishment of good communication channels among the school's faculty [66–68];
- Continuous training of teachers with experiences such as cascade training [27];
- High levels of emotional involvement with students and their families, which takes the form of encouraging family participation in the daily life of the school, caring for socioemotional development and other aspects of development outside of academics, creating a positive environment, and encouraging family participation in education [64,69];
- Paying special attention to diversity, personalizing curricular adaptations, and optimizing available resources, based on systematized planning [65].

To detect the level of effectiveness of educational centers, value-added measures in context are of great interest, since they allow the effect of external variables, such as the ESCS, to be controlled to find out if the center is operating effectively with the resources it has at its disposal [18,20]. This consideration is made because it is usually assumed that those centers that are located in less favorable areas will have more difficulty achieving optimal academic results [47]. We share the methodological approach of Martínez-Abad et al. [46] and Lizasoain [16] for the detection of high value-added centers, as it implies the characterization of very high-efficiency centers (CAEF) and very low-efficiency centers (CBEF), which we consider indispensable. The detection of schools and their subsequent characterization would serve to find good practices that could be generalized to contribute to the reduction of the inequality gap between students [45,54,70], as not all education systems would be able to guarantee equity in all their centers [19,20,45,54,60].

Therefore, the following research questions were addressed:

- (1) To what extent do student and family variables contribute to student achievement in Mathematical Reasoning (MR) and Linguistic Communication (LC)?
- (2) Is the use of high residual and gross score criteria relevant in the selection of CAEF and CBEF?

2. Materials and Methods

In this research, a non-experimental or ex-post facto methodology and a correlational design have been used. Specifically, multilevel hierarchical regression models have been used. This study has a double objective:

- (1) To find out to what extent social, cultural, and academic variables at the student and school levels, as perceived by families, influence performance of Mathematical Reasoning (MR) and Linguistic Communication (LC) skills, through hierarchical linear models;
- (2) To evaluate the relevance of high residual and gross score criteria in the selection of CAEF and CBEF.

2.1. Instruments

Two instruments were used, both designed and administered by Agencia Andaluza de Evaluación Educativa (Andalusian Agency for Educational Evaluation) (AGAEVE):

- **ESCALA (E**scritura, **C**álculo y **L**ectura en Andalucía (Writing, Calculation, and Reading in Andalusia)) test: this test has been carried out annually and evaluates the academic performance of Andalusian students in the 2nd year of elementary school in MR and LC. For the preparation of the test, after the design process, a pilot study was carried out with 1000 participants to evaluate the relevance of each question and classify them according to the degree of difficulty. Once the questions, which have a practical orientation, have been selected, they are administered to the schools. The tests make it possible to obtain an evaluation of the students’ development of competencies in each skill, as well as overall results by class and center. The results are used for information purposes for the administration, schools, and educational inspection;
- **Context questionnaires:** this is an instrument administered to families in order to find out the socioeconomic characteristics of the students. This allows us to know the evolution and development of the educational centers and the students who attend them based on their socioeconomic characteristics.

The scores corresponding to the dependent variables were extracted from the ESCALA tests on MR and LC. Data for the following independent variables were obtained from the context questionnaires. The processing of variables was a preliminary step in the realization of multilevel hierarchical models (see Table 1):

Table 1. Selected independent variables, description, and statistical processing.

Variable Name	Description	Processing
GenderNI	Single dichotomous choice (boy = 0; girl = 1)	
ESCSNI	Amount of resources available at home (dichotomous variable yes or no: room only for your daughter or son, adequate place for study, internet, educational software on the computer to facilitate learning, electric dishwasher, dryer, and digital book reader), at work (ordinal scale: inactive population; domestic work in own household; specialized personnel in agriculture and fishing, manufacturing industries, construction, mining, and handicrafts; personnel in catering, protection, sales, and other services; personnel in basic positions including security forces; professional support technicians and technicians; clerical and administrative employees; small business, professions requiring a university degree, and business management) and the level of study (ordinary choice: incomplete primary studies or did not attend school; General Basic Education or Compulsory Secondary Education Degree; Baccalaureate, First-Degree Vocational Training, BUP, COU, Intermediate Vocational Training or Arts; Second-Grade Vocational Training or Higher-Level Vocational Training or Higher-Level Training Cycles in Vocational Training or the Arts, and Diploma, Bachelor’s Degree, Degree, Doctorate) of both parents, attendance at cultural activities (attendance at cinema, theater, and museums or exhibitions on an ordinal scale: not at all, a little, quite a lot, or a lot) and number of books owned.	Factor analysis from which an index with normal distribution was obtained [42]. It should be noted that the formulation of the response options changed slightly from one academic year to the next, including the variable of attendance at cultural activities in 2014. The criterion followed to order the professions and the educational levels that were provided by the AGAEVE.

Table 1. Cont.

Variable Name	Description	Processing
BedtimeN1 (BedN1)	Ordinal scale through which the time students go to bed during the week was evaluated (4 options: before 9pm, 9pm–9:30pm, 9:30pm–10pm, and later than 10pm).	Range 1–4, where 1 was the lowest value and 4 was the highest.
Amount of homework (AmountHN1)	Likert-type ordinal scale in which the amount of homework was evaluated (4 options: few, fair, should have less, should not have any).	Range 1–4, where 1 was the lowest value and 4 was the highest.
Time spent doing homework (TimeHN1)	Ordinal scale in which the amount of time the student dedicates to the accomplishment of homework was evaluated (5 options: none, 15 min, 16–30, 31–60, +60 min).	
Reading promotion (ReadingPN1)	Likert-type ordinal scale (none, little, enough, and a lot) for 4 questions (I read with the student, we usually read at home, shared reading, or commenting on the reading) that evaluates the commitment of the reader.	Sum of the scores assigned by the parents. Range 1–20, where 1 was the lowest value and 20 was the highest (11–12/12–13); Range 1–16, where 1 was the lowest value and 16 was the highest (13–14/14–15/16–17).
Extracurricular activities (ExtracurricularN1)	Single dichotomous choice (yes or no) for 4 types of extracurricular activities (sports, musical, language, or other).	Sum of the scores obtained. Range 0–4, where 1 was the lowest value and 4 was the highest.
Screen consumption hours (ScreenN1)	Likert-type ordinal scale (no time, up to one hour, 1 to 2 h, or more than two hours) for two different questions (watching TV or playing games).	Sum of scores achieved on both questions. Range 1–8.
Family expectations (FamilyExpN1)	Ordinal scale through which the level of education that the child will reach was expressed. Both the father and the mother give the level of studies that they believe the student will complete from 5 options (obligatory studies, medium vocational training, secondary school, higher vocational training, or university degree).	Sum of the scores assigned by the parents. Range 1–20, where 1 was the lowest value and 20 was the highest.
Family involvement with the student (FamInvStuN1)	Likert-type ordinal scale (never, some days, almost every day, every day) applied to 5 questions (encourage to study, ask about homework, check homework, ask about how you have done at home, and help with homework), through which the involvement with the student was evaluated.	Sum of the scores reached in the questions and dichotomization of the variable. Range 1–20, where 1 was the lowest value and 20 was the highest.
Involvement of families with the school (InvFamSchN1)	Likert-type ordinal scale (none, little, enough, and a lot) for 5 questions (attendance at tutorials, participation in school activities, relationship with the school's parent association, relationship with the parent delegates, and relationship with the School Council) that evaluate the involvement with the school.	Sum of the scores reached in the questions. Range 1–20, where 1 was the lowest value and 20 was the highest.
Type of center (TypeCenterN2)	Nominal variable that describes the type of center (funding): public, subsidized, or private.	Creation of dummy variables: Subsidized (0 = no; 1 = yes) and Private (0 = no; 1 = yes).
Center size (SizeN2)	Number of students who performed the ESCALA test in the school.	Schools with less than 11 students were not considered.
Aggregated variables (AggregatedN2)	Average of N1 variables for each center.	Average of the scores obtained by the school for each variable.
GenderN2	Proportion by gender of the center.	In the level two aggregate, gender ratios were used instead of averages.

The context questionnaires varied according to the years; therefore, Table 2 shows the variables used in each academic year. For the aggregate, that is, the school-level variables, the available N1 variables were used.

Table 2. Variables, by academic year, collected in the context questionnaire.

Variables	Academic Year				
	2011–2012	2012–2013	2013–2014	2014–2015	2016–2017
GenderN1	X	X	X	X	X
ReadingPN1	X	X	X	X	X
InvFamSchN1	X	X	X	X	X
FamilyExpN1	X	X	X	X	X
ESCSN1	X	X	X	X	X
BedN1			X	X	X
ScreenN1			X	X	X
ExtracurricularN1			X	X	X
FamInvStuN1			X	X	X
AmountHN1				X	X
TimeHN1				X	X
TypeCenterN2	X	X	X	X	X
SizeN2	X	X	X	X	X

2.2. Population

After signing an agreement with the AGAEVE in 2017, the census data obtained for Andalusian students in the 2nd grade of elementary school (7–8-year-old students), were used. The results from the 2010–2011 to 2016–2017 school years—except for the 2015–2016 school year, when there were no context questionnaires—were part of the research. Andalusia is an autonomous community in southern Spain with a population of 8,427,404, the largest in the country [71]. Performance in international tests, such as the Programme for International Student Assessment (PISA), was 30 points below the international average in mathematics [72]. First, cases that did not complete the assessment of either competency were discarded. After this process, the total number of participants in the study was 410,030 students (49% female; 51% male). The participating schools varied by year (see Table 3), with the minimum number of participating schools being 2040 and the maximum 2138. Table 3 shows the data disaggregated by academic year and gender. For the detection of the effectiveness of schools, only the schools that participated in all the evaluations were used, which amounted to 1786.

Table 3. Total data on participating students by academic year, gender, and educational centers.

Academic Year	No. of Students	Gender		Centers
		F%	M%	
2011–2012	77,828	48.9	51.1	2040
2012–2013	81,903	49.2	50.8	2131
2013–2014	85,736	48.6	51.4	2115
2014–2015	84,757	48.9	51.1	2138
2016–2017	79,806	49.1	50.9	2092
TOTAL	410,030	49	51	

2.3. Procedure

First, the variables were adjusted for their use in the models (see Table 1 column 3). The ESCS variable and the rest of the ordinal covariates remained on their original scale. Although there are limitations in this decision, in educational sciences, the use of typed scores is generally accepted because they come from unobservable constructs measured indirectly [73]. Therefore, the values are interpreted, taking the reference population as a reference, as increases in standard deviation units [73]. In the case of nominal variables, dummy variables were created, such as the type of center and gender. Second, subjects belonging to schools with fewer than 11 students were eliminated because such small schools are subject to greater sampling variability [18]. Once the aforementioned cases of each grade were discarded, multilevel regressions were carried out using hierarchical linear

models [14,27,47,74]. At first, the null model, that is, the model without any covariates [73], was calculated:

$$y_{ij} = \beta_0 + \mu_{0j} + \varepsilon_{ij}$$

After verifying the existence of significant differences in variance at both levels [73] and that the Intraclass Correlation Coefficient (ICC) was greater than 10% [14,75], predictive covariates were added at both levels. This process was done, at first, by including all the available variables in order to have a preliminary view of the behavior of the model and the significant or insignificant covariates that it returned. Subsequently, variables were included and excluded to adjust the model, ensuring that only variables that were significant at 99% confidence were included. Therefore, the model was considered refined when the covariates included were significant at 99% confidence and the proportion of explained variance was greater than the null model. Additionally, with the criterion of the likelihood ratio [73], significant differences were obtained between the null model and the refined model. Hence, the second is a better model, as it includes more parameters [73]. All the analyses were carried out using Statistical Package for the Social Sciences (SPSS) version 25. Once the model is refined, the residual scores N2 (u_{0j}) are calculated for each of them [74], the residual score being the difference between the expected and achieved scores. This score allows us to find centers with added value, since they are considered to be working effectively due to having an empirical or observed score above their expected score [25,27,47,64,65]. To identify CAEFs and CBEFs, the criteria of Martínez-Abad et al. [46], which are extreme residual scores (centers with the highest positive or negative average residual score over 5 years) and extreme scores (centers with the highest or lowest average score over 5 years), were taken as a reference.

3. Results

First, the descriptive results for the two competencies assessed (see Table 4 and each of the covariates by course (see Table 5) are presented.

Table 4. Descriptive results of the scores in the different skills by year.

Academic Year	Skill	Average	Standard Deviation	Maximum	Minimum
2011–2012	MR	503.54	97.41	628.81	218.92
	LC	504.20	97.63	647.07	235.82
2012–2013	MR	503.31	97.15	623.04	152.57
	LC	504.06	97.14	621.69	200.89
2013–2014	MR	502.82	97.26	609.89	144.45
	LC	503.12	97.66	624.78	162.46
2014–2015	MR	502.87	97.01	596.91	79.19
	LC	503.22	97.38	615.7	144.44
2016–2017	MR	504.64	96.19	600.07	77.02
	LC	505.80	96.11	613.46	129.57

As can be seen in Table 4, the means and standard deviations did not undergo significant variations over the years, beyond the changes introduced in the family questionnaire. The standard deviations of N1 were greater than those of N2, indicating that there is greater heterogeneity in scores between families than between centers (see Table 5). The largest standard deviation was found in the size of the center, illustrating the diversity of Andalusian schools under this criterion.

Table 5. Descriptive results of the scores in the different covariates by year.

Academic Year	Statistics	Variable ¹										
		A	B	C	D	E	F	G	H	I	J	K
A = ESCS; B = InvFamSch; C = FamilyExp; D = ReadingP; E = Bed; F = Extracurricular; G = Screen; H = FamInvStu; I = AmountH; J = TimeH; K = Size												
2011–2012	Average	0.02	10.44	7.95	13.01							
	SD ²	1	3.38	2.67	5.58							
	Min	−3.92	1	1	1							
	Max	2.26	20	10	20							
2012–2013	Average	0.04	10.63	7.97	8.15							
	SD	1	3.33	2.66	3.91							
	Min	−3.57	1	1	1							
	Max	1.94	20	10	20							
2013–2014	Average	0.02	10.29	7.99	10.9	2.89	1.34	3.85	18.78			
	SD	1	3.19	2.67	2.81	0.73	0.87	1.05	1.86			
	Min	2.75	1	1	1	1	0	1	1			
	Max	3.07	20	10	16	4	4	8	20			
2014–2015	Average	0.04	11.11	8.03	10.42	2.88	1.40	3.85	16.92	2.05	3.79	
	SD	1	3.32	2.67	2.79	0.74	0.89	1.06	2.98	0.57	0.86	
	Min	−2.73	1	1	1	1	0	1	1	1	1	
	Max	3.09	20	10	16	4	4	8	20	4	5	
2016–2017	Average	0.06	12.2	8.13	10.46	2.91	1.50	4.08	18.41	2.13	3.58	
	SD	1	3.36	2.59	2.79	0.74	0.88	1.24	2.08	0.64	0.91	
	Min	−2.87	1	1	1	1	0	1	1	1	1	
	Max	3.06	20	10	16	4	4	8	20	4	5	
VariableN2												
2011–2012	Average	−0.03	10.5	7.89	12.87							40.54
	SD	0.55	1.05	0.83	1.64							19.03
	Min	−2.90	5.75	4.69	5							12
	Max	1.56	15.43	9.95	16.94							128
2012–2013	Average	−0.011	10.7	7.92	8.15							44.51
	SD	0.53	1.02	0.82	0.85							21.02
	Min	−2.17	7.53	2.52	4.18							12
	Max	1.61	14.4	10	16.7							166
2013–2014	Average	−0.03	10.37	7.93	10.89	2.9	1.32	3.86	18.77			43.39
	SD	0.53	0.98	0.83	0.64	0.21	0.28	0.28	0.56			20.77
	Min	−2.41	7.6	2.38	5.75	1.95	0.25	2.43	9.8			12
	Max	1.55	14	10	13.33	3.90	2.45	5.95	19.9			145
2014–2015	Average	−0.01	11.18	7.96	10.39	2.9	1.39	3.86	16.93	2.04	3.79	42.3
	SD	0.53	1.06	0.81	0.68	0.21	0.28	0.28	1.49	0.18	0.32	19.74
	Min	−2.53	8.05	2.04	5.04	2.04	0.13	2.71	11.21	1.24	1.39	12
	Max	1.60	15.8	9.87	12.41	3.87	2.38	6.14	19.53	3.35	4.75	120
2016–2017	Average	−0.00	12.33	8.05	10.42	2.93	1.44	4.11	18.41	2.12	3.59	40.09
	SD	0.51	1.23	0.79	0.68	0.22	0.3	0.35	0.58	0.19	0.34	19.1
	Min	−2.30	6.58	3.24	6.47	2.00	0.36	2.89	12.53	1.32	2.05	12
	Max	1.57	16.32	9.67	12.24	3.73	2.88	6.76	19.73	2.79	4.76	122

Note 1: A = ESCS; B = InvFamSch; C = FamilyExp; D = ReadingP; E = Bed; F = Extracurricular; G = Screen; H = FamInvStu; I = AmountH; J = TimeH; K = Size; Note 2: Standard Deviation (SD).

Secondly, the results of the multilevel hierarchical regression are shown for the LC and MR skills. The refined model is presented, consisting of the result of the model with all the significant variables possible. Table 6 shows the percentages of variance reduction ratios and variance explained by year and discipline, differentiating between students and residual scores between schools. The results provided are with the refined model, that is, with the predictors, included. The ICC indicates the effect of the school on explaining the results, being higher in RM for all years. On the other hand, the percentage of variance explained was higher in the case of LC and schools, so the inclusion of predictor variables allows for a more accurate estimation of the contribution of schools to the development of competencies. Therefore, the calculation of their effectiveness will be more accurate when controlling the student characteristics [76].

Table 6. Proportion of reduction (%) in variance and variance explained by academic year and skill and ICC for refined model.

			Variance Ratio	Variance Explained	ICC
2011–2012	MR	Between students	89.19	10.81	25.57
		Residual between schools	87.22	12.78	
	LC	Between students	86.82	13.18	22.58
		Residual between schools	76.13	23.87	
2012–2013	MR	Between students	89.84	10.16	24.95
		Residual between schools	86.93	13.07	
	LC	Between students	86.86	13.14	19.34
		Residual between schools	73.85	26.15	
2013–2014	MR	Between students	88.81	11.19	23.2
		Residual between schools	85.47	14.53	
	LC	Between students	87.82	12.18	21.56
		Residual between schools	79.03	20.97	
2014–2015	MR	Between students	87.22	12.78	22.35
		Residual between schools	83.85	16.15	
	LC	Between students	83.66	16.34	18.34
		Residual between schools	74.87	25.13	
2016–2017	MR	Between students	86.65	13.35	20.91
		Residual between schools	84.64	15.36	
	LC	Between students	84.28	15.72	20.44
		Residual between schools	76.38	23.62	

The covariates were added as a fixed part. The results with the significant covariates (99% confidence) for each year are presented in Appendices: Table A1 (MR) and Table A2 (LC). The results must be interpreted while taking into account that the values of the variables are not directly comparable since they have different measurement scales. In some cases, there are standardized scores (ESCS), ordinal scale scores, and in others, for example, dichotomous scores (gender). To find out the type of variable, we recommend referring to Table 1, where the processing is explained, and 6, where the descriptive analyses are presented. Therefore, taking, as a reference, the results of the MR for the year 2016–2017, the expected average results, according to the intercept with no more covariates, for boys of medium ESCS, would be 290.68 with a standard deviation of $SD = 23.13$. For the female gender, this would correspond to an increase of 3.03 points in the results for the skill. An increase of one point in the ESCS would lead to an increase of 15.32 points in MR, while an increase of one point in the amount of homework would lead to a decrease of 2.57 points in MR. On the other hand, if the center's average increases by one point regarding bedtime, it would be accompanied by an increase of 13.09 points in MR, or if the center's average in commitment to reading increases by one point, it would be accompanied by an increase of 6.02 points in MR.

The highest estimates for N1 were ESCS, gender, and homework time in both skills. In N2, the time spent on homework and the center's commitment to reading could be highlighted in both skills as the variables with the highest estimates, even though these were only used in the last two years. The average score was lower in the case of LC, being the skill where the least variation was explained by the center according to the ICC. The direction of the variables was constant for all courses, that is, family expectations added while an increase in the perception of the number of families subtracted. However, there were changes in direction between levels. While screen consumption increased the score at the student level, it subtracted it at the center level. The amount of homework subtracted at the student level but added at the center level. These changes deserve more attention as they may be the result of the multicollinearity that we face in research studies. The discussion section expands on the interpretations. The centers' average ESCS was only significant in the 2016–2017 academic year in LC, increasing the result when it was favorable. Likewise, for this academic year and skill, the results could suggest that centers that only admit female students may obtain worse results. Figure 1 includes a summary of the variables associated with performance by competency.

Parameters		MR	LC
GenderN1	InvFamSchN1	✔	✔
ReadingPN1	BedN1	✔	✔
ESCSN1	ExtracurricularN1	✔	✔
FamilyExpN1	ScreenN1	✔	✔
AmountHN1		✘	✘
TimeHN1		✘	✘
FamInvStuN1		✘	✘
<hr/>			
SubsidisedN2	SizeN2	✘	✘
ScreenN2		✘	✘
GenderN2			✘
ESCSN2			✔
FamilyExpN2	ReadingPN2	✔	✔
BedN2	FamInvStuN2	✔	✔
AmountHN2	InvFamSchN2	✔	✔
TimeHN2		✔	✔

✔ Increases performance
✘ Performance decreases

Figure 1. Summary of significant parameters and their direction distributed by competency.

Thirdly, the centers were selected. The process began by eliminating from the study those centers that had not participated in all evaluations conducted during the academic years under study, so as not to lose the longitudinal character of the study. The final number of participating centers was reduced to 1786. The residual scores were calculated for each year and skill. The average residual score of the center in both skills was calculated prior to this. In addition, the average scores of the residual scores in the five analyzed academic years were calculated. The gross scores were calculated by a process analogous to that for the residual scores. Finally, 50 CAEF centers (25 centers with the best average score and 25 with the best average residual score) and 50 CBEF centers (25 with the worst average score and 25 with the worst average residual score) were selected.

Therefore, the correlation between both criteria and the average ESCS of the center was calculated. Table 7 shows Pearson’s correlation between the average residual score, the average score, and the average ESCS of the center. The mean residual score and the mean score had a high and positive relationship ($r = 0.87$); however, the mean residual score did not show any relationship with the mean ESCS. In contrast, the mean score did have a positive mean relationship with the mean ESCS ($r = 0.44$). These results could be interpreted as meaning that the centers with high residual scores would have high mean scores, and vice versa, with the criteria of scores and extreme residual scores being parallel in our case. However, the criterion of an extreme residual score may control the influence of the ESCS, so it was ultimately the criterion used for the selection of the 50 CAEFs and CBEFs, discarding the use of gross scores because they do not control for context effects measured from the ESCN. In this way, we also ensured that there was no overlap in the selection of centers.

Finally, the 50 CAEFs and 50 CBEFs were selected. Of the CAEFs, 37 were public, 2 were private, and 11 were subsidized. Of the CBEFs, 33 were public, 2 were private, and 15 were subsidized. Table 8 presents a brief description of them according to their effectiveness category, distinguishing between the aggregate variables common to the 5 years, the score, and the residual score. In addition, in order to determine possible differences, a t-test was performed. Among the results, it should be noted that, as expected, there were differences in the mean score and mean residual score, with the scores being higher

in the CAEFs; in family expectations ($d_{\text{Cohen}} = -0.46$), and in families' encouragement of reading ($d_{\text{Cohen}} = -0.58$), which was also higher in the CAEFs with moderate effect size [77]. However, no differences were found in families' commitment to the center, in size, or in ESCS.

Table 7. Pearson's correlation between mean residual score, mean score, and ESCS.

		Mean Score	ESCS Average
Mean residual score	Pearson's correlation	0.87	0.01
	Sig. (bilateral)	0.00	0.86
Mean score	Pearson's correlation		0.46
	Sig. (bilateral)		0.00

Table 8. Center descriptions and mean comparison tests between CAEFs and CBEFs.

VariableN2	Selection	N	Average	SD	Levene		T Student	
					F	Sig.	t	Sig.
FamilyExp	CAEF	50	7.82	0.63	3.59	0.06	2.26	0.03
	CBEF	50	7.48	0.84				
ReadingP	CAEF	50	10.49	0.56	1.73	0.19	2.93	0.00
	CBEF	50	10.12	0.70				
ESCS	CAEF	50	-0.15	0.46	5.74	0.02	1.51	0.13
	CBEF	50	-0.31	0.59				
InvFamSch	CAEF	50	11.25	0.94	0.01	0.93	1.60	0.10
	CBEF	50	10.95	0.93				
Size	CAEF	50	39.68	18.08	0.61	0.44	1.60	0.10
	CBEF	50	34.16	15.44				
Score	CAEF	50	565.59	14.9	25.21	0.00	54.14	0.00
	CBEF	50	417.56	32.86				
Residual Score	CAEF	50	58.41	7.97	12.37	0.00	29.01	0.00
	CBEF	50	-63.37	13.77				

4. Discussion

The results of the multilevel hierarchical analysis are mostly consistent with previous findings in the scientific literature. The ESCS at the student level is the variable that has the greatest influence on the results for both skills [21,57]. Female students perform better in both tests in the 2nd year of elementary school [5], meaning there is a gap between these findings and those obtained in later educational stages, in which male students perform better in MR [14,25,30–32,36,38,39,45,49–51]. These results reveal a possible gender gap at these ages which needs to be studied and deepened in order to be solved from the teaching–learning process.

Coinciding with Wei [37], it has been shown that, at early ages, a high level of student support, as well as a high level of time spent on homework, is associated with poor academic results [76]. This could be due to the fact that those students who receive more help or dedicate more time to schoolwork are also those who need more help and time, being a direct consequence of their performance capacity. Attendance at extracurricular activities is positive for performance, so it would be advisable for schools to make the appropriate efforts to encourage it, although it would be interesting to expand on these findings to find out if there are differences between recreational or academic extracurricular activities. However, this may be no more than a spurious correlation mediated by ESCS, since families with a higher economic and cultural level are those that provide greater opportunities [45] and resources [19,34,39,78] for this type of activity.

As for school-level variables, it is noteworthy that the school's ESCS has not been significant in all academic years, with a greater presence in LC. It is possible that Andalusian schools compensate for the differences between students at this level, which would explain why subsidized schools obtain a lower level of performance. The center's mean ESCS was only significant in one year, 2016–2017, for the LC competency. Likewise, the results suggested a decrease in LC in the case of centers with only female students, results similar to those of López-González et al. [76], in which they also had a change in gender direction at the center level. Although this could be a model fit, the results may suggest that female students would benefit from a mixed gender composition in the centers. The increase in the size of the center, in some years, is associated with a decrease in MR performance, which contradicts the results obtained in other previous studies [27]. It is remarkable that an increased use of screens in the center correlates negatively with performance, contrary to what was happening at the level of the student body. Higher screen consumption would be associated with worse development [79–81], especially when the use is for entertainment [82], so this result deserves further investigation. At first, it could be inferred that it would be evidence of a greater possession of resources, however, students from more disadvantaged families seem to use devices more, perhaps because their families have fewer resources and skills to educate or entertain their students, so they would impose fewer limitations [78,82].

Family expectations have been significant at both levels. The results of the OECD [53] are confirmed, showing better expectations from families with a higher ESCS. Family involvement in the school has also been significant at the school level, confirming that greater family commitment to the school improves educational performance by fostering a sense of belonging [54]. However, it was only significant in one year, and the direction was different from the level of the student body, so we believe that future studies should focus on this issue. Finally, it is striking that the variables referring to the amount of homework and time spent on it, at the school level, present a significant and positive association with performance, contrary to what happened at the student level. Schools that demand less homework seem to be more effective, perhaps because of a better organization of time both inside and outside the classroom [83]. However, a more in-depth review of this variable would be necessary to allow for a more realistic interpretation.

With regard to the selection of CAEFs and CBEFs, given the high correlation between the criteria of scores and residual scores, in both disciplines, it is estimated that it is preferable to use the residual criterion, as this also allows us to control contextual variables [18,20]. The development of these criteria using census data ensures robustness and reliability in the detection of CAEFs and CBEFs, taking into account both excellence, as centers of proven effectiveness, and equity, when considering their own context [16]. The procedural model followed for the selection of centers could facilitate the development of specific interventions aimed at improving the effectiveness of schools [60] and expanding knowledge of the variables that help explain educational performance [9,25,27,47,64,65]. However, given the complexity of the educational system and the study of social sciences, it is assumed that the results are partial when taking the performance in certain competencies as a reference, with the educational reality being more complex and beyond the results of diagnostic evaluations [6,76]. Therefore, we believe it is important for educational evaluation and improvement to create dialogue between paradigms, riding between the macro and micro scales, as well as the international and the local [73].

4.1. Limitations

Regarding the limitations of the study, we consider that the context questionnaires that accompany the ESCALA tests do not collect all the contextual variables that may be affecting the educational performance of students. The variables at the school level, for the most part, are only the result of the aggregation of variables at the student level. The anonymous processing of the results did not allow for decisions such as reducing the sample and expanding the variables associated with the schools by means of questionnaires

or other tools. In addition, the data analyses used do not allow the establishment of causal relationships, the search for which we consider interesting as future research. Finally, the strong collinearity of the constructs with which we work in educational sciences, coming from indirect measures of measurement and the processes used, are limits that we must assume and consider for future studies.

4.2. Prospective

In the future, it may be useful to extend the use of the selection of centers with a qualitative study to find cultural variables that improve the work of the centers. On the other hand, it may be appropriate for future editions of the instrument to incorporate questions about child education attendance and immigrant status, in addition to reflecting on the reformulation of the question regarding the use of screens. Furthermore, the number of questions about the centers should be increased in order to improve the statistical model and the knowledge of the variables that could explain school effectiveness. Finally, as mentioned above, the complexity of the educational system requires a study from different paradigms that allow for an enrichment of the body of knowledge from different criteria and points of view.

5. Conclusions

The study of factors associated with school performance and effectiveness allows for the diagnosis of educational systems to assist in decision making at the macro and micro levels. In the present research, some factors were found that could be related to educational performance. Among them, the influence of the ESCS stands out, since it shows that there is a gap in the equity of the educational system as well as the lower performance of male students, which could mean a gender gap to be more deeply investigated.

On the other hand, criteria for the selection of high- and low-efficiency centers were evaluated. The use of residual scores is considered to be an acceptable criterion for the evaluation of the effectiveness of centers. This score allows the influence of contextual factors to be controlled. Finally, it should be mentioned that there seems to be a greater influence of the center on the RM results than on those of LC, which could be a limitation for the promotion of equity in the centers, since this competency is instrumental in the development of the other competencies.

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Appendix A

Table A1. Results of the multilevel model with significant variables ($p < 0.00$) of MR per course.

Parameters	2011–2012		2012–2013		2013–2014		2014–2015		2016–2017	
	Estimation	SD	Estimation	SD	Estimation	SD	Estimation	SD	Estimation	SD
Intercept	424.84	9.77	418.71	9.21	294.89	31.75	402.54	20.8	290.68	23.13
GenderN1	1.97	0.59	2.32	0.58	1.69	0.6	3.55	0.59	3.03	0.6
ReadingPN1	0.86	0.06	0.46	0.07	0.48	0.11	0.73	0.11	0.51	0.12
ESCSN1	20.2	0.38	21.28	0.37	18.55	0.38	15.94	0.38	15.32	0.39
FamilyExpN1	4.89	0.12	4.91	0.12	5.17	0.12	5.07	0.12	4.71	0.12
InvFamSchN1	0.86	0.09	1.1	0.09	0.48	0.1	0.34	0.09	0.81	0.1
BedN1					2.49	0.43	2.52	0.41	2.89	0.42
ExtracurricularN1					4.89	0.37	5.34	0.35	5.35	0.37
ScreenN1					3.95	0.3	2.48	0.29	1.62	0.25
AmountHN1							-3.18	0.54	-2.57	0.49
TimeHN1							-14.1	0.37	-16.5	0.37
FamInvStuN1					-0.92	0.17			-0.98	0.16
SubsidedN2			-7.33	2.65	-11.32	2.61	-10.04	2.51		
BedN2									13.09	4.61
AmountHN2							27.39	6.27	26.97	5.82
TimeHN2							23.1	3.27	17.03	3.22
ReadingPN2									6.02	1.42
FamInvStuN2					6.2	1.82				
FamilyExpN2	3.91	1.28	3.9	1.18	5.05	1.32				
ScreenN2							-15.09	3.58		
SizeN2	-0.25	0.06			-0.19	0.05				

Appendix B

Table A2. Multilevel model results refined with significant variables ($p < 0.00$) of LC per course.

Parameters	2011–2012		2012–2013		2013–2014		2014–2015		2016–2017	
	Estimation	SD	Estimation	SD	Estimation	SD	Estimation	SD	Estimation	SD
Intercept	333.89	12.08	372.51	8.07	367.64	25.34	364.96	21.41	256.86	23.7
GenderN1	26.46	0.59	24.33	0.58	19.85	0.6	27.34	0.59	28.28	0.59
ReadingPN1	0.84	0.06			0.58	0.11	0.86	0.11	0.7	0.12
ESCSN1	20.61	0.38	23.19	0.36	19.32	0.38	18.3	0.38	14.79	0.38
FamilyExpN1	4.99	0.12	5.52	0.12	5.32	0.12	5.37	0.12	4.74	0.12
InvFamSchN1	0.83	0.09	1.09	0.09	0.38	0.1	0.35	0.09	0.61	0.1
BedN1					2.38	0.43	3.14	0.41	2.23	0.42
ExtracurricularN1					4.63	0.37	4.65	0.35	5.09	0.36
ScreenN1					3	0.3	2.15	0.29	0.94	0.25
AmountHN1							-3.04	0.54	-2.55	0.48
TimeHN1							-16.84	0.37	-17.44	0.36
FamInvStuN1					-0.91	0.17			-0.44	0.16
SubsidedN2	-8.88	2.6	-7.38	2.31	-7.9	2.5	-12.28	2.28	-7.39	2.45
ESCSN2									13.46	2.62
GenderN2									-23.87	8.84
BedN2									14.61	4.75
AmountHN2							24.11	5.74	23.78	5.91
TimeHN2							21.24	2.95	22.03	3.33
ReadingPN2					5.89	1.7			4.49	1.64
InvFamSchN2	2.94	0.98							2.78	0.77
FamilyExpN2	8.81	1.22	8.31	1.03	5.23	1.32	5.99	1.12		
ScreenN2					-9.78	3.66	-14.06	3.34		
SizeN2							-0.12	0.05		

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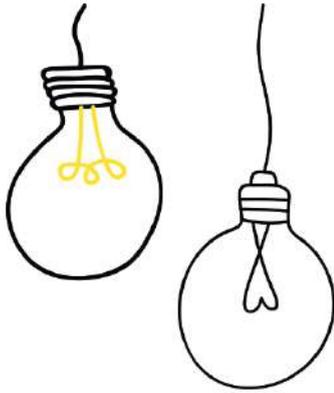
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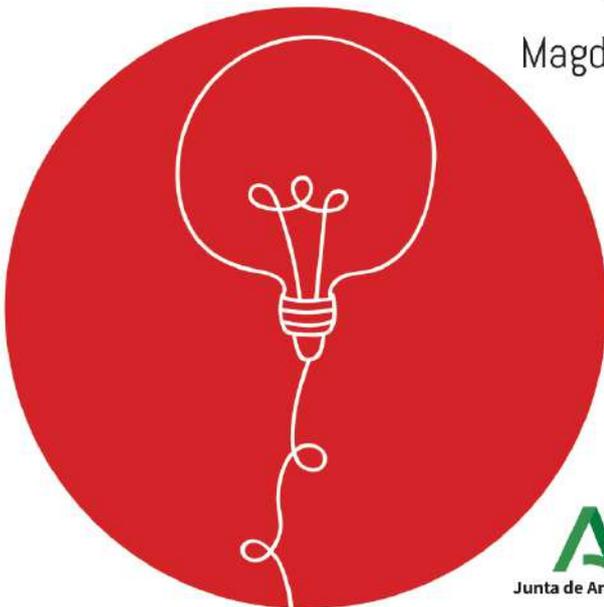
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Gerardo Gómez García

Dykinson, S.L.



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PRUEBAS ESCALA**

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RESUMEN

Garantizar la equidad en la calidad educativa entre el alumnado de diferente origen social, cultural y género es uno de los objetivos prioritarios de la agenda 2030, como garantía de progreso social. En el presente capítulo se persigue comprobar el nivel de equidad y paridad existente en los centros escolares andaluces en relación con el dominio de la competencia lingüística. Se lleva a cabo un estudio a través de modelos jerárquicos multinivel. Se utilizaron los datos censales derivados de las pruebas diagnóstica ESCALA (Escriura, CÁlculo y Lectura en Andalucía) del curso 2016-17 en la competencia lingüística. Los resultados arrojados indican que habría una relación entre una mayor eficacia en los centros y más equidad de género en los resultados, pero menos equidad en relación con el nivel socioeconómico. En conclusión, la evaluación educativa podría servir para detectar y visibilizar posibles mejoras con relación a estos resultados. A través de las políticas educativas y el quehacer diario se puede proponer su solvencia, considerando que la complejidad del sistema educativo nos arroja resultados parciales que deben completarse con otras investigaciones y paradigmas.

1. INTRODUCCIÓN

Promover una educación de calidad es el cuarto objetivo de desarrollo sostenible establecido por las Naciones Unidas en la Agenda 2030. Dentro de dicho objetivo, se destaca la educación como motor de la transición ascendente de la movilidad socioeconómica (General Assembly of United Nations, 2017). Se comprende que la educación debe orientarse hacia la consecución de una sociedad más equitativa (United Nation, 2020), y es responsabilidad de los sistemas educativos propulsar dicha equidad de resultados de una forma generalizada en la sociedad (General Assembly of United

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Nations, 2017; United Nation, 2020). Los centros educativos, en particular, se posicionan como una protección frente a las desigualdades socioeconómicas del alumnado (Schmidt et al., 2015), favoreciendo la movilidad socioeconómica que tiene por objetivo la agenda 2030. Por ello, el presente trabajo parte de la pregunta: ¿son equitativos y paritarios los centros educativos andaluces en la enseñanza de la competencia lingüística?

Los factores y características personales del alumnado influyen en el desempeño académico (García-Jiménez, Torres-Gordillo & Rodríguez-Santero, 2020). Entre estos factores, el nivel socioeconómico y cultural de las familias y el sexo del alumnado destacan por estar entre los más estudiados. No obstante, la escolarización ha sido un factor determinante en la democratización de la educación y de la sociedad (OECD, 2017). Prueba de ello es que las escuelas favorecen la equidad de los sistemas educativos (Schmidt et al., 2015). La evaluación educativa ha permitido enriquecer el corpus de conocimiento referente a los factores relacionados con el rendimiento educativo (Greaney & Kellaghan, 2008; Johansson, 2016). Los modelos jerárquicos lineales, entre otros, han permitido distinguir entre los factores asociados a las características personales y al centro escolar (Heck & Reid, 2017), permitiendo la evaluación de la equidad y la paridad en el rendimiento educativo.

Un bajo nivel socioeconómico y cultural, tanto del alumnado como del centro educativo, se relaciona con un menor desempeño académico (Gamazo et al., 2018; Martínez-Abad et al., 2017). No obstante, en las primeras etapas de escolarización, esta relación no parece ser tan determinante (García-Jiménez, Rodríguez-Santero & Torres-Gordillo, 2020), lo que podría interpretarse como que la escolarización a edades tempranas promueve la equidad (García-Jiménez, Rodríguez-Santero & Torres-Gordillo, 2020; Schmidt et al., 2015). Sin embargo, esa relación de los centros con menor ISEC (Índice Social, Económico y Cultural) y menor desempeño dictamina los límites de la equidad en los sistemas educativos (López-González et al., 2021). Es un deber de las escuelas, especialmente de aquellas adscritas al sistema público de educación, estar al servicio de la democracia y de la justicia social. Se ha de insistir en que su quehacer y funcionamiento han de estar centrados en favorecer una educación igualitaria y de calidad a todo el alumnado (Karakolidis et al., 2021; Sampaio & Leite, 2015; Seabra et al., 2020).

Existen otras características personales que determinan el resultado académico del alumnado. Una de las que han sido ampliamente estudiadas es la influencia del sexo de los aprendientes sobre los mencionados resultados académicos. Los estudios han comprobado que, mientras las alumnas tienen un mejor desempeño en asignaturas

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relacionadas con la competencia lingüística, los alumnos, en contraposición, salen con un mejor nivel de competencia en asignaturas de razonamiento matemático (Troncoso et al., 2016). No obstante, resulta significativo que, a edades tempranas, no habría diferencias en los resultados de ambas competencias (Muñoz-Chereau & Thomas, 2016). Esto podría significar que es la socialización lo que limita la paridad en los resultados y fomenta la inequidad (Wach et al., 2015).

Teniendo en cuenta los hechos mencionados, se propuso como objetivo de esta investigación comprobar el nivel de equidad y paridad existente en los centros escolares andaluces en relación con el dominio de la competencia lingüística, llevando a cabo para ello un estudio a través de modelos jerárquicos multinivel.

2. MÉTODO

Para la realización del estudio se han utilizado los resultados de las pruebas ESCALA (E^Scritura, C^Álculo y L^Ectura en Andalucía) del curso 2016-17 que realizó la Agencia Andaluza de Evaluación Educativa (AGAEVE). Concretamente, se han utilizado los resultados de la evaluación en competencia lingüística para responder al objetivo de investigación. Estas pruebas se administran junto a un cuestionario de contexto a las familias, que permite extraer características socioeconómicas. Los datos tienen un carácter censal, ya que las pruebas se administran a todo el alumnado de 2º de Primaria de Andalucía, con edades entre 7 y 8 años.

Respecto al proceso, el análisis de datos ha consistido en un análisis jerárquico multinivel utilizando pendientes e intersecciones aleatorias (Gaviria Soto & Castro Morera, 2005; Raudenbush & Bryk, 2002). Como variable dependiente se usó la competencia lingüística y como variables independientes se emplearon dos variables descriptivas: sexo e ISEC. El sexo es una variable dicotómica (niño o niña), mientras que el ISEC es el resultado de un análisis factorial del número de libros en casa, profesión y estudios de los padres, asistencia a actividades culturales y recursos disponibles en el domicilio.

3. RESULTADOS

En el análisis jerárquico multinivel se incluyeron las variables independientes sexo e ISECN1 (N1 indica el nivel de alumnado), permitiendo variar ambas, mientras que los

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resultados de la prueba ESCALA en competencia lingüística se utilizaron como variable dependiente (LENGUAPTNI, que se refiere a las puntuaciones tipificadas a nivel de alumnado). En la Tabla 1 se presentan las estimaciones de los parámetros de covarianza y en la Tabla 2 la estructura de las covarianzas de efecto aleatorio:

Tabla 1

Estimaciones de parámetros de covarianza^a

Parámetro	Estimació n	Desv. Error	Wald Z	Sig.	Intervalo de confianza al 95%		
					Límite inferior	Límite superior	
Residuo	6731,01	34,89	192,93	,000	6662,98	6799,74	
Intersecció n + SEXO +	UN (1,1) ¹	1995,07	75,88	26,29	,000	1851,75	2149,48
ISECN1 [sujeto =	UN (2,1) ²	-327,59	34,83	-9,4	,000	-395,87	-259,32
CENTRO]	UN (2,2) ³	61,44	22,6	2,72	,007	29,87	126,36
	UN (3,1) ¹	-299,54	20,52	-14,6	,000	-339,75	-259,33
	UN (3,2) ²	44,54	10,33	4,31	,000	24,3	64,79
	UN (3,3) ³	70,93	9,21	7,7	,000	55	91,48

^a Variable dependiente: LENGUAPTNI

¹ intersección

² covariables

³ pendientes

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Tabla 2

Estructura de covarianzas de efecto aleatorio (G)a

	Intersección CENTRO	SEXO CENTRO	ISECN1 CENTRO
Intersección CENTRO	1995,065630	-327,591692	-299,543836
SEXO CENTRO	-327,591692	61,436281	44,541540
ISECN1 CENTRO	-299,543836	44,541540	70,931552

Sin estructura

^a Variable dependiente: LENGUAPTNI

Todos los parámetros de las covarianzas resultaron significativos. Por lo tanto, con respecto al sexo, las intersecciones (1,1) y las pendientes (2,2) varían significativamente. Asimismo, entre las intersecciones y pendientes, las covariables también son significativas (2,1). Estos resultados podrían interpretarse como que los centros educativos con mejores resultados tienen mayor equidad entre sexos, es decir, su pendiente disminuye porque existe una relación negativa entre pendientes e intersecciones (2,1). En cuanto al ISECN1, las intersecciones (3,1) y las pendientes (3,3) varían significativamente. Por otro lado, existe una relación positiva y estadísticamente significativa entre las covariables (3,2), que podría interpretarse como mayor inequidad (aumento de la pendiente) entre los centros con mejores resultados con respecto al ISECN1.

4. DISCUSIÓN Y CONCLUSIONES

Los resultados aportados en el presente trabajo ponen de manifiesto algunas perversiones del sistema. La primera es que haya diferencias en las intersecciones, es decir, que asumamos que hay centros educativos más eficaces que otros. Esto coloca en

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clara desventaja al alumnado que acude a los centros menos eficaces, suponiendo un indudable perjuicio para ellos. Además, los centros con mejores resultados serían más inequitativos, es decir, habría mayores diferencias entre el alumnado de bajo y alto ISEC que acude a un mismo centro. Estos resultados alejan el propósito de conseguir una educación democratizadora y equitativa, que permita la transición de las personas más desfavorecidas hacia un futuro más próspero (General Assembly of United Nations, 2017; United Nation, 2020). En definitiva, el alumnado más deprimido socioeconómicamente encuentra mayores dificultades para prosperar en la sociedad (Gimenez & Barrado, 2020).

En cuanto a la paridad, destaca que los centros más eficaces son los más paritarios (Muñoz-Chereau, 2019). Sería interesante profundizar en los factores escolares que subyacen a este hecho, a fin de poder extraer conclusiones generalizadas y generalizables. Quizás, una mayor calidad en la educación por parte de los centros, medida en este caso como los resultados en comunicación lingüística, sería beneficiosa para la totalidad del alumnado que asiste. No obstante, contradice al resultado anterior, ya que los centros con mejores resultados son más inequitativos, lo que podría deberse a una mayor relevancia de otros factores a estas edades (Kluczniok & Schmidt, 2020; Marks, 2017), como sí podría serlo la estimulación del entorno (Kluczniok & Schmidt, 2020).

Futuras investigaciones podrían explorar los resultados en relación con otras competencias, como el razonamiento matemático, así como el estudio de la influencia del tipo de centros. Si bien los estudios realizados a partir de resultados de pruebas diagnósticas implican relevantes aportaciones, es conveniente recalcar que los valores de equidad y justicia social que persigue el sistema educativo son más complejos y amplios de lo que se puede estudiar desde esta perspectiva (Sampaio & Leite, 2021). Además, sería positivo complementar con estudios cualitativos de la cuestión que profundicen en las interpretaciones del profesorado y de las familias sobre la equidad y la paridad en la educación. En cuanto a las limitaciones, los resultados utilizan un único curso del sistema educativo andaluz, lo que limita la generalización de los mismos. Por ello, también se propone como estudios futuros la realización de los mismos análisis utilizando otras poblaciones de edades diferentes.

En conclusión, es necesario que instituciones y docentes pongan el foco en fomentar una educación obligatoria más equitativa y paritaria, evitando la frecuente homogeneización del perfil del alumnado en los centros con un menor ISEC. De esta forma, se ampliarán las posibilidades de este alumnado de alcanzar un mejor rendimiento

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académico y así prosperar en sociedad. Solo prestando atención a la educación de los niños y niñas de hoy, conseguiremos una sociedad más justa, democrática e igualitaria el día de mañana.

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