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Teachers should not just live by their opinions: evidence-based education

No solo de opiniones debiera vivir la maestra: la educación basada en evidencias

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“No solo de pan vive el hombre. Yo, si tuviera hambre y estuviera desvalido en la calle no pediría un pan; sino que pediría medio pan y un libro. Y yo ataco desde aquí violentamente a los que solamente hablan de reivindicaciones económicas sin nombrar jamás las reivindicaciones culturales que es lo que los pueblos piden a gritos”

(Federico García Lorca, 1931)

Abstract

The teaching profession has evolved over time and has always been based on decision-making. Evidence-based education (EBE) is based on using existing scientific knowledge to take the best decisions, integrating scientific evidence, teaching experience and the reality of the students. To this end, a series of steps are proposed: formulation of the research problem, information search, critical reading of the information, decision making and implementation. Approaching decision-making from this perspective involves incorporating the best scientific evidence into the professional activity of teachers, as one of the most important challenges currently facing the profession.

Keywords: Basic Education; Scientific Methods; Search Strategies; Decision Making.

Resumen

La profesión docente ha ido evolucionando a lo largo del tiempo y siempre ha estado basada en la toma de decisiones. La educación basada en la evidencia (EBE) apuesta por utilizar el conocimiento científico existente para tomar las mejores decisiones, integrando la evidencia científica, la experiencia docente y la realidad del alumnado. Para ello, se proponen una serie de pasos: formulación del problema de investigación, búsqueda de información, lectura crítica de la información y toma de decisiones y puesta en práctica. Abordar la toma de decisiones desde esta perspectiva supone incorporar las mejores evidencias científicas en la actividad profesional de los/as docentes, como uno de los retos más importantes en la actualidad para la profesión.

Palabras clave: Educación Básica; Método científico; Estrategia de búsqueda; Toma de decisiones.

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Key points

What is known

- In education, there are many and diverse decisions to be taken.
- Teaching experience is a particularly important added value, but not all experience is synonymous with being up-to-date and based on scientific knowledge.
- Contrasting information is necessary to make the best decisions when faced with a problem.

What this work contributes

- Research and practice must be two areas that go together to improve the reality of education.
- The best scientific evidence is obtained from the most rigorous studies, such as systematic reviews.
- In order to make decisions, information from scientific evidence must be integrated with teaching experience and the reality of the students.

Practical scenario

In the staff of a public pre-school and primary school, there is a debate about the need to modify the pedagogical model that is assumed in its educational project. One of the alternatives for change is to convert the Montessori Method into the pedagogical axis of the school.

Faced with this proposal, there are teachers who say that the school's methodology (essentially traditional and expository) should not be modified because the students' academic results have been good in previous years and, therefore, if there is any weakness, we must look for the reason in other factors. Other teachers support the proposal because what they have heard about the method seems to them very much in line with the times, and they wonder whether doing the same thing over and over again is the most appropriate thing to do. Finally, one teacher suggests that the most suitable method for change is Reggio Emilia; she tells the staff that, some time ago, she started to follow an account on social networks and that they share very interesting experiences. Moreover, scientific studies have been shared in these groups that support the results of this method.

Given this situation, and taking into account that the management team is committed to dialogue to make decisions involving all its teaching staff, what should they do, and are all positions equally valid?

Being a teacher: from School Culture to Evidence-Based Education

Responding to the question of what it means to be a teacher still poses a considerable challenge today. While didactics has been shaping up as a discipline, research in the educational field continues to increase, and its rigor and quality are growing. However, didactics, as a scientific discipline, is still a young science today.

This has led to conceptions associated with a teaching origin that is closely related to the idea of art or craftsmanship persisting in response to the question of what it means to be a teacher, where personal skills reinforced by practice make a person a good teacher, and where little importance is placed on scientific evidence in its foundation. This reality is accompanied by the traditional dependence of the discipline on other areas - psychology, sociology... - which makes education even more challenging to become an independent scientific field.

Given the existence of this operational reality and the need for teachers to adopt a critical perspective on their own practice, the positions that pay attention to teaching not being a research-based profession (Hargreaves, 1996) and advocate for the development of Evidence-Based Education (EBE) become relevant, where scientific knowledge is considered the main source on which to base decisions.

It should be noted in this regard that the idea of evidence should be conceived from the literal translation of evidence from English, therefore being understood as proof or finding and, therefore, refutable, and not as something already unquestionable (Navarro-Mateu et al., 1999). EBE emerged in

the 1990s, with the key role of the Campbell Collaboration, an organization formed by individuals from four countries, many of whom are linked to the Cochrane Collaboration, which originated in the field of medicine (Hederich et al., 2014). It is the result of extending Evidence-Based Medicine (EBM) to other disciplines (psychology, social work...) as Evidence-Based Practice (EBP) (Sánchez-Meca et al., 2002), including education.

Therefore, in accordance with the educational reality, the situation presented for its resolution, and the trajectory explaining the origin of EBE, it can be affirmed that, to make an educational decision as proposed, a systematization of the process is necessary to ensure the acquisition of scientific evidence, combined with experience and existing values for decision-making. In this line, based on Rosenberg and Donald (1995), Navarro-Mateu et al. (1999) propose four fundamental steps for the application of EBM, which can be extrapolated to the educational field (Baños et al., 2021): i) formulate a clear question; ii) search for relevant articles in scientific literature; iii) critically evaluate the evidence provided by these articles; and iv) make decisions and implement useful findings into practice. These steps are then developed to address the scenario presented following this model.

Formulation of a research question

Questions in the field of education are continuous and very diverse. Each teaching-learning context raises questions according to countless factors: the educational stage, the sociocultural context, the subject area, the reality of the students, etc. In our daily practice, teachers question our methodology, the influence of the family context on the students' future, the appropriateness of homework, among many other elements. In summary, asking questions in the educational field is inherent to the profession of a teacher.

However, not always is a question formulated in a way that can be addressed with a format that facilitates the search for information to answer it; or, despite its correctness, the question may not exactly fit the information we need to obtain or the research methods that can be employed. A wrong formulation of a question implies that all efforts to answer it may be in vain (Greenhalgh, 2015). Therefore, once the topic of interest is known, it is vital to formulate a clear and specific question, associated with the subjects on which a decision must be made and considering the information we intend to collect, in order to search for and obtain the scientific evidence that will help us make decisions.

In one of the previous "Research Pills" corresponding to this section (Sánchez-Martín et al., 2023a), where you can read more about this, we addressed different formats for formulating research questions: PICO format (general model or for intervention questions); PECO (for exposure to risk or protective factors); SPIDER (for mixed methods or qualitative studies); or SPICE (for program or service evaluation). Regardless of their format, all of them must meet the FINER criteria: they should be Feasible, Interesting, Novel, Ethical, and Relevant.

Therefore, as a starting point, good questions are needed, which implies that they narrow down the scenario, the participants and the questions explicitly asked in order to facilitate as rigorous and systematic a search for information as possible.

While it is true that the problem has been defined in the staff group, it is necessary to specify the problem to which they intend to find a solution and whose answer will be used to make decisions. Does the debate focus on whether we want to change methodology, whether we are committed to an active methodology, and whether the Montessori Method is appropriate?

Concretely, and in accordance with the situation reproduced in the school, the problem presented and to be solved could be defined as follows, according to the PICO (Personal- Intervention- Comparison- Outcome) format: Does the Montessori Method (I) provide an improvement at the academic, social and emotional level (O), in comparison with the traditional method (C) for Infant and Primary Education students (P)?

Searching Form Information

Searching for information is not an easy task. At the classroom level, the World Wide Web (WWW) is a major resource base and teachers search for information on it. The accuracy of the sources consulted can, however, be questionable (McMillan, 2010). Very often, it is the use of the search engine that initiates the process, resulting in countless web pages where blogs, social networks, non-peer-reviewed articles, conference contributions, and many others are mixed together.

Beyond the habit, which can be trained towards a scientific search, it is necessary to recognise the complexity of a rigorous search in databases. Although it is said that the field of education lacks enough quality studies that allow, for example, a well-founded contrast of methodologies, the truth is that an additional problem is identified in the existence of multiple databases where the studies carried out on the same problem are scattered (Baños et al., 2021). This makes it very difficult to extract the meaning of the research carried out on the same topic (Sánchez-Meca et al., 2002) and, therefore, to obtain evidence that allows decisions to be made. Searching in journals specific to the area does not ensure that all the works carried out or those of the highest quality can be found, which is why organisations related to EBP insist on the need to search for systematic reviews of the scientific information available, which, in our case, could be located by considering specific education databases (Hederich et al., 2014; Sánchez-Martín et al., 2022).

As an extension or prolongation of the Cochrane Collaboration from the field of medicine to the field of social sciences, the Campbell Collaboration is an international social science research network that aims to produce high-quality, open-access, synthesis-oriented scientific evidence. On its website (<https://www.campbellcollaboration.org/>), numerous systematic reviews on educational issues can be found. However, in the context of the complexity of educational practice, these systematic reviews are still very scarce and more work needs to be done to develop them (Sánchez-Meca et al., 2002).

Beyond the Campbell Collaboration, the finding of systematic reviews - and, in their absence, of other quality studies - requires systematised search strategies in the main databases (Web of Science, Scopus, ERIC...), which professionals must be familiar with. This issue of information search will be addressed in a separate paper in this section of Research Pills.

Some of the staff will probably not search for information, either out of disinterest, because they feel it is not their responsibility, or because of lack of time. Those who do, are probably using a generic web search engine, which may direct them to any kind of information, not necessarily scientific.

The right approach would be to search for information according to a clear search strategy in the main databases. As a minimum, the teacher is expected to consult one of the most common reference sites: Google Scholar or Dialnet, for example.

If known, on the Campbell Collaboration website (<https://www.campbellcollaboration.org/website-search?searchword=montessori>), the teacher could find a systematic review on the impact of the Montessori Method on academic and non-academic outcomes: Randolph, J. J., Bryson, A., Menon, L., Henderson, D. K., Kureethara Manuel, A., Michaels, S., Rosenstein, D. I. W., McPherson, W., O'Grady, R., & Lillard, A. S. (2023). Montessori education's impact on academic and nonacademic outcomes: A systematic review. *Campbell Systematic Reviews*, 19, e1330. <https://doi.org/10.1002/cl2.1330>

Critical Reading of Information

When we read information – especially if it is of a scientific nature – the natural tendency is to consider the information as true and, consequently, assume that it has been originated using the scientific method properly. Thus, the reader tends to consult the conclusions of the study, overlooking the methodological aspects of the research. However, when it comes to extracting and selecting evidence, it is essential to critically read the information. Not all studies, due to their design and conduct, show evidence of the same value, resulting in a necessary hierarchy of evidence (Hederich et al., 2014). The quality of evidence indicates to what extent we can trust that implementing what is proposed will bring more benefit than risk (Sánchez-Sánchez and Aguinaga, 2013). To do this, it is necessary to pay attention

to the adequacy of the design to the research problem and to the analysis carried out; in essence, to the methodology used for the study.

Not all research designs provide a similar level of scientific evidence, which has led to the proposal of the so-called Hierarchy of Evidence (Sánchez-Martín et al., 2024). In general, randomized controlled trials are considered to be of higher quality among primary studies compared to case studies or cohort studies. Above all other types of studies are systematic reviews or meta-analyses (Sánchez-Martín, 2022; Sánchez-Meca et al., 2002). However, it has recently been proposed to consider systematic reviews or meta-analyses (secondary studies) as a lens through which primary studies are viewed and analyzed. In this regard, systematic reviews, when available, can be seen as the best tool for understanding the existing evidence on a particular topic and making informed decisions based on it.

When critically reading the information, also in the case of systematic reviews, checklists for critical reading and risk of bias assessment should be used, which were described in a previous paper, and which differ according to the study design (Sánchez-Martín et al., 2023b). The use of these checklists will be the subject of a forthcoming Research Pill.

Teachers should not consider any information as synonymous with evidence. Papers should be assessed by critical reading. If the systematic review mentioned above is chosen as a source, it should be reviewed using the appropriate critical reading checklists for systematic reviews (Sánchez-Martín et al., 2023b). In general, these checklists are structured to answer three general questions: are the results valid, what are the results, and are they applicable to your context?

Being aware of the distance between what is proposed and the daily work of teachers, it is worth highlighting at least the idea that the sources to be consulted must have a certain scientific validity and that not all sources can have the same weight for decision-making.

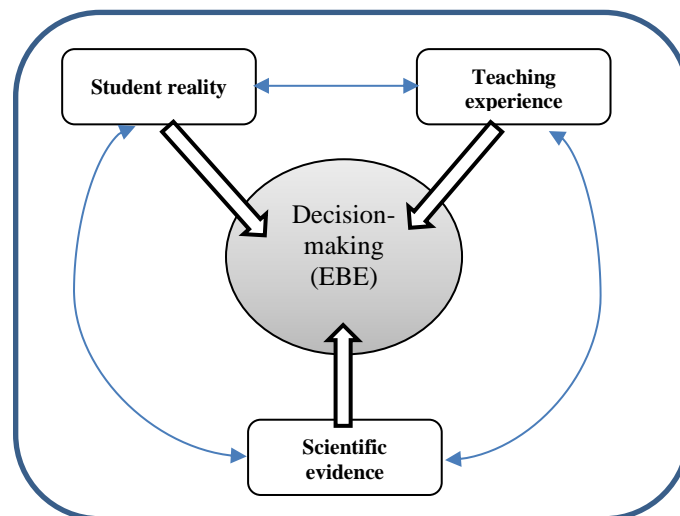
Decision-making and Implementation

Once the information search has been conducted and the best evidence has been identified, it is time to make the best possible decision and implement it, which is the ultimate goal of Evidence-Based Education (EBE).

It is relevant at this point to remember that evidence cannot be understood as synonymous with truth and that, according to scientific principles, it should be conceived as the best possible knowledge, at the current moment, on the topic at hand. In this sense, Guyatt (2008) proposes a triadic model for decision-making, where scientific evidence alone is not sufficient. To make the best decision, in addition to the evidence obtained from the most up-to-date and highest-quality scientific publications, one must consider the experience – in this case, of the teacher – and the preferences and values of those for whom a decision must be made – in this case, the students. In other words, it is the interaction of the best available scientific knowledge, the teacher's experience, and the reality of the students that will lead us to make the best possible decision. Additionally, in institutional management, it is also necessary to consider other elements such as the institution's mission and values, as well as available resources (Muir Gray, 1999).

Figure 1

Evidence-based education (EBE) decision-making process



Source: own elaboration based on Hederich et al. (2014).

The teachers who make part of the teaching staff must contrast the scientific evidence obtained, their teaching experience and the students at whom the methodology is aimed, bearing in mind that scientific evidence is not equally valid as an unsubstantiated opinion expressed by a teacher. The systematic review found shows, after a rigorous systematic review of published studies, that the Montessori Method has a significant impact on both the academic and non-academic results of students. Therefore, its application is not now an occurrence, but is scientifically substantiated. Based on this reality, teachers should contribute their experiences (if they have any) and reflect on the application of the method according to the context of the school and its students. If there are other alternatives, such as Reggio Emilia, other scientific evidence should be found to contrast the relevance of one method or another to evaluate this specific educational reality.

Advantages and Disadvantages

The implementation of EBE for decision-making has advantages and disadvantages that have already been defined for the medical field and which can also be transferred to the educational field. We will take as a basis the contributions of Navarro-Mateu et al. (1999).

Among the advantages, it is clear that EBE favours the integration of theory (based on scientific knowledge derived from the best research) and practice, which can be learned and worked on and is cumulative, which improves knowledge of the scientific method, increasing the ability to use sources of information and increasing confidence in decisions. Students are also exposed to the most effective practices, decreasing unnecessary variability.

Among the obvious disadvantages are the limited training of teachers in the subject, which requires time and effort to learn and put into practice. In addition, access to restricted sources of information may involve an economic cost for which funds are non-existent. In addition, there is the added problem of the scarcity of primary research on some topics, especially in the case of systematic reviews. Other not insignificant risks of misuse of EBP can be the disregard of teaching experience, relying exclusively on scientific evidence, and not incorporating the values and preferences of students in decision-making.

Conclusions

Over time, and to a considerable extent in line with the development of didactics, the teaching identity has changed constantly. In each period, there have been challenges to which we, as teachers, have responded more or less satisfactorily. Surely, the most pressing challenge in current times lies in the need to create a greater awareness of the scientific nature of our profession. Beyond personal skills, beyond the eminently human nature of our work, we are trained professionals who must take into account, when making our decisions, the results provided by science in education. Opinion for opinion's sake is not valid, and this idea should be extended to decision-making, where it sometimes seems that anything goes.

It is important not to forget that EBE is based on making the best possible decisions taking into account the experience of teachers and the opinions and values of learners, in combination with the best up-to-date scientific evidence. Incorporating scientific evidence into decision-making is not easy, especially in a school culture built up over decades that has not progressed in line with the development of didactics as a scientific discipline and social changes. In our schools, there are behaviours and ways of teaching and learning that are not questioned because they are part of the tradition, if we may say, of the school heritage, which selects some ways of doing things and rejects others. It is urgent to evaluate educational practices in accordance with the scientific evidence that has emerged over the last few decades, while progress continues to be made in knowledge that is still scarce. For this, however, we need receptive receivers.

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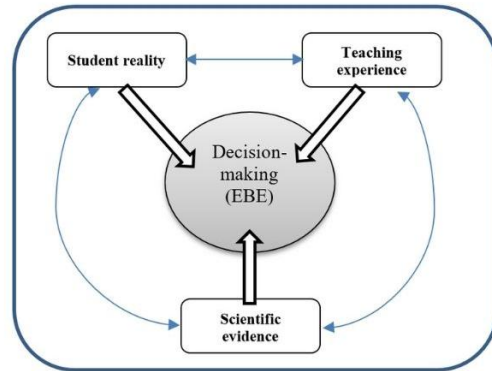
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Appendix

Teachers should not just live by their opinions: evidence-based education

Why do we make this reflection?

Teaching has always been a profession based on decision making. Evidence-based education (EBE) is based on using existing scientific knowledge to make the best decisions, integrating scientific evidence, teaching experience and the reality of the students. It is necessary to move towards this approach, avoiding an approach that relies exclusively on the existing school culture.



How do we do it?

1

We ask a question

- Asking questions is **very common in education**.
- We need to formulate questions that can be addressed from a **research point of view**.
- A valid format is the **PICO format**.

2

We look for information

- Very often, teachers use the **World Wide Web** as a resource bank.
- We need to develop strategies for a **rigorous search**, which provides us with scientific evidence.
- The **Campbell Collaboration website** has numerous systematic reviews.

3

We make a critical reading

- Not all the information you read is true.
- We need to **assess the quality** of the evidence by **ranking it**.
- To make a critical reading, we use **checklists**.
- **Systematic reviews** provide quality scientific evidence.

4

We make decisions

- Once the search for information has been carried out, it is time to **make decisions** and **put them into practice**.
- When making decisions, we consider the **scientific evidence**, but also the **teaching experience** and the **reality of the students**.



Pay attention:

There are **advantages**, but also **risks and disadvantages** to the application of EBD. Making more reliable and informed decisions does not mean disregarding the teacher's experience; nor does it mean disregarding existing resources and context when making decisions.

