

Bursting the bubble: the role of scientific publications in popular science

Despite persistent calls for educational research to crystallize as a tool to facilitate school improvement and renewal processes (Aguado, 2023; Davis, 1999; Owen et al., 2023), in general terms, its incorporation into the daily life of schools is not occurring effectively. The problem is complex and its causes, therefore, multiple. For instance, it would be necessary to continue raising awareness about the importance of the issue, as teachers themselves sometimes do not perceive research as a useful tool in their work. Furthermore, it seems that the educational policies that are being implemented do not make a firm commitment to its incorporation into practice. On the other hand, educational research findings may be disconnected from the interests or needs of teachers at different levels. This could derive from the existing gap between teachers and researchers, which likely originates in the supposed dichotomy between research and teaching practice, which erroneously places both groups in watertight compartments (Aguado, 2023). This framework does not facilitate the fulfilment of fundamental conditions, such as perceived usefulness and interest for those who are in practice, who, unfortunately, in most cases act as mere spectators of research.

On the one hand, therefore, the training of future teachers should insist on raising awareness of the benefits of educational research and equip teachers with the skills and tools to look critically at classrooms and schools. Undoubtedly, the possibility for teachers of all educational levels to do research and to base their practice on the results of their research, as well as the approach of joint projects between schools and universities, would help to stimulate the processes of educational renewal (Aguado, 2023).

On the other hand, it is important to bear in mind that there is a considerable amount of knowledge generated by research that could be useful in teaching practice. However, it is clear that this information rarely reaches potential stakeholders. Certainly, the dissemination of scientific knowledge generated by educational research is not a simple question and, in fact, it would be a matter of going beyond the mere transfer of knowledge to achieve the desired social impact:

that these results are applied and improve different key aspects of education (Aliaga et al., 2018).

GENESIS AND EVOLUTION OF POPULAR SCIENCE

Although earlier examples exist, the origins of scientific popularization are associated with the increasing complexity of theories developed in the so-called scientific revolution of the second half of the 17th century (Spurgeon, 1986). The concept of popularization emerged within the context of the natural sciences, as we shall see, that most of its development took place.

In 1687, Sir Isaac Newton published *Mathematical Principles of Natural Philosophy*, which was largely incomprehensible to most readers, particularly due to its inherent mathematical complexity. From that moment onward, works began to emerge seeking to disseminate his theories in a language more accessible to the public. For example, in the publication «The Elements of Sir Isaac Newton's Philosophy», Voltaire sought to popularize the theories of his friend Newton (Voltaire, 1738). In other scientific disciplines, such as biology or geology, the necessity for popularization emerged at a more delayed pace and is primarily attributed to two factors: the expanding technical vocabulary and the substantial volume of knowledge generated from the 19th century onwards.

At the beginning of the 19th century, the astronomer John Hershel, in a letter sent to the natural philosopher William Whewell, made explicit the need to «digest what is now known, in every branch of science... to provide a connected view of what is done and what remains to be done.» This baton was picked up by the Scottish mathematician Mary Fairfax Somerville (1780-1872), who would become one of the pioneers of scientific popularization, thanks to the publication of her book of «On the Connection of the Physical Sciences» in 1834 (Holmes, 2014). In this work, Mary Fairfax provides a comprehensive account of the state of science in her time and does so by reducing the mathematical apparatus to a minimum with the aim of making it accessible to all interested persons.

During the 20th century, the tradition of science popularization in the field of natural sciences increased with the advancement of knowledge. We all have in mind the names of extraordinary science popularizers who developed their work in the 20th century, such as the marine biologist Rachel Carson (1907-1964), the astronomer Carl Sagan (1934-1996), the paleontologist Stephen Jay Gould (1941-2002), writer and biochemist Isaac Asimov (1920-1992), theoretical physicist Richard Feynman (1918-1988) and others who continue to do so such as the mechanical engineer Bill Nye, the primatologist Jane Goodall, the writer Bill Bryson, the paleoanthropologist Juan Luis Arsuaga or the physicist José Manuel Sánchez Ron, among many others.

DISSEMINATION OF EDUCATIONAL KNOWLEDGE TODAY

Despite the consolidation of scientific popularization in the 20th century, the field of education has not evolved at the same pace, although there is a growing concern about this issue. The University of Delaware, for example, has created the Center for Research Use in Education (CRUE), whose main objective is to facilitate the integration of educational research with educational institutions at all levels and with political agents involved in educational decision-making.

The issue of translating educational research findings into the context of practice is not straightforward (Carrier, 2017). In a relatively recent theoretical model, it has been suggested that the key may lie in considering that the process is bidirectional, and that both the people who generate the research findings and those who are in practice need to be considered for effective knowledge translation (Farley-Ripple, 2021). In this bidirectional relationship, the importance of intermediaries (people, activities, or motivations) that facilitate the exchange, transformation, and communication of information generated in research and in schools has been established (Shewchuk, & Farley-Ripple, 2022, 2023).

There is a growing number of concrete initiatives aimed at disseminating knowledge resulting from educational research. Most of them take the form of books that summarize scientific advances related to education in a way that is accessible to interested persons, whether they are researchers or not. In recent years, there has been a particular emphasis on works related to neuroscience applied to education (see, for example, Mora, 2024 or Willingham, 2023), but specific handbooks on the use of scientific evidence for decision-making in education are also emerging (see, for example, Petty, 2023).

Thanks to the evolution of technology, there are more and more channels, beyond books, in which there is a presence of educational dissemination. Although they have their drawbacks, social networks seem to be a good platform for the dissemination of knowledge (Gutiérrez-Sánchez, 2023). In fact, there are very interesting initiatives in these environments in which people involved in educational research try to disseminate not only their own research among their colleagues, but also to all people who might be interested. A notable example of these actions is the contributions of Ismael Sanz, Professor of Applied Economics at the Universidad Rey Juan Carlos, who disseminates results in his profile on the social network X (@sanz_ismael), including a brief and very accessible explanation of them and a link to the scientific work from which these conclusions are drawn (see Figure 1).

Figure 1

Publication by Professor Ismael Sanz in X (22/07/2024)

Ismael Sanz @sanz_ismael · 16h
 Más libros en casa, mejores resultados en matemáticas, historia, geografía, lengua e inglés. 

- 1 Estudiantes con 11-50 libros: +16 puntos
- 2 Estudiantes con 51-100 libros: +24 puntos
- 3 Estudiantes con 101-200 libros: +32 puntos

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TABLE 2 Estimated effect of the regulatory change on academic scores in different competencies.

Variables	Composite Index*	Spanish	English	Mathematics	History and geography
Female student	-0.05*** (-0.009)	13.20*** (-0.542)	11.99*** (-0.538)	-22.19*** (-0.632)	-16.56*** (-0.596)
Academic mathematics	0.93*** (-0.018)	59.63*** (-1.062)	70.08*** (-1.056)	-25.70*** (-1.24)	56.21*** (-1.17)
Immigrant	-0.15*** (-0.016)	-9.51*** (-0.954)	-2.78*** (-0.948)	-9.72*** (-1.114)	-5.10*** (-1.05)
Early childhood education	0.10*** (-0.010)	3.88*** (-0.566)	5.06*** (-0.563)	6.65*** (-0.661)	4.00*** (-0.624)
Books 11-50	0.37*** (-0.026)	16.39*** (-1.513)	18.56*** (-1.504)	17.66*** (-1.766)	15.81*** (-1.666)
Books 51-100	0.57*** (-0.026)	24.39*** (-1.526)	30.21*** (-1.517)	25.24*** (-1.782)	25.52*** (-1.681)
Books 101-200	0.77*** (-0.027)	32.26*** (-1.557)	40.81*** (-1.548)	34.96*** (-1.819)	35.13*** (-1.72)
Books >200	0.95*** (-0.027)	39.05*** (-1.556)	48.60*** (-1.547)	44.00*** (-1.817)	44.84*** (-1.713)

We believe that practices such as the latter are appropriate for the rigorous dissemination of knowledge, since the «informative summary» provided is accompanied by a reference to the scientific work that faithfully supports the information being transmitted. However, it is important to bear in mind that the knowledge disseminated in social networks runs the risk of being produced in an environment far removed from the rigorous selection procedures that manuscripts are subjected to in scientific journals, which makes the appearance of hoaxes relatively common (García-Carmona, 2023).

WHAT CAN WE DO FROM SCIENTIFIC JOURNALS?

Studies on who reads research articles are scarce, but they place the interest in the narrow circle of the research context and not in people involved in teaching at different educational levels (Mohammadi et al., 2015). However, as Aliaga et al. (2018) showed in their analysis of educational research journals in Spain: «... fundamental aspects are still pending, such as the evaluation of their most social aspects (local impact, language, changes in the community, etc.), those most

closely related to the environment in which they are produced and which they should serve» (p. 576). We could say that, at present, the knowledge generated by educational research remains largely encapsulated in the bubble of the research community, and its relevance to teachers at non-university levels of education is rather limited. However, about half of the papers currently published in our journal include research in the context of early childhood, primary or secondary education, which could be attractive and useful to teachers of these educational levels, and even to families and other agents involved in education.

Starting with this issue, each article published in «Education XX1» now includes a «Dissemination» button on its page, providing access to an infographic in which the authors explain, using accessible vocabulary, the main results of their research in terms of their applicability and impact in the classroom and/or in education policy. The same infographic is the one we use on our social networks (@EducationXX1) to share the interesting articles we publish in each issue. We thank the authors for their efforts to disseminate their work and hope that, thanks to them, the results of their research will have a wider dissemination and scope in practice.

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