https://doi.org/10.6092/issn.1825-8670/16383 ISSN 1825-8670

# Revitalising Empirical Research in Education with Citizen Science: From (Solving) Misinterpretations to (Embracing) Opportunities

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Published: May 30, 2023

**Rivitalizzare la ricerca empirica in campo educativo con la *Citizen Science*: interpretazioni errate e opportunità**

Empirical research in education needs to be revitalised. However, there are some misunderstandings to solve: I) experts must refrain from expropriating the teachers from any possibility of voicing about scientific research that matters; II) considering scientific evidence as incontrovertible fact is erroneous; III) believing that the only research worth being conducted at school is that that delivers certainty and political/ethical impartiality is the last misconception. A couple of obstacles to counter these misunderstandings subsists: I) the teacher training, which does not equip teachers to comprehend and conduct scientific research; II) the practices of accountability of scientific production in academic institutions pushing researchers to publish low-quality/interest studies. In this context, Citizen Science (involvement of non-researchers in interactions with researchers as equals) can be a promising resolving direction.

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La ricerca empirica in campo educativo deve essere rivitalizzata. Tuttavia, ci sono alcuni equivoci da risolvere: I) gli esperti devono astenersi dall'espropriare gli insegnanti da qualsiasi possibilità di esprimersi sulla ricerca scientifica che conta; II) considerare l'evidenza scientifica come un fatto incontrovertibile è errato; III) credere che l'unica ricerca che valga la pena di essere condotta a scuola sia quella che fornisce certezza e imparzialità politica/etica è l'ultimo equivoco. Un paio di ostacoli per contrastare questi equivoci sussistono: I) la formazione degli insegnanti, che non li mette in grado di comprendere e condurre la ricerca scientifica; II) le pratiche di accountability della produzione scientifica nelle istituzioni accademiche che spingono i ricercatori a pubblicare studi di bassa qualità/interesse. In questo contesto, la Citizen Science (coinvolgimento di non ricercatori in interazioni con i ricercatori professionisti alla pari) può essere una promettente direzione risolutiva.

**Keywords**: Citizen science; Empirical research; Educational research; Statistics; Statactivism.

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# 1. Introduction

In his seminal work on phenomenological pedagogy, Piero Bertolini (2021) repeatedly emphasised how empirical research, i.e., research that requires data constructed from the field to arrive at answering a question, is a necessary but not sufficient condition for interpreting educational phenomena. Empirical research needs a robust theory of education and a high awareness of methodology, methods, strengths, and limits. However, Bertolini was ahead of his time by raising the issues of empirical educational research (Tarozzi, 2021). He recognised empirical research as fundamental to building a rigorous understanding of educational facts.

> [...] only conducting methodologically sound empirical research can put the educator in a position to act with sufficient confidence [...]. Under certain conditions, therefore, empirical research is an indispensable tool for education [...] to have tangible possibilities of realising itself according to safe and, above all, correct perspectives of scientificity (Bertolini, 2021, p. 228)

In this regard, what Bertolini denounced is unfortunately still relevant today: educational research based on a solid educational theory still needs to be improved or more varied compared to the proliferation of research promoted by other disciplines on educational phenomena. This research production unbalance explained (and still explains) the persistent situation of epistemological and social (in terms of power) minority of education as a science.

However, it is not the only explanation. It is more than just a matter of how many scientific products are published or how strong the connection to educational theory is. What is at stake is how empirical education research is considered (Zeuli, 1994). In other words, it is about unmasking the habitus (Bourdieu, 1977) of communities of practitioners (both teachers and researchers) concerning science and empirical research. Indeed, the habitus refers to a system (subjective but not individual) of internalised structures, schemes of perception, conception, and action common to members of the same group or class.

In this article, I want to raise some issues concerning empirical research, trying to contribute to making empirical research alive and vital in and for education. Understanding the habitus (which generates misunderstandings - at least three - and reveals obstacles) can help to propose a decisive direction.

# 2. Misunderstandings

## 2.1. First misunderstanding: research is for professionals

The first misunderstanding is to consider empirical research an exclusive activity of the community of experts, i.e., professional researchers. Indeed, if it remains solely an activity conducted by researchers, the risk of being a discourse between experts for experts is high. In this context, it is necessary to reflect on where the teachers are.

According to Appadurai (2014), research is everyone's right. The future is a cultural project that considers research as a human right (the right to know and use methods so citizens can systematically increase their knowledge to improve their lives).

This is even more evident for those who practice education. Indeed, Bertolini argued:

> One of the fundamental characteristics of the pedagogical discourse [...] consists in the constitutive connection between theory and praxis [...]. This dialectical unity of theory and praxis in education is theoretically founded through the concept (the dimension) of the future [...]; the future is not a metaphysical concept, but rather the material horizon, infinitely to be determined, for the human action (Bertolini, 2021, p. 174).

Across these quotations, we can trace the cultural "capacity for aspiring," unequally distributed in society, for imagining and arguing for a better life and education. If it is a right, then scientific research is not something that can remain cryptic. Empirical research cannot be an activity considered only for professionals.

## 2.2. Second misunderstanding: research cannot be criticised

Connected to this view of scientific research is the second misunderstanding, which concerns the notions of evidence and "evidence-based," conceived as granitic conceptions. On this, Biesta (2007) wrote:

> What is most significant here is that although there may be different views about how research can and should be used in educational practice, there seems to be an almost unanimous expectation that research can tell us 'What works,' that it can provide 'sound evidence' about the likely effects of policy and practice, and 'sound evidence of effectiveness' more generally (Biesta, 2007, p. 12).

Thus, the solidity of the evidence (or rather a shared expectation about this solidity) shields scientificity from criticism and often becomes the argument of those who declare research methodology as a fact transcending history. Here, Husserl's lesson on factual sciences is in the watermark: "Merely fact-minded sciences make merely fact-minded people" (Husserl, 1970).

In line with this Husserlian dictum, Bertolini warned about the conditions for entirely legitimate empirical research.

> [...] not 'any' empirical research is entitled to such a recognition, and that the latter must in any case always be placed within the structure of meaning proper to that science [...] empirical research has and must have its theory. That is, empirical research cannot be theoretically indifferent or the result of simple interest in the 'visible' (if not 'objective') aspects of the phenomena it addresses (Bertolini, 2021, p. 229).

There is, therefore, no scientific research in education without a critical and evaluative attitude: "it is important to be able to 'interpret' the data by relating them to the general interpretative framework" (Bertolini, 2021, p. 231).

## 2.3. Statistics are synonymous with specific and politically neutral results

The third misunderstanding is considering statistics and measurement around educational phenomena as synonymous with certainty and political (but also ethical) neutrality of results. In the age of measurement (Biesta, 2009), everything about teaching is to be evaluated to, as the rhetoric of efficiency and effectiveness likes to say, "make learning visible" (Hattie, 2008). This making of learning visible occurs through statistical procedures, meta-analysis, and effect size calculations.

On the one hand, if empirical research is reduced to quantifying educational phenomena, it legitimises the feeling of exemption of teachers (Borghi & Giullari, 2015) from other research methodologies and practices. Moreover, this would reinforce the idea that research should only be an activity of experienced practitioners. On the other hand, it would hand statistics a power it does not have. It is one among many forms of representation of reality. It, therefore, has nothing to do with the truth of phenomena, with the visibility of learning. Statistics is a set of strategies to manage uncertainty and error in representing a portion of reality as much and as best as possible. As I have stated, scientific evidence is not the certainty but the result of a discourse (i.e. the rigorously implemented scientific method) that seeks to give reasonable justifications to probability judgments. Likewise, statistics is the management of the limits of scientific representations. These are why it is necessary to accompany other forms of representation of reality (other methods, other research strategies and practices) with those derived from statistics. Not doing so would be a dangerous form of epistemic reductionism of the educational real that occurs when statistics produce the "authority of facts" because employed alone. Moreover, this is why decision-makers are mobilised around this particular representation of reality (Borghi & Giullari, 2015) because facts acquire authority through statistics (i.e. the idea of statistics). As the etymology of the word reminds us, statistics have long been associated with power and with state power (Bourdieu, 1977; Desrosières, 2011).

The principle of the *auctoritas* of statistical quantification has given rise to a deleterious representation of scientific research at school: it is the driving force behind a constant comparative and quantitative evaluation of the activity of agents (students but also teachers, school managers, principals, educational

institutions, teaching practices), placed in competition with each other through a technology defined as "benchmarking" (Bruno, Didier, & Vitale, 2014). Evaluations are now so systematic that they are confused with action. Once the quantification procedures are codified and routinised, their products are reified. They tend to become "reality" through an irreversible chain effect (Desrosières, 2011). We are thus required to indefinitely intensify our performance in the sphere defined by the indicator.

The practices induced by benchmarking are a constant poor reproduction of the same behaviours to the detriment of variation, experimentation, and unforeseen events. In this sense, methodological reductionism is a factor that reinforces these practices. Including teachers in the increasingly dense meshes of quantification thus is one of the primary means of reducing the research possibilities offered. In this context, teachers are on the margins: reduced to mere executors of evaluations or, at worst, powerless spectators.

Nevertheless, if one were to treat evaluation and statistics for the contribution they can make to the understanding of education (i.e., it is worth repeating: a restricted form of representation of reality that contributes to limiting uncertainty and error through the indication of a probability), then the authority of facts would fall away. Statistics themselves could be used as a challenge to statistical representations of reality. This is what, for instance, statactivism does (Bruno *et al.*, 2014).

Although statistics can be blamed for their complicity with power, the history of their links to social reform and emancipation is equally long and rich. In the past, statistics have also shown that another reality was possible or made other possibilities real. Therefore, it is urgent to recognise how social movements use statistics and quantification as part of their repertoire of actions, whether criticising some prevailing statistics or using others as powerful tools of political struggle.

The history of the link between statistics and social liberation is a long one. An interesting example is offered by the book *The Inheritors: French Students and Their Relations to Culture* by Pierre Bourdieu and Jean-Claude Passeron (I refer here to the Italian edition: Bourdieu & Passeron, 1971), which reports on research from 1964. The book shows how schools did not redress cultural inequalities between pupils but implemented the exact opposite, recognising and validating the cultural capital of those who had received it from the family. This was demonstrated by correlated variables, in particular, the socio-professional category of the father with different measures of student life and school success, thus showing that the children of parents belonging to those social categories already in possession of significant cultural capital are the ones who succeed in taking the educational paths considered most prestigious. This book showed what everyone already knew from personal experience. However, it summed up those individual experiences and objectified them statistically: it used a product of the system itself, which showed its internal contradictions — the public service of national education that pretended to defend injustice and invoked the ethics of teachers who dispensed knowledge in the general interest, but then in reality did nothing but restore and perpetuate injustice.

I can mention complementary sociological research in the Italian context, "Le vestali della classe media: Ricerca sociologica sugli insegnanti" (Barbagli & Dei, 1969), where qualitative data and statistics were used in the service of detecting short circuits in formal education.

So, not all numbers come to harm. Refusing to reckon with numbers rarely serves the interests of those experiencing social fragility (Piketty, 2014). In other words, to regard statistics as politically neutral is a misunderstanding.

## 3. Hindering factors to implementing empirical research in education

I quickly noted some misunderstandings around empirical educational research in the previous paragraphs. Scientific research is fundamental in schooling, and misinterpreting its role is counterproductive for everyone. This is due, not exclusively, to experts' social discourse and habitus about the scientificity of research (Kuhn, 1962): how science is produced and consumed co-construct these misunderstandings. The first: research can only be done by experts, expropriating the lay public from any possibility of voicing. This would contradict what Appadurai says regarding rigorous research as a right (Appadurai, 2014).

Furthermore, a right belongs to everyone. A right is not to be granted and not to be conquered (or worse, deserved) but to be guaranteed. In this sense, I invite us to consider how much the world of experts facilitates or, on the contrary, hinders access to research.

A second misunderstanding is to consider scientific evidence as incontrovertible fact. Evidence is, on the contrary, the scientific expression of an explanatory probability of a phenomenon. Accompanying the idea of unassailable and monolithic evidence is the last habitus: believing research that is more quantitative and statistical because it is a harbinger of certainty and political and ethical impartiality on educational phenomena to be worthy of being conducted. I can define at least a couple of obstacles to counter these misunderstandings-the first. When Bertolini argues for the need to be able to "interpret" data (Bertolini, 2021, p. 231), in my opinion, he captures a dramatic hindering situation concerning teacher training. To this, I add a second obstacle on the side of researchers: the practices of accountability of scientific production in academic institutions.

### 3.1. A first obstacle: the lack of research training for teachers

Empirical education research is deemed extrinsic to teaching and educative practices. Teachers from academic training must be more skilled in empirical research and critical reading/fruition of scientific publications. Teachers need more use for research. Comprehensibly, without adequate training in this regard, the world of research methodology can be perceived as repulsive (Turner, Sutton, Gray, Stevens, & Swain, 2018). However, competence in research methods significantly contributes to (future) teachers' professionalism (Froehlich, Hobusch, & Moeslinger, 2021). A basic understanding of research methods is essential for students to fully appreciate the literature underpinning their later academic or professional careers (Allen & Baughman, 2016).

Teacher education should increasingly make future teachers (at least) critical research users, if not also deliver rigorous and scientific tools for interpreting educational phenomena. I am convinced that this kind of professional education can nurture aspiration: without aspiration, there is no pressure to know more. Furthermore, aspiration degenerates into reverie or despair without systematic means to obtain new relevant knowledge (Appadurai, 2014). To build and maintain a democratic society, one needs to be informed. One can hardly be informed unless there is an opportunity to do research. Research training triggers a virtuous circle between building teachers' professionalism and a democratic society.

### 3.2. A second obstacle: academic push for publishing useless studies

Research experts are often academics. Whether their research stems from teachers' actual and practical needs must be clear. Therefore, if it is true that teachers do not benefit from research and read little of it, it is necessary to ask whether university research captures their interests and needs. Most European funding lines ask researchers to co-create (Vaughan & Farrah, 2020) research as, for too long, they have been permeable to communities of practice (Meister Broekema, Horlings, & Bulder, 2022). This is because the motto "publish or perish" has become an invasive reality in defining the careers of university researchers. Research has lost quality in the name of quantity (Lee, 2014), as only metrics allow experts to continue doing research and be recognised institutionally. It is a system that has legitimised the numerosity of publications at the expense of practical, politically relevant, humanising research. Furthermore, this system very quickly impacts those who want to learn how to do research (Horta & Li, 2022).

## 4. Citizen Science as an opportunity

From what has been said, revitalising empirical research in education through appropriate processes to resolve misunderstandings and overcome obstacles is desirable. Both objectives can be achieved through a social practice around empirical research: Citizen Science (Arnstein, 1969). Citizen Science, where *citizen* is to be understood as lay person/non-expert, is a process of community activation aimed at the vol-

untary participation and involvement of non-professional researchers in the scientific process to address real-world problems.

Interestingly, Citizen Science has evolved in the context of diminishing trust in the so-called world of experts and the opening of science to external scrutiny.

On the one hand, it has been noted that citizens in post-industrial countries have become sceptical of scientific findings (Allum, Sturgis, Tabourazi, & Brunton-Smith, 2008; Inglehart, 1971). This scepticism defines low levels of trust towards science and threatens the legitimacy of science as an institution (Brewer & Ley, 2013; Eagleman, 2013). Even more so today, after years of the COVID-19 pandemic (Bromme, Mede, Thomm, Kremer, & Ziegler, 2022), in which experts were identified with the scientists who indicated the rules of behaviour and social restriction (Sulik *et al.*, 2021; Yokoyama & Ikkatai, 2022).

The control over science by actors outside the institution is enabled, according to Hess, by the process he calls "epistemic modernisation". This concept informs the process through which the programmes, concepts and methods of scientific research are opened up to the control, influence and participation of users, teachers, non-governmental organisations, social movements, minorities and social groups that can represent perspectives on phenomena divergent from those of economic and political elites and professional scientists (Hess, 2007, 2009).

In this sense, public participation in science is a way to rebuild this trust. It also redefines, by counteracting the misunderstandings I introduced earlier, the actors in the scientific process (in a participatory, collaborative and multi-level partnership). This scientific research simultaneously includes a critique of scientific research itself, suggesting the ethical direction of research (i.e. use of meaningful statistics, helpful in improving social justice).

According to Haklay (2013), there are four levels of participation. The first level is crowdsourcing, where an organisation recruits citizens to contribute to research through data collection and measurements in line with a research protocol prepared by professional researchers belonging to an organisation (usually a research centre or a governmental and non-governmental organisation). The advent of the internet has significantly boosted this: in most cases, crowdsourced research nowadays takes place using the internet (Lee, Arida, & Donovan, 2017).

The second level is called "distributed intelligence": here, projects are defined by the scientist(s), and the citizen(s) contribute by collecting data and are involved in their interpretation.

Level three is participatory science/research. Here, the citizen(s) refine the research questions, contribute to the data collection, modify the research protocols if necessary, and write the research conclusions and reports.

The fourth and final level, Haklay calls CS "extreme": citizens are intensively involved in most, or the entire development, of the scientific process together with the researcher(s) as they define the research question, conduct the data collection and analysis, interpret that data, and contribute to the dissemination of the results (dissemination and writing of scientific articles, for example).

Citizen Science research requires training of non-researchers in research, its vocabulary, rules and methods. Likewise, it should not be taken for granted that experts know how to relate to "citizens": researchers will have to learn how to manage participatory processes in research. What may happen, however, is promising: teachers trained in the critical understanding of scientific research, researchers promoting useful, interesting studies, co-defined with the end-users.

## 5. Concluding remarks

The Citizen Science field is terminologically complex. There needs to be more consensus about what to call the field and the people engaged in it (Eitzel *et al.*, 2017). Nevertheless, Citizen Science involves research projects initiated by volunteers to fill gaps in existing knowledge, often focusing on community concerns. This active involvement means that volunteers interact with researchers as equals in the research process in less hierarchical structures (Rasmussen, 2019; Wiggins & Wilbanks, 2019). Therefore, it can help resolve misunderstandings and open a scientific practice in which professionals' values are the driving force. It encourages teachers to train themselves in research, even after being hired. It

brings scientific research back into the realm of the rights and not the privileges of experts. It becomes science while keeping the level of criticism of how science is done high.

This is a proposal for reflection. There are still many points to be explored: the ethical (Baard & Sandin, 2022), educational (Roche *et al.*, 2020), political, and organisational (Phillips, Ballard, Lewenstein, & Bonney, 2019) aspects that are by no means secondary. Here, I am drawing attention to the fact that there is a need to revitalise empirical education research. Apart from all the problems that Citizen Science brings with it and needs a viable solution, it is a set of strategies to be considered shortly.

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