EXPERIMENTATION AS A CATALYST FOR INCLUSIVE, PRACTICE-BASED, AND CHALLENGE-ORIENTED EDUCATION

LA SPERIMENTAZIONE COME CATALIZZATORE PER UN'ISTRUZIONE INCLUSIVA, BASATA SULLA PRATICA E ORIENTATA ALLE SFIDE

Aurora Ascatigno
University of Chieti-Pescara
aurora.ascatigno@unich.it

Double Blind Peer Review

Citazione

Ascatigno A., (2023) Experimentation as a catalyst for inclusive, practice-based, and challenge-oriented education; Giornale Italiano di Educazione alla Salute, Sport e Didattica Inclusiva - Italian Journal of Health Education, Sports and Inclusive Didactics. Anno 7, V 4. Edizioni Universitarie Romane

Doi:
https://doi.org/10.32043/gsd.v7i4.1061

gsdjournal.it
ISSN: 2532-3296
ISBN: 978-88-6022-485-9

ABSTRACT

This work stresses inclusiveness through experimentation in shaping educational practice while reflecting emerging arguments in the literature on inclusion for social learning processes. Most notably, we discuss the role of experimental methodology as a transdisciplinary approach that can be used to study inclusivity in shifting education dynamics, specifically in the social sciences. This raises awareness that higher-level learning is associated with practice-based and challenge-oriented education.

Questo lavoro sottolinea l'inclusività attraverso la sperimentazione nel plasmare la pratica educativa, riflettendo al tempo stesso gli argomenti emergenti nella letteratura sull'inclusione per i processi di apprendimento sociale. In particolare, si discute il ruolo della metodologia sperimentale come approccio transdisciplinare che può essere utilizzato per studiare l'inclusività nel cambiamento delle dinamiche dell'istruzione, in particolare nelle scienze sociali. Ciò aumenta la consapevolezza che l'apprendimento di livello superiore è associato a un'istruzione basata sulla pratica e orientata alle sfide.

KEYWORDS
Experimental methodology, social sciences, social learning, inclusive education.
Metodologia sperimentale, scienze sociali, apprendimento sociale, istruzione inclusiva.

Received 11/12/2023
Accepted 27/02/2024
Published 27/02/2024

Introduction

In recent decades, researchers have shown growing interest in experimentally studying people's decision-making and behaviour. This interest has grown especially among researchers from late-comer experimental disciplines, such as certain social sciences, including education and economics. By and large, experimentation can play a crucial role in contexts in which the human being is the leading entity, as an individual and a person, to be included in education policy-relevant research projects and, more broadly, in social schemes. As will be discussed in the paper, a part of the literature on social inclusion in the perspective of education supports that experimental methodology can be understood as a valid research approach. Inclusion and experimentation are increasingly part of the prevailing global discourses in education, as evidenced by reviewing key areas, dimensions, analytical frameworks, and the evolution of international policy development (among others, see Brown, 1992; Green, 2008; Bryk, 2015; and Zanniello, 2023). In particular, the experimental methodology can be used to study the decisions and choices of people moving towards a sustainable and inclusive society over time, starting from the need to implement initiatives to promote inclusive education, informing other aspects of human life. Before providing a possible definition of experimentation, it is necessary to consider that, among the various other disciplines within the social sciences, education and economics are disciplines that coexist in symbiosis and contaminate each other. This coexistence and contamination can be motivated by the fact that they shape contexts that permeate, *de facto*, the life of human beings from the earliest years of their existence and accompany them throughout their lives, and, frequently, decisions made in one context can influence the other and vice versa. In this regard, according to Sáiz-Manzanares et al. (2020), the coexistence of economic and human development, social welfare, and the need to protect the environment requires systematic implementation within the education system. It is therefore crucial to emphasise an inclusive society that recognises the different needs of all groups of people, without discrimination, and ensures an adequate allocation of resources. Given the profound impact of education on the social and economic development of a nation, it is therefore necessary to incorporate specific concepts and content into the various stages of education through the design of targeted curricula or curricular components, primarily to address nontechnical skills in education, among other aspects (for insights on this point, see Cohen et al., 1999; Cohen, 2006). In this way, a possible relationship between education and

economics can be further established, allowing people to develop a sense of responsibility. As a result, people would act relatively more responsibly, both individually and collectively, to ensure a more significant transition to a somewhat more inclusive and sustainable society. In this arena, we refer to the conceptualisation of experimentation following Sengers et al. (2019), who conceptualise experimentation "*as an inclusive, practice-based and challenge-led initiative designed to promote system innovation through social learning under conditions of uncertainty and ambiguity*" (Sengers et al., 2019, p. 161). Therefore, the choice of conducting experiments is relevant, as it would allow the study of the decisions and choices of people working on their own, that is, independently, but also interacting with each other. In particular, people can interact in different environments characterised by uncertainty and ambiguity, such as society, conceived as an entire laboratory from a social constructivist perspective. Within the society, understood in this way, it is possible to test abstract hypotheses as well as the concrete application of new knowledge, new ways of thinking and new "*technologies and practices in order to purposively re-shape social and material realities*" (Sengers et al., 2019, p. 154). Also according to Kok et al. (2021), participation in experiments allows the stimulation of "*learning and reflexivity among participants*" (Kok et al., 2021, p. 1812).

Based on this premise, it is possible to consider the learning process that can be triggered in people by actively participating in an experiment. This aspect will be discussed within this work after focusing on the issues of inclusion and social learning. In this wake, it is necessary to underline that while adopting an experimental methodology for studying sustainability issues is crucial for promoting the transition to an inclusive society (e.g., Wieczorek, 2018), such issues are not the subject of this work. Here, rather, we provide a reflection and discussion on the role of experimental methodology in the social sciences, which can be understood, among other things, as a series of tools adopted for experimental investigation in education, given its potential also to inform social learning and inclusive education. In this regard, we will consider some supporting examples found in the literature, which allow us to highlight the need to implement the experimental methodology in the field of education, especially to enable the achievement of the inclusion objective while favouring contamination with other related disciplines. From this perspective, the scope of the experimental methodology may be further applied not only to evaluate the effectiveness of educational programs and policies but also to study decision-making and to assess how decision-makers use available information. Each person, with their uniqueness and ability to interact with others, mainly determines the effectiveness or not of

education programmes and policies. The effectiveness of programmes and policies can be tested through experimentation to provide possible solutions to problems and bring to light critical issues that allow improvements to be made to what already exists. In this work, among other possible forms of engagement, we refer to those typical aspects of the experimental methodology used to design and conduct social science experiments in controlled environments, where "*laboratory experience suggests that all of the characteristics of "real world" behavior that we consider to be of primitive importance-such as self-interest motivation, interdependent tastes, risk aversion, subjective transactions cost (time is consumed), costly information (it takes time to acquire and process information), and so on-arise naturally, indeed inevitably, in experimental settings.*" (Smith, 1976, p. 274). In this work, we are the first—to our knowledge—to start systematising and approaching experimentation in the social sciences as a source of inclusivity in education. We maintain that it is possible to build relatively inclusive communities by designing a supportive and nurturing experimental environment for students aimed, above all, at facilitating the understanding of specific educational content and social learning. The remainder of the paper is organised as follows: Section 1 briefly describes some aspects of experimental methodology and its role within the social sciences. First and foremost, let us mention some of the typical and essential experimental methods and procedures that need to be followed to design and conduct a certain experiment and achieve a systematic result. Then, considering one of the specific roles of experimentation in creating networks of multiple interrelated individuals who cooperate to facilitate the transition to an inclusive and sustainable society, Section 2 briefly discusses the concept of inclusion and social learning. Finally, Section 3 describes some theories that underpin inclusive education, such as behaviourism, cognitivism, and constructivism. These theories allow us to understand the existence of some theoretical implications that suggest the need for further recourse to experimentation in education to achieve the goal of inclusion. A brief discussion of the main topics covered in the paper is presented in the final section of this work.

1. Experimental methodology in the social sciences: An overview

According to Webster & Sell (2014), over time, the experimental methodology has become an essential tool of scientific research, not only for the "hard" sciences such

as physics, chemistry, and biology but also for the “soft” sciences such as the social sciences. Although it is not the only method of research, experimentation in the social sciences has grown considerably since the 1940s as a result of significant historical changes due mainly to two factors: The emergence of new fields of research and advances in science and technology. Among the other disciplines that fall within the broader scope of social sciences, it should be remembered that at the beginning of the last century, sociologists, psychologists, pedagogues, economists, and experts in communication sciences began to design and carry out experiments in the various fields of interest, involving real people as experimental subjects and obtaining the early experimental pieces of evidence. By exploring and analysing the results of these experiments, scientists from the various aforementioned disciplines have managed to better understand how people interact, dialogue, influence each other, learn, and cooperate, among other features. Although these disciplines may seem distant from each other, the convergence of the results above with compatible theories catalysed the rise of experimental methods in the social sciences and, consequently, possible contamination among disciplines themselves. In addition, technological advances over time have made it possible both to develop equipment and instruments that can be used in laboratories set up for experimental purposes and to conduct experiments outside the laboratory walls (e.g., on the field, through the Internet, computers, televisions and screens, audio and video recorders, and other devices). In short, according to Sadoff (2014), and Webster & Sell (2014), the experimental methodology is a powerful approach as well as a tool whose adoption in the social sciences is mainly the result of a synergy between the exploration of new research areas and advances in technology. As a result of this synergy, it has been possible to design and conduct experiments that are relatively more rigorous and controlled experiments by social scientists than in the past. Overall, regardless of the application area, experimental methodology allows researchers to understand the extent to which a variety of factors can influence an individual’s decisions and actions in a specific experimental setting and in a controlled environment. It is worth mentioning that researchers choose to experiment for different purposes: first, testing hypothesis—and thus theories—by means of a hypothetico-deductive method; second, searching for facts and/or regularities by resorting to an inductive approach; third, exploring unexpected results or results that cannot be explained by existing theories, forth, using an abductive approach; fifth, providing advice to decision-makers, such as the government, by testing programmes and policies in advance; last but not least, informing teaching and learning techniques (e.g., evidence-based education and the related). By going back to basics, some specific

experimental methods and procedures should be followed to ensure the experiment is conducted properly in the social sciences. In this regard, outlined below are some basic steps the experimenter should follow to design and conduct the experiment correctly in the strictest sense of the word: Formulating the research question; determining the experimental design that will answer the research question; actually organising the experiment; conducting an ex-ante pilot experiment; randomly recruiting subjects (e.g., students, children, particular social groups such as ethnic or gender identities, professionals, and other categories of experimental subjects); randomly assigning subjects to task/s; running the experiment; paying subjects with money—it only applies to experimental economics—in accordance with the precepts of the Induced Value Theory (Smith, 1976); processing and analysing experimental data using quantitative methods. In particular, it is worth mentioning that the random assignment of experimental subjects to tasks (control and/or treatment) plays a crucial role in experiments that study people's decision-making (for example, see Sadoff, 2014). Among other issues, when testing a hypothesis, specifying the proper experimental design is of the utmost importance in minimising bias in the results. This often involves using at least one control group, multiple treatment groups in multiple replicates, and as few variables as possible. We also consider the important role played by random subject selection during the recruitment process. In detail, "*a sample of N individuals is selected from the population of interest. Note that the "population" may not be a random sample of the entire population and may be selected according to observables; therefore, we will learn the effect of the treatment on the particular sub-population from which the sample is drawn.*" (Duflo et al., 2008, p. 7). Often, the experimental subjects taking part in the experiment are volunteers who are randomly recruited by the experimenter via posters, online announcements, links and/or via software such as ORSEE (among others, see Greiner, 2015). However, experimental subjects who participate in an experiment are often understood as pseudo-volunteers in the sense that they participate in the experiment because they belong to a particular group of people (e.g., class of students, field of professionals, population that lives and acts in a specific territory or a characteristic portion of this population and so on) (see Eckel & Grossman, 2000).

Following Sadoff's (2014) approach, it is necessary to randomly divide the experimental subjects pool to study the causal relationship between variables and the effectiveness of a programme or policy. This division will have to take place at least "*into two groups: the treatment group […] and the comparison (or control) group […]. The treatment group then is exposed to the "treatment" […] while the*

comparison group […] is not." (Duflo et al., 2008, p. 7, square brackets added). Broadly speaking, the random assignment of experimental subjects to an experimental group would be considered as "*a powerful tool that we may need to trust to produce useable results.*" (Charness et al., 2012, p. 3). Explained in this fashion, it is possible to study the causal relationship between variables, taking into account the experimental groups, for example, through the average treatment effect (ATE), understood as the expected value of the difference between the value of the independent variable between the treated and non-treated groups (Cerulli & Potì, 2012; Vollenweider, 2013). Similarly, it is also possible to consider the average treatment effect on the treated (ATET), which measures the average impact of belonging to a treatment group on the overall value of the independent variable (Vollenweider, 2013). Most experimental studies are conducted to evaluate the effectiveness of education programmes—and related qualifications by fields of study—by identifying causal relationships between variables. Among other still-existing approaches, many of these studies make use of the pretest-posttest control group design (Campbell, 1957), where two main groups emerge: Group A (control group) and Group B (treatment group). The experimental subjects are randomly assigned to either Group A or Group B. There are two time periods, "before" (pretest) and "after" (posttest); in each time period the experimental subjects are observed and experimental data are collected. Between the two periods, the effect of the independent variable emerges through the intervention administered only to the members of Group B (treatment group). Among other existing techniques for studying causal relationships, we can mention the Difference-in-Differences (DiD) technique, through which it is possible to build and estimate the regression model based on the standard DiD technique, noting that "*the between-group difference in post-pre differences (i.e., the difference in differences) identifies the average effect of the treatment for members of the treatment group during the post-treatment period*" (Gardner, 2022, p. 5). By doing so, the average treatment effect can be estimated and, if statistically significant, inferences can be made to assess the effectiveness of a particular treatment.

With the widespread use of experimentation in the social sciences, several challenges have emerged, particularly in the field of education. In this regard, Sadoff (2014) highlights the logistical difficulties, costs, and lack of resources in schools as barriers to experimentation. However, Sadoff (2014) herself also argues that the costs of experimentation are lower than the resources required to implement ineffective policies. Furthermore, this author stresses the importance of learning even from null experimental results. Indeed, even if an experiment produced results different from those expected, even if they were null, it should

not be considered a failure. For instance, understanding which programmes or policies do not work helps to reorient and redesign decisions while informing future interventions. It is precisely in this way that experimentation can be viewed as a learning tool. By and large, the use of experimental methodology is recognised by several social science researchers. Still, many of them lack a complete understanding of this methodology, which poses challenges in conducting, analysing and interpreting results (Sadoff, 2014). Webster & Sell (2014) highlight the importance of increasing the adoption of experimental methodology in education, including the integration of experimental studies conducted in controlled environments. Furthermore, these authors emphasise the importance of designing experiments in education regardless of the overall impact of a specific programme. In this sense, experimental research is crucial for understanding social phenomena, such as social learning, which requires in-depth knowledge of variables and the relationships between them. By combing through the above literature, Sadoff (2014) states that the use of experimentation in education will increase as people can better understand the production function of education, which also further highlights the symbiotic relationship between education and economics (see Bowles, 1970). Indeed, as briefly mentioned and in line with Sadoff (2014), the impact of education on our lives is also observed in various outcomes that people manage to achieve in adulthood (e.g. employment, health, behaviour, etc.). For this reason, too, both small and large-scale experiments should also inform the decisions of those responsible for designing and implementing education programmes and policies.

2. Experimentation as inclusivity and social learning

As emerges from the previous Section, the concept of experimentation, with its methods and applications, that we deal with in this paper is associated both with influential, measurable, and quantifiable phenomena, as well as the related critical willingness that underlies it. Indeed, following what is entailed here and in the emerging literature regards research purposes and not merely a reshaping of thoughts and practices. It cannot thereby be seen as a neoliberal deregulation and privatisation initiative (for example, see Peters, 2000; Davies & Bansel, 2007; and O'Neill, 2015). Still, rather, it is a methodological approach—founded epistemologically (for insights, see Montmarquet, 1993; Moberger, 2020)—already

widely initiated in other fields of scientific research, including the social sciences. According to Kok et al. (2021), experimentation makes it possible to create networks of multiple individuals to facilitate the transition towards an inclusive and sustainable society by generating learning among individuals interacting in a particular environment. To this end, it is necessary to consider the key role of cooperation between the different agents that make up society and intend to make it more inclusive and sustainable, taking into account the pivotal role of education. In this regard, as reported by Kok et al. (2021), Schmidt et al. (2020) provided four aspects for defining and recognising the character of inclusion. The first aspect is normative and is based on the idea that actors involved in the analysis and interpretation of research results should be involved in the inclusion process itself. This aspect reflects the concept of public participation and deliberation (among others, see Görsdorf, 2006; and Smith, 2009). A second aspect highlights how collaboration between science and society leads, roughly speaking, to better research results by integrating different perspectives and values in order to address real-life challenges such as sustainability and inclusion; in this spirit, the role of cooperation can be emphasised and learnt from. The third aspect concerns the legitimacy of co-produced research results, which is crucial for implementing research and innovation policies (e.g., Domitrovich et al. 2008; Hulleman & Cordray 2009; Hatton, 2014). Lastly, the involvement of different actors in cooperative processes can stimulate collective learning and build trust among actors. After all is said and done, a common denominator related to social learning and social preferences stands out, and this represents what we consider accordingly. However, although inclusion is essential for societal development, some concerns arise about possible problems, such as exclusion and limitations of some interdisciplinary processes. In the first argument, Kok et al. (2021) argue that the activity-based research approach indicates that the active involvement of researchers in society is crucial for transformations towards inclusion. Concerning interdisciplinarity processes, these authors claim that it is necessary and appropriate to use the logic of abduction. Abduction has been applied to various issues in many research fields as explanatory reasoning. When it comes to abduction, it can be stated that its logic consists of applying rules underlying the generation and justification of hypotheses (among others, see Hanson, 1958; Simon, 1973). Additionally, exploring Dewey's (1939) concept of a means-end continuum, which adds an intriguing dimension to understanding abduction, we may think of it as a heuristic tool that enhances our grasp of this concept. By and large, since abduction is a reasoning process to aid discovery, its efficacy in unifying many intellectual areas devoted to clarifying problem-solving processes is

ubiquitous, making abduction a reliable rule of inference. One prominent argument of this type was formulated by Richard Boyd during the 1980s, as documented in his works (e.g., Boyd, 1984). The argument begins by emphasising the dependence of scientific methodology on theory. This encompasses various aspects such as the design of experiments, evaluation of data, selection between competing hypotheses, and more. In recent years, certain experimental scientists have started paying attention to humans' role in explanatory considerations of reasoning. In this sense, it is necessary to consider that the use of experimental methodology can support the application of the logic of abduction. In the realm of social inclusion, experimentation often aims to contribute to the transformation of society. This involves making society more inclusive, accessible, and better integrated into teaching and learning. The primary focus, therefore, is on implementing interventions that prioritise inclusive education. This transformation process requires a redefinition of the relationships between decision-makers within the system itself and the strengthening of their cooperation, which generates learning and responsibility. From this perspective, experimental laboratories, for instance, aim to contribute to these transformation processes by focusing on the practical implementation of desired inclusive paths (Kok et al., 2023). Nevertheless, structural and socio-material factors shape the dynamics of inclusion and exclusion in purportedly inclusive experiments. This implies a need for a more thorough examination of how these factors interact with inclusivity (Kok et al., 2021; see also Packer & Goicoechea, 2000). Within this framework, the opportunity to include different people in cooperative processes and, thus, in certain experiments presupposes providing a brief discussion of the concept of social learning. The term social learning can refer to the process by which people acquire new knowledge, behaviour or skills by observing and interacting with others in the social environment (Bandura, 1971, 1977). Indeed, by carrying out a series of experiments, Bandura confirmed the ability of humans to explore and develop new behaviour, primarily through observation and imitation. He also refined his forerunner idea to include the concept of self-efficacy (see also Bandura, 1984), that is, the perception of being able to perform a skill that will accomplish what is intended by the person practising it. It therefore refers to a process focused on interaction, imitation and learning between the people who form society. According to Elliott & Lang (2004), social learning has its roots in social learning theory (see also Bandura & Walters, 1963). Consistent with this theory, social behaviour is determined by two kinds of learning: Learning through observation and learning through reinforcement, while some mediational processes help determine whether a new behaviour is developed. Since learning is about

interacting with some environments and making a permanent change in social behaviour that improves knowledge and human performance (e.g., Driscoll, 1994), social learning theorists distinguish between learning and producing a response. This distinction allows them to view the entire modelling process as a way of acquiring new behaviours that are appropriate in social contexts (see also Davies, 2013). The modelling influences previously learned responses through disinhibitory effects and recall. For example, children experience positive or negative reinforcement by observing a model receiving reinforcement for a particular behaviour. Observers tend to inhibit punitive responses in others but perform the modelled behaviour that gets the desired reinforcement. According to Elliott & Lang (2004), there is good empirical support to demonstrate the effectiveness of modelling in helping children, but also people in general, develop social skills and social understanding. Against this background, a novelty in social learning concerns peer interventions based on the belief that peers can be effective models of change for those with limited social skills. Sometimes peers can reinforce positive social interactions and influence social behaviour in different ways. Peer interventions can be more effective than teacher-directed interventions because peers can provide more targeted monitoring and reinforcement, while early studies on social learning theory viewed social learning as an individual process influenced by the social context, such as the imitation of behaviour (see Reed et al., 2010). Nevertheless, these authors argue that the above view is quite limited because a large part of learning takes place within social contexts and occurs within social practices. As a result, new approaches have been developed that assume social learning as a process of social change in which people learn from each other and, in turn, influence broader systems beyond society. These new approaches originate groundbreaking research and are based on organisational and social learning theories, which emphasise active participation and interaction between people and the environment in which they live and/or operate. Furthermore, there is confusion between the concepts of social learning and participation: These concepts are often confused with their potential outcomes, such as sustainable human behaviour. Again, little distinction is made between individual and collective social learning. This might explain why, on the one hand, social learning theory produces a valuable framework for understanding how learning emerges, but, on the other hand, predicting actual human behaviour can be challenging, given the numerous patterns and potential reinforcements in a person's environment. In line with Reed et al. (2010), this conceptual confusion makes it difficult to understand social learning and evaluate its effects, limiting the capability to design effective interventions and measure the achievement of learning objectives. Therefore,

conceptual clarity is needed to structure social learning and develop more effective approaches to advancing it (to explore research techniques and methodologies to assess social learning, see Ernst, 2019). Over time, several theoretical models have been proposed to explain learning processes, but none of them focus exclusively on social learning. As Reed et al. (2010) described, Kolb (1984) represents a learning cycle in which people experience, reflect, conceptualise, and apply what they have learned. Mezirow (1995) also distinguishes between instrumental, communicative and transformative learning, similar to double-loop—or generative—learning, used to improve the cognitive models of people, which involves reflection on underlying assumptions. Learning can occur at different levels and can lead to changes in attitudes and behaviour, as well as fostering trust and shared goals. The concept of social learning has been fairly extended, too, to organisations and communities of practice, demonstrating that social units can learn and change collectively. Kok et al. (2021) argue that this concept is similar to Freire's (1970) approach concerning collective critical learning about social circumstances and how they impact outcomes. For these reasons, social learning requires a change in understanding on a larger scale, going beyond individuals or small groups to include larger social units or communities of practice: How social learning occurs can be far-reaching and, at the same time, less understood, as can the change in understanding or scale at which it occurs, so it can be difficult to operationalise in its entirety. As with other theories, social networks play an essential role in social learning, influencing opinions and views. In keeping with Kok et al. (2021), the relationships between individuals who form social networks and interact can be studied through experimentation (among others, see Bucciarelli & Liberatore, 2020). Learning can occur through social interactions such as information transfer and deliberation, which are influenced by the social norms, network structures, culture, and worldviews of the people involved. Likewise, power dynamics and scale are noteworthy in influencing social learning outcomes, which requires bringing diverse knowledge holders together in appropriate contexts to foster learning. Considering this viewpoint, fostering social learning and involving all individuals in the inherent learning process is imperative, necessitating collaboration among the relevant agents. Reed et al. (2010) note that various authors have provided different definitions or interpretations of social learning. In addition, they provide some guidance on how to identify social learning: First, it should demonstrate a change in individuals' understanding, which may be superficial or affect a more profound shift in attitudes or beliefs. Second, social learning should extend beyond the individual level, affecting entire communities and real societies through social interactions within social and institutional networks while identifying sub-

processes involved in developing it (on this point, see also Bruni, 2023). On this aspect, Reed et al (2010) argue that conceptual clarification is crucial to effectively facilitate understanding of the phenomenon of social learning and to improve the sustainability of social-ecological systems. Following Bruni (2023), it is worth *mentioning* that "*[t]he basic assumption was that the human being and his formative processes could be investigated by combining various dimensions of thought, on the one hand linked to spatio-temporal, i.e. empirical-experimental categories, and on the other hand capable of designing the transformation of the contingent, of being in a different way projectual. The need to keep the educational subject anchored to real reality and to find forms of scientific reasoning capable of grasping and interpreting the real subject's authentic formative and identity needs arose from many sides, both theoretical and concrete.*" (Bruni, 2023, p. 6). Thus, social learning becomes defined as a real change in understanding that moves beyond individually-focused education and evolves within larger social units through social interactions and learning to socially interact in multi-agent scenarios. Several scholars also believe that further studies in this direction are desirable.

On the basis of what has been introduced, it is necessary to consider that the phenomenon of social learning is the subject of experimental studies by scholars belonging to different disciplines, highlighting the transdisciplinary character of experimentation and the concept of inclusion. In this regard, the following experimental works can be mentioned: John et al. (2016) as far as pedagogy is concerned; Kalkstein et al. (2016) in psychology; Dollard & Miller (2013) in sociology; Ballinger et al. (2003), and Sigmund et al. (2010) in economics. Ultimately, as claimed by Stewart et al. (2013), research on ICT innovation, exemplified by studies such as those by Sørensen (1996) and Williams et al. (2005), reveals an overarching pattern of protracted social learning processes. These processes involve stages like experimentation, interaction with potential users, encountering failures, subsequent reinvention, and in-depth engagement with both technology and individuals. The aim is to comprehend and mould technologies and practices effectively. These dynamic processes are embedded within specific domains of practice and existing social relations, fueled by aspirations to instigate change and harness the potential of new technology. Contrary to being mere byproducts of techno-enthusiasts' hype, the emerging technological frames, as illustrated by Bijker (1995), necessitate a foundation in the pre-existing context and practices of stakeholders. In this context, particularly within the realm of scholarly publishing, it is imperative to consider the established practices elucidated by scholars such as Hyysalo (2006, 2009). A concept emerges from the latter author in line with this paper: Learning for learning economy and social learning. It is

undoubtedly of interest to those who are discovering that experimentation has a primary place in the educational environment to a greater extent than a mere computing aid to classroom teaching.

3. Recalling some theories underlying inclusive education

Seen from a birds-eye perspective, one of the possible main objectives of experimentation in the widely dispersed processes of social learning and social inclusion is to contribute to the transformation of society by making it more inclusive, accessible, and better integrated into teaching and learning, starting with implementing interventions aimed at making education, above all, inclusive. The term 'inclusive' is widely used in educational research for different purposes and in different ways, with a variety of specific research designs serving various functions. Hence, it has several meanings and is an educational concept that has proven elusive to define precisely, being used and understood differently by education professionals in different fields and sub-disciplines. On the one hand, while there exists a general consensus and understanding that inclusive education entails "*a process of increasing participation and decreasing exclusion from the culture, community, and curricula of mainstream schools*" (Booth et al., 2000, as quoted in Florian & Black-Hawkins 2011, p. 814), the implementation of this process varies widely, and limited knowledge regarding the specific details of classroom-level practices emerges (i.e., inclusive practice). On the other hand, Mitchell (2008) distinguishes between integration and inclusive education, contending that inclusive education extends beyond the mere placement of learners with special education needs in age-appropriate regular classrooms within the learner's local school (integration). Meanwhile, inclusion should involve "*[p]utting in place a whole suite of provisions including adapted curriculum, adapted teaching methods, modified assessment techniques and accessibility arrangements, all of which require support for the educator at the classroom level*." (Mitchell, 2008, p. 27). Therefore, the emphasis is placed on factors—especially within schools of every order and degree and universities of all levels—that impact the evolution of thinking and practice, alongside broader contextual influences that might limit such progress. The assertion is made that numerous obstacles faced by learners stem from entrenched thought patterns. As a result, strategies for fostering inclusive practices must include interventions in thought processes to stimulate an

exploration of overlooked possibilities for advancing practice (see also Nes, 2003; Ainscow, 2005; and Ainscow & Sandill, 2010). In terms of the conjuncture mentioned above, the perspective offered by Al-Shammari et al. (2019) also stresses inclusive education: It aims to ensure all students' access to and quality of education and has become a globally recognised approach. As mentioned earlier, however, its implementation requires changing the mindset of those who design and implement inclusive education programmes and policies. In any case, even if the latter are in favour of inclusion, the integration of diverse groups, especially those with social or emotional difficulties, remains a challenge (see Hornby, 2014). Some of the difficulties can be understood as physical-technical constraints, such as the number of specific devices and capacity of available spaces, the quantity and quality of teachings taught experimentally, the quality of support to include all students, and the necessary teachers' skills (among others, see Botha & Kourkoutas, 2016). Despite some constraints, it is necessary to note that inclusion means, first of all, promoting tolerance and respect for diversity and requiring a different approach to traditional education, involving all members of the school/academic staff and students as active agents of the change. In this context, Al-Shammari et al. (2019) provided a theoretical examination encompassing three definitive theories that constitute the cornerstone and normative criterion of contemporary inclusive education. Each of these theories aids educational decision-makers by offering strategies grounded in evidence-based practices, including experimental methods, to enhance learning for every student. The three theories are behaviourism (see Watson, 1924, 1928; and Skinner, 1953, 1974), cognitivism (see Piaget, 2001 [1947], 1954; and Vygotsky, 1965 [1934], Vygotsky, 1978), and constructivism (see Vygotsky, 1967; and Piaget, 1970, 1973). Interestingly, they state that behaviourism is a fundamental theory of learning that views learning as a sequence of stimuli and responses, linking behaviour to consequences. This theory focuses on the observable and the influence of the environment on human behaviour. Inclusive educational practices based on behaviourism are applied to the educational environment, emphasising students' behaviour and performance. Direct or explicit instruction, for instance, represents a method that has proven effective in educating students with special needs in standard classrooms. This method breaks down complex activities into smaller ones (see Simon, 1962) and involves teachers guiding students through learning. In addition, behaviourist principles are reflected in strategies such as functional behaviour analysis and using assessment and feedback to modify and improve student behaviour. Instead, cognitivism directs its attention to cognitive functions, such as thinking, memory, and motivation in the learning process, recognising the

importance of corresponding mental activity in learners. The related cognitivist perspective aims to make knowledge meaningful by linking new information with previously acquired ones. Accordingly, inclusive educational practices based on cognitivism promote students' mental processing, engagement, and interaction during learning, encouraging them to connect their past experiences with new inputs and ways to update them. This theory uses methods/strategies such as framing, synthesis, and concept mapping (on this specific point, see Novak & Gowin, 1984; and Novak, 1990, 2010 [1998]) to support the cognitive needs of particular learners. It is worth remembering that the guiding cognitivist principles for pedagogical practice include, among others, actively engaging students, structuring information to facilitate processing, and creating environments that encourage connections with prior knowledge. Finally, theoretical constructivism focuses on creating cognitive tools that reflect the culture and learning experience. It emphasises the social dimension of learning and, thus, social learning, which mainly involves observing and interpreting information to build cognitive capabilities while reinforcing neural networks. The social role in cognitive development through interaction is predominant. In terms of constructivism, learning entails the individual construction of meaning rather than mere memorisation. Educational activities grounded in constructivism are meaningful and connected to the concept of active learning—practical experiences through interactions with the environment, and the development of knowledge and understanding as a process of adaptation. In inclusive constructivist educational practices, teaching methods enable students to actively explore complex topics and establish connections between key concepts rather than isolated fragments of knowledge. In a nutshell, constructivism promotes active and experiential learning, placing value on social interaction and the individual construction of meaning. It is rooted in an inclusive approach that fosters collaboration within the educational community. Building upon this foundation, one can reference the concept of Experiential Learning Theory (Kolb, 1984). According to this theory, to initiate and develop the learning process in individuals, it is imperative for them to learn from experiences and actively engage in doing something. This theory also advocates for the reinforcement of experimental methodology in education to enhance learning. Notably, researchers like Egbert & Mertins (2010) have conducted experiments in behavioural economics, considering students' capacity to learn through experiences and active participation. In their work, Egbert & Mertins (2010) explicitly facilitated a deeper integration of education and economics by emphasising the link between experiential learning theory and behavioural economics. In accordance with recent literature (see Stuart, 2018; Stuart &

Sargeant, forthcoming; and Kauffman et al., 2022), we draw on a number of suggestions to offer to decision-makers in the field of inclusive education. Each suggestion was proposed especially within the framework of encouraging struggling students to imagine better, with the definition of better left to the discretion of the scientist. Many of these suggestions align with recognised pedagogical principles applicable in various contexts, although their relevance to inclusivity is variable. As we delve into the specifics of educating scientific imagination, we uncover overarching themes inherent in these suggestions that we can explore within the context of inclusivity.

(i) Utilise open-ended prompts, such as metaphors, experimentation, and visualisations.

(ii) Foster an enhancement in students' self-confidence.

(iii) Offer positive role models to students.

(iv) Delegate responsibilities to students.

(v) Cultivate a critical mindset through experimentation.

(vi) Foster discussions, both within and outside the laboratory setting.

(vii) Refrain from being overly dogmatic.

(viii) Steer clear of fostering competitive environments.

(ix) Promote a culture where everyone feels comfortable admitting areas of uncertainty.

To conclude, although it is quite difficult to distinguish between current terms such as inclusive pedagogy, inclusive education, and inclusive practice, the concept of inclusive pedagogy and its theoretical assumptions are to be kept distinct from the terms inclusive education as well as inclusive practice which we address in this paper (among others, see Alexander, 2004; and Florian & Black-Hawkins, 2011). This might open up new opportunities mainly for experimental and empirical studies but also for further questions and aims to be pursued in the near future.

Conclusions

This paper provides a novel perspective on the topic of experimentation in inclusive education, which has been underestimated and not fully addressed by current research in the social sciences. There are many more topics we could discuss when it comes to experimental methods and scientific education, especially with regard to inclusion. One of the pioneering studies in this regard was conducted by Engelhart in 1930, and Stanley's study (1967) was later added, both noteworthy and mutually shared. In the context of this paper, we contemplate the observation that several studies (e.g., Sadoff, 2014; Wieczorek, 2018; Kok et al., 2021; Kok et al., 2022) regard experimental methodology as a valuable tool for promoting inclusion—and sustainability—in education among various existing research methodologies. Furthermore, these studies underscore that the purpose of experimental methodology extends beyond evaluating the effectiveness of educational programs and policies. We also reflect on other works that have delineated the theoretical underpinnings critical to aspects of inclusive education, utilising experimental methodology as employed in other social sciences. Notably, we observe that through its results, experimental methodology can offer insights to decision-makers in both the field of inclusive education and in other disciplines that prioritise placing the person at the centre of their study and application. Browsing through the literature and following Sáiz-Manzanares et al. (2020), it becomes evident that education necessitates an interdisciplinary perspective and a blend of qualitative and quantitative research methods, recognising that each context is unique and demands approaches tailored to the needs of individuals. Despite significant progress in this direction, there remains a need to explore new methodological, technological, and social tools to achieve a broader and more inclusive response, thereby contributing to the creation of a sustainable and inclusive society. There is a need for further experimental and non-experimental research in the field of inclusion and social learning to gain a better understanding of these issues. According to Al-Shammari et al. (2019), combining theoretical foundations with practical approaches to learning, such as experimentation, is essential for achieving inclusion. This integration allows for the incorporation of aspects from behaviourism, cognitivism, and constructivism, providing a more comprehensive and adaptable approach to inclusive education. The amalgamation of these different approaches can foster more effective and beneficial inclusive education for all students, regardless of their specific needs. As briefly mentioned earlier, experimental methodology, particularly through the analysis of experimental results, allows us to seek answers and solutions to common problems, fostering interdisciplinary collaboration. This approach helps us

understand cause-effect relationships and consider why and how people cooperate and learn from each other, thus promoting inclusion.

Acknowledgments

The author is grateful to Edgardo Bucciarelli and Alfredo Colantonio for providing invaluable advice and guidance. The author is equally thankful to the anonymous reviewers for their insightful comments, which helped improve an earlier version of this paper.

References

Ainscow, M. (2005). Developing inclusive education systems: What are the levers for change? *Journal of Educational Change*, *6*(2), 109-124. https://doi.org/10.1007/s10833-005-1298-4.

Ainscow, M., & Sandill, A. (2010). Developing inclusive education systems: The role of organisational cultures and leadership. *International Journal of Inclusive Education*, *14*(4), 401-416. https://doi.org/10.1080/13603110802504903.

Alexander, R. (2004). Still no pedagogy? Principle, pragmatism and compliance in primary education. *Cambridge Journal of Education*, *34*(1), 7-33. https://doi.org/10.1080/0305764042000183106.

Al-Shammari, Z., Faulkner, P. E., & Forlin, C. (2019). Theories-based inclusive education practices. *Education Quarterly Reviews*, *2*(2), 408-414. 10.31014/aior.1993.02.02.73.

Ballinger, T. P., Palumbo, M. G., & Wilcox, N. T. (2003). Precautionary saving and social learning across generations: an experiment. *The Economic Journal*, *113*(490), 920-947. https://doi.org/10.1111/1468-0297.t01-1-00158.

Bandura, A. (1971). *Social learning theory*. New York: General Learning Press.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191-215. 10.1037//0033-295x.84.2.*191.*

Bandura, A. (1984). Recycling misconceptions of perceived self-efficacy. Cognitive Therapy and Research, 8, 231-255. https://doi.org/10.1007/BF01172995.

Bandura, A., & Walters, R. H. (1963). *Social learning and personality development*. New York: Holt, Rinehart and Winston.

Bijker, W. E. (1995). *Of bicycles, bakelite, and bulbs: Toward a theory of sociotechnical change*. Cambridge: MIT Press.

Booth, T., Ainscow, M., Black-Hawkins, K., Vaughan, M. & Shaw, L. (2000). *The index for inclusion: Developing learning and participation in schools.* Bristol: Centre for Studies on Inclusive Education.

Botha, J. & Kourkoutas, E. (2016). A community of practice as an inclusive model to support children with social, emotional, and behavioural difficulties in school contexts*. International Journal of Inclusive Education*, *20*(7), 784–799. 10.1080/13603116.2015.1111448.

Bowles, S. (1970). Towards an educational production function. In Lee Hansen (ed.), *Education, income, and human capital*, pp. 11-70. NBER.

Boyd, R. (1984). The current status of scientific realism. In J. Leplin (ed.), Scientific realism. *University of California Press*, Berkeley, pp. 41-82.

Bruni, E. M. (2023). Meaningful, affective and social learning in the algorithm domain. *Giornale Italiano di Educazione alla Salute, Sport e Didattica Inclusiva – Italian Journal of Health Education, Sports and Inclusive Didactics*, *2*(7), 1-11. https://doi.org/10.32043/gsd.v7i2.894.

Bryk, A. S. (2015). Accelerating how we learn to improve. *Educational Researcher*, *44*(9), 467-477. https://doi.org/10.3102/0013189X15621543.

Bucciarelli, E., & Liberatore, A. (2020). Does trust create trust? A further experimental evidence from an extra-laboratory investment game. In Bucciarelli, E., Chen, S.H., & Corchado, J.M. (eds), Decision Economics: Complexity of Decisions and Decisions for Complexity. *Springer-Nature*, Cham. https://doi.org/10.1007/978-3-030-38227-8_32.

Campbell, D. T. (1957). Factors relevant to the validity of experiments in social settings. *Psychological Bulletin*, *54*(4), 297–312. https://doi.org/10.1037/h0040950.

Cerulli, G., & Potì, B. (2012). Evaluating the robustness of the effect of public subsidies on firms' r&d: An application to Italy. *Journal of Applied Economics*, *15*(2), 287–320. 10.1016/S1514-0326(12)60013-0.

Charness G., Gneezy U., & Kuhn M. (2012), Experimental methods: Between-subject and within-subject design. *Journal of Economic Behaviour & Organization*, *81*(1), 1-8. https://doi.org/10.1016/j.jebo.2011.08.009.

Cohen, J. (2006). Social, emotional, ethical, and academic education: Creating a climate for learning, participation in democracy, and well-being. *Harvard Educational Review*, *76*(2), 201-237. https://doi.org/10.17763/haer.76.2.j44854x1524644vn.

Cohen, E. G., Lotan, R. A., Scarloss, B. A., & Arellano, A. R. (1999). Complex instruction: Equity in cooperative learning classrooms. *Theory into Practice*, *38*(2), 80-86. https://doi.org/10.1080/00405849909543836.

Davies, M. (2013). *The Blackwell companion to social work*. Chichester: Blackwell Publishing.

Davies, B., & Bansel, P. (2007). Neoliberalism and education. *International Journal of Qualitative Studies in Education*, *20*(3), 247-259. https://doi.org/10.1080/09518390701281751

Dewey, J. (1939). *Theory of valuation. International Encyclopedia of Unified Science.* Chicago: University of Chicago Press.

Driscoll, M. P. (1994). *Psychology of learning for instruction.* Boston: Allyn & Bacon.

Dollard, J., & Miller, N. E. (2013). *Social learning and imitation*. Abingdon: Routledge.

Domitrovich, C. E., Bradshaw, C. P., Poduska, J. M., Hoagwood, K., Buckley, J. A., Olin, S., Romanelli, L. H., Leaf, P. J., Greenberg, M. T., & Ialongo, N. S. (2008). Maximizing the implementation quality of evidence-based preventive interventions in schools: A conceptual framework. *Advances in School Mental Health Promotion*, *1*(3), 6-28. https://doi.org/10.1080/1754730X.2008.9715730.

Duflo E., Glennerster R., & Kremer M. (2008). Using randomization in development economics research: A toolkit. In Schultz, T.P, & Strauss, J.A. (eds.), *Handbook of Development Economics*, Vol. 4, pp. 3895-3962, Elsevier.

Eckel, C. C., & Grossman, P. J. (2000). Volunteers and pseudo-volunteers: The effect of recruitment method in dictator experiments. *Experimental Economics*, *3*, 107-120. https://doi.org/10.1023/A:1026572918109.

Egbert, H., & Mertins, V. (2010). Experiential learning with experiments. *International Review of Economics Education*, *9*(2), 59-66. https://doi.org/10.1016/S1477-3880(15)30050-5.

Elliott, S. N., & Lang, S. C. (2004). Social skills training. In *Encyclopedia of Applied Psychology, Three-Volume Set*, pp. 427-433. Elsevier Science Ltd. https://doi.org/10.1016/B0-12-657410-3/00792-3.

Engelhart, M. D. (1930). Experimentation as a technique of educational research. *The Phi Delta Kappan*, *13*(2), 58-61. Retrieved from https://archive.org/details/sim_phideltakappan_193008_13_2/page/58/mode/2p and http://www.jstor.org.cupdx.idm.oclc.org/stable/20257916 on 14th November 2023.

Ernst, A. (2019). Research techniques and methodologies to assess social learning in participatory environmental governance. *Learning, Culture and Social Interaction*, 23, 100331. https://doi.org/10.1016/j.lcsi.2019.100331.

Florian, L., & Black-Hawkins, K. (2011). Exploring inclusive pedagogy. *British Educational Research Journal, 37*(5), 813-828. https://doi.org/10.1080/01411926.2010.501096.

Freire, P. (1970). *Pedagogy of the Oppressed*. London: Penguin.

Gardner, J. (2022). Two-stage differences in differences. *arXiv preprint arXiv:2207.05943*. 1-33. https://doi.org/10.48550/arXiv.2207.05943.

Görsdorf, A. (2006). Inside deliberative experiments: Dynamics of subjectivity in science policy deliberations. *Policy and Society*, *25*(2), 177-206. https://doi.org/10.1016/S1449-4035(06)70078-9.

Green, L. W. (2008). Making research relevant: If it is an evidence-based practice, where's the practice-based evidence? *Family Practice*, *25*(Supplement No. 1), I20-I24. https://doi.org/10.1093/fampra/cmn055.

Greiner, B. (2015). Subject pool recruitment procedures: organizing experiments with ORSEE. *Journal of the Economic Science Association*, *1*(1), 114-125. https://doi.org/10.1007/s40881-015-0004-4.

Hanson, N. R. (1958). *Patterns of discovery. An inquiry into the conceptual foundations of science.* Cambridge: Cambridge University Press.

Hatton, D. D. (2018). Advancing the education of students with visual impairments through evidence-based practices. *International Review of Research in Developmental Disabilities*, *46*, 1-22. https://doi.org/10.1016/B978-0-12-420039-5.00001-0.

Hornby, G. (2014). *Inclusive special education: Evidence-based practices for children with special needs and disabilities.* New York: Springer.

Hulleman, C. S., & Cordray, D. S. (2009). Moving from the lab to the field: The role of fidelity and achieved relative intervention strength. *Journal of Research on Educational Effectiveness*, *2*(1), 88-110. https://doi.org/10.1080/19345740802539325.

Hyysalo, S. (2006). Representations of use and practice-bound imaginaries in automating the safety of the elderly. *Social Studies of Science*, *36*(4), 599-626. https://doi.org/10.1177/0306312706058426.

Hyysalo, S. (2009). Learning for learning economy and social learning. *Research Policy*, *38*(5), 726-735. https://doi.org/10.1016/j.respol.2009.01.003.

John, B., Thavavel, V., Jayaraj, J., Muthukumar, A., & Jeevanandam, P. K. (2016). Design of Open Content Social Learning That Increases Learning Efficiency and Engagement Based on Open Pedagogy. *Turkish Online Journal of Educational Technology-TOJET*, *15*(1), 20-32.

Kalkstein, D. A., Kleiman, T., Wakslak, C. J., Liberman, N., & Trope, Y. (2016). Social learning across psychological distance. *Journal of personality and social psychology*, *110*(1), 1.

Kauffman, J. M., Anastasiou, D., Hornby, G., Lopes, J., Burke, M. D., Felder, M., Ahrbeck, B., & Wiley, A. (2022). Imagining and reimagining the future of special and inclusive education. *Education Sciences*, *12*(12), 903. https://doi.org/10.3390/educsci12120903.

Kok, K.P., van der Meij, M.G., Wagner, P., Cesuroglu, T., Broerse, J.E.W., & Regeer, B.J. (2023). Exploring the practice of Labs for sustainable transformation: The challenge of 'creating impact'. *Journal of Cleaner Production*, *388*, 135994. https://doi.org/10.1016/j.jclepro.2023.135994.

Kok, K. P., Gjefsen, M. D., Regeer, B. J., & Broerse, J. E. (2021). Unraveling the politics of 'doing inclusion' in transdisciplinarity for sustainable transformation. *Sustainability Science*, *16*(1), 1811-1826. https://doi.org/10.1007/s11625-021-01033-7.

Kok, K. P., de Hoop, E., Sengers, F., Broerse, J. E., Regeer, B. J., & Loeber, A. M. (2022). Governing translocal experimentation in multi-sited transition programs: Dynamics and challenges. *Environmental Innovation and Societal Transitions*, *43*, 393-407. https://doi.org/10.1016/j.eist.2022.05.001.

Kolb, D. A. (1984). *Experiential learning: experience as the source of learning and development*. New Jersey: Prentice-Hall.

Mezirow, J. (1995). Transformation Theory of Adult Learning. In M. Welton (Ed.), Defense of the Lifeworld: Critical Perspectives on Adult Learning, pp. 37-90. *State University of New York Press*, New York.

Moberger, V. (2020). Bullshit, pseudoscience and pseudophilosophy. *Theoria*, *86*(5), 595-611. https://doi.org/10.1111/theo.12271.

Montmarquet, J. A. (1993). *Epistemic virtue and doxastic responsibility.* Lanham: Rowman & Littlefield.

Nes, K. (2003). Why does education for all have to be inclusive education? In Allan, J. (ed.) Inclusion, participation and democracy: What is the purpose? Vol. 2, pp. 67-80. Kluwer Academic Publishers, London.

Novak, J. D. (1990). Concept maps and Vee diagrams: two metacognitive tools to facilite meaningful learning. *Instructional Science*, *19*(1), 29-52. https://doi.org/10.1007/BF00377984.

Novak, J. D. (2010) [1998]. *Learning, creating and using knowledge*. Mahweh: Lawrence Erlbaum Associates.

Novak, D. J., & Gowin, D. G. (1984). *Learning how to learn*. New York: Cambridge University Press.

O'Neill, A.-M. (2015). The New Zealand experiment: assessment-driven curriculum – managing standards, competition and performance to strengthen governmentality. *Journal of Education Policy*, *30*(6), 831-854. https://doi.org/10.1080/02680939.2015.1033766.

Packer. M. J., & Goicoechea, J. (2000). Sociocultural and constructivist theories of learning:Ontology, not just epistemology. *Educational Psychologist*, *35*(4), 227-241. https://doi.org/10.1207/S15326985EP3504_02.

Peters, M. (2000). Education policy, welfare and the language of the market. The Australian *Educational Researcher*, *27*(2), 63-85. https://doi.org/10.1007/bf03219721.

Piaget, J. (1954). *The construction of reality in the child.* London: Routledge.

Piaget, J. (1970). *Genetic epistemology.* New York: Columbia University Press.

Piaget, J. (1973). *To understand is to invent: The future of education.* New York: Grossman Publishers.

Piaget, J. (2001) [1947]. *The psychology of intelligence.* New York: Routledge.

Reed, M. S., Evely, A. C., Cundill, G., Fazey, I., Glass, J., Laing, A., Newig , J., Parrish, B., Prell, C., Raymond, C., & Stringer, L. C. (2010). What is social learning?. *Ecology and society*, *15*(4), 1-10. https://www.jstor.org/stable/26268235.

Sadoff, S. (2014). The role of experimentation in education policy. *Oxford Review of Economic Policy*, *30*(4), 597-620. https://doi.org/10.1093/oxrep/grv001.

Sáiz-Manzanares, M. C., Gutiérrez-González, S., Rodríguez, Á., Alameda Cuenca-Romero, L., Calderón, V., & Queiruga-Dios, M. Á. (2020). Systematic review on inclusive education, sustainability in engineering: An analysis with mixed methods and data mining techniques. *Sustainability*, *12*(6861), 1-18. https://doi.org/10.3390/su12176861.

Schmidt, L., Falk, T., Siegmund-Schultze, M., & Spangenberg, J. H. (2020). The objectives of stakeholder involvement in transdisciplinary research. A conceptual framework for a reflective and reflexive practise. *Ecological Economics*, *176*, 106751. https://doi.org/10.1016/j.ecolecon.2020.106751.

Sengers, F., Wieczorek, A. J., & Raven, R. (2019). Experimenting for sustainability transitions: A systematic literature review. *Technological Forecasting and Social Change*, *145*(1), 153-164. https://doi.org/10.1016/j.techfore.2016.08.031.

Sigmund, K., De Silva, H., Traulsen, A., & Hauert, C. (2010). Social learning promotes institutions for governing the commons. *Nature*, *466*(7308), 861-863. https://doi.org/10.1038/nature09203.

Simon, H. A. (1962). The architecture of complexity. Proceedings of the American Philosophical Society, *106*(6), 467-482.

Simon, H. A. (1973). Does scientific discovery have a logic? *Philosophy of Science*, *40*(4), 471-480. https://doi.org/10.1086/288559.

Skinner, B. F. (1953). *Science and human behavior.* New York: Macmillan.

Skinner, B. F. (1974). *About behaviorism*. New York: Knopf.

Smith. V., L. (1976). Experimental economics: Induced value theory. *American Economic Review*, *66*(2), 274-79. https://www.jstor.org/stable/1817233.

Smith, G. (2009). *Democratic innovations: Designing institutions for citizen participation.* Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511609848.

Sørensen, K. H. (1996). Learning technology, constructing culture. Sociotechnical change as social learning. STS Working Paper no. 18/96, Centre for Technology and Society, University of Trondheim, Norway.

Stanley, J. C. (1967). Experimentation in education. *Theory Into Practice*, 6(2), 66-68. https://doi.org/10.1080/00405846709542055.

Stuart, M. T. (2018). *How thought experiments increase understanding. In The Routledge Companion to Thought Experiments.* London: Routledge.

Stuart, M. T., & Sargeant, H. (forthcoming). Inclusivity in the education of scientific imagination. In E. Hildt, K. Laas, C. Miller, & E. Brey (eds.). Building inclusive ethical cultures in STEM. *Routledge*, London.

Stewart, J., Procter, R., Williams, R., & Poschen, M. (2013). The role of academic publishers in shaping the development of Web 2.0 services for scholarly communication, *New Media and Society*, *15*(3), 413-432. https://doi.org/10.1177/1461444812465141.

Vollenweider, J. (2013). The effectiveness of international environmental agreements. *International Environmental Agreements: Politics, Law and Economics*, *13*, 343–367. https://doi.org/10.1007/s10784-012-9193-y.

Vygotsky, L. S. (1965) [1934]. *Thought and language*. Translated by E. Hanfmann, & G. Vakar. Boston: MIT Press.

Vygotsky, L. S. (1967). Imagination and creativity in childhood. *Journal of Russian & East European Psychology*, *42*(1), 7-97. https://doi.org/10.1080/10610405.2004.11059210.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Edited by M. Cole, V. John-Steiner, S. Scribner, & E. Souberman. *Harvard University Press*, Cambridge (MA).

Watson, J. B. (1924). *Behaviorism*. New York: Norton.

Watson, J. B. (1928). *The ways of behaviorism.* New York: Harper and Brothers.

Webster Jr, M., & Sell, J. (2014). Why do experiments?. In Webster Jr, M., & Sell, J. (eds.), *Laboratory experiments in the social sciences* (Second Edition), pp. 5-21. Academic Press. https://doi.org/10.1016/B978-0-12-404681-8.00001-7.

Wieczorek, A. J. (2018). Sustainability transitions in developing countries: Major insights and their implications for research and policy. *Environmental Science & Policy*, *84*, 204-216. https://doi.org/10.1016/j.envsci.2017.08.008.

Williams, R., & Edge, D. (1996). The social shaping of technology. *Research Policy*, *25*(6), 865-899. https://doi.org/10.1016/0048-7333(96)00885-2.

Williams, R., Stewart, J., & Slack, R. (2005). *Social learning in technological innovation experimenting with information and communication technologies.* Aldershot: Edward Elgar.

Zanniello, G. (2023). Educational practices, evidence-based experimentation and R-A with project. *Italian Journal of Educational Research*, XVI, 30, 011-022. https://doi.org/10.7346/sird-022022-p11.