Learning from Negative Experience: A Philosophical Exploration of "Productive failure"

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Abstract: Failure is a part of learning. This is not only a leading conjecture of various instructional design frameworks, but also a key component of well-known educational philosophies. We argue that bridging the divide between contemporary empirical research programs that position failure as pedagogically desirable and the philosophical-conceptual analysis of failure may open a space for a broader, more inclusive discussion of the pedagogical nature of failure. We focus on the instructional design of "productive failure" (Kapur, 2015) and the works of John Dewey and Lev S. Vygotsky.

Keywords: "Productive Failure", Dewey, Vygotsky, Negative Experience

Introduction

Learning necessarily begins with 'not having learned something yet', a gap that exposes the limitations of previously known paths of acting and thinking (Benner & English, 2004). Associated with this gap are moments of failure, of not being able to solve a given problem. Failure, however, is not an objective 'thing', but emerges dialogically within the interaction of the subject and the world. The world, we could say, reveals itself to us in our shortcomings and insufficiencies; it reveals itself to us in our *failure* (Koschmann, Kuuttii & Hickman, 1998, p. 25).

While the fact that learning is connected to failure—and knowing to not-knowing—is easily understood, we argue that more consideration is required for failure as a pedagogical category. The category of 'failure' is flexible as it can describe an individual experience ('I feel like I have failed'), or an external fact ('I have failed to solve this task correctly'). Furthermore, it is not clear if, and to what extent, failure are externally constructible in both a reliable and educationally meaningful way. Is all failure productive for learning? What does it mean if I 'failed' to solve a problem that someone posed to me, but did not particularly 'care' that I was unable to solve it? How we come to answer these questions has profound implications for failure-oriented pedagogies and learning designs.

Our first aim is to bring attention to contemporary research programs that position negativity as pedagogically desirable. We focus on the instructional design of *Productive Failure*, (henceforth PF; Kapur, 2015) where failure is designed for and serves as preparation for future learning (Schwartz & Martin, 2004). We offer that the PF notion of failure, while making a significant contribution to the normalisation of failure in current educational discourses, remains conceptually underdeveloped. Our second aim is to draw out different aspects of 'failure' and discuss its pedagogical nature by considering Dewey's theory of experience and Vygotsky's *Zone of Proximal Development*.

Negativity and Failure in discourses about learning and education

The general idea that negativity is a guiding principle of educational practices can be found in a number of 'failure-oriented' pedagogies and research programs: to illustrate, we find it in educational studies of uncertainty (Jordan & Reuben, 2014), argumentation and collaboration (Lam, 2019), impasse-driven learning (VanLehn, 1988), constructivist design-based research (Abrahamson, 2012), and conceptual change pedagogies (Lee & Byun, 2012). Nonetheless, in today's policy- and market-driven educational discourses, the space for failure seems to become increasingly precarious. With an emphasis on evidence-based practice and predictability of educational processes, standardised performance outputs tend to be privileged over the harder to measure, longer-term learning outcomes. When easily measurable attainment is privileged, struggle and failure become hindrances: "more often than not, researchers have tended to focus on different methods for structuring learning and problem-solving activities so as to achieve performance success" (Kapur & Bielaczyc, 2012, p. 46). Consequently, despite failure acting as a fountainhead of insight and understanding in the disciplines (Firestein, 2015; Trninic, Wagner, & Kapur, 2018), failure in the contemporary classroom is associated with failure to learn—and avoided.

The PF learning design provides a much-needed counterpoint to the current research climate in education and the learning sciences. Guided by the observation that "learning and performance are not always commensurable" (Kapur, 2016, p. 289), PF contends that short-term failure might have hidden efficacies for longer-term learning that are overlooked in performance-focused research. PF sacrifices maximising

"performance in the shorter term" (Kapur, 2016, p. 289) with the aim of activating relevant prior knowledge in order for students to "notice inconsistencies and realise the limits of their prior knowledge" (Kapur, 2016, p. 293) through failure during unguided, collaborative attempts at solving problems before instruction. The problem design is tuned to such a degree that students are unlikely to solve the problem (hence 'failure'), but are able to meaningfully explore potential solutions; in turn, their initial struggles appear to enhance their learning from subsequent instruction (hence 'productive failure'). In a number of empirical studies, PF has been associated with measures of better 'conceptual understanding' compared to *direct instruction*, which is defined as the traditional paradigm of providing instruction followed by problem solving. While PF aids the normalisation of failure in a climate of educational research and practice that tends to pull away from moments of failure, we find that in PF, 'failure' actually receives only limited attention. It is defined simply as the inability of students to "generate or discover the correct [canonical] solution(s)" (Kapur, 2015, p. 52) to a posed problem. In this paper, we want to draw two of the most well-known proponents of a failure-oriented educational theory—Dewey and Vygotsky—to further develop a pedagogical concept of 'failure.'

The role of failure in the educational theories of Dewey and Vygotsky

'Failure' is essential to Dewey's understanding of education as a process of growth by experience (Nardo, 2018). In Dewey, in the interaction with the world—both material and social—the individual repeatedly experiences "friction" and "resistance" (Dewey, 1916/2008, p. 39). Upon being incapable of achieving an end-in-view the individual realises that existing skills or beliefs are insufficient or false, which, in turn, causes perplexity and confusion (English, 2013). Through the reflective processing of what has caused said resistance, failure becomes part of an educational experience (Dewey, 1916/2008, p. 147).

In Dewey, failure—manifesting as "resistance" occurring upon not succeeding at something by trying––is not "a mere void of lack" (Dewey 1916/2008, p. 47) to be overcome in a predefined way. Rather, failure brings to the surface potential; it is, so Dewey, "the power to grow" (Dewey, 1916/2008, p. 55). In a Deweyan perspective, what constitutes as 'failure' is not externally determined, but rather the result of a complex, contingent and relational process of meaning-making. To some differences the learner remains indifferent. Meaningful failure, thus, is more than a 'knowledge awareness gap': In addition to being confronted with something that one has not yet learned, this 'something' has to be connected to something one wanted to achieve.

To think of failure as a pedagogical category, it is worthwhile to consider Vygotsky. Vygotsky views failure as an inescapable element of development. In *Thought and Language*, Vygotsky offers the metaphor of a child's mind bumping "into the wall of its own inadequacy," whereupon the resultant bruises "become its best teachers," to describe learning from failure; at the same time, Vygotsky also highlights the importance of social guidance in education in the zone of proximal development (ZPD, Vygotsky & Kozulin, 1986, p. 165). ZPD can be understood as the space of possible actions that the learner cannot do without assistance, yet can accomplish with assistance. The ZPD framework indicates that not all failures are necessarily productive. One example of pedagogically useful failures can be found in Vygotsky's account of the development of pointing. There, the development begins with a failed grasping movement towards some object beyond the infant's immediate reach. A caregiver observes this failed grasping action and moves the object towards the infant. With repetition, the child comes to understand that other people can provide a means of reaching beyond his or her limited bodily capacity.

Wertsch (1979) argued that proximal development rarely, if ever, follows the simple pattern of a child acknowledging his or her own not-knowing and this resultant 'gap' being 'filled' by the expert. Rather, the process follows a certain logic in which the child, after initially failing to interpret the adult's utterances in a way meaningful to the activity, becomes increasingly able to follow directives and transitions from other-regulation (letting others regulate her movements) to self-regulation.

Just as in Dewey, in Vygotsky we encounter failure as a multi-layered construct that is more complex than the opposite of success. Proximate development, following the Wertsch-Vygotsky account, is a nonlinear process rather than a switch from failure to success. It involves the situation as the child perceives it, and the situation as the adult perceives it; what is not-known must be negotiated.

Discussion

Dewey's and Vygotsky's accounts of learning in connection to 'failure' emphasise the dialogic nature of failure. Vygotsky noted that awareness starts with noticing differences, seeing what is *not* the case. The child engages in guided activity, and through this, the awareness of the adult-meaning of the situation emerges in contrast to prior assumptions. Inspired by Vygotskian perspectives, some educational designers have called this the "action before concept" design framework (Trninic, Gutiérrez, & Abrahamson, 2011). The essential understanding of learning underlying this design can be found in the following quote: "Learning itself is not conscious… Nevertheless, the process depends on conscious processes in feeling and detecting changes. The consequence is felt as difference"

(Ginsburg, 2010, p. 185). In turn, the purpose of initial educational activities is about building awareness—being able to "see"—rather than reaching a performative end state. This coincides with our Deweyan argument that the performative endpoint of an educational activity (e.g., solving a task) *is not the educational purpose of said activity*. Its educational purpose is the growing awareness of negativity, which emerges from a felt difference in a socially-guided activity.

In Dewey's account, failure connects the inability to solve a given problem with a certain relevance assigned to that problem. Failure only becomes meaningful in connection with a volition, a *doing*. For failure as a pedagogical category this means that it cannot be externally created. Dewey emphasises: "The only way in which adults consciously control the kind of education which the immature get is by controlling the environment in which they act and hence *think and feel*." (Dewey, 1916/2008, p. 24, emphasis added) In PF, in contrast, failure has the potential to benefit learning, "*if well designed for*" (Kapur, 2015, p. 52, emphasis added). In that, an understanding of failure that contributes to learning as something that can be—or even *has* to be—created voluntarily and externally. Form a Deweyan perspective, however, if failure is an externally predefined category, meaningful educational experiences might actually be made unavailable: "To make an end a final goal is but to arrest growth" (Dewey, 1931/2008, p. 307).

In PF, failure is seen as productive if it leads to subsequent performance success. Failure that does not eventually lead to predefined performance success is called "unproductive failure" (Kapur, 2016). Failure, in other words, is valuable to the extent by which it prepares students to produce a certain predefined result—the canonical solution. This approach to failure makes sense given an experimental research commitment to quantify the 'effect' of failure on formal learning processes. In light of the discussion of failure developed in this paper, however, failure as a means for 'preparation' requires further differentiation. Dewey provides a critical perspective on PF's position of failure as a preparation for future performance: "What, then, is the true meaning of *preparation* in the educational scheme? In the first place, it means that a person, young or old, gets out of his present experience all that there is in it for him at the time in which he has it. When preparation is made the controlling end, then the potentialities of the present are sacrificed to a supposititious future" (1938/2008, p. 30). Reducing failure to preparation for future instruction in order to achieve a certain goal, from a Deweyan perspective, throttles the educational potential of the experience of failing. He notes further, pointing at the impossibility to know the future we seek to prepare individuals for in education: "The ideal of using the present simply to get ready for the future contradicts itself. It omits, and even shuts out, the very conditions by which a person can be prepared for his future" (Dewey 1938/2008, p. 30). What makes failure potentially meaningful, we gather based on this brief analysis, is the quality of learner's engagement with failure. Rethinking PF with Dewey and Vygotsky, we offer, may help us to reframe the aims of education and the role of teaching beyond the current focus on testable academic achievement. More broadly, it may eventually enable us to reframe the disciplines not as filled with 'content' but as particular forms of not-knowing (Firestein, 2012).

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