




Some Consequences of ‘Acting As If’ for Mathematics Education and Educational Research

Tracy Heliwell¹ · John Mason^{2,3} 

Received: 5 September 2025 / Accepted: 13 October 2025 / Published online: 10 November 2025
© The Author(s) 2025

Abstract Attributed to William James, the phrase *acting as if* turns out to pervade educational practices and research, including assessment. It lies at the heart of interactions between teachers and learners and, in the presence of artificial intelligence, raises questions about how assessment is conducted. This paper explores the consequences of ‘acting as if’ for mathematics education and educational research.

Résumé Attribuée à William James, l’expression « agir comme si » s’avère omniprésente dans les pratiques et la recherche en éducation, y compris sur le plan de l’évaluation. Elle est au cœur des interactions entre enseignants et apprenants et, dans un contexte où l’intelligence artificielle est présente, elle soulève des questions sur la manière dont on réalise les évaluations. Dans cet article, nous explorons les implications de l’expression « agir comme si » pour l’enseignement des mathématiques et la recherche en éducation.

Keywords Acting as if · Assessment · Educational research · Classroom practice · Intention · Attention

Introduction

The explicit articulation of *acting as if* is generally attributed to William James, who uses the notion, though not always the phrase, throughout his writing, as part of his pragmatic approach to describing experience rather than attempting to convince readers of abstract psychological phenomena. While the specific phrase *acting as if* is credited to James, the idea of behaving as if one already possesses a

✉ John Mason
john.mason@open.ac.uk

¹ University of Bristol, Bristol BS8 1QU, UK

² The Open University, Milton Keynes, UK

³ University of Oxford, Oxford OX1 2JD, UK

desired quality or can achieve a desired outcome has roots in earlier philosophical and psychological thought, and the concept was later developed by figures such as Alfred Adler (1964). It continues to be used by many counsellors and therapists, particularly in cognitive behavioural therapy (WebRef) to encourage clients to act as if they are the way they want to be, in order to ‘be more themselves’ and to ‘be the most that they can be’.

Acting as if has become a well-studied and widely promoted way of overcoming trepidation and lack of confidence. It seems to us that it underpins how people (and probably other animals) become socialised or enculturated into the practices of their cultural group. As such, it lies at the heart of human teaching and learning, and therefore it lies at the core of what makes assessment problematic: *how can an observer distinguish between trained behaviour and insightful manifestation of comprehension?* For example, is behaviour that appears to be imitation of some behavioural pattern intentional, or merely enculturated-trained? This challenge of assessment is greatly amplified by the sudden growth of artificial intelligence (AI) and the consequent re-emergence of the Turing problem: *can a human being’s learning be distinguished from an AI bot on the basis of responses to probes (examination questions or even interviews)?*

Inspecting one’s own experience soon reveals a complex of layers of awareness and increasing levels of conviction:

from ‘simply acting’
to being aware of *acting as if* while being unsure about where the acting is coming from or how it has arisen,
to being aware of intentionally *acting as if* in order to counteract any personal uncertainty or doubt,
to discovering oneself confidently and deliberately enacting some action.

The antithesis of *acting as if* is freezing in the face of obstacles or challenges. Perhaps therefore, a deeply aware person is in some sense always aware of the depth of their *acting as if*.

As the authors of this paper, we have become increasingly aware of how accurately and widely the phenomenon of *acting as if* accounts for much of human behaviour in general, and behaviour in education in particular. It is our aim in this paper to bring this to the surface, and to consider implications for teaching, learning, and researching.

As with James, our interest and concern is for the lived experience, in our case, of learning mathematics, of teaching mathematics, and of teaching mathematics teachers. The emphasis is on experience, mindful that: ‘One thing people don’t always learn from experience is that they do not often learn from experience alone: something more is usually required’ (Mason, 1994a).

That ‘something’ can be initiated by prompts and reminders to construct personal narratives, and ‘own explanations’ (Chi & Bassok, 1989).

Possible Origins of *Acting As If*

William James is widely quoted as having articulated the principles of *acting as if*, but it is not easy to find them in his writing. For example, in *Essays in Pragmatism*, James sets the scene for a critique of educational research which we elaborate in the ‘*Acting as if and Research*’ section: ‘In all our discussions about the intelligence of lower animals, the only test we use is that of their acting as if for a purpose. Cognition, in short, is incomplete until discharged in act’ (James, 1948 p. 18).

But how might one distinguish between a genetically based reflex action and an available action selected in order to achieve a purpose? Where does purpose come from? For example, what sort

of an experiment could be performed to find out whether when a bird flies off from a bird feeder, it ‘knows’ where it is going? It seems that people might also not always ‘know’ what they are about to do next. The body can know things without being consciously aware, a point which we take up in the ‘Acting as if and Research’ section.

In a chapter on determinism in the same book, James writes that he has no intention of proving for human beings...

... that the freedom of the will is true. The most I hope is to induce some of you to follow my own example in assuming it true, and acting as if it were true. If it be true, it seems to me that this is involved in the strict logic of the case. Its truth ought not to be forced willy-nilly down our indifferent throats. It ought to be freely espoused by [people] who can equally well turn their backs upon it. (James, 1948 p. 37)

In the Gospel of Relaxation section of *Talks to Teachers on Psychology: and to students on some of life's ideals*, James explicitly espouses acting as if:

So to feel brave, act as if we *were* brave, use all our will to that end, and a courage-fit will very likely replace the fit of fear. Again, in order to feel kindly toward a person to whom we have been inimical, the only way is more or less deliberately to smile, to make sympathetic inquiries, and to force ourselves to say genial things. (James, 1899 3rd para)

In a chapter entitled Reality of the Unseen, in *Varieties of Religious Experience: a study in human nature*, James again uses his *acting as if* principle, in the form of a slogan of uncertain origin but immense therapeutic consequences: ‘Act as if what you do makes a difference, because it does’ which in turn brings to mind Gregory Bateson’s focus on ‘differences that make a difference’ (Bateson, 1973). In order to have impact or influence, it is important to use *acting as if* in situations where it does actually make a difference, where it matters. James again:

We can act *as if* there were a God; feel *as if* we were free; consider Nature *as if* she were full of special designs; lay plans *as if* we were to be immortal; and we find then that these words do make a genuine difference in our moral life. Our faith *that* these unintelligible objects actually exist proves thus to be a full equivalent in *praktischer Hinsicht*, as Kant calls it, or from the point of view of our action, for a knowledge of *what* they might be, in case we were permitted positively to conceive them. So we have the strange phenomenon, as Kant assures us, of a mind believing with all its strength in the real presence of a set of things no one of which it can form any notion whatsoever. (James, 1917 Chapter 3)

For us this speaks to the core of children’s learning, in which all manner of nouns and verbs are used which adults use *as if* they are substantial, when for children they are as yet abstract.

In *The Meaning of Truth: a sequel to ‘Pragmatism’*, James presages the issue of the Turing test, and indeed all educational assessment:

Before I can think you to mean my world, you must affect my world; before I can think you to mean much of it, you must affect much of it; and before I can be sure you mean it AS I DO, you must affect it JUST AS I SHOULD if I were in your place. Then I, your critic, will gladly believe that we are thinking, not only the same reality, but that we are thinking it ALIKE, and thinking of much of its extent (James, 1909).

Finally, in *Principles of Psychology*, James reiterates how *acting as if* describes how enculturation and socialisation come about:

A practical observation may end this chapter. If belief consists in an emotional reaction of the entire [person] on an object, how *can* we believe at will? We cannot control our emotions. Truly enough,

a [person] cannot believe at will abruptly. Nature sometimes, and indeed not very infrequently, produces instantaneous conversions for us. She suddenly puts us in an active connection with objects of which she had till then left us cold. “I realize for the first time,” we then say, “what that means!” This happens often with moral propositions. We have often heard them; but now they shoot into our lives; they move us; we feel their living force. Such instantaneous beliefs are truly enough not to be achieved by will. But *gradually* our will can lead us to the same results by a very simple method: *we need only in cold blood act as if the thing in question were real, and keep acting as if it were real, and it will infallibly end by growing into such a connection with our life that it will become real.* It will become so knit with habit and emotion that our interests in it will be those which characterize belief (James, 1890 p. 322)].

Kurt Vonnegut echoes James when writing ‘We are what we pretend to be, so we must be careful about what we pretend to be’ (Vonnegut p. 5).

A good example in mathematics is the question of the meaning of 0.9 recurring and its relation to 1. Many teachers have reported that it was only through a long period of acting as if the two are the same, that they came to find themselves fully convinced. Of course, the issue is compounded because in a non-standard model of the reals, they may in fact be different!

Lived Experience of Acting As If

In alignment with James’ focus on lived experience, we offer various accounts of our own or observed experience of others *acting as if*, hoping these will resonate with readers’ experience. The accounts are accompanied by accounting for what was observed in relation to *acting as if* and other psychological-educational constructs as appropriate.

Chanting

A power of 10 is chosen, for example 10,000. A teacher begins to announce a number in the thousands, digit by digit (on the promise that the chosen number does not end with a zero). The students chant back the complement of that number to 10,000, digit by digit, in an alternating rhythm with the teacher (teacher in bold font):

Four thousand... *Five thousand ... three hundred... six hundred ... and sixty.. and thirty... eight ... two*

At first, this seems impossible, but after a while, students cotton on to doing it, even though often they may not actually experience ‘knowing’ how to do it, or to ‘know’ the complement in its entirety. They *act as if* they know without actually ‘knowing’. One might say that deep down they know, or they may develop an awareness through reflection, but the experience at first is of *acting as if*.

A group of students are invited to chant together counting down from 100 in steps of nine-tenths. The pace speeds up as a pattern becomes clear.

The voices seem confident until suddenly a sense of a looming crisis arises when approaching 90. The *acting as if* confidence evaporates, and people become aware of having settled into a pattern without conscious deliberation.

Being Taken to be an Expert

On numerous occasions, both authors have found themselves suddenly waking up to the fact that we do not ‘know’ what we are doing, that we are far from expert, but that we are being expected to behave expertly. We are, in the moment, only *acting as if* we are experts. For example, when joining a new institution or new social grouping, we know that we both observe closely how others are acting, and then attempt to act similarly, as if we belonged. This seems to be what James was referring to in the earlier quotations.

As a new mathematics teacher educator, Tracy had few teacher educator behaviours. What follows is an extract from her diary at the time:

It was during those subject sessions that I was struck by a feeling of not belonging. ... Both in lesson de-briefs and in taught parts of the course, I was conscious of not wanting to *tell* prospective teachers how to teach, or even tell them how *I* would teach, but I was unsure what the alternatives might be. ...

With an awareness of the need to change, I found myself facing what felt like a necessary process of letting go of certain ways of being that I had previously valued so strongly, in order to become something other..

For several years, Tracy had to *act as if* she knew what she was doing, before she felt herself to be a teacher educator.

Try-Outs

We both recognise ‘trying something out’ but without conviction, and when no hiccups occur, there is a tendency to try it again. Over time, we find ourselves gradually internalising the action so that it becomes acting with conviction; the as-if fades away. For example,

Using abstract nouns in mathematics education, like ‘phenomenological’, ‘epistemological’, and other phrases, and over time coming to use them quite spontaneously in order to express ourselves; Getting the hang of proving from first principles that a given function is continuous using epsilon and delta.

A deliberate policy to try something out, to *act as if*, can be used as a means to overcome feelings of inadequacy or uncertainty, as occurs in some cognitive behaviour therapies. It leads an enquiring mind to raise doubts about whether someone truly believes or knows something, or is simply *acting as if*.

Some people appear able to become part of a group more easily than others. They can *act as if* they are like those people, perfectly naturally. Others find fitting in more challenging. This raises a question about identity, whether some people are in a lifelong search for a single identity, while others are able to manage a complex structure of multiple selves, as ‘coordinations’ of the different components of the psyche (Mason & Metz, 2017). It seems a plausible conjecture that people who are not good at reading other people’s behaviour might struggle in this regard, finding it difficult to *act as if* they belong or to convince themselves thereby that they do really belong.

Fig. 1 Hopscotch and number track, with associated number line

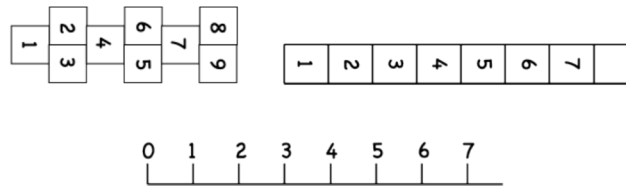
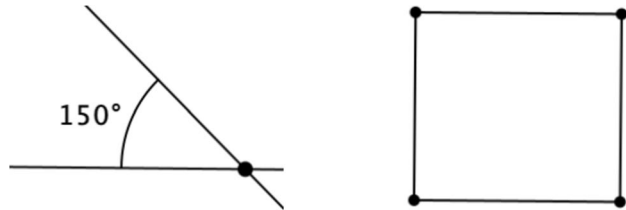


Fig. 2 An ‘impossible angle’ and a ‘non-square’



Convergence

After years of co-teaching as a mathematics teacher educator, when observing my colleague teach, I regularly pre-empt what he will say, before he says it, as the exact words I would myself have said. It is *as if* we are on the same wavelength.

There are other moments when there may be a flash of recognition of what it is like to be (thinking/ acting like) another person, but these moments are too rare and too delicate to be researched by the gross research methods currently available. Even when we experience a convergence for a brief moment, as if we know what it is like to be the other person, we cannot be certain, and when confirmation is sought, there are multiple reasons for people to deny that that was what they were thinking.

Obstacles to Acting as If

Adopting *acting as if* is not always straightforward. It can require real effort.

Transitions from Number Tracks to Number Lines

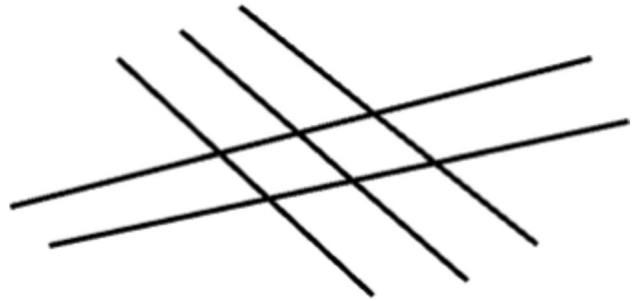
Young children often encounter numbers in boxes in hopscotch, before being introduced to number tracks (see Fig. 1). Children are encouraged to step or hop along these tracks in various games, accompanied by counting. Later, they are expected to make a transition to number lines in which the number is at the end of an interval rather than ‘on the interval itself’.

Having successfully ‘tracked’ their progress, having educated their awareness to associate counting with cells along the track, they are expected to reassociate counting with the end of an interval, or with a position on the number line. They need to let go of *acting as if* the count is of or in the interval, and start *acting as if* it is at the end or completion of the interval. There are links here with announcing a count during pointing or after having pointed at the next item. The important link is, however, not so much visual as enacted.

Looking As If

Mathematical diagrams are necessarily static, even though they are often intended to be viewed as but one frame from a dynamic film, or in other words, as instantiating a generality in one particular case.

Fig. 3 Diagram illustrating 2×3



However, there can be something mesmerising in a diagram. Some students seem to *act as if* they are fixated by the particularity: the diagram takes on a corporality.

Diagrams such as shown in Fig. 2 are for them simply impossible, rather than a diagram in which things are not shown ‘to scale’.

Figure 3 shows an instance in which some lines look to be parallel.

Conceiving Fig. 3 as illustrating a general method of multiplying integers, should the two groups of lines be parallel? Some learners may take that as a requirement simply because they *look* parallel.

When teaching mathematics, encountering students who find it difficult to move beyond a particular example or who need examples to be drawn accurately/to scale.

These students seem to be ‘stuck in the empirical’ (where observation and measurement is prioritised over, say, logic or theory). For some students, this seems to hold them back, close them down to new possibilities. We might prompt these students by saying, ‘just *act as if* that angle is 150 degrees’, ‘perhaps try to *act as if* it were a square’, or ‘but what might happen *if* those lines were *not* parallel?’.

Algebra

Despite the immense power that arrives by denoting an as-yet unknown number by a symbol, and proceeding to construct an equation, many learners are perplexed by algebra. They are expected to *act as if* the letter x is a solution and to proceed on that basis. Sometimes it emerges that the assumption is not even valid! A contradiction arises. Similarly, reasoning by way of contradiction means *acting as if* something is the case, reaching a contradiction, and deducing therefore that the assumption is wrong, as in a proof that $\sqrt{2}$ is irrational.

Pedagogic emphasis on the trio ‘Concrete–Pictorial–Abstract (CPA)’ in earlier years of schooling may enculturate some children into a reliance on the physical, the tangible, as the totality of reality (i.e. being ‘stuck in the empirical’), blocking them from appreciating the scope of an intended generality and its relationship to a particular instantiation (Mason & Pimm, 1984). The trio from which CPA was derived was probably Jerome Bruner’s trio Enactive–Iconic–Symbolic. Being more abstractly expressed, Bruner’s trio informs pedagogic actions but is not likely to induce children to think that they are being told ‘how to think’. Shifting attention from ‘measure’ of the particular to ‘relationship between two or more aspects’ may require special pedagogical attention for some students.

Being aware of the phenomenon of *acting as if* could spark teachers to distinguish between ‘wanting their students to act as if a diagram is not to scale’ and ‘their students acting as if diagrams and other physical manifestations are as they appear’.

Trying on Different Coats

When working with prospective mathematics teachers, telling them that teaching during the year is an opportunity to ‘try on different coats’.

Some of the prospective teachers that Tracy has taught have expressed some of the challenges associated with teaching other (more experienced) teachers’ classes. Sometimes they talk about having to teach mathematics in a way that ‘doesn’t feel natural’ to them or that they are using methods that they would not use if they were teaching a different class, supervised by a different teacher. Tracy counsels them to try things out, to try things on for size. ‘This year is for trying new things, and acting as if you are that teacher, some of the time, whilst working out the teacher you are becoming’. Prospective teachers quite regularly reflect on certain acts becoming natural, over time, and finding purpose in those acts that they would otherwise not have tried.

Acting as if like another more established teacher can involve conflict with personal values, trying to locate your own teacher-self while adopting behaviours and classroom rubrics of an established teacher. Where they succeed, it can prove to be helpful, if only to sharpen awareness of their own dispositions and preferences; when the dissonance is too great, they may protest, even leave the course, or simply do what is expected, *acting as if* but painfully. Sometimes a student is dubious about one or more practices but upon *acting as if*, they come to realise what the practice is enabling for the students, and they also learn something about themselves as teachers. *Acting as if* can serve as a mechanism to help someone open themselves to alternative possibilities.

Acting As If and Research

Enquiry, evaluation, and assessment are all forms of educational research. A conundrum encountered by educational researchers is that observers can only describe what they notice of other people’s actions. It is so tempting to *act as if* descriptions of other people’s behaviour are factual.

However, observing behaviour and then describing it is, at best, constructing statements that the person seems to be *acting as if* they were intentionally so acting, thoughtfully and considerately. Any attempt to be more precise requires interpretation, which may be incomplete or even mistaken, raising profound questions about the research paradigm of using theoretical constructs to account for observed behaviour.

This is the reason for distinguishing between accounts of behaviour and accounting for that behaviour when creating data. A cornerstone of the Discipline of Noticing (Mason, 2002a, b) is the distinction between giving an account of some behaviour, with as little emotional, judgemental, or theoretical aspects as possible, and accounting for that behaviour by reference to abstract and theoretical constructs, judgements, and emotional elaborations. The point is that when observation of actions is encrusted with emotions, judgements, and theory, the reader is unable to discern whether the observation is about what was observed or about the observer. Indeed, even a brief-but-vivid account of an action reveals as much about the observer’s focus and locus of attention as it does about the subject being observed. A form of Heisenberg relationship pervades educational research: the more precise and detailed an observation, the more it reveals about the observer’s predispositions, proclivities, and sensitivities to notice (Mason, 2002a, p. 191).

Since it seems that an observer can only ever report that someone ‘acts as if they know what to do and knows that they are doing it’, there is always a gap between observed and lived experience. There is a further gap, however, between lived experience and the narrative constructed to account for that experience. It lies between *acting as if* one thinks, believes, desires, etc., and actually thinking, believing,

or desiring. In early work towards artificial intelligence, Marvin Minsky (1975) treated the source of an action as the filling of values for parameters required for a particular action to be enacted. Where default values are available, the action is enacted without further ado. When some parameter values have to be filled in arising from the situation, behaviour may be interpreted as cognitive consideration. More recently, Tor Norretranders (1998) captures this in his title, *The User Illusion*, in which he challenges the notion that human actions are always driven by conscious cognition. Daniel Kahneman (2012) similarly distinguishes between action which is enacted as part of the psycho-somatic functioning of the human psyche (system 1) and a cognitively considered intentionally enacted action (system 2). Mason and Metz (2017) proposed two further systems for initiating action, one based in emotions, and the other based in non-rational sensitivity to creative energy.

When Umberto Maturana's famous observation that 'everything that is said, is said by an observer' (Maturana, 1988) is added to the mix, the possibility of being able to make valid assertions about other people's behaviour (including what they say about it) is completely undermined. Even when lived experience is reported, the observation arrives from an observer (part of ourselves). Consequently, the observation is at best partial, because 'to express is to over stress' (Mason, 2002a, b, p. 209). As well as being partial, it is probably biased in various ways such as delineated by Kahneman (2012).

The question arises as to whether an action arises from someone *acting-as-if* they know what they are doing, or whether that behaviour is being generated by them as part of their having internalised that action, or somewhere along that spectrum of enculturation, socialisation, and internalisation. This is neatly summarised in education by the notion of the *didactic tension*, first formulated by Guy Brousseau (1984, 1997) (see also Mason, 1994b, 2002b):

The more precisely a teacher describes the behaviour they seek in their learners, the easier it is for learners to display that behaviour without generating it from themselves.

This in turn arises as a consequence of the *didactic contract* (Brousseau, 1984, 1997), which is often implicit rather than explicit. A simplistic but commonly held version of the contract is that

A teacher's role is to set tasks for learners;
the learners' role is to undertake the tasks set by the teacher,
in which case the expected or required learning will take place.

The recent explosion of AI apps has reinforced the emptiness of this version of the contract, and the search is on for meaningful education in place of AI completable and completed tasks.

Assessment

Assessment is a form of educational research. It is an attempt to gauge the extent to which a student has 'learned' what was intended by the curriculum, which is fraught with *as if* difficulties. Take this parent's account, for example:

My children do all of their mathematics homework a 'personalised online learning platform'. I once witnessed my son using an app on his phone that accesses the camera to view one of these questions, and then solves it for him in a matter of seconds.

Such online platforms record how long students are taking to answer each question, and teachers have access to this data. Some children have learned not to enter the answer generated by their phones immediately, but to wait a while, so that it seems to the system (and the teacher) *as if* they have worked on the question for themselves. Based on this data, teachers are not able to distinguish between students

who genuinely worked on the questions and those who did not. What is being learned is not mathematics, but how to work around the system.

An obvious way around this dilemma is to make students sit examinations, away from access to AI. But such evidence is only a snapshot at a particular time and in particular conditions. Interactions over time are likely to give a more rounded picture. Even so, AI makes it possible to rehearse a large number of problem types, to enculturate/train behaviour so that a suitable action becomes available to students in the moment when they need it. But this is a far cry from obtaining evidence that the students have comprehended and internalised the constructs, and that they are flexible in the use of appropriate procedures.

Assessment consists of an observer (or examiner) deciding to what extent someone's behaviour is consonant with or consistent with *acting as if* they 'understand'; that is, they comprehend and appreciate the topic at hand. This *acting as if* takes place somewhere on a spectrum between 'gargling' terms without much meaning or comprehension, and using terms to express meaningful relationships, perhaps not previously encountered.

One consequence of the didactic contract is that a student tries to *act as if* they know what they are doing, while the teacher (or examiner) tries to construct probes which will reveal what the student has comprehended and appreciates, as well as what actions and awarenesses they have internalised. The rise of AI means that these actions are suddenly in doubt. The whole enterprise of education, of what education consists of, is under question.

Artificial Intelligence

When ChatGPT was asked, 'act as if you are a child who prioritises observation and experience over theory or pure logic and respond to my questions as that child', and after some negotiation, it was then asked, 'what is a half?' then later, 'what is half of 13?' and then, 'what is 0.9 recurring'. It successfully responded in tones redolent of a 10-year-old child, using language that might be expected, even inserting emojis. It also offered some instances of physical situations to illustrate what it (as a child) said, quite convincingly managing to *act as if* it were a child.

However, it was impossible to decide from the responses alone whether it was generating those responses from comprehension and appreciation of the underlying ideas, or simply trotting out what it had been trained to say. This does suggest a positive use for AI: when planning a lesson, getting it to *act as if* it is a learner, in order to refine and hone the tasks and the interaction with learners, even before the lesson takes place.

Artificial Intelligence and the Turing Test

The rise of AI has amplified considerably the parallel between the Turing Test and assessment. The question is how to determine whether a response to a probe is coming from a person striving to comprehend, to make meaning, to construct a personal narrative, or whether it is compiled from a sampling of extant scripts, and represents only trained and habitual behaviour.

James' remark that 'cognition is incomplete ... until discharged in an act' bespeaks particular assumptions about how actions are enacted. A current perspective, which aligns with some ancient psychology, sees animals (and particularly humans) as predictive organisms. Actions employed successfully in the past are prepared to be enacted by resonance with recent experience and the current situation as perceived. Rationality often has little or nothing to do with this preparation, often generating a *post hoc* narrative (Norretranders, 1998). What is 'discharged' may often be a prepared action of which the animal is consciously unaware.

The consequence of being alert to *acting as if* is that the most an observer can assert about an observed action is that the subject is ‘acting as if’ they had prepared and intended (whether consciously, emotionally, physically, or in some combination) to so act. In other words, all educational research would benefit from acknowledging the *acting as if* assumption underpinning reported observations.

Conclusions

Acting as if is a mainstay of human-human interaction, a ladder for the development of expertise, and the bane of attempts at assessing learners or evaluating teaching. It is a stance that can be taken intentionally, but is also an accurate description of a good deal of un-intentioned behaviour. Even the experience of acting genuinely from comprehension may be a product of previous *acting as if*. Research tends to be based on the trust that the accounts given of behaviour and taken as genuine are intentional, purposeful, and complete. Assessment is a particular case in point. Indeed, the more aware one becomes of the role of *acting as if*, the greater the problem of assessment of expertise and comprehension becomes.

Author Contribution Both authors contributed equally.

Data Availability No further data other than quoted in the paper exists.

Declarations

Ethical Approval and Consent to Participate No ethical approval was required or sought, and no consent to participate was required. All data arise from personal experience.

Competing interest The authors declare no competing interests.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article’s Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Adler, A. (1964). *The Individual Psychology of Alfred Adler*. H. Ansbacher and R. Ansbacher (Eds.). New York: Harper Torch books.
- Bateson, G. (1973). *Steps to an Ecology of Mind*. London, UK: Granada.
- Brousseau, G. (1984). The Crucial Role of the Didactical Contract in the Analysis and Construction of Situations in Teaching and Learning mathematics. In H. Steiner (Ed.) *Theory of Mathematics Education; paper 54*. p110-119. Bielefeld: Institut für Didaktik der Mathematik der Universität.
- Brousseau, G. (1997). *Theory of Didactical Situations in Mathematics: didactiques des mathématiques, 1970–1990*. N. Balacheff, M. Cooper, R. Sutherland, & V. Warfield (Trans.). Dordrecht, Netherlands: Kluwer.
- Chi, M. & Bassok, M. (1989). Learning from examples via self-explanation. In L. Resnick (Ed.) *Knowing, Learning and Instruction: essays in honour of Robert Glaser*. Hillsdale: Erlbaum.
- James, W. (1899). *Talks to teachers on psychology: and to students on some of life’s ideals*. New York: Holt.
- James, W. (1909). *The Meaning of Truth: a sequel to ‘Pragmatism’*. London: Longmans.
- James, W. (1917). *Varieties of Religious Experience: a study in human nature*. London: Longman.

- James, W. (1948). *Essays in Pragmatism*. New York: Hafner.
- James, W. (1890; reprint 1950). *Principles of Psychology* Vol 1 New York: Dover.
- Kahneman, D. (2012). *Thinking Fast, Thinking Slow*. London: Penguin.
- Mason, J. (1994a). Learning From Experience. In D. Boud, & J. Walker (Eds.), *Using Experience for Learning*. Buckingham: Open University Press.
- Mason J (1994b) Researching From the Inside in Mathematics Education: locating an I-You relationship. In: Ponte J, Matos J (eds) Proceedings of PME XVIII, Lisbon, Portugal, pp 176–194.
- Mason J. (2002a). *Researching Your Own Practice: the discipline of noticing*, London: RoutledgeFalmer.
- Mason, J. (2002b). *Mathematics Teaching Practice: a guidebook for university and college lecturers*, Horwood Publishing, Chichester.
- Mason, J. & Metz, M. (2017). Digging Beneath Dual Systems Theory and the Bicameral Brain: abductions about the human psyche from experience in mathematical problem solving. In U. Eligio (Ed.) *Understanding Emotions in Mathematical Thinking and Learning*. Cambridge: Elsevier/Academic Press.
- Mason, J. & Pimm, D. (1984). Generic Examples: Seeing the General in the Particular. *Educational Studies in Mathematics*. 15(3) p277-290.
- Maturana, H. (1988). Reality: the search for objectivity or the quest for a compelling argument, *Irish Journal of Psychology*. 9 (1) p25-82.
- Minsky, M. (1975). A Framework For Representing Knowledge. in P. Winston, (Ed.) *The Psychology of Computer Vision*. New York USA: McGraw Hill. p211-280.
- Norretranders, T. (1998). (J. Sydenham Trans.). *The User Illusion: cutting consciousness down to size*. London: Allen Lane. WebRef. <https://cogbtherapy.com/cbt-blog/2013/8/26/act-as-if>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.