

## THE KEYS TO THE KINGDOM: WHY WE CAN'T IGNORE ASSESSMENT IF WE CARE ABOUT REAL IMPROVEMENT IN THE TEACHING AND LEARNING OF STATISTICS

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*Recommendations from research for statistics teaching and learning at school level have evolved over the decades but have consistently advocated a set of broad principles: use of meaningful problems and/or realistic data, utilising technology tools, and the prioritisation of concepts over procedures. Despite this, the pipeline of this advice into policy and classroom practice has proven to be punctured. This paper presents a theoretical argument for how neoliberal imperatives in the education system within the social context of a school may act to restrict teacher agency to a narrow, assessment focused, decision space. We argue that this creates a tension between the aims of reformists in statistical education and the inertia of exam systems, presenting a case for future research on that basis.*

### BACKGROUND

Much research into statistics education over the last thirty years can trace its lineage back to three principles presented some thirty years ago by Cobb (1992): emphasise statistical thinking; more data and concepts, less theory, and fewer procedures; and foster active learning. The legacy of these recommendations can be seen influencing research explored in recent reviews of the field (e.g., Ben-Zvi et al., 2018; Langrall et al., 2017) and curriculum reform guidelines (e.g., Bargagliotti et al., 2020; Franklin et al., 2007). Despite this consistency however, the movement of research into practice appears to be slow-moving (e.g., Nicholson et al., 2006), and while some educational jurisdictions such as New Zealand have made progress with curriculum and assessment changes reflecting these recommendations (Forbes, 2014), other jurisdictions continue to fail to take meaningful or systemic account of them. In England for example, the coursework component of the General Certificate of Secondary Education (GCSE) assessments at age 16, which once ensured all students took part in an extended piece of statistical investigations, was removed in the mid-2000s, arguably a backward step. Perhaps one of the reasons for the consistency in the recommendations over recent decades is precisely because of the lack of progress in practice and policy, as our efforts as a research community continue to be focused on finding new arguments and new evidence in attempts to make the recommendations stick. It is our contention here that in order to enact systemic change, we have to understand the constraints of the system itself, and since assessment in particular seems to hold the keys to the kingdom of meaningful change within educational systems, we investigate precisely how that might work in statistics education here. It is often observed that classroom practice is dominated by 'teaching to the test,' a mechanism summarised neatly by Swan and Burkhardt (2012) as WYTIWYG, or "what you test is what you get." Here we argue that there are very specific ideological drivers rooted in the neoliberalisation of society that make assessment preparation an increasingly high-stakes driver of classroom culture and therefore can act as a brake on meaningful, widespread reform in statistics education when the assessment and classroom practice 'pull' in different directions. Furthermore, we make the case that our role as researchers seeking to improve teaching practices is to find ways to subvert this mechanism and make it work as an accelerator of change instead—to ensure that assessment practices are aligned with useful research recommendations, not dragging down the whole system. In the recent reform of post-16 A-level Mathematics qualifications in England, a version of the approach we advocate was attempted with limited success (Nicholson & Ridgway, 2018), and we believe more research is needed in order to ensure this promising avenue for reform is not simply dismissed.

### NEOLIBERALISM IN EDUCATION

Neoliberalism is an ideology that emerges from economics and can be superficially characterized as a belief in elevating free markets to a position of primacy in all aspects of economic and social life across societies. Neoliberal governments engage in a continual process of marketisation, creating markets where previously none existed, and deregulating those that do. Through this process, ideas such as consumer choice, value for money, competition, and efficiency are embedded in the discourse, and activity is transferred from the public sphere to the private sphere through privatization,

deregulation, and financialization (Connell, 2013). In education, neoliberalism demands competition and markets, and so schools are transformed into a site of market activity with parents and students as consumers, where parental choice over where to send their students forces schools to compete for students to whom individual funding is often attached by both direct and indirect methods. Neoliberal education reforms are characterized by a pervasive regime of accountability where outcomes are credentialised and through which individual teachers, schools, and even national education systems in their entirety are judged and ranked to provide the market with information through which to make choices (De Lissovoy, 2013). The key demand of neoliberalism is competition, and this can be seen in schools, pitting student against student, teacher against teacher, and school against school—all through the mechanism of the high-stakes assessment, for example, GCSE and A-level in the English context. It can also be seen at a global level with appeals to the need for a ‘world-class’ education system encouraging nations to enact reform with the goal of positioning their education systems at the top of international rankings such as the Program for International Student Assessment (PISA) (e.g., Furlong, 2013; Yeh, 2018). The neoliberal imperative we have set out embeds a cultural discourse around “raising-achievement” and “raising-standards” as a primary mechanism for success in the education marketplace (Furlong, 2013) which places significant emphasis on the role of measurement. In order to compete, student progress must be demonstrated, and in order to demonstrate progress, students must be measured and tracked in micro detail. In response, a culture of managerialism—using measurement and tracking to manage the atomic ‘quality’ of teachers and schools—is created. The neoliberal state itself engages in a process of standardization in order to achieve its competitive aims in the international marketplace, creating and shaping practice through regulatory bodies (such as Ofqual and Ofsted in England), conveying credibility and legitimacy to the market forces perceived as necessary to drive competition and deliver improvement (Rasco, 2020).

## SOCIAL PERSPECTIVES

Social theories, such as described by Bourdieu (e.g., Bourdieu & Passeron, 1990) provide a theoretical basis for describing how neoliberalism in education forces ever more attendance to the outcomes of assessment and hence drives classroom practice, through a kind of neoliberal magnetism, using assessments as the magnets. According to Bourdieu a field is a social context; in education this could be a school, a mathematics classroom, or an education system. Participants within a field each have habitus, internalized practices, beliefs, and expectations. They also have forms of social capital which can be advantageous or disadvantageous within the field (Costa & Murphy, 2015). In a neoliberal school system, therefore, those forms of social capital which align with the neoliberal practices of competition, raising standards, and accountability are advantageous, and students, teachers, and schools themselves are rewarded for activating these social capitals. The discourse of the field of education then becomes locked in a cycle through which advantage is conferred on that which contributes positively to the demands of the accountability system, and the primary mechanism of accountability is assessment. Bourdieu described how neoliberal discourse acts as a self-reinforcing system, orienting choices and exerting a symbolic force (Bourdieu, 1998). In the context of statistics education in a mathematics classroom, teachers are oriented towards those actions that confer success in the market they operate in, defined by accountability structures rooted in the success of their students in assessment (Ömür & Bavli, 2020). The school structures they operate in reinforce this orientation through institutional goals that in England are focused on meeting the perceived demands of the school regulator, Ofsted. The primacy of assessment data produces a consistent pressure that works to frame the utility of any classroom activity in terms of how it contributes to success in exams (Gallagher & Smith, 2018). Such is the self-reinforcing alignment of the system that even when acknowledging how assessment narrows the taught curriculum, potential prescriptions must still be clothed in the trappings of improving systems of accountability in order to establish credibility, never questioning the validity of accountability measures themselves (e.g., Moss et al., 2021). Furthermore these structures of accountability may generate “perverse incentives” where behaviour that may not be advantageous to the individual student is enacted in an effort to “game” the system (Hursh, 2007). While it is easy to fall into the trap of treating these structures as inevitable, and it may appear that we are constructing an argument for why attempts to implement change are futile, we take the opposite view. The knowledge that assessment is key is powerful, and can be seen not as a barrier, but as a basis on which to build a site for resistance. Even if they cannot be removed entirely, magnets can be moved, adjusted, rotated,

and realigned, creating fields that work with, rather than against, the vector directions that we consider evolutionary (and perhaps revolutionary) rather than just proprietary, capitulatory, or simply hereditary.

### AGENTS OF CHANGE

In this model, it is clear that far from teachers not being ‘good enough’ to change the system, that they are instead struggling against misaligned forces that coerce conflict between what they know to be best (from their professional knowledge, from research, from their ethical principles) and what they are asked to do in their professional practice. Here, it may be tempting to suggest that *teacher agency* does not and may not exist in a model where assessment, surrounded by a field of neoliberal accountability, exerts a pull that constrains choices so strongly.

Teacher agency can be used as a lens to understand how teachers engage with policy and enact practice, however precise definition is contested and often inexact (Priestley et al., 2015). Tao and Gao (2017) describe three main ways of conceptualizing agency: agency as an innate variable; agency as doing; and agency as the capacity to act. These descriptions differ, with the former seeing agency as something defined by the individual, while the latter two situate agency as a phenomenon that emerges from a wider social context. There is a further tension between agency as “doing” and agency as “capacity to act.” Clearly, in order to do, there must be the capacity to act, but it can be claimed that the capacity to act without subsequent action does not necessarily support the existence of agency. Conversely, action itself is not evidence of agency, as agency implies that the action was a purposive choice made by the individual. In the context of education as a social field, we consider agency as capacity to act, with teachers acting agentially within systemic constraints that include “teacher beliefs, knowledge and skills, available resources, culture, and external drivers of change” (Rycroft-Smith & Macey, 2021, p. 2). Agency therefore is achieved through the individual’s engagement within an environment, and teachers act by interacting with their environment rather than as an isolated individual acting within an environment (Priestley & Biesta, 2013). Agency is exercised through the individual’s efforts interacting with available resources, community cultural values, structures, and practical constraints (Figure 1).

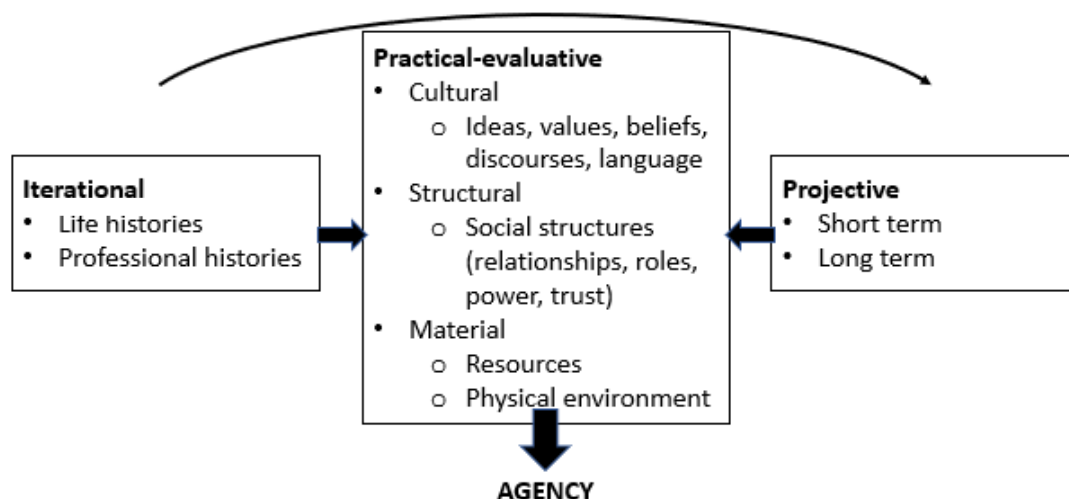


Figure 1. A model of teacher agency (Priestley & Biesta, 2013, p. 193)

For the classroom teacher, this may be macro-scale decisions such as longer-term planning, resource creating or selection, and lesson planning, or the constant stream of micro-decisions made within the context of a lesson. Regardless each of these decisions interacts with the social field, with those decisions that engage advantageous forms of social capital preferentially selected. We return, then, to the idea of a kind of neoliberal magnetism using assessment to create a system of forces, operating on the social field of the school to create something like a magnetic field, effectively constraining teacher agency and narrowing the space of possibility within which teachers can make choices about statistics education, shown in Figure 2.

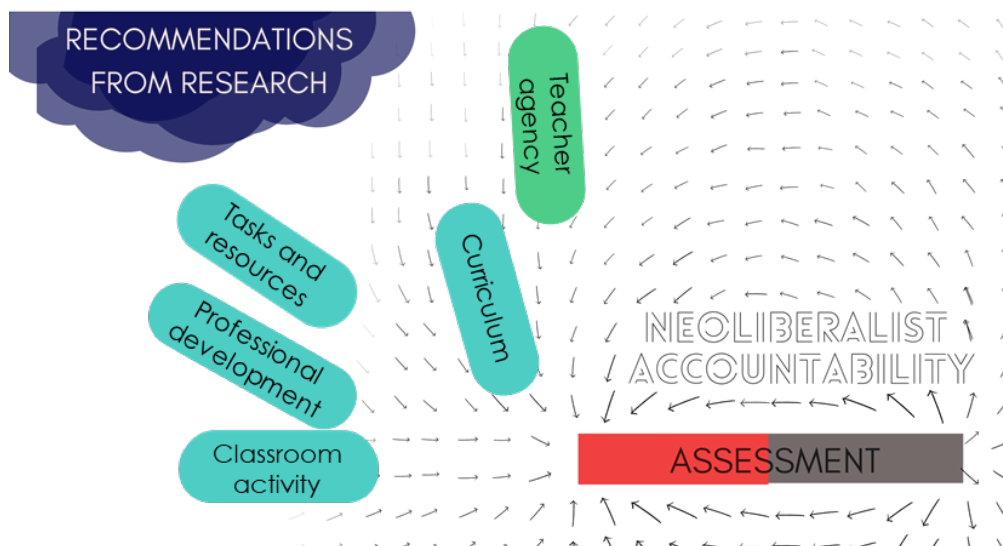


Figure 2. A model of neoliberal accountability as a magnetic field around assessment

In this ecosystem, attempts to influence practice by supporting the teacher or even the school directly are likely doomed to failure, not because of any individual failings of the teachers involved, nor due to the quality of the interventions designed. Instead, attempts are likely doomed to failure because of an all-pervasive pull, operating at all levels of the system as a powerful normative force dragging even the most enthusiastic practitioners away from the practices our statistics education research community may call desirable and back, inevitably, to servicing the needs of assessment, and preparing students to ‘deliver’ against a torpid and anaemic view of statistical activity as defined by assessment. In a review of high-stakes assessment items in the UK, Ridgway and Nicholson (2019) highlight the incorrect use of statistical techniques and representations, applied inappropriately to implausible contexts (Ridgway & Nicholson, 2019)—clearly these items are incompatible with recommendations encouraging students to learn by solving realistic problems with realistic data.

## CONCLUSION

A theoretical argument has been set out in this paper, using the ideas of teacher agency, social theory, and neoliberal ideology to describe the process through which assessment acts as an anchor on teachers’ agency, professional development, and classroom practice, as well as available tasks and resources and curriculum. The proposed solution therefore is that if we wish to enact change in a system with such a strong normative pull, naturally, we must focus our attention on the source of the pull. While it is certainly an appealing image to imagine removing the magnetic field of neoliberalism and setting the teacher free to visit the exciting lands of research-informed practice and explore new horizons (Figure 3), this kind of emancipation is unlikely. As we have described, neoliberalism is a powerfully self-reinforcing system operating at sub-national, national, and international levels. Instead, we suggest focusing our energy on the primary mechanism through which neoliberalism is enacted: the assessment structures which reveal the intent of the system. If we truly wish to change statistics education for the better, we must, in the words of Burkhardt and Schoenfeld (2018), focus at least some of our energy on designing “tests worth teaching to” (p. 2). We contend both that an important role for this community is to make the research case for “better” assessment through robust research-based design, and that more research needs to focus explicitly on how changes in assessment alone, or in combination with professional development activities, impact on classroom practices.

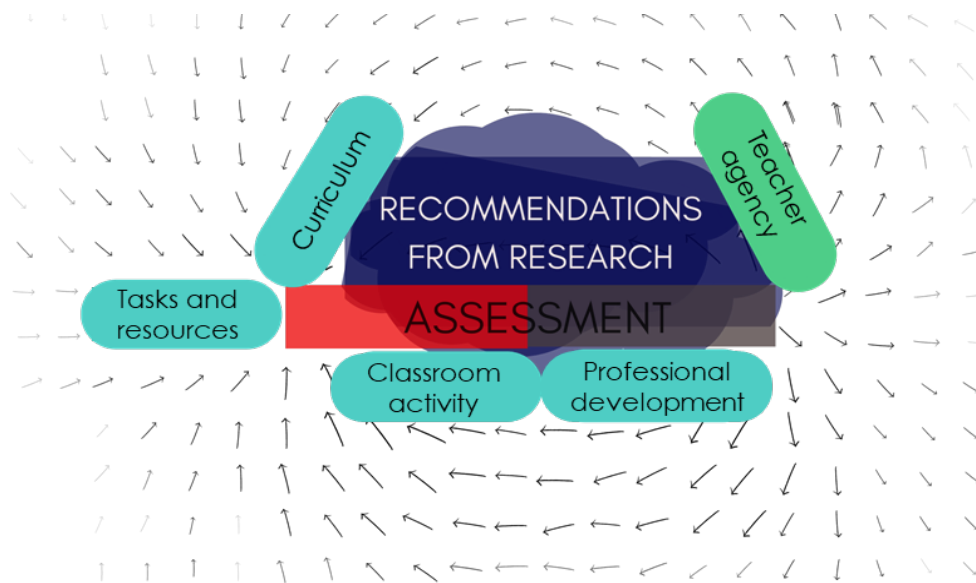


Figure 3. A model of assessment (and its associated magnetic field) instead located *within* recommendations from research

In the recent English A-level reform, some attempt was made to acknowledge the role of assessment on classroom practice with the embedding of a large dataset into exam specifications (Nicholson & Ridgway, 2018), and more research is needed both to explore the effect of this change in classrooms and to learn from it. Neoliberalism and hyperaccountability measures have unleashed forces in the education system that continue to power decision-making at every level. We take the perspective that a solution of better *positioning* of assessment practice within recommendations from research—with the important caveat that these recommendations be from a robust evidence base, with clear consensus, and transparently produced—allows for the harnessing of some of this force, rather than the continuing, exhausting need to fight against it, producing better *alignment* of all the elements of the system.

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