(*un*) Doing Standards in Education with Actor-Network Theory

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Abstract:

Recent critiques have drawn important attention to the depoliticized consensus and empty promises embedded in network discourses of educational policy. While acceding this critique, this discussion argues that some forms of network analysis – specifically those adopting actor-network theory (ANT) approaches - actually offer useful theoretical resources for policy studies. Drawing from ANT-inspired studies of policy processes associated with educational standards, the article shows the ambivalences and contradictions as well as the possibilities that can be illuminated by ANT analysis of standards as networks. The discussion outlines the diverse network conceptions, considerations and sensibilities afforded by ANT approaches. Then it shows four phenomena that have been highlighted by ANT studies of educational standards: ordering (and rupturing) practice through 'immutable mobiles', local universality, tensions among networks of prescription and networks of negotiation, and different co-existing ontological forms of the same standards. The conclusion suggests starting points, drawing from these ANT-inspired network analyses, for examining policy processes associated with educational standards.

Among recent policy studies, some well-justified challenges have been raised over the conception of networks. Jo Frankham (2006) provides a thorough critique of conventional network thinking – particularly in considering the proliferating appeal of 'learning networks' as an educational policy ideal and practice. She rightly points out the potential of network metaphors to presume to map and therefore fix flows of information and resources, to assume a 'language of consensus' and a collective desire for positive connectedness, to suggest homogeneity where there is incompatibility, and to neutralize or obscure the micro-politics of educational processes. Jenny Ozga (2009) shows that network principles have been deployed in discourses of educational governance reforms to signal the decentralization of performance management to local education authorities and schools. However, cautions Ozga, the network functions only as an appearance of deregulation while the 'centre' continues to control the data and decision-making. The critique of network for both authors illuminates the tensions embedded in its promise of democratic, decentralized governance and its associations with trust, flexibility and responsiveness.

However, not all network analyses of policy assume that a network signifies benign distribution, depoliticized 'flows' or connections of consensus. Nor does the metaphor of 'network' necessarily refer to a flat and static horizontal array of linkages. Some accounts trace the dynamic, complex and contested negotiations of network formations in policy processes, as well as the efforts required to sustain what are usually precarious connections. Such accounts attend to the multiple and often ambivalent or contradictory effects of networks set in motion through policy processes. These accounts tend to associate themselves with STS - studies of technology and science, and in particular with a branch of STS called actor-network theory (ANT).

Proponents of STS/ANT have argued that one of its most promising contributions is to open new understandings of policy processes, through

> (1) a propensity to cause trouble, provoke, be awkward; (2) a tendency to work through difficult conceptual issues in relation to specific empirical cases, deflating grandiose theoretical concepts and claims (and even some ordinary ones); (3) an emphasis on the local, specific and contingent . . .; (4) caution about the unreflexive adoption and deployment of standard social science lexicons (e.g. power, culture, meaning, value); (5) reflexive attention to the (frequently unexplicated) notions of our audiences, value and utility. . .
> (Woolgar, Coopmans and Neyland, 2009, pp 21-22)

In this spirit, the present discussion purports to introduce possibilities afforded to educational policy analysis through actor-network theory. More properly termed a 'sensibility' and now a highly diffuse cloud of diverse studies and approaches, ANT has emerged in interesting directions since its early enthusiastic uptakes. Indeed, many of its progenitors such as Bruno Latour, John Law and Michael Callon have struggled to avoid defining it as a set of theoretical ideas and have distanced themselves from others' efforts to do so. Frankham (2006) points out problems that have also frustrated prominent ANT commentators: that many ANT uptakes have solidified particular models of analysis, have reified concepts such as 'networks', and have colonized their objects of inquiry in representational ways that ANT approaches were intended to disrupt (see McLean and Hassard, 2004 for a summary of such critiques). In a much-cited volume of essays *Actor Network Theory and After* (1999), Law (1999) attacked the many misinterpretations of ANT's topological assumptions for homogenizing the spatial and relational possibilities of socio-material events instead of tracing their incoherent complexities. Other authors argued to delimit ANT's claims, destabilize its language, unravel its models, and open its conceptual scope (Latour, 1999; Mol, 1999).

But in the past decade there has continued a remarkable profusion of 'after' ANT uptakes and hybridic theoretical blends as ANT has travelled across disparate disciplines ranging from organizational change to cyber-punk semiotics and urban planning to medical sociology. A growing, if still surprisingly limited, educational interest in ANT is evident in studies of curriculum and schools (McGregor, 2004; Nespor, 2003), higher education (Fox, 2005), literacy (Hamilton, 2009; Leander and Lovvorn, 2006), and educational policy and change (Clarke, 2002; Edwards, 2002; Nespor, 2002; Waltz, 2004). These uptakes have each helped to extend and reconfigure ANT ideas in ways that trace the mess, disorder and ambivalences that organize policies and practices such as those comprising education. Some have tried to periodize these developments as early-ANT, after-ANT, ANT-diaspora and so forth. Some avoid saying 'ANT', alluding to their work in broad terms as complexity, STS broadly, or ducking labels altogether. But for the purposes of promoting the contributions of ANT's theoretical resources, it seems useful to stick with one term for this wide constellation of ideas. Therefore, 'actor-network theory' (ANT) is employed here as a loose, contingent marker to refer to all approaches, early-, after- and in-between, that have associated themselves with 'ANT' at some point. These approaches share notions of human/nonhuman symmetry, network not as metaphor but as socio-material performances that enact reality, and translation in multiple and shifting formulations. Using this one term also helps to distinguish ANT approaches from other available conceptions of socio-material practice and interobjectivity that have captured interest among educational

researchers, such as post-structural geographies, complexity theory, and cultural-historical activity theory.

In direct opposition to network discourses of consensus and democratic decentralization, ANT treats networks as contested and precarious multiplicities which order practices, bodies and identities through complex enactments. The key point is multiplicity – not just multiple views, but enacting multiple worlds – multiple simultaneous ontologies, as analysts have argued working with ANT resources (Law, 2004b; Mol, 2002; Moser, 2008). Further, and most important, a network in ANT *does not connect things that already exist, but actually configures ontologies*. For educational policy analyses, Edwards (2002) has claimed that ANT thus 'provides a framework for analysing the exercises of power by which cultural, social and economic capital is produced and reproduced' (p 355). When exploring the multiple enactments that comprise any one object such as a policy, ANT provokes questions about the politics that constrain, obscure, or enable certain enactments to be most easily performed and recognized, and why.

The following discussion argues the continuing merits of actor-network theory as one approach to study educational policy. The focus chosen here are those policy processes associated with developing and mobilizing educational standards. Standards have become integral to educational policies intended to guide curriculum, pedagogical practice, assessment, reform initiatives and teacher supervision. A reasonable definition of standard could be 'any set of agreed-upon rules for the production of (textual or material) objects' (Bowker & Star, 1999, p.13). That is, practices of developing and integrating educational standards are not only politically contested, but actively produce and order the texts, identities, objects and bodies that assemble to become educational practices – practices of pedagogy, assessment, administration, public relations, policy-making and so forth. The purpose of standard-setting practices could thus be described as the attempt to order practice at a distance. Standards aspire to ensure consistency and comparability in the everyday conduct that occurs at diverse locations in which a whole constellation of relations meet and weave together in particular ways to constitute practice. Popkewitz (2004) argues that in education as in most aspects of governing modernity, standards fabricate particular kinds of people to effect some desired action towards a perceived problem (p246). Whether we are examining the most common form of educational standards, measures of children's learning, or other 'salvation' fictions in the form of standards for school improvement, teacher regulation and the like, writes Popkewitz (2004:248), what needs to be questioned are 'the standards and rules of reason through which the child and teacher are *made* as objects of scrutiny, interpretation and administration' [italics added]. But for any idea such as an educational standard to be 'mobile, durable and capable of inciting action at a distance' the idea must 'have the form of a trace, an inscription, a representation' (Bowers 1992: 117). Formal or prescribed standards that attempt to define levels of competence across locations, therefore, take a variety of 'trace' forms in educational practices: curriculum documents, assessment instruments, and accountability systems. In the following discussion, sample studies were selected to introduce ANT-uptakes in very different sites of standards enactment: prescribed curriculum standards, professional practice of standardized protocols, standardized student achievement testing, literacy assessment, and professional standards of competency.
The studies also offer different theoretical perspectives of networks within ANT.

The discussion is theory-based, and proceeds in three parts. The first section introduces network concepts and analytical approaches of ANT (including the recent proliferations calling themselves 'after ANT') pertinent to processes of enacting standards. The second section briefly presents ANT-associated studies of standards – their forms, their diverse enactments and their multiple effects. These studies illustrate not only different complexities in these policy processes but also different conceptualizations of networks. The conclusion suggests contributions that ANT's theoretical resources might offer to analysis of educational standards and studies of educational policy more broadly. The overall purpose here is suggestive, rather than definitive. A single article cannot engage in depth the diffuse theoretical debates now associated with actor-network theory, or retrace the fine-grained complexities of ANT-analysis explicated in the different studies that are mentioned. So sacrificing depth for breadth, this overview is intended to suggest starting points for analysis through a glimpse of uptakes associated with actor-network theory today.

Actor network theory and educational standards

Actor-network theory traces the ways in which human and non-human elements are enacted as they become assembled into collectives of activity. These complex, interwoven 'networks' can spread across space and time, and produce policies, knowledge and practices. ANT-inspired studies trace the micro-interactions through which diverse elements or 'actants' are performed into being: how they come together - and manage to *hold* together - in 'networks' that can act. These networks produce force and other effects: knowledge, identities, rules, routines, behaviours, new technologies and instruments, regulatory regimes, reforms, illnesses and so forth. No anterior distinctions such as 'human being' or social 'structure' are recognized – everything is performed into existence. Callon (1991) explains that the nature of all agents and what they do depends entirely on the morphology of relations in which they are interwoven.

ANT sensibilities are particularly useful for following these relational strategies. An ANT approach notices how things are invited or excluded, how some linkages work and others don't, and how connections are bolstered to make themselves stable and durable by linking to other networks and things. Further, and perhaps most interesting, ANT studies tend to focus on the minute negotiations that go on at the points of connection. As Law (2004a) explains, the focus is on 'looking down' at the particular, not looking up at the general or abstract. Things – not just humans, but the parts that make up humans and nonhumans - persuade, coerce, seduce, resist, and compromise each other as they come together. They may connect with other things in ways that lock them into a particular collective, or they may pretend to connect, partially connect, or act disconnected and excluded even when they are connected. The connections are never settled, but constantly being re-negotiated, shifting the alignments and forms of the entities that have come together.

The following concepts have been frequently invoked in ANT-associated analyses of educational processes (Fenwick and Edwards, forthcoming 2010). *Symmetry* is the radical refusal to distinguish among non-human and human energies and forms: objects, nature, technology, texts, concepts, consciousness, and desires all exercise influence in assembling and mobilizing the 'networks' that comprise bodies, as well as standards, policies, institutions, knowledge, identities and so forth. *Translation* refers to the micro-negotiations among elements that work to shape or

change them, and link them into extended chains of interconnected activity. Processes of *enrolment and mobilization* work to include and exclude elements from the chains, and direct this activity such that the network is performed into existence. S*tabilization* is what happens when the network appears to be complete and durable and to exercise force while concealing all the dynamic translations that created it and continue to maintain it. *Fluid objects* and quasi-objects (e.g. see Mol and Law, 1994; Law and Singleton, 2005) are all the entities constituting 'reality' like bodies, institutions, instruments or scientific knowledge. They are produced by networks and perform themselves as stable, but in fact are highly precarious.

There are as yet relatively few published studies employing ANT to examine educational policy processes in general and standards in particular. However, available studies indicate clear points for ANT's analytic utility. First, ANT-inspired studies accept the centrality of artifacts. Thus they can trace the negotiations and performances through which educational standards achieve and maintain some durable form as a consequence of the socio-*material* relations in which they are located and performed (e.g. see Gorur, forthcoming 2010; Nespor 2002). Second, ANT analyses can reconfigure the terms and assumptions involved in considering educational standards. Such analyses signal rifts and disjunctures in prescriptions of educational standards and so-called implementations (e.g. see Edwards, 2009; Mulcahy, 1999, 2007). These rifts open new possibilities, and recognize important ambivalences, oscillations, and transgressive enactments that are all contained within standards in practice.

Third, ANT does not consider the policy terrain as configured by 'powers that be' that create and impose a set of standards. Instead, standards as well as these 'powers' are understood always to be *effects* that emerge through a series of complex interactions (e.g. see Hamilton, 2009). No structures or transcendent entities or values are accepted as pre-existing the ongoing assembly of networks. Rizvi (2009) argues that the ANT concept of 'assemblage' is particularly useful in global policy analysis to understand how conflicting values such as market economics, equity and social justice are constantly assembling, disassembling and shaping one another in a moving entity. No discrete values are accorded privilege or exercise agency in educational policy, but rather there is a messy shifting assemblage comprised of ongoing material and political practices that establish a precarious values consensus-of-the-moment. Of course, certain non-ANT educational analyses also analyse processes of standard-setting and standards-usage as emergent, multifarious and discontinuous. However, an ANT-inspired treatment of a particular set of educational standards themselves as a series of networks – some of which are still in flux – recognizes the many negotiations that lead to translations of entities at each node of the political decision enactment: specific terms of language, materials, coalitions of people, existing documents, disciplinary bodies of knowledge, and so on. ANT helps locate the many inclusions and exclusions that occur in assembling these networks of standards, which can be easily obscured in references to standards that appear to exist as inevitable and immutable.

Fourth, the socio-material emphasis of ANT has inspired educational analysts to seek beyond the politics of language and the negotiations of ideologies in standards debates to focus on the ways that *material* objects and actions are implicated in the plays of standard formations (e.g. see McGregor, 2004; Waltz, 2004). The examples below show how standards are performed in diverse socio-material forms, indeed in spaces between diverse and distributed forms, forms which are constantly in tension and moving. As Hunter and Swan (2007: 414) show in their ANT

analysis of equity policy and professionals in education: 'Policy and policy documents are not as 'fixed' as we may believe. Policies can be oppressive, but they can also be used as means to force social change in unexpected ways.'

Finally, ANT-analysis steps outside conceptions of local-global scalar distinctions in considering educational standards (e.g. see Nespor, 2004). That is, to view standards as imposed from higher to lower hierarchical levels in an organization or community, or to understand 'globalized' standards that must be implemented locally, is to accept an ontological distinction between these scalar levels. As Law (2003) explains, ANT recognizes no such distinction. Instead, it traces how a network becomes extended, through a proliferation of networks and links, to function across far-flung regions of space and time. The question is not what occurs at local and global 'levels' and how they influence one another, but rather, how networks become more or less long or more or less connected, performing comparable (if often distinctly different) practices. Network length is the effect of how various materials became assembled to allow the network to function and achieve some stability. What appears as difference in size and scale is simply the end product of network extension actions.

Nor is a 'network' imagined in narrow terms as linear, flat chain of linkages joined by straight lines of relations. In the studies described in the next section, networks are shown to be formed through nodes or links, but they also have spaces – undefinable, ineffable – between the nodes. And nodes are diverse. Some are layered sites where many texts, persons, instruments and other nodes criss-cross in their interactions, and others may only be activated at certain times. Most important, all of these nodes are precarious. Links can be dissolved, translations refused, and mediation attempts transformed into unanticipated directions. There is no all-powerful system pre-existing these many negotiations between the different entities, and whatever may appear to be an immutable system of performance measurement is in fact held together very provisionally by myriad connections – as well as spaces between them – that can be identified and re-opened.

Examining educational standards with ANT

The following paragraphs illuminate these issues drawing from ANT-associated studies of standards and their mobilization in practice. In the educational literature, Nespor (2002) shows how standardized tests act as immutable mobiles, traveling across time and space to 'enrol' human as well as non-human entities into a network that acquires durability and stability. Edwards (2009) and Mulcahy (1999, 2007) work with the conceptualization of curriculum and teaching standards as actually existing in different ontological forms, as representations and as performances. In studying professional practice, Timmermans and Berg (1997) argue that 'universal' standards even in the most high-stakes, tightly controlled instances are always 'local' universality, performed in a particular, contingent and situated crystallization of movements. Murdoch (1998) suggests that different networks – of both standard prescription and more open negotiation – are entwined in each instance of practice. Hamilton's (2009) study of standardized literacy assessment protocols provides an educational example of these prescriptive/negotiative networks at play. All conceptions highlight the spaces and disjunctures that open between a formal standard and the press of everyday demands and priorities in educational practice, and all four show these spaces as generative opportunities where invention and adaptation emerge to enrich standards.

Ordering practice through immutable mobiles

Within classic ANT analysis, a particular list of educational standards might be described as an 'immutable mobile' (Law, 2003). The list appears to be immutable and stabilized as a self-contained and self-evident object. The roiling, messy network(s) of invention, resistance and negotiations that produced the list are rendered invisible. The list is 'punctualized' – fixed in time in the form of an object. It is mobile - it can travel across far-flung distances of geographic, cultural and political spaces to regulate activity, what Latour (2005), following Foucault, has called 'the conduct of conduct'. That is, a list of standards for learner achievement or teacher performance can be transmitted from some centre such as a government department to school districts, teacher associations, textbook publishers and even, through international organizations such as the OECD, to other governments. The logic would be that, as 'immutable' a list would be more powerful, as it travels around these spaces, dictating terms and even shaping the actualities of knowledge and action that should constitute acceptable educational competency and performance.

An example of this can be seen in standardized tests of student achievement. Increasingly mandated across states and provinces in North America, such tests help to link together massive networks through the movement of the test as an immutable mobile - an intermediary that embeds a history of network constructions, struggles and mediations which have settled into one fixed representation. Nespor (2002) explains that the fixed items of such tests work to 'translate' complex learning practices into limited categories, the calculation of which translates year-long and vastly different educational processes around the state into numeric scores. Teachers are bypassed as mediators of pedagogy and knowledge, and students are directly enrolled into subject matter that has been translated into the test's limited forms of knowledge. And because the stakes are high in the calculative process (schools scoring less than a certain percentage lose their accreditation), Nespor shows that the test mobilizes a whole series of events and people to align with its forms: administrators force curricula to conform to the test's demands, teachers drill classes in test preparation, remedial classes are arranged to improve students' test achievement, and fear is mobilized among all. The result is a

> funnelling, hierarchical network in which the state becomes a centre of accumulation collecting standardized representations of all the students in its political borders. The state can then summarize and compare students as a class, and more importantly speak for and act upon them. (Nespor 2002: 375)

In these extended networks of evaluation, as Nespor (2002) points out, certain kinds of materials and people are assembled and translated to become aligned with the standardized form while others such as the testers, supervisors and the state are not. But these actors also are effects of network processes. They are combined with other forms, representations and artefacts. They are 'hooked up' with other networks already on the move: 'historically and geographically stretched out in materially heterogeneous networks that overlap and interact with one another' (Nespor 2002: 376). As Latour (2005) points out, a war room can command and control anything only as long as it maintains connection with distributed sites of action through continuous transport of information. Evaluation and accountability 'is made only of movements, which are woven by the constant circulation of documents, stories, accounts, goods and passions' (Latour 2005: 179).

What the ANT perspective contributes is much greater focus on the objects and texts that mediate these evaluative processes, and the diverse and unpredictable negotiations that occur as these objects intermingle with teachers and learners, even become part of them, in everyday micro-interactions. Further, ANT shows the interconnectivity of all things and people into interweaving networks. For Nespor (2002), this insight gives rise to important questions for educational policy: Is it practical, or politically effective, to segregate educational issues from the other materials and networks (community, housing, health, etc) tied to them? And, how can actors mobilize politically effective networks, mindful of the importance of artefacts in directing these networks, to engage school change issues such as standardization?

However, given the diverse forms proliferated through standards in practice, ANT helps illuminate the multiple heterogeneous possibilities that are embedded *within* any formal iteration of educational standards that are inscribed in these texts, these immutable mobiles. In practice, these possibilities emerge and jostle in unexpected ways. The possibilities emerge as different elements are introduced into practices of standards development and their usage, as different material limitations and cultural expectations contribute to and resist the ideas contained within written standards, and as one set of written standards collaborates with other forms of standards at play in any region of educational practice. Thus what may be characterized in certain analyses as local 'resistance' to standards is viewed by ANT as one visible instantiation of a whole series of possibilities and transgressions. ANT shows that these are not added to the list of standards, the immutable mobile, by particular people, but that hetereogeneity is contained within the standards themselves. The mobile is not so immutable as it appears, but is capable of multiple unfoldings. And this is a central observation of ANT: every artifact at play embeds so many mappings of memory, association and performativity that immutability is impossible. In this way, ANT reveals the *uncertainty of standards* as both rhetorical positionings and as bases for judgement and governance of educational activity.

To be precise, this line of thinking emerged in what some label as 'after ANT' discussions (Hetherington and Law, 2000). When studies of networks created through orderings of standardization began to focus on standards that failed, it became clear that the 'immutable mobile' concept was not adequate to describe what was happening.

> ANT became too managerialist in its early versions as it thought about objects. Its intuition about the importance of relations was right, but it got itself too concerned with standardization, with the rigidities of immutable mobiles that, if they exist at all, exist within rather specific and rigid networks that try to reach out over long distances and achieve centralized control. Perhaps, then, we need to be looking at networks that are more relaxed, networks where such control is less important. Perhaps we need to be looking at networks where objects precisely have to adapt and change shape if they are to survive. (Law and Singleton 2005: 339)

This points to the fluidity of objects, that they are constantly unfolding as practices. Educative practices are closely influenced by standards on all fronts: curriculum, governance, student achievement, teacher performance. But, as the next examples show, the networks through which these standards are enacted - when they actually succeed in translating behaviours of people and objects - appear far more ambivalent and loose than some notions of centrally-controlled networks would allow.

Local universality

One perspective of how standards work in practice draws from ANT concepts to show how even the most strictly-defined protocols are always performed in unique ways in practice. Timmermans and Berg (1997) examine professional practice of standard protocols such as Cardio-Pulmonary Resuscitation (CPR). What they find is that universality is always local universality. Further, in practice a standard functions not as one professional's strict performance of a standard but as the outcome of negotiation processes among various actors.

In a typical standard of practice, a protocol is specified in text – such as a procedure with written directions and possibly accompanying tools. A protocol is defined by Timmermans and Berg as a technoscientific script that crystallizes multiple trajectories. They examined and found that:

> The protocol designers, funding agencies, the different groups of involved physicians, patients' hopes and desires, organizational facilities, laboratory capabilities, drug companies, the patients' organs' own resilience, and so forth, all come into play in the negotiation processes leading up to the 'final' protocol. What kind of drugs are used, how they are to be dosed, who should receive them: all these 'decisions' are not so much a product of consciously developed *plans* as a result of these continuous, dispersed and often contingent *interactions*. The actual shape of the tool, in other words, resembles no one 'blueprint' but is accomplished 'in-course'.
> (Timmermans and Berg 1997: 283, emphasis added)

Protocol as a standard interferes in these different trajectories, changing these trajectories in the moment when they are brought together. This moment not only gathers and transforms, but also creates visibility of all the trajectories and roles and purposes of those involved. This is why Timmermans and Berg call it a 'crystallization' of multiple trajectories. As a network moment, a moment of translation in Latour's terms, this transaction is contingent and temporary. Whatever is performed in that moment is not guaranteed to have any stability or prescriptive power for ensuing action. In the 80 different cases of CPR they observed, Timmermans and Berg (1997: 288) found that in most cases, professionals adapt the standard: 'seen from their perspectives, it is the protocol's trajectory which is secondary and which is aligned to their own goals and trajectories… it is dealt with in terms of their local specificities'. Nurses act beyond their scope by dropping hints to inexperienced physicians, which may prompt more aggressive treatment by the physician, new drugs not specified by the protocol are introduced, and strict directives of the protocol are altered in situations of 'the very hopeless patient'. Tight control also is unreasonable for non-human elements in medical situations where machines break down, X-rays can show unexpected images, and blood cells can behave oddly. The protocol's explicit demands always need tinkering, a notion that intuitively is also the case for educators.

This conception of ANT adds explicit recognition of what is actually going on in this translation of standards. In the moment of translation, the protocol is one actor with a historical trajectory, in a commotion of actors each with their own trajectories, which are drawn together in the press to perform that protocol with some reasonable outcome aligned with their own desires:

> Local universality, then, implies a context of practice, of multiple crystallizing and dispersed trajectories, of reappropriation, repairing, combining, and even circumventing the protocols and standards, of leaving margins of freedom, of reminding, of long processes of negotiation, of

diverse interests, and so forth.

<div align="right">(Timmermans and Berg 1997: 298)</div>

This conception helps shift the focus from standards as an exercise of domination and submission or resistance, to an interplay and scaling that is performed anew in each setting.

Spaces of prescription/spaces of negotiation

Another ANT-influenced perspective views formal standards as a regulatory network flowing and unfolding alongside and even entwined with the adaptive and resistant flows. For example, Susan Leigh Starr's (1995) studies of nurses shows that while they understand clearly the evidence-based standards meant to govern their practice, on the wards they are continually trying to carve out spaces of discretionary practice within the classification of competencies scheme. Eventually a standardized network becomes constructed out of this localized informal practice, then is superimposed on that practice. The ward therefore is not a 'site of resistance' to the standards but a network of 'alternate orderings'. Thus, Starr views the stabilization of standards to occur through a series of tradeoffs between generality and local uniqueness - between network builders and enrolled entities – who must reach agreements or compromises if a network is to be stable through time and space. Along this line, Murdoch (1998) conceptualizes 'spaces of prescription' and 'spaces of negotiation' that co-exist and loosely correspond, not in dualistic opposition but in duality. Spaces of prescription, tightly ordered and normalized, are created through networks where entities are pulled closely together into assemblages that clearly exclude certain actants, which are pushed out to form alternate assemblages. Spaces of negotiation are created through networks where links between actors and intermediaries are provisional and divergent, where norms are hard to establish and standards are frequently compromised: various components of a network continually negotiate with one another, forming variable coalitions and assuming ever-changing shapes. These two spaces of network configurations, prescription and negotiation, form two sides of the same phenomenon and cannot exist without one another. Further, both spaces can flow from the same network.

Drawing from ANT approaches, Hamilton (2009) explores the networks of negotiation and prescription in the assessment of literacy standards. Hamilton traces the implementation in England of a standardized Individual Learning Plan (ILP) that manages student literacy progress in adult Skills for Life programmes. While originally intended as a formative assessment activity, the ILP became a performance measure tool for administrative purposes, a measure of quality assurance. What interests Hamilton most is how these individual learning assessment practices work to align local practices and identities to global or systemic practices of literacy. The ILP becomes incorporated in practice, not through straightforward prescription of particular behaviours, but through negotiations of various responses and accommodations from teachers. These range from cynicism to strategic compliance to creative adaptation of the format. The ILP form itself can generate new objects, bits of paperwork whose regulation and flow are complex to coordinate: initial assessments, tracking information, learning agreements, paperwork to synchronize practice across teachers, and templates to help teachers achieve consistency in reporting. Learners' experiences become shaped by the language of aspirations and achievements dictated by the ILP. Learner and teacher identities become shaped by the struggles to negotiate the ILP, to meet the inspectors' requirements yet protect the emergent and diverse nature of

literacy learning. The tutors become mobilized in creative 'bridging' activities which also are, for them, ethically conflicting and deeply uncomfortable activities.

Tracing these interactions and the networks they form, Hamilton shows how the ILP becomes a key artefact in the process of social ordering through prescriptive as well as negotiative networks. The ILP mobilizes prescription through its location as a central nexus of practice where various discourses and policy strands meet. However, it is highly contentious among teachers, and it is embedded in everyday face-to-face negotiations of literacy education – literally at the 'heart' of teaching-learning processes. But further, as Hamilton (2009) observes, these ILP-generated networks of standards can work to *contain* the ruptures and fissures – they attempt to hold together the disjunctures of tutors' ethical conflict and other negotiations, and prevent them from becoming visible. So, while the circulation of texts in an evaluative network achieves consistency and comparability in the ordering of practices in particular ways, this achievement depends upon stabilizing *only* certain practices as the norm. Hamilton's network analysis shows the complex enactments through which educational standards manage to 'purify' education of difference and multiplicity.

Standards in different ontological forms
Here is where the notion of an immutable mobile, while helpful to show how a list of standards moves in and around different networks of practice, enrolling them into one extended network across sites separated widely by time and physical space, is somewhat limited. Standards become transmuted at these different sites as much as they transform and mobilize actors. The relations are not immutable, and the networks are sometimes more incoherent than coherent. And yet, the official standards, whatever they may have been originally, appear to hold a recognizeable presence across these sites. The code is understood and is visible throughout the network joints. Actors themselves believe that they are performing the standard even when the objects and actions they produce deviate in fundamental ways from the standard's inscribed purposes. How can these multiplicities be explained in the name of standardization?

Writers who puzzled through these anomalies with ANT-related theories (Law and Singleton, 2005; Mol and Law, 1994) suggest that the problem may be with our perception of difference. We attempt to see an object holding a stable shape in the networks it acts upon. But these writers push further to consider that the issue is not just epistemological – perceptual and conceptual difference, but ontological. Objects themselves are sometimes far more variable, unfolding and fluid, than fixed. This is demonstrated particularly dramatically in the object of a disease in medicine (Law and Singleton, 2005), because diagnosis and evidence-based treatment protocols depend on the assumption that a disease is a singular, distinct and identifiable object. However in their study of alcoholic liver disease, Law and Singleton found that the actual object of ALD was enacted very differently in the community treatment centre, the hospital and the physician's office: it was not only conceived differently, but organized, diagnosed, and treated differently, with different effects. Here then is a notion of a messy or 'fluid object' that maintains some consistency but whose internal structures and boundaries shift over time and through its negotiations in different networks. Similarly with educational standards: as a fluid object, a standard for practice or for learners' competency can mobilize and link together extended networks that maintain key continuities even though practices at different nodes may look very different.

Edwards (2009) adopts these 'after ANT' concepts to tackle the same issue concerning Timmermans and Berg (1997), Murdoch (1998) and Starr (1995), that of the discrepancies and apparent incoherence that open in the material moments of educational practice - between formal textual prescriptions of standards and the inventive adaptations of practitioners. He follows the messy classroom enactments of curriculum standards prescribed for the vocational curriculum, comparing activities in college and secondary school contexts. Of course, multiple enactments are brought forward in the unpredictable connections and 'translations' among flipcharts, textbooks, tools, iPods, hands, smells and desires. As he traces these embodied connections, Edwards shows that curriculum standards inhabit different forms at the same time in particular contexts. Teachers learn to articulate these different ontological forms simultaneously in enactments that represent a 'betrayal', in ANT language of the processes of translation, of the prescribed curriculum standard. Thus these articulations and the spaces across which they move are not instantiations of control and subjugation, but of continuous play in which all forms of the standard – curriculum document, moments of classroom enactment, student behavior, classroom equipment – mutate as they translate one another.

In Mulcahy's (1999) tracings of cooking teachers working with students in kitchens, she also shows how different forms of competency standards are present and held in tension in a series of embodied relations. The set of national industry standards, normally represented on a piece of paper, also lives in teachers' interpretations of such standards in their demonstrations and directions to students. But also present are teachers' embodied and very personal professional standards of practice that are too 'materially complex' for formal representation as competency – such as predicting the effect of a flavour on a particular dish. Further, local standards of adaptation come to bear as teacher-cooks have accommodated practices over time to particular contexts (shaped by such things as faulty equipment or unavailability of good quality ingredients). Further, teachers draw from accumulated experience of watching and assessing students' growing capacity, for example, knowing when students have come to embody acceptable performance in some aspects of a skill while they may not quite master other aspects. Teachers' work with students, then, is unfolded through embodied negotiation of these different forms of standards, such that no one formal standard or term of competency becomes privileged over another.

> Standards are accomplished face to face, through interactional work. They
> are not so much read off the written specifications and then applied, as recreated on the job, using
> the written specifications as a resource or guide. Achieving competence is a matter of using
> embodied skills, face-to-face communication, and collective negotiation by which the outcomes
> of the work can be taken into account. (Mulcahy 1999: 94)

These various representations of standards incorporating bodies in motion, equipment, ingredients, dishes produced, politics, talk, and texts are not static and separate, but flow constantly in movement and relations in the site of teaching and cooking. Indeed, Mulcahy (1999: 97) argues that teachers knowingly engage in a 'strategic juggling of representational ambiguity' among these varied standards. This juggling translates the formal competency standard into diverse representational forms of competency that settle the 'problem' of difference at the local level.

In examining standards developed to regulate teacher competence in Australia, Mulcahy (2007) uses ANT approaches to explore the politics through which such professional standards appear to be unitary and stable, and construct a particular teaching identity. She contrasts what she calls two different idioms for conceiving standards: a *representational* approach which has commanded most authority in education and which views standards as a technology for describing pre-existing realities of teaching, and a *performative* approach which treats standards as relationally enacted in various everyday practices. Focusing on the latter Mulcahy shows how, in different sociomaterial practices and arrangements ranging from statewide consensus-seeking to teacher education to school settings, standards are enacted differently. To reconcile these different ontological forms would create an undesirable closure, replacing the dynamism of various enactments of standards with a rigid consensus that offers little more than the original formal prescribed standard. Instead, Mulcahy argues for holding differences in tension – different practices of standards, scales and settings – all together. These tensions produce healthy fissures, tunnels, folds and unmapped spaces. Inventive possibilities emerge continuously at these fissures. As Murdoch (1998) shows, actors naturally seek the cracks, rifts, and folds for manouevring within networks, finding the contestable lines and sites where they can alter the network's shape and invent themselves differently.

The question then becomes not only, 'where *are* standards?', but also what political negotiations enable certain performances of standards and constrain others. Mulcahy claims and then demonstrates how an ANT approach can trace the material specificities of these performances, showing how bodies, dispositions, pedagogical encounters and understanding are produced at the point of situated performance in specific environments. This approach yields an important counter-narrative to the more conventional representational treatments of standards as a-contextual, abstract disciplinary regimes. There cannot exist any stable, unitary forms of standards. In ANT logic, they are performed in multiple different, even conflicting, enactments. Following Law and Singleton (2005) and others who explore the 'ontological politics' of difference performed in the same object (e.g. Mol, 1999), this assertion encourages less focus on the threat of governmental regimes supposed to be wielded by educational standards, and more on exploring difference. Specifically, ANT-related analyses examines the politics through which different performances unfold, associate, infect one another, become amplified or disabled, and exist in tension, more or less productively.

Conclusion

In an ANT analysis, standards attempt to create comparability by controlling conduct across space and time. This is accomplished through traces and representations that can fix an idea and move it around – through specifying texts, required tools, or mandated protocols. However, for standardization to actually work, as Bowker and Starr (2000: 232-233) suggest, there must emerge a difficult balance of comparability across sites alongside 'margins of control', spaces of 'intimacy', for actors in practice. High levels of control and maximum visibility threaten the very intimacy that can enable standardization to come to life in the networks of action at each site. The ANT accounts of standardization attempts in education make this abundantly clear. The concept of an 'immutable mobile' of standards travelling around different regions and insinuating itself into different messy negotiations among actors in ways that translate all into an extended network is inadequate to describe educational practice, or arguably any practice.

Different assemblages are possible in the network of standardization, assemblages that emerge among the nodes and folds of extended networks, but not as stable entities. These assemblages themselves are continually emerging and shifting and dissolving into new forms as the actants encounter interruptions and discover new approaches. Local network negotiations will always be pressed by actor's creativity, objects' limitations, other networks functioning in the same space that reinforce different meanings of quality and priorities – all jostling alongside and modifying a standard's demands of compliance. While these assemblages often bear sufficient comparability to sustain the most necessary dimensions of consistency, they also demonstrate Law's (2003) admonition that there are no orders, only orderings – that are always precarious.

The negotiations are always marked by struggle. As the examples here all illustrate, attempts at ordering can never be complete. First, comparability across an extended network threatens the manageability of each unique network or system sharing particular contextual exigencies. Members of these networks act in ways to achieve what is uppermost for them, what glues together their network – saving this patient, producing the best-tasting dish for this clientele, enabling this learner's confident participation in literacy practices. The standards network is one thread woven into these networks. Second, regardless of the attempts to control conduct at a distance, network members appear to be constantly adapting and inventing, translating for themselves and finding spaces and openings to do so. Third, standards themselves exist in multiple ontological forms that are performed simultaneously and that, as networks themselves, are continually changing shape. Educators, like other practitioners, are quite used to juggling these shape-shifting forms and their tensions of simultaneity within the high voltage dynamic of everyday commotion. In these ways, an ANT analysis highlights the limitations of conventional accounts of standards as globally formed ideals troubled by imperfect local implementation, or as cases of domination and subjugation that require local resistance to top-down exercises of power. ANT-analyses also avoid framing issues of standards as a problem in achieving consistency across domains by reconciling local and global enactments. Instead, the analyses here show just how precarious are attempts at ordering, how immutable mobiles are always mutable, and how the network spaces that proliferate around instantiations of standards always generate uncertainties, transgressions, and wonderfully generative ambivalences.

For educational researchers interested in standards and processes of standardization, an ANT approach urges a focus on this mess and particularly on the materializing processes it accomplishes. The trick is to follow the interplays that occur at the most local levels of practice, in ways that resist the urge to clarify, order and distinguish. The examples outlined in this discussion in particular show the insights produced when we trace the interplays not only of a particular standard attempting to become universal, but of all the other standards and their networks that intersect with the universal. ANT analyses then focus on the different strategies and inventions that emerge – some responding to one another, but others simply co-existing together and being juggled by educators and learners. These include strategies invoked to enrol actors into networks that extend universal standards, as well as actors' strategies to react to or reinvent these networks. Standardization networks will adopt the strategies that best ensure stability, and, as Murdoch (1998) argues, take the shape that will be most durable whether this is a more open network of negotiation, a messier network that enfolds ambivalence and incoherence, or a more closed network of prescription. And of course, ANT maintains an important insistence on tracing how objects in education influence and even project these

strategies. In ANT-infused studies of educational standards, we are invited to explore the many interplays and openings of uncertainties– not just moments of transgression or resistance or fabrication but also the ambivalences between prescription and negotiation. From his ANT-analysis of standardized curriculum standards and testing in schools, Nespor concludes that:

> instead of seeing some participants as 'reformers' and others as 'contexts', the idea is to account for all in the same terms by viewing them as historically and geographically stretched out in materially heterogeneous networks that overlap and interact with one another. …Implicit or explicit, battles over how things in the here and now will be articulated with (or conceptualized in terms of) settings and events distant in time and space are at the core of the struggle for educational justice. The key questions for educators in this struggle are how different kinds of schooling will entail different kinds of trajectories and pathways for students, what kinds of socio-cultural geographies these pathways collectively define, how the pathways and geographies are made visible to teachers, parents and children, and how different groups use them to contextualize and make particular kinds of school events meaningful. Nespor (2002: 376-7)

Murdoch (1998) also notes that ANT also helps address a central question of why actors permit themselves to be enrolled into networks promoting standardized practices, particularly reflexive actors (humans). Educational analysts featured here also show how ANT concepts can be modified and opened to trace complex shifts and manglings in these negotiations around standards. These accounts reframe the debate around standards significantly, abandoning the attempt to track implementation (and correlated coercions) of universal educational standards that simply maintain focus on the most powerful actors and reinforce managerialism. These more open, flexible ANT-analyses employed by educational researchers such as Mulcahy (2007) focus on the ineffable moments of performance, on the ephemeral bodies and representations that emerge in educational events occurring at the confluence of networks. Such analyses explore the tensions among different enactments of standards, tracing how these tensions jostle together in a particular region of practice.

Overall, in examining practices of developing educational standards and integrating them into everyday practices of audit and performance, ANT sensibilities ask: How do powerful networks (particular stabilised knowledges, accountability systems, evaluative practices) emerge? What connections assemble objects and people into these extended networks that can wield so much influence? What and who becomes included and excluded? What individual identities and behaviours are translated in becoming part of the network? What negotiations occur as individual elements take up, resist, or compete with the attempts to enrol and mobilize them into particular patterns of action and knowledge? The policy analysis then becomes a question of how things like standards – that is, the assemblies of texts, objects, bodies, practices and desires that instantiate what we recognize as 'standards' – become enacted.

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