Innovation in school mathematics? Historical iterations and other enduring dangers: A response to Lisa Darragh

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In this response, I interrogate the limits of innovation in school mathematics within a historical context. I explore the continuities as well as shifts in the normalizing practices of school mathematics. I argue that the notions of "free choice" and "surveillance" are not only specific to neoliberal regimes but also are embedded in histories of modern schooling. The historical context enables us to explore the dangers of innovative learning environments such as ordering the differences on a hierarchy in addition to the production of particular identities.

Introduction

Seeking a change in teaching and learning practices has long been a concern for mathematics education. Innovative pedagogical methods and curricular ideas are always presented to ensure 'better' learning environments for all students. While these 'innovative' approaches are considered to improve teaching and learning mathematics, they do more as argued in Darragh's paper: Identities for students and teachers are produced, regulated, and normalized by the multiplicity of societal narratives such as neoliberalism, colonialism, racism, sexism and so on.

Darragh's paper revisits how the identities of mathematics learners and mathematics teachers are being produced and regulated in "technology-rich, innovative learning spaces". These learning environments are located in Aotearoa New Zealand; but she also situates the processes of identity formation of learners and teachers within neoliberal ideology, twenty-first-century narratives, and the EdTech discourse of educational corporations. Rather than positioning teachers or learners as fully agentic humans, her conceptualization of identity enables an analysis of the multiplicity of discourses that regulate the identities and normalize particular actions and participation in "ILE (innovative learning environment) spaces".

My response draws on the historical background of normalization practices, including "free choice" and "the use of surveillance" in learning spaces. Although Darragh notes that these two normalization practices are the features of "new" classrooms or online learning platforms in our digital era, I discuss how these practices historically have been part of the modern world, particularly they are embedded within the practices of schooling and school mathematics. In my response, first, I explicate the historical emergence of sciences of

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decision-making, which is beyond neoliberal ideology, that makes discourses of "free choice" possible and reasonable. Here, I also bring historical shifts in the practices that organize and regulate uncertain learning spaces that are presumed to be planned, stabilized, and secured. Following these, I consider the dangers of the common way of thinking about change and innovation, including the differentiating mechanisms in school mathematics.

Historical continuities of normalization in educational spaces and shifts in the practices of educational decision making

Educational spaces are complex, dynamic, and uncertain. Social actors of (mathematics) education experience several predicaments when they are asked to make choices among a range of options. While one decides different choices, the notion of uncertainty embedded in decision-making processes is not always subject to endless possibilities. Rather, decisions are produced in systems that include scenario planning, risk profiling, algorithmic modelling, and data analysis (Amoore, 2011). Are these emerging practices of data collection, analysis, and representation new to social and educational spaces? How might we historically think about these processes and their exacerbation with the increase of online education?

How to act and participate in the real world under uncertain conditions is not a new problem. Hacking (1990), for example, explored how statistics and probability became technologies to formulate complicated realities into stabilized entities to tame the chance in the modern world. These technologies of data collection and analysis have been concerned with "making up people" as administrable citizens of the state. With the avalanche of printed numbers, future society became designable through counting people and their habits. The enumerations resulted in populational categories that constitute human kinds (Hacking, 2007). The categories for humans such as effective housekeeper, intelligent adult, or democratic citizen have been placed into enclosed and disciplinary spaces to order, differentiate, classify and normalize proper and improper modes of actions and participations in the world (see Foucault, 1995).

One of the most familiar examples from schooling has been the wide circulation of intelligence tests in the late 19th century modern nation-states, a particular context that can be remembered as a major breakthrough in education with the industrialization, public education, and waves of migration. Schools were seen as an effective technology that prepared children for industrial work and average adult life (Danziger, 1997). While later these tests were to compare the 'national' IQ level of countries and classify the regions along a continuum of values (Valero, 2017), the widespread adoption of standardized tests were linked to eugenic projects that aimed to purify population as well as maintenance of a White supremacist society (Davis & Martin, 2018). Back then, ability groups were considered as an innovative strategy to plan effective learning environments. The societal hope of dividing students was not only about economic development and progress but also was concerned with race betterment and ensuring the well-being of population(s) (Yolcu & Popkewitz, 2019). Commitment to the knowledge produced through multiple data points, including scores of

standardized math tests and time on solving mathematics questions, instead of arbitrary decisions, was a tactic to rationalize the tracking of students.

The contemporary calculations of the future and uncertainty have shifted. They are less about spatial classifications but more related to the configurations of spaces of security and control (Foucault, 2007). These spaces are not enclosed in the disciplinary sense: Rather than spatial distribution of individuals in advance, there is a widespread installation of control technologies across spaces and possibilities (Deleuze, 1992). The tools like robots, smartphones, or networked machines enable perpetual training, frequent and faster surveillance, and continual monitoring of communities to maintain the safety and stability of the world. Within the data produced through these devices, practices of algorithms, data analytics, or risk profiling become "the authoritative knowledge of choice" to anticipate the future uncertainty (Amoore, 2011). Here, the notion of free choice would not simply be constrained by data, but data analytics is part of what we call 'free choice' or 'informed decisions' that we make under uncertain conditions. Despite the changes in the tools and technologies, the uncertainty of educational spaces was resolved through apparently precise, specific, and quantitative data networks in which reasonable and rational choices could be made. The explosive interest in data based decision-making can be framed as a historical reiteration of the hope for a safe and stable world (Heyck, 2015).

In contemporary educational research, while tracking and assessing students' IQ levels become unwanted, old-fashioned practices, we do still have standardized exams. However, today, standardized assessment items emphasize 21st-century skills such as problem solving, modelling, or systems thinking. That is, despite the changes, there is persistent trust in the data produced through the standardized tests. Nevertheless, contemporary educational choices could no longer rely only on the tests. There should be more to attend to the contextuality and uncertainty of learning environments.

In addition to contemporary modified testing practices, students and teachers are asked to produce their data in their contexts. For example, continual in-class tracking of children's mathematical learning trajectories is considered as active agents to close the "education gap" between ambitious goals of reform and actual student mathematical thinking (Daro, et al., 2011, p. 11). With the tools of the digital age, ongoing classroom assessment of mathematical trajectory becomes possible (e.g., Confrey & Maloney, 2012). Installation of these tools into the classrooms does not only provide rapid and frequent feedback for teachers who make instructional decisions but also contributes to the ongoing surveillance of learning environments.

The historical desire for stable and secure world orders the calculation of uncertain educational spaces. As I have briefly discussed, and as Darragh argues in her paper, these social processes have normalizing effects in educational settings. Nevertheless, the normalization has long occupied the landscape of school mathematics despite the changes in technologies and tools such as IQ tests, skill-based assessment items, or classroom trajectories. So, it is possible to refer to the process of normalization as a historical spiral,

moving from layer to layer, never stabilizing itself and the practices are always open to modification and adjustment with the changing conditions.

Dangers of normalization practices: Differentiating axes of school mathematics

Administration of the landscape of school mathematics with normalizing practices has been a way to make the children as a particular kind people. Darragh discusses this process as production of identities that are "scripted" by the contemporary neoliberal regime. Particularly, she talks about the 21st-century mathematics learner (and the teacher) who embodies capitalist behaviour in online platforms, takes responsibility for their own learning, and performs identities as an entrepreneurial. With the discourses of "free choice", she takes our attention toward the generation of agentic performances that are controlled through ongoing surveillance and data collection.

The network of school mathematics practices produces a normative and regulatory space for 21st-century mathematics learners and it simultaneously generates axes of differentiation. Children are no longer categorized as mathematically defective, disable, slow or remedial, but they are profiled as "at-risk" not only through the generalizations of national or international exam score but also through ongoing classroom assessment results. The children who are outside of the normative accounts of educational spaces are categorized as at risk, disadvantaged or underrepresented and become the objects of interventions, such as teaching, research, or reform to conserve the historically planned order and stability of the world.

While the normative accounts regulate and produce particular human kinds, they simultaneously generate the "others". The differentiated spaces for children are configured as the laboratories of experimenting the innovative or new ideas of school mathematics. In order to be prepared to the shifts in the educational spaces, novel psychological categories are generated in addition to the desired identities. This includes, for example, the interest and willingness of students to persist on mathematical tasks (Organization for Economic Co-operation and Development [OECD], 2018). While willingness to do mathematics is formulated as one of the desired distinctions of 21st-century mathematics learners in these accounts, the differentiated spaces are simultaneously generated for others who are seen and perceived as 'unwilling' to do mathematics.

At the end of the plenary paper, there is an important question that Darragh raises: "For whom are these [identity] scripts more available?" Taking into account the differentiated axes embedded in school mathematics, I want to take this question a step further. I wonder, what specific technological devices are available for whom? Are there any additional and modified pedagogical strategies for those who act outside of the boundaries of produced identities? What differentiated categories are designed for those who push against the boundaries of 'innovative learning environments'?

Conclusion

In mathematics education, everybody wants to make a change and innovation: Teachers, researchers, students, parents, policymakers, and curriculum reformers to name a few. These innovations are not only concerned with teaching and learning mathematics but also with producing identities, normalize particular subjectivities and also generate spaces for others. Exploring the history behind the reform and change offers ways to problematize what is given as natural, sensible, and necessary part of mathematics education including those rules and conventions that configure what we perceive as "change" within the boundaries of how we conventionally reason about school mathematics.

If we think of the normalization processes in the innovative learning spaces as historical, the identity "scripts" for 21st-century mathematical learners are also embedded in the numerical practices of testing, visualizing, or modelling the big data. As more teachers and learners get enumerated, the complicated realities of learning spaces are formulated into stabilized entities. Application and production of data are to render classrooms certain, secure, and stable with rational decisions. The stabilizations do not only make up people but also enable axes of differentiation. It is a simultaneous process of production of identities and their differential constitution.

Despite the shifts in the tools and practices of normalization and differentiation, the historical reiterations to secure the uncertainty in learning environments reveal that there is something sticky in the 'reason' of school mathematics. How we think about change in mathematics education is embedded in a style of reasoning that normalizes particular subjectivities while differentiates the others. Despite the shifts in the tools and technologies, mathematical learning environments have been occupied with the production of objects of teaching, research, and policy. Then, the snapshots of learning environments, which were narrated at the beginning of the plenary paper, are not a change in the premises that constitute objects in educational spaces. Rather, it is a historical iteration of 'reason' of school mathematics that makes, normalizes, and differentiates particular human kinds.

One might ask: Isn't there a possibility to perform any agentic identities in this digital era? Is there no space to be free in our choices? Is nothing changing at all? Are we going to give up inventing digital technologies or searching for possibilities of change in mathematics education? I would say no. "What is given up", as Popkewitz (2008) writes, "is the notion of planning people" that "stabilizes and fixes the boundaries of freedom" (p. 184). So, the change is never deadlocked. On the contrary, the spaces for performing freedom and other potentialities could be found in the very act of exploring historical shifts and iterations, where the resistance can become the continual interrogation of what is think-able and say-able within the boundaries of current practices.

References

Amoore, L. (2011). Data derivatives on the emergence of a security risk calculus for our times. *Theory, Culture & Society, 28*(6), 24–43.

Confrey, J., & Maloney, A. P. (2012). Next generation digital classroom assessment based on learning trajectories in mathematics. In C. Dede & J. Richards (Eds.), *Steps toward a digital teaching platform* (pp. 134–152). Teachers College Press.

Danziger, K. (1997). *Naming the mind: How psychology found its language*. Sage.

Daro, P., Mosher, F., & Corcoran, T. (2011). *Learning trajectories in mathematics: A foundation for standards, curriculum, assessment, and instruction*. Consortium Policy Research Education.

Davis, J. & Martin, D. B. (2018). Racism, assessment, and instructional practices: Implications for mathematics teachers of African American students. *Journal of Urban Mathematics Education, 11*(1-2), 45–68

Deleuze, G. (1992). Postscript on the societies of control. *October, 59*, 3–7.

Foucault, M. (1995). *Discipline and punish: The birth of the prison*. Vintage Books. (Original work published 1975).

Foucault, M. (2007). *Society must be defended: Lectures at the College de France, 1975–76*. Picador.

Hacking, I. (1990). *Taming of chance*. Cambridge University Press.

Hacking, I. (2007). Kinds of people: Moving targets. *Proceedings of the British Academy, 151*, 285–318.

Heyck, H. (2015). *Age of system: Understanding the development of modern social science*. Johns Hopkins University Press.

Organization for Economic Co-operation and Development. (2018). *PISA 2021 Mathematics Framework (Draft)*. OECD Publishing.

Popkewitz, T. S. (2008). *Cosmopolitanism and the age of school reform: Science, education, and making society by making the child*. Routledge.

Valero, P. (2017). Mathematics for all, economic growth, and the making of the citizen-worker. In T. S. Popkewitz, J. Diaz, & C. Kirchgasler (Eds.), *A political sociology of educational knowledge: Studies of exclusions and difference* (pp. 117–132). Routledge.

Yolcu, A., & Popkewitz, T. S. (2019). Making the able body: School mathematics as a cultural practice. *ZDM Mathematics Education, 51*(2), 251–261.