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Geometry, subjectivity and the seduction of language

Tony Brown

Manchester Metropolitan University, Manchester, United Kingdom

Background

This paper offers some theoretical and practical reflection on how we share geometry and make it part of our lives, and in so doing link to a shared mathematical heritage. The discussion of this theme draws on Husserl's speculations on how geometry originated but how then it increasingly became seduced by language as a result of human attempts to capture, signify and share its concepts. Some work by undergraduate student teachers engaged in body movement and other geometrical exercises is depicted. Through considering how such exercises link to the students' spatial awareness the paper considers more generally how the evolution of geometry relates to its representation in cultural forms. The paper draws on contemporary conceptions of subjectivity in which humans identify, or are identified, with particular discursive conceptions of the world. This provides a paradigm for understanding how humans are discursively constituted with respect to particular mathematical understandings of spatial phenomena referenced to their growing awareness of how they are related to the physical world.

Research Questions

With respect to how geometry is tackled within school learning:

- What is lost and what is gained by mathematics being forced into descriptive categories?

(And, a question asked less often in mathematics education research),

- how is the learner/teacher lost (or gained) in being read through descriptive categories?)

And those descriptive categories transform the objects they locate.

- Mathematics is always created or transformed in its interface with humans. Humans need to mediate mathematical experience for the cultural existence of mathematics to be acknowledged. For example, humans theorise mathematics as a manifestation of the physical world, as in geometry. Or mathematics is processed as pedagogical forms for consumption in schools .

And we as learners, teachers and researchers are also transformed or produced through descriptive categories, since we similarly read each other and ourselves through these categories .

Methods

Main literature sources will be Derrida's discussion of Husserl's Origin of Geometry, linked to the work of Gattegno plus current work in geometry, including Spyrou et al and Schubring.

Frame

In geometrical study we are confronted with ideal mathematical objects that are also a function of their cultural heritage. That is, the objects often derive from their human construction, made with respect to configurations observed in the physical world. In his classic Origin of Geometry, Husserl argues that to understand geometry or any other cultural fact is to be conscious of its historicity, albeit implicitly. Ideal objects can only ever be accessed through technology or perceptual filters that are both time and culture specific. Those technologies or filters display some historical continuity, revelatory of how

they emerged from earlier manifestations. Yet our very selves have been created in a world that has a physical organisation and an analytical heritage consequential to a long history of geometrical awareness. I fit in to the social world through participation in shared ways of organising and apprehending the world. Our perceptions of the world are inevitably processed through aspects of this symbolic heritage. We cannot be geometrically naïve insofar as our subjectivity results from identifications with this shared heritage. Our physical experiences are processed and understood through that vocabulary of set moves and analytical strategies. We have learnt some of these things in school, or through everyday life experiences. Yet in a fundamental sense they are also part of us, contributory as they were to our very formation as we have learnt to move our bodies in a specific physical world, partially created by our ancestors who had similar bodies. An earlier paper examined how aspects of subjectivity were linked to spatial awareness. It offered examples of, a child being directed to move around a banana plantation in an equatorial country where consistent patterns of daylight assisted orientation, and of students in school in the same country trying to apprehend geometric configurations derived from Western culture. This paper offers some theoretical and practical reflection on how we signify geometry and make it part of our lives and in so doing link to a shared, albeit local, cultural heritage. It is shown how this sharing relates to subjective formation in which the human is understood, by her self and by others, through her specific geometrically aware apprehension of the world.

Research findings

Mathematics teaching is often in the business of enabling students to better apprehend and use socially derived mathematical apparatus. But that business often drives mathematics into forms more easily managed in the educational contexts concerned and accountable within the regulative apparatus that keeps those contexts in check. That is, in teaching situations culturally or historically defined mathematical objects are recast as pedagogical and assessment objects that result in the erstwhile mathematical definitions becoming implicated in socially governed processes. This paper has argued that the meanings of mathematical objects are necessarily a function of the relationships within such social settings. That has always been the case. The truth of mathematics is constructed, preserved and signified through apparatus that is necessarily cultural and hence temporal. Geometry has been depicted as an example of a field comprising ideal objects held in place in the collective memory through the technologies that have been developed to access it. In the school context, those technologies are used to formally assess understanding of the field and student conformity with social norms. Geometry has been converted into particular linguistic forms for accountancy purposes or formal recognition, such as tests/exams. This can compromise aspects of geometrical learning, such as where continuous experience is prematurely read against discrete categorisation. And students and teachers also find themselves read against discrete categories with respect to their engagement with mathematical phenomena. Their actions are partitioned according to a discrete mark up of the mathematical terrain. Teachers are not teachers in themselves but teachers subject to particular cultural specifications. Specifically they work to curriculums that mark out the field of mathematics in particular ways. And student engagement with mathematics is assessed according to how recognisable it is against this frame.