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Reading Koopman's (2019) "How we became our data" as an invitation to resist the formatting of the 'informational person' with the support of mathematics education

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Abstract
In this paper, after a review of Koopman´s (2019) historical account of the 'informational person', I elaborate Koopman's work by pointing to specific formatting techniques that shape the 'education-informational personhood' through schooling: school certificates, algorithmic processing of educational attainment, and the formatting of the students' background. By means of historical and current examples of these techniques, I highlight the weight of specific choices involved in the selection of formats for data production, processing and information sharing. Further, I address the reflexivity of information techniques in the informatics of the students' background, as these techniques perpetuate historical categories of social difference but are also used as a means for critical reflection of this perpetuation. I proceed with a discussion of the role of implicit mathematics as a formatting technique in education. Finally, I offer possibilities to resist, with the aid of mathematics, 'infopolitics' that operates by means of data and algorithms.

Keywords: education, sociology of quantification, implicit mathematics, algorithms, genealogy, infopolitics.

Infopower

In the introduction to his genealogy of the informational person, Koopman alerts us to Otto Neuraths 'Isotypes' (the international system of typographic picture education), an inter-translatable pictorial language associated with the utopia of information's universality. However, Neurath did not restrict this idea to the epistemic function of information (in the particular shape of logical positivism), but pursued a political utopia. When he wrote about his intention to "bring together all kinds of people", he envisaged a "pedagogy of the social sciences" that back translates curves and numbers to inform the public about unequal distribution of wealth, health,

housing, work, schooling, etc., based on empirical data.[1] The motto of his pedagogy was: "It is better to remember simplified images of quantities than to forget exact numbers" (Neurath, 1926, cited in Hartmann & Bauer, 2002, transl. EJ).

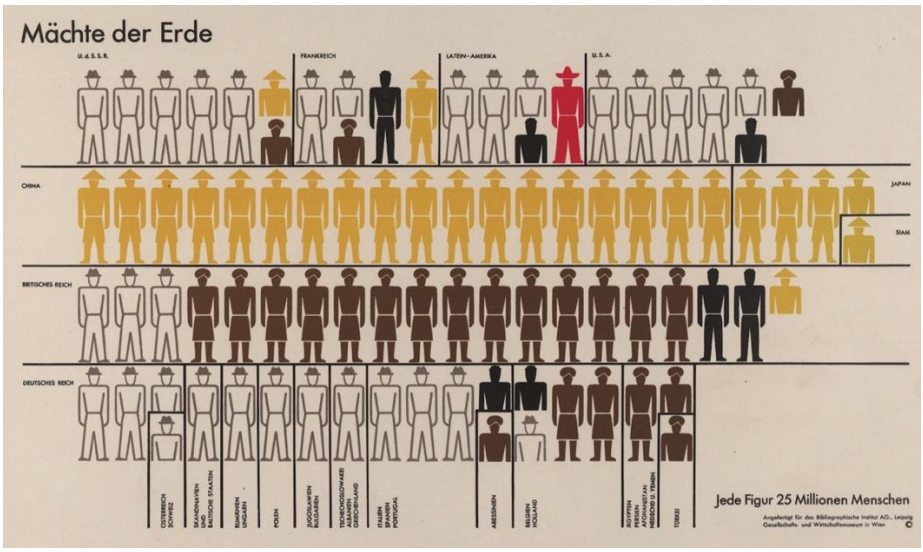

Figure 1. 'Powers of the earth' from the image-statistical primer by Gert Arntz and Otto Neurath (1930, p. 23). Copyright: Gesellschafts- und Wirtschaftsmuseum Wien.

Koopman argues that infopower in the form of an "informatics of race", which datafies and imports racial meanings into social practices, does not automatically represent "technological racism" (p. 113). Infopower remains normatively ambivalent: On the one hand, the "informatics of race" produces or accelerates political injustice, on the other hand, the very same techniques allow us to uncover discriminatory practices. In the context of Neurath's program, the diagram "Powers of the earth" with its racialized and ethnized icons (Fig. 1) may be an example of the normative ambivalence of infopower, rather than of "technological racism".

Koopman reasons that we became our own data through the operation of *infopower*, a layer of power that is both epistemic and political.[2] Data about ourselves, through binding us to their specific *formats*, pave the way for who we can become and dispose how we can act. The antecedents of the operational techniques of infopower are to be found in the "humble forms, plain cards, ordinary dossiers and unassuming documents" (Koopman, p. 155) that were assembled at large scale long before the advent of computer technology or data science. Through his genealogy of the massive production and use of person-related data, Koopman shows that their longer histories were fraught from the start.

[1] Neurath gave himself the title "Consulting sociologist of human happiness", when he worked as an adviser in planning a garden district for families with low income in Bilston (Hartmann & Bauer, 2002, p. 23).

[2] Koopman upholds that infopower is not captured by Foucault's regulating biopower, normalizing disciplinary power or sovereign power (p. 164 ff.).

Koopman locates the emergence of the "informational person" (p. 6) in the first half of the twentieth century in the United States, where he identifies significant early moments in the shaping of our present data-driven selfhood at a "time where America regarded itself as a world-universal project" (p. 32). Koopman argues that there is a particular "style of reasoning" affiliated with infopower, which relies on the production of ever more data (p. 159). Viewed from my perspective as a mathematics educator, this account is particularly attractive in view of the fact that it attends to specific techniques and devices developed for recording, organizing, transforming, displaying and storing data. These techniques evolved into quantifications subdued to a calculus.

Koopman's Foucauldian genealogy refers to three domains of identity: documentary identity, psychological identity and racial identity. In this essay it is impossible to do justice to Koopman's fascinating historical analysis of these three domains, for which he brings to light from the archives various examples of data-related techniques, such as birth certificate blanks, diagrams of definitions of personality, housing appraisal forms and redlining maps, complemented by astonishing examples from the accompanying bureaucratic, scientific and economic discourses.

Three genealogies of the informational personhood

As his first example, Koopman traces the emergence of "human bookkeeping" in the context of the large-scale introduction of standardized birth certificates, aided by volunteer networks of women's clubs, in the United States at the beginning of the twentieth century. Bureaucrats gave much attention to the design of the blank forms in their attempt towards standardization in order to avoid, for example, the scenario described by the Kansas state registrar that a "surging mass of data would be hurled upon us" and to overcome diversity of answers like "fine baby" or "yes" or "4 A.M." to the same question about health (p. 44). Less innocent data points comprised "legitimacy" of birth and "color" or "race" of parents. The birth certificate made it possible to "draw up persons as if out of nowhere" (p. 6) and pin down, make accessible and processable the infantile subjects exactly through these, and only these, data formats. But a missing document also decides who will never have existed. Following Koopman, the next stage of documentary identity involved the development of social security account numbers in the form of a numerical 9-digit code in the 1930s, with the concomitant challenges of harvesting and managing big data, which became aided by newly developed mechanical punch-cards machines (which occupied over an acre of floor space in the records office in Baltimore). The birth certificate, of course, was necessary for proof of identity, when applying for the number through an application form with sixteen data points to be filled in by about twenty-six millions of (eligible) workers.

Koopman's second example concerns the emergence of the "algorithmic personality" calculated by a rising cadre of psychometricians who attempted to measure various assemblages of traits in the form of indicators. Widely propagated concepts of personality, such as the Big Five/Six turn out to be an outcome of an information processing device developed hundred years ago around the *test* as its crucial element, most prominently targeted at intelligence and personality as the focus of World War I testing. In this context, an NRC-appointed Committee with the euphemistic title 'Emotional Fitness for Warfare' developed a pre-selection instrument, the 'Psychoneurotic Inventory', which Koopman identifies as the first personality test (p. 79). Later, Gordon Allport's and Henry Odbert's (1936) impressive list of 17953 items for personality traits clearly shows the necessity of using mathematics as part of the emerging psychometric apparatus in order to reduce and aggregate data for creating communicable outcomes. Koopman stresses how the format of the test, together with the algorithmic compilation of its data, allows abstraction from individuals and so its application to *any* of us. As to the style of reasoning, Allport characterized his test-data driven approach in an unexpected way: "In all probability, as has been the case with the study of intelligence, we shall be able to give reliable quantitative results before we understand the precise nature of that with which we are dealing" (Allport, 1921, p. 447, cited p. 84).[3] Koopman points to the centrality of standardization and its performative function: As with any unit for physical quantities, as soon as it is "rigorously standardized and portable tools for its measurement are furnished for use, the unit measured by the standards *becomes real*." (p. 84). With standardization of data-formats algorithms became a central element in the psychometric apparatus, which replaced "subjective narrative studies with the objective sheen of numbers, graphs and other informational tableaux" (p. 74).

In his third genealogy, Koopman excavates redlining as "segregating data" in the context of a wide network of racial datafication: in technical manuals and algorithms developed in the real-estate industry before they migrated into institutions of federal housing policy in the depression. Its pervasive impact can be made visible by comparison of the Home Owners' Loan Cooperation's maps if overlayed by current demographic data by means of geoinformatics (p. 109).[4] With this genealogy of redlining Koopman intends to add to the literature a "critical technical analysis" and underscore the interrogation of information techniques in order to highlight subtle layers of structural-institutional racism, which he refers to as "technological racism" (p. 113). By means of his focus on techniques, Koopman shows how the built-in technological racism that structures social practices, such as the algorithms of redlining, can persist even after disappearance of overt racist attitudes (p. 223, fn 28) with the most severe outcomes.

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[3] This comes close to the substitution of validity by reliability in present approaches in educational testing by means of IRT-models.

[4] The normative ambivalence and hence never neutral application of racialized data is clearly visible in this application for uncovering its own effect.

Formatting and fastening: How infopower operates

> Madeleine Swann: I see you left this final question blank: 'What is your occupation?'
> James Bond: Well, that's not the sort of thing that looks good on a form.
> Madeleine Swann: And why is that?
> James Bond: I kill people. (Spectre, 2015, James Bond)
> "If you have to leave questions blank on Schedule A, you should include a letter of explanation that says why it doesn't apply. This is so the officer doing your background check knows you didn't forget to fill it in." (Government of Canada, Help Centre, immigration application, Canada, Date modified: 2023-05-19).

While there is a level of complexity of the theoretical considerations offered by Koopman, which there is no space to capture here, I shall selectively pick out some key ideas. Koopman pays particular attention to the *formats* as part of an "assembly", which operates beyond what is being explicitly communicated. These "formats dispose rather than coerce" (p. 159).

Throughout his genealogy Koopman instantiates the key notion of *infopower*, which he sees exercised through *formatting* and *fastening*. The three historical accounts reveal disparate instances of *formats* that focus the manufacture, processing and distribution of information: the birth certificate focuses on the production of data, measuring personality on information processing, and the genealogy of redlining focuses on the outcomes. One easily recognizes the disciplining function of the blank form (be it a bureaucratic 'Formular'[5], a psychometric questionnaire or a multiple-choice achievement test) through designations of categories to be selected, questions to be answered and meta-text about how to fill in the form properly, as well as sanctions in the case of incorrect data or formal invalidity.

For Koopman, formats appear at different levels: (i) formats of input data (e.g., name, sex, race, weight and legitimacy of baby; structured personality traits in test items; characteristics of a property that lead to addition and subtraction of value), born out of the necessity of regular and accurate accounting, (ii) sets of routines and disciplined methods – formats – for data storage and handling, (iii) formats established through information sharing norms (specific displays, graphs and diagrams; a 'certificate' might also be thought of a specific format of an outcome of a process). Standardization of these formats constitutes specific informational techniques. As a consequence, the emerging and initially flexible objects of information about persons, which are incorporated in the techniques, become *fastened* to their particular formats that eventually dispose (enable and restrict) what we can *do* and who we can *be*. *Fastening* indicates a double sense of pinning us

[5] Interestingly, 'form' is a homonym in English for two different meanings, for which there are different German words, one of which is 'Form', meaning 'form' in the general sense, while the 'form' that one fills in, is a 'Formular'.

down and of accelerating the process, to which could be added that it does so unequally. Speeding up is particularly obvious in current examples that are based on computerized algorithms in the context of 'big data' and its discourse of overcoming the limits of human perception and capacity.

The infopower of school discipline and attainment

I find it tempting to propose a genealogy, in the footsteps of Koopman's, of how the subject becomes formatted and fastened by educational data that constitutes the informational person in the context of public schooling, the "edu-informational personhood", as it were. Take the example of certification of deportment and attainment in school reports, which are "not mere externalia attached to us from which we might detach our truer selves as we please, but are rather constitutive parts of who we can be" (p. 8).[6] The educational personhood is part of the documentary identity, but also of the datafication of mind as an expansion of our psychological selves. Not only has psychometrics come to "define the futures of school children shown by these instruments to be neurotic or aggressive" (p. 179), but the techniques of the standardized test and the operational schemas for diagnosis migrated from educational psychology to educational achievement tests and centralized state examinations. New fields of study have been established by similar tactics of affiliated experts to secure "for their fledging field of research the status of science" (p. 179) and make "plausible the idea that these informational instruments were telling people something true about themselves" (p. 78). When standardized measures of attainment are charged against data of student backgrounds, this informatics associates educational selves with racial, ethnic, cultural and class identities. For making more tangible my proposal of a genealogy of the "edu-informational personhood", I have selected from the archive (retroactively produced through the internet), some examples of the "informational mechanisms" (p. 20) associated with Koopman's domains of identity. In view of my focus on the particular aspects of infopower, which rely on techniques that involve quantified categories and evolve into algorithms, some specific details will be needed.

School certificates are prominent elements of our "lifelong paper trail" (p. 6) that Koopman sees inaugurated by the birth certificate. A Koopman-style genealogy should look at the point when data-infrastructures were sufficiently established as a condition for a large-scale introduction of education certificates and attend to *specific* modes of standardization of grades. Further, and more in line with Foucault's notion of a *dispositif*, it is important to look for the strategic function of responding to an urgent need. Even a cursory look into the history of school certificates reveals the transportability of formats and their diverse political functionalities.
In their history of grading in public school in the United States, Schneider and Hutt (2014) see standardization as a key technology of educational bureaucratization in

[6] Not only students but also teachers and their grading practices became an object of interest in educational infopolitics, e.g. regarding 'grade inflation'.

the context of mass schooling connected to similar movements in industry as a consequence of mass processing of trading goods, expanding national (labor) markets and synchronization in the face of mobility of the population. At the beginning of the twentieth century, modelled by the psychometricians' apparatus, policy-makers and school leaders sought for alignment of techniques. As to the formats, the history reveals imports from England, but also a particular attention paid to the practices of Prussian schoolmasters. In comparison, a genealogy of Prussian school certificates would reveal their emergence with the dominant model of selfhood being 'character'. The first type of large-scale school reporting in German states occurred mid nineteenth century, which in turn was only possible after perfectionating an emerging data infrastructure in the form of the population registration system. While elementary school reports became a widespread instrument for monitoring and ensuring adequate school attendance for all children, the main function for secondary school leaving certificates, in a context of imperialism and militarism, was to secure the quality of civil servants and to exclude politically unwanted candidates from universities.[7]

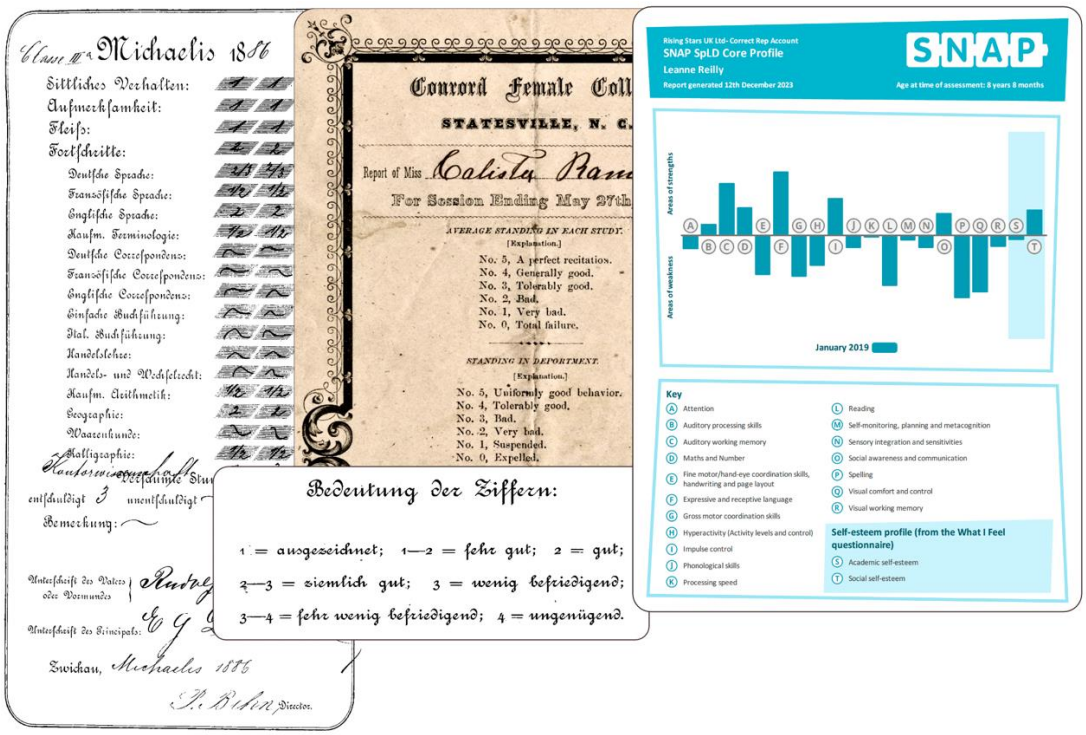

Figure 2. a) Report from the Handelsschule Zwickau 1886. Source: Zeugnisheft, Handelsschule Zwickau, 1886-1888, courtesy of Klaus Friedrich Pott, Geschichte der kaufmännischen Berufsausbildung [history of commercial training] at https://klaus-pott.de b) Bedeutung der Ziffern [meaning of the numerals] on the report from the Handelsschule Zwickau. c) Report Card from Concord Female College 1863. Source: J. G. Ramsay Papers #1568, Southern Historical Collection, Wilson Library, The University of North Carolina at Chapel Hill. d) Example of a child's Core Profile generated with SNAP-SpLD (Special Needs Assessment Profile- Specific Learning Difficulties) Copyright: Hodder & Stoughton Limited 2019.

[7] "Oversupply" of graduates from the German Gymnasium instilled a public debate about the recruitment of an administrative and political elite in the face of a perceived threat of the "breeding of an educated proletariat dangerous to the state" (Chancellor Bismarck in a letter to the German emperor, 1890, cited in Bölling, 2010, p. 18)

The formats from a commercial school in Saxony in 1886 (Fig. 2a and 2b) and a female college in North Carolina in 1863 (Fig. 2c) show an emerging standardization and numerical codification with captions for their conversion into linguistic categories for valuation. The report-selves from the North Carolinian school can consist of thirty-six combinations, twelve of which are negative valuations (bad, very bad or total failure for achievement, combined with bad, very bad, suspended or expelled for deportment). In the German example the numerals (Fig. 2b) translate into excellent (1), very good (1–2, 'one to two'; noted with a slash in the report), good (2), tolerably good (2–3), less satisfactory (3), considerably less satisfactory (3–4) and unsatisfactory (4). While the German evaluative attributes are more abstract as they are used for both achievement (progress [Fortschritt]) and deportment (comprising moral behavior [sittliches Verhalten], attentiveness [Aufmerksamkeit] and diligence [Fleiß]), in the U.S. report the numbers appear more aligned with the idea of measurement of higher and lower levels (including a grade 'zero').

Standardization of evaluative attributes and formalization by means of numbers, as reflected in school reports, aims at consistency of evaluations over time for comparing progress. The underlying logic resembles what Desrosières (2001) identified as the pragmatic "accounting realism" of bookkeeping, which is based on a shared trust in the 'reality' of the numbers used. In line with this logic, the example of the "core profile" of Lean Reilly (Fig. 2d) visualizes strengths and weaknesses in the style of a vertical positive-negative bar chart (although without a unit) as used in financial statements (e.g., sales minus targets) that allows tracking of data for reviewing a pupil's progress. It is digitally generated by a tool, the Special Needs Assessment Profile-Specific Learning Difficulties (SNAP-SpLD; Weedon, Reid & Ruttle, Hodder & Stoughton Limited, 2019), which quantifies the evaluations given by school personnel or parents based on their answers to Likert-scale questions on frequency of behavior in eleven categories and voluntary diagnostic probes[8]. The tool produces combinations of 20 'specific learning needs', 17 'social, emotional and behavioral needs' and specific 'barriers to mathematics learning', which lead to suggested interventions to choose from, school and home reports written by an algorithm as well as automated comparison of reports. The widespred application of (statistical) processing techniques to psychometric data and achievement-metrics aspires to imitate the natural sciences and inherits what Desrosières (2001) describes as "metrological realism" that assumes to achieve reliable metrics independent of its measurement apparatus. Now this form of realism appears to merge with the much older logic of the "accounting realism" of measuring progress towards outcomes in school reports.

[8] For the additional probes an age norm is mentioned and there are links to information and literature suggestions.

Infopower operating through current educational assessment technologies, social media or classroom surveillance platforms[9] fastens teachers, school personnel, parents and students alike as they dispose both what they can do and who they can be in the context of the classroom and in their accelerated school-related interactions with regard to the formatting of the child. Moreover, procedures for easy storage of ever more data and reports decide over what will be remembered from every individual student. The claimed disembodied expertise of computerized interactive diagnostic tools and learning analytics appear to resonate with the general promise of algorithms to bypass subjective interpretations and eventually overcome imperfections and limitations of human judgement. A new "psychometric realism" emerges in the context of 'emotion detection' (Williamson, 2021, p. 361) when neuroscience, behavioral economics and biomedical fields join psychology in producing new forms of psychometric evidence. Specialized fields have emerged that manufacture different components of the edu-informational self.[10]

The informatics of the students' background and the functioning of schools

As to the informatics that produces a social geography of schools[11], which I attempt to trace, it is important to recognize the normative ambivalence of infopower. What I intend to show is, that in a similar manner as the cognitive ability became essentialized as difference in student potential by an 'informatics of the mind', the background of the student body of a school became the essence of differences in potential of the school. The formatting techniques of infopower achieve this through algorithms for detecting 'overachieving students' or 'overachieving schools' by comparing the outcomes 'expected by chance' (and not by institutions) with actual (school) outcomes measured by standardized reading or mathematics achievement tests.

An early study using racialized informatics of student background, which perhaps inaugurated the overall technical approach, I found in a report by Fetters, Collins, and Smith (1968) with the humble sub-title "Technical Note Number 63 for the Office of Education". The authors attempted to identify and characterize underachieving and overachieving elementary schools in using data from the Coleman report, for which they created two lists of schools: "Hence it is clear that in order to determine the effect of purely school-related factors on a child's achievement, we must find out how

[9] See for example Manolev, Sullivan and Slee (2019) on a school-based social media platform; for mathematics education see, for example, Jablonka (2017a).

[10] I am indebted to the reviewers for drawing my attention to the work of Ben Williamson and for their astute comments.

[11] The label 'inner city school', as far as I can know, is associated with a range of deficits in the context of structural disadvantages, comparable to schools that in Germany have more recently become labelled 'Brennpunktschulen' ['hotspot schools', literally 'focal point schools'] in public discourse.

much better or worse he did in the achievement test than other children *with similar backgrounds*" (p. 2, emphasis in the original).

The student "background" was formatted through a questionnaire with around 50 questions about age, sex, race, ethnicity, their homes (e.g., stepfathers, grandfathers, fosterfathers), status, parental interest, attitudes, motivations and aspirations. The answers to these questions were used to calculate, by means of regression techniques, the expected verbal scores of almost 112000 students, compared to their actual scores to obtain "a student's achievement differential" and, as their average, a "school's achievement differential".[12] By comparison of students' differentials within and across schools, the authors sought differences in "school quality" (the proportions that did not depend on students' background), which indeed were found.

There are two important points I would like to make regarding the informatics of the students' background in this inaugurating example. The first relates to the performative role of the algorithm in the formatting. This is an effect that cannot anymore be seen as easily with current data technologies, in particular not with machine learning. Here, the authors explicitly state that the number of interaction terms in their regression model is limited by computational capacity of the available computer software. As a consequence, they developed "two separate prediction equations, one for whites, the other for non-whites using an interaction-free model for both groups." They also state that "Oriental-Americans were included with whites since their test scores are more like those of whites than those of Negroes or other minority groups." (p. 24).[13] The second point concerns standardization: Regarding the formats of data input, the authors state that many "could have been formed or scaled differently; it is doubtful that any two persons would agree completely on these matters." (p. 25-26). Meanwhile the rapid expansion of applications of statistical methods in educational research entailed a standardization of formats for data input points, which eliminated the possibility of such methodological doubts. The process mirrors what Thevénot (1984) analyzed as an 'investment in form': Standardization of categories and of rules for their application, their translation into numbers and the application of standardized procedures for their compilation and presentation establishes unconfined formal equivalence and allows for mass production and management of such numbers that guarantees 'results'.

The current informatics of the students' background in the context of international or national achievement testing in many European countries and the United States format 'background' through employing a range of 'data input points' (to use Koopman's term), including race, ethnicity, gender, family language, migration status,

[12] As "achievement" they used the student's scale scores on a 50-questions multiple-choice test with sentence completions and synonyms, which itself is obviously biased, but the procedure would be the same, if this were not the case.

[13] The model for white students had 76 predictor variables, one of which was for race; the model for non-white students had 79, four of which were for race.

culture and socio-economic status. Comparisons, more aptly described as "gap gazing" by Gutiérrez (e.g., 2008), usually reveal average achievement differences between these backgrounds (of students or schools) and a majority (of white, male, middle class, non-immigrant students of the dominant cultural or linguistic groups), and if not, the technical apparatus evident in the example sketched above is used to explore the particular conditions of a school that lead to their "overachievement" (e.g. under the label of 'school quality' as a tactics of 'evidence-based education'). In consequence, despite the deployment of the informatics of the background in pointing to inequalities in education, the import of racialized, culturalized, gendered etc. data renders them normatively ambivalent.

Resisting infopower with the aid of mathematics

With the now genealogically sharpened gaze directed to the informational techniques that have come to fasten our (educational) selves, there emerge three important aspects regarding the role of mathematics, to which I turn in the following.

The first observation concerns the crucial step of changing data points entered by means of language into numbers, which in turn allows algorithmization of the operational schema for information handling. This mutation is tangible and accessible in the history of school grades; it did not necessarily include standardization across schools or contexts. In the example of the diagnostic tool, an algorithm converts the numbers back into information addressed to school personnel and parents. However, formats of information sharing need not include back-conversion into language, which is most obvious in the widespread use of numerical grades and their aggregates as seemingly durable measures of school achievement.

The second point concerns the migration of data formats and algorithms across contexts, which is conditioned by the transcription of data into numbers because it abolishes the need to use different specialized techniques of processing and displaying information in each context. The objectified and materialized formats can travel across contexts, can be repurposed and transported into new technologies. Once selected, fastened and standardized, the torpor of these ready-made formats inhibits creativity in developing new formats. Take the example of the complex task of converting descriptions of social status and economic income or wealth of family (consisting of more than one person) into a measure of students' background (e.g., Ensminger and Fothergill, 2003). In international comparative mathematics and science achievement studies, the same format has been used repeatedly and internationally: The PISA index of economic, social and cultural status, originally intended for wealthy OECD nation-states, "combines into a single score the financial, social, cultural and human capital resources available to students". In particular the questionnaire items including examples of "home possessions" and access to mobile phones raise challenges of comparability across time and contexts, as noted in the

report (OECD, 2019, p. 52). But who looks at details in technical reports? The portability and repurposing of formats of data generating and processing is also exemplified by the migration of testing techniques from psychology into education.[14] Their format, however, is not suitable for assessing the common learning experiences of students across schools, as their construction aims at maximizing differences between individuals while at the same time minimizing the number of items; this process demands excluding all tasks that do not sufficiently discriminate test-takers. Koopman's notion of infopower as a layer of power that is both epistemic and political, reminds us to look at the constitutive effect of any particular selection of substance and format of tests for creating achievement differences for particular groups of students (Jablonka, 2016). This is their political effect.

This leads me to my third point about the weight of formats in the creation of new realities about ourselves. Koopman's genealogy shows the long history, complexity and contingent nature of *selections of formats*, including accidental details. These then become the condition for quantifications on which mathematical algorithms can be performed, which then produce ever new numbers. A focus on techniques reveals how officers, technicians and designers of forms and questionnaires *create* these formats. Numbers "create new things and transform the meanings of old ones", as Porter (1995, p. 17) reminds us in his history of quantitative and standardized forms of measurement in the United States and Western Europe. In this context it is important to note that data or information without reference to a theory or discourse does not constitute knowledge. As Desrosières (1998) shows in his genealogy of emerging statistics about people, the relation between theory and data indeed has been interpreted differently in various discourses.[15] Koopman emphasizes that informational techniques, rather than being viewed as only aiming to represent something already there before (that they will always fail to capture fully), should be looked at in their function of formatting and stabilizing our informational selves.

Infopower operates beyond what is being explicitly communicated – as Koopman reminds us. In its computerized forms it constitutes a layer of implicit mathematics embodied in technology, with the experts' formatting labor disappearing in their surrogates (Gellert & Jablonka, 2009). Mathematics education might help in unlocking and confronting information presupposed in communication through asking: "How is it formatted? What burdens and benefits are embedded in those formats?" (Koopman, p. 187). These questions resonate with the agenda of critical

[14] And the algorithms associated with person-related 'big data' have indeed been designed in other fields (e.g., control engineering, image recognition, econometrics, epidemiology, medicine, genetics) and became repurposed for producing data about persons.

[15] With the refinement of informational techniques, mathematical techniques have co-evolved (Desrosières, 1998), now available as packaged computerized algorithms, comprising both methods based on theoretical-mathematical analyses and others that operate purely computationally (Gelman & Vehtari, 2021). The development culminates in data-driven computational approaches, such as data "mining", "dredging" or "snooping" and processing by meta-algorithms, including "machine learning" to create knowledge about ourselves (Jablonka, 2017b).

mathematics education that appropriates mathematical techniques to help students recognize the social conditions that influence their lives (e.g., Frankenstein & Powell, 1994; Gutstein, 2006; Powell & Brantlinger, 2008; Skovsmose, 2023). Further, interrogating the tools that shape students' educational selves can widen the repertoire of communications about methodological standards, while alerting to the larger social contexts within which statistics and mathematics is used in line with suggestions made by Appelbaum and Davila (2009) or Fish and Persaud (2012).

Suggested by the reading of Koopman, a focus on the productive function of formats in creating new realities, away from (mere) attending to what has been omitted in quantifications and mathematical models, opens new paths to be pursued. Stressing the performative function of the mathematics-aided informatics of the educational person, which bring into being the realities that they set out to describe, may assist in escaping the fastening of teachers and students to measures of achievement and to overcome the impediments of the "assessment stance" with its limited conception of equity (Appelbaum, 2019).

Koopman's account of the normative ambivalence of an „informatics of race" (and ethnicity, gender, family language, migration status, culture and socio-economic status, …), exhibits the reflexivity of information techniques, which on the one hand operate as medium of producing social subjects formatted through importing racial or other categories of social difference into new social practices, while on the other hand the same techniques operate as a basis for reflection on the results of this very process in pointing to their injustice, such as in studies of social (in)justice in mathematics education. In generally avoiding the practice of fastening students to their backgrounds (instead of their foregrounds) I propose to restrict our use of those categories, if any, to the purpose of critical reflection.

If information sustains the status of the unquestioned presumption that Koopman concedes to it, resistance indeed can only operate from within: "a resistance to *this* kind of fastening, a resistance to *that* kind of canalizing and accelerating", which would be a resistance of occupation, contestation, and transformation (p. 193).[16] Mathematics classrooms might be the place for teachers and students to attend to the political work of formatting through creating opportunities for alternative designs at the level of micro-techniques, as for example experimenting with alternative formats of "data input points" (e.g., of multiple-choice questions, of student background data), responding to modes of how data are formatted and processed by algorithms through experimenting with simple unplugged examples (e.g. algorithms used for rankings) in order to irritate and destabilize existing formats of reporting and

[16] Mathematical and statistical knowledge itself obviously helps in subverting formatting through *specific* assessment techniques: In a conversation with a group of high achieving mathematics students in Tornio, Finland, who faced their upcoming matriculation examination that (at that time) used relative grading based on a normal distribution, they had the idea of campaigning to convince their high achieving peers to not give their best so as to keep down score limits for all students.

to recognize that there will always remain ambiguity and entities that resist categorization.

The present work of the formatters is the history of the possible futures of the formats through which we will conduct ourselves. But how can we know whether we will be in a position to recognize our data, if they have become something that ceases to be a singular event in time, if data are not entered into a machine as given categories, but taken by sensor-systems without human interference?

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