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The arithmetic of the meanings. Qualitative comparative analysis in the
sociology of education

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Introduction

The world of school and education is a diverse world. Seen from the perspective of research methodology, it seems to be populated by a multitude of data communicating and data generating organisations. The school is, of course, populated not by data communicators but by students and teachers who generate a wealth of unstructured, qualitative, textual data in their daily activities. The almost incomprehensible volume of documents is accompanied by qualitative data brought to life by the researcher's interest: observation diaries, informal reflective journals, open-ended questionnaires and unstructured or semi-structured interviews generate the primary data available on the world of education.

Research methodology has responded to the abundance of unstructured, qualitative textual data with a separate field from data mining, which has built up its own toolbox for structuring and modelling textual data under the names of text mining, text analytics and, more recently, natural language processing (NLP). The principle is always the same: to structure qualitative (textual) data so that it is available in a structured (quantified) form for analysis by mathematical operations. These methodologies are all quantitative in their approach, aiming for high reliability and external validity, but always at the cost of information loss. Some of the specific richness and depth of meaning is necessarily lost here, because these methodologies cannot compete with qualitative analyses carried out by the researchers, nor is this their aim.

The subject of our thesis is the qualitative comparative analysis (QCA) and its possible applications in education. It is a research-methodological dissertation, which aims to understand, present and apply as deeply as possible a new research-methodological analytical tool in the domestic educational discourse that can be applied to qualitative data. We will try to analyse as deeply as possible, going back to the mathematical (Boolean-algebraic) foundations, the algorithms that provide the steps of QCA, in order to help understand the methodology and to define its applicability. In addition to the novelty of the methodology, the topicality of the subject is justified by the abundance of qualitative data, which is as much a feature of education as of other fields of social science. In addition to its research applications, the scope of which this thesis seeks to define as precisely as possible, QCA is also relevant from a pedagogical point of view. It is a multi-step, algorithmic research methodology, which can be taught and practised in small sample studies: students can generate and analyse the textual data themselves. From an educational point of view, it is advantageous because it allows the full spectrum of research methodology, from data generation to advanced analysis,

to be demonstrated, thus moving the teaching of research methodology out of the sterile world of sample exercises on generated data. The analysis process is based on Boolean algebraic operations and the implementation of the analysis algorithm is far from trivial. It is a complex, multi-step algorithm that can be performed "by hand " (even on your own generated data) for a small number of conditions. In our research, we have followed this path, hoping to provide a tool for research-based teacher education for those committed to this new paradigm of teacher education. The importance of research methodologies, the algorithms for the production of scientific claims, from the point of view of science policy and university pedagogy can hardly be overestimated for the Hungarian science of education. Their consistent cultivation and teaching ensures the place of educational science alongside economics and sociology among the social sciences. Without research-methodological progression, educational science would have remained an ideology of practice.

Structure of the thesis

The epistemological problem of the structure of the thesis was that we had to introduce the theory (and indeed the meta-discourses) of a research methodology (the QCA) without defining the research methodology itself in advance. The chapters on general research methodology theory therefore precede, and the chapters on quantitative and narrative psychological content analysis follow, the chapter on qualitative comparative analysis. The reason for this is our preferred deductive structure, moving from theoretical concepts to their application.

The structure of the dissertation is thus deductive, conceptualising our subject from the perspective of research methodology theory, and then, after explaining the specific topic (QCA), we turn to the possibilities of application, also demonstrating the combination with narrative psychological content analysis. We preferred deduction based on the Luhmannian social theory (Bangó 2004, Brunczel 2010, Luhmann 1999). We consider modern society as a society of functionally differentiated, self-referential subsystems, one of which is precisely the science. The self-referentiality or autopoiesis of science does not imply introspection or anti-empiricism, but simply the requirement that our concepts be derived from the science. The concepts that have entered the scientific canon have previously passed some kind of test of the communicative rule that fundamentally organises scientific communication, the true/false binary, which of course does not mean that we should accept them uncritically.

In the first main chapter of the dissertation, we reviewed the characteristics of qualitative research. Qualitative comparative analysis is analysis on textual data, but the name is misleading. To distinguish it from qualitative research, we first had to consider the characteristics of qualitative methodologies. In the second main chapter, the methodology itself was discussed in detail. In the third chapter, the possibilities of inter-methodological combinations and the use of QCA were explained. We analysed semi-structured qualitative interviews using the methodology and applied a subtype of the methodology, crisp set QCA (csQCA).¹ Both our data and our subject belong to the field of sociology of education. The interviewees are disadvantaged university students, and in the interviews with them we identified regularities in their socialisation path. In combining the methodology, we demonstrated the link between QCA and qualitative and narrative psychological content analysis. Based on the thesis statement, all this is perhaps not trivial: that's why we recommend the reader our work.

Methodology and subject, research questions and hypotheses

The theoretical part of our research is meta-research, our subject is a research methodology. In the theoretical chapters our methodology is the hermeneutic circle. Nothing more unusual than this in a social science thesis, yet we cannot claim otherwise: throughout the thesis we have followed a circular, iterative process² of shifting focus between the part (our subject, the QCA) and the whole (the research methodology theory), which we hope leads to an understanding of qualitative comparative analysis. This lead is not an outcome but a process. The application is twofold: we apply theoretical concepts to our object, thus we are dealing with the third (and returning) part of the hermeneutic understanding-interpretation-application, and then we apply our object in an empirical research.

The other methodology of our research is qualitative comparative analysis, applied to semi-structured qualitative research interviews (n=25). The application aims at exploring the socialisation characteristics of disadvantaged students in the accidental sample (Sántha

¹ There are four types of QCA: crisp set (cs), fuzzy set (fs), multi value (mv) and time series (tc) QCA. The crisp set QCA works with binary/Boolean/Qualitative conditions, and in this paper we will discuss this in detail and with applications as far as possible. The other types are not the subject of this paper.

² The notion of the hermeneutical circle and its conceptual change is not our subject, a good introduction to the extensive literature on the topic is Károly Veress (2019).

2006:77) in terms of preschool attendance, family and school support (primary and secondary socialisation arenas). The methodology was applied manually with three conditions.

Our further research direction was a combination of QCA and narrative psychological content analysis. It is indeed a combination, and not simply a matter of analysing the same data (interview transcripts) with different methodologies, always at the risk of obtaining non-comparable results on different subjects. Nominal variables are constructed from the intermediate results of qualitative comparative analysis. This will be the variable for the interviews (as units of observation), to which we will add another variable according to a type of narrative psychological content analysis.

Our subject is the application of qualitative comparative analysis in the sociology of education (theory). The empirical part of the research will focus on the socialisation characteristics of the life paths of disadvantaged students based on semi-structured qualitative life path interviews (praxis). The theses of the paper address these theoretical and empirical research topics. The claims of the empirical part refer to the students in the accidental sample, the research is not representative.

The novelty of the thesis has two sides: on the one hand, we have placed qualitative comparative analysis in the context of research methodologies by applying relevant concepts and inter-methodological comparison, and on the other hand, we have applied it to new data by methodological triangulation.

Our research questions and hypotheses:

Theory (research questions)

1. What is the difference between qualitative and quantitative research methodologies?
2. What type of methodology is QCA? Where does it fit in between research methodologies?

The intermethodological research questions are:

- 2.1 Where does QCA fit in the space of expectations about methodologies, i.e. how does it stand in terms of reliability and external-internal validity?
- 2.2 Is QCA a quantitative or qualitative methodology?

2.3 Is QCA a variable or case-oriented methodology?

2.4 How does it relate to the basic forms of scientific research logic, deduction and induction?

2.5 Is QCA an idiographic or nomothetic methodology?

3. What is QCA suitable for? What types of social science questions can be addressed using QCA as a research methodology?

The third question led me to the research questions and hypotheses of the practice:

4. What are the conditions for successful admission to higher education for disadvantaged students in the sample studied?

5. Hypothesis H1: The cases of social mobility in the sample have systematic life paths: most of them are characterised by pre-school participation, parental and teacher support. "111" will be the most frequent row in the hypothetical truth table. The minimum formula for successful university admission in the sample analysed can be determined.

6. Hypothesis H2: A higher proportion of categories of secondary thinking processes according to the Hungarian Regressive Imagery Dictionary (Martindale 1984, Pólya-Szász 2013) will be found in the analysed corpus.

Results

Qualitative comparative analysis is an analytical, variable-oriented, nomothetic, quantitative methodology, suitable for the analysis of texts and the Boolean-algebraic determination of the conditions of social phenomena in both deductive and inductive research. Its external validity is a function of its sample.

By performing QCA, we obtained the minimal formula of the primitive term prescribed by the hypothetical truth table: $Y=T+kP$. This minimal Boolean term is the result of a qualitative comparative analysis based on interviews with college students, which in our research provides information on the socialization history of successful university admission. We could classify most of the interviews under configuration 8th, i.e. „111” cases, which was our hypothesis H1.

According to the minimal formula, the presence of teacher support (T) or parental support (P) is a sufficient but not necessary condition³, the latter being a sufficient condition even without explicitly attending kindergarten (k). The consistent reflection of the role of parents and teachers in the life course interviews and the co-occurrence of both socialisation phenomena demonstrate both the crucial importance of the supportive environment and the systemic nature of the life course of those who achieve higher education.

Based on the de Morgan's laws, we have prescribed the complement of the minimal formula for outcome non-completion:

$$y=t(K+p)$$

$$y=tK+tp$$

According to the complementary formula, the students in the sample would not have entered higher education with only preschool attendance or without parental and teacher support. This highlights the importance of parental and teacher support in the sample and in the period under study. It is crucial for the interpretation of the result that the students in the sample did not have compulsory kindergarten education from the age of three during their childhood, so that the result does not in itself imply a small role for kindergarten education, but rather the countervailing role of parental and teacher support. The conspicuous lack of a role for nursery

³ A sufficient but not necessary condition in the causal sense of the term, following Ragin (2014:100).

education is, on the basis of this study, only a life course specificity, linked to the earlier characteristics of the regulatory environment.

The relative frequency values for the categories of the Regressive Imagery Dictionary were generated for our corpus of 25 interviews using Wordstat 8 software, only the student responses were included in the corpus. The proportion of content classified in the categories of secondary thinking processes relative to the size of the corpus was 11%, and the proportion of primary thinking content was 4%: this was our hypothesis H2, in which we assumed a higher presence of secondary content.

The results reported in this thesis, which are encapsulated in the minimal formula, are not surprising: disadvantaged university students were certainly helped in their accumulation of cultural capital by parental and teacher support. Their presence, element by element, would be a trivial hypothesis if we think about the students' life histories. The evidence of their co-presence, even if not in a representative sample, draws our attention to something very important: the systematic features of the life course of disadvantaged students, and indeed the fact that these systematic features exist. It seems trivial but in fact it's a very important issue, both theoretical (or even ideological) and practical, determining the allocation of resources to the institutions of social mobility.

The author's paper on the subject was published in 2016 in *Educatio* under the title *Systematic life paths* (Galántai 2016).

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