The emergence of computer-assisted qualitative data analysis in the Hungarian educational sciences between 2010 and 2017

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Abstract

The main objective of this research is to reveal the current state of computer-assisted qualitative data analysis in Hungarian educational sciences on the basis of specialized literature that appeared between 2010-2017 in Hungarian-speaking areas. Data were obtained by using qualitative content analysis with a combined (deductive and inductive) logic. A list of codes was set up, and a priori coding was used. This was followed by an inductive analysis of the deep layers of the text segments. The results had been obtained in the following areas: information about software functions (1), using several types of software in the same qualitative analysis (2), and the relationship between courses in educational science and computer-assisted qualitative data analysis (3). The research has made it possible to draw parallels between the Hungarian qualitative methodological repertoire and international trends.

Keywords:
Computer-Assisted Qualitative Data Analysis
Hungarian Educational Sciences
Software functions

1   Introduction

The methodological approach of research in the Hungarian educational sciences was characterized by an intensive change in the last fifteen years, the widespread use of the qualitative methodology contributed to the multi-faceted study of pedagogical problems. Since the 2000s there have been several studies in Hungarian educational sciences that are based on the theoretical and practical elements of qualitative research methodology, or ones that put these in new contexts. There have been qualitative studies focusing on teachers' activity, reflective thinking, beliefs, and also works treating school development.

The aim of this research is to explore the current situation of computer-assisted qualitative data analysis on the basis of specialized literature (periodicals, books and abstracts) published between 2010-2017 in Hungarian educational sciences. We are looking for answers to the question what the relationship between international qualitative methodological trends and Hungarian qualitative research methodology is, with a special attention to computer-assisted qualitative data analysis appearing in research in educational sciences.

Recently, the role of computers in processing non-numerical data has become more important. Computer-assisted qualitative data analysis is not the only qualitative method but it covers a variety of data processing techniques: it offers a possibility to code data, to create memos, commentaries, variables, or to perform various searches, use links, use elements of content analysis, and build networks.

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2   Historical Background

It is beneficial to start the tour of Hungarian qualitative pedagogical research methodology by putting the qualitative methodology into its international environment. The research carried out in Hungarian pedagogy in the late 19th and the early 20th centuries was characterised by trying to find new ways: descriptions were published and problematic areas were defined about schools, including work on assessment or educational topics (Kemény, 1934). The 1960s and 70s were characterised by quantitative studies in Hungarian educational sciences. The opposition between the quantitative and qualitative paradigms was not prominent as there were only large sample studies based on statistical analyses. In the late 1980s some publications using qualitative methods were published, some of which included analyses of video recordings of teachers at work (Falus, 1985), or a paper focusing on the appearance of the ethnomethodological approach in pedagogy (Szokolszky, 1986). In the early 1990s some more papers using qualitative techniques were published (E. Szabó, 1997; Szabolcs, 1999), but the real breakthrough in qualitative research methodology in educational sciences came in the 2000s. At this point, a significant change came both in theory and practice, and several books and papers focused on the latest international trends. The efforts made in the late 2010s can be traced in the solidification of methodological background, the spreading of computer-assisted qualitative data analysis, and the combination of the quantitative and qualitative paradigms, also known as 'mixed methods'.

The results of studies discussing the development of qualitative pedagogical research methodology (Sántha, 2009; Sántha, Katonáné & Subrt, 2017) reflect the progress achieved by the qualitative methodological repertoire from the beginnings. These studies pinpointed that the spreading and implementation of theoretical writings about the theoretical and practical elements of qualitative research methodology can be dated to the early 2000s, so this period can be seen as the initial phase. It is this period when studies based on qualitative methods and papers discussing the theoretical and philosophical background of the qualitative paradigm began to appear in the discourse of Hungarian educational sciences and peer-reviewed conferences. The first steps were made amid scepticism coming from people in the profession. Fifteen years ago Hungarian experts predicted that in qualitative educational science methodology the following elements would have influential roles: technical terminology (e.g. triangulation), different qualitative methods in empirical research, computer-assisted qualitative data analysis and a demand for mixed methods. The last fifteen years witnessed a fast development in the world of qualitative pedagogical research. The international background is immense, so the foundation and development of a Hungarian qualitative pedagogical methodology was a huge task. The pursuit of the systematization of qualitative methodologies presented internationally found its way into Hungarian educational sciences as well, but the "qualitative revolution" which refers to the fundamental changes in qualitative methodology as suggested by Corbin & Strauss (2015) can also be seen as an internal revolution but can hardly be seen in Hungarian discourse about qualitative methodology. Finding the position of computer-assisted qualitative data analysis in Hungarian educational sciences can contribute to finding solutions to problems, and to illuminate the position and unsolved problems of this field. This positioning is even more important because a rapid development in our broader geographical region (cf. development in Polish or Turkish qualitative methodology) can be witnessed.

Computer-assisted qualitative data analysis dates back to the 1990s. The notion was first introduced to international science by Nigel Fielding and Raymond Lee (Fielding & Lee, 1991). In the 1980s several programs were developed by independent teams (e.g. Aquad, Ethnograph, NUD*IST) that served as instruments of processing qualitative data corpora. Later, partly as upgraded versions of these programs, partly as new, innovative developments, researchers developed new software, which were capable of processing multi-coded data (texts, pictures, audio and video) and network building, and which are still in use today.

The great triad of the 2000s and our days are Atlas.ti, MAXQDA and NVivo (Cisneros Puebla & Davidson, 2012), the „mainstream" (Seale, 2010), which enable both textual (coding) and conceptual (network building) work. These programs are entirely based on the theory of qualitative approaches, and besides structuring data according to categories they also help the comparative analysis of these categories.

When comparing software capable of analysing qualitative data, besides complexity, practicality, and user-friendliness, Lewins & Silver (2007) also emphasize how they handle tasks involved in the research process, how they represent data and results, and how they can handle different concepts together. Seale (2010) highlights that the most important features of today's programs are speed, exactitude, and the possibility of teamwork among researchers. Going along with Dömsödi's (2014) claim that there is no single software capable of catering for every research demand, it is advisable for users to try several different types in the initial stages of their research. Moreover they should pay attention not only to the functionality of the

program, but also to the subjective factors that come up (e.g. colours, window system, visualisation techniques) before making a final choice.

3 Methodology of Research

3.1 Sampling and Data Collection

During the research, the full content of the issues of ten periodicals published in Hungarian-speaking areas was analysed (Iskolakultúra, Új Pedagógiai Szemle, Magyar Pedagógia, Pedagógusképzés, Képzés és Gyakorlat, Educatio, Eruditio-Educatio, Pedacta, Neveléstudomány, HERJ) between 2010 and 2017. We also analysed all books and volumes in the same period that contained material about computer-assisted qualitative data analysis, as well as the abstracts of the National Conference on Education (ONK) which is the most prestigious peer-reviewed conference in educational sciences in Hungary. The study included 60 text corpora (papers, books, chapters, and abstracts), the details of which can be seen in Table 1.

Papers	Books, chapters	Abstracts
11	6	43

Table 1: The sources used.

When choosing the texts, we insisted that they should contain theoretical or methodological elements related to computer-assisted qualitative data analysis.

3.2 Data Analysis

The data obtained from texts (papers, chapters and abstracts) were analysed using qualitative content analysis with a combined (deductive and inductive) logic. During a combined process, the analysis starts with drawing up a sketchy list of codes, then the subcodes are formulated inductively from the text corpus (coding is a process in which one or more codes are assigned to objects/texts according to their meanings). During deductive content analysis we start out from theory, or use a system of codes generated on the basis of our own experience, where we match text passages to the codes. In order to eliminate overlaps, it is necessary to define codes as precise as possible.

During the analysis, we produced a list of codes based on a deductive logic, using a priori coding. A priori coding is a form of data coding during which the codes are generated before the analysis, based solely on theory, or even the researcher's own experience. The analysis was based on three codes: information about software functions (1), emergence of different types of software in the same qualitative analysis (2), and the relationship between courses in educational science and computer-assisted qualitative data analysis (3).

The process based on deductive logic was followed by an inductive discovery of the deep layers of the text segments, i.e. finding subcodes that constitute a match between the meaning of texts and subcodes. Concerning the information about software functions we established two subcodes (basic and special functions); concerning using several types of software in the same qualitative analysis we established two subcodes (GIS– Google Earth and MAXQDA– VennMaker); and concerning the relationship between courses in education science and computer-assisted qualitative data analysis we established two subcodes (course descriptions and empirical studies). The code system used in the study is shown in Figure 1.:
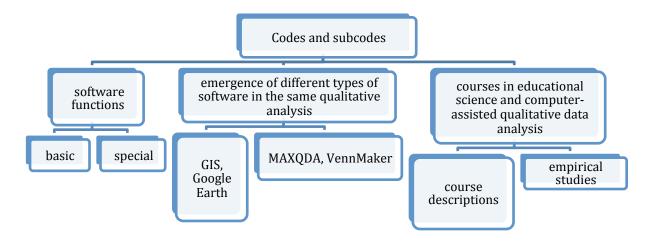
Figure 2: The code system.

The text corpora were recoded after two days (i.e. intracoding was used), so as to find the place of content still in question. The reliability index of the coding showed a total identicalness.

4   Results and Discussion

The results of the qualitative study are detailed on the basis of the codes, listed in the chapter about data analysis. On the basis of the texts analysed we explore the content of Hungarian education literature discussing software functions, and draw a parallel with international trends. Then we analyse Hungarian publications that present software capable of qualitative data analysis in an empirical context. Finally, we explore publications in pedagogical literature that deal with the curriculum of research methodology courses about software use, and we also present a summary of the beliefs of users concerning different types of software.

4.1   Information about software functions

In the section about software functions the description of two subcodes can be set apart: basic functions (e.g. coding, memos, visualisation), and special functions (e.g. georeferences).

To illustrate the theoretical and practical background necessary to create and develop Hungarian research workshops of computer-assisted qualitative data analysis it should be emphasized that technical literature in Hungarian focusing on the relevant problems in alignment with international trends in educational sciences is now at hand. As an example, it is now possible to present a recent volume treating qualitative research in educational sciences in Hungarian that – besides the comparative functional analysis of Atlas.ti, MAXQDA, and NVivo – also opens up the latest technical achievements available (e.g. georeference) to educational sciences (Sántha, 2013). The appearance of methodological and technical developments in qualitative analyses can be traced in several international journals and efforts can be discovered in the exploration of reflections from users of software capable of qualitative analysis and to investigate the quality of these analyses (Niedbalski & Slezak, 2016; Salmona & Kaczynski, 2016). Similar analyses can rarely be seen in Hungarian qualitative pedagogical literature, there is only one paper treating this subject: Sántha, Katonáné & Subrt (2017) carried out an extensive analysis of qualitative methods used in empirical studies and their theoretical background, including the significance of software.

Following international trends, Hungarian technical literature is now also capable of connecting triangulation typologies and computer-assisted qualitative data analysis (Sántha, 2015, 2017c), primarily based on Denzin (1989), Flick (2008, 2014), and Kuckartz (2014). Qualitative research methodology uses the term triangulation metaphorically to create complex strategies to study the same phenomenon. Triangulation can be seen as one of the validators of qualitative research. Denzin's (1989) concept of multiple triangulation is a mixture of the elements of data, of investigator, methodological and theoretical triangulation, preferring the

use of a variety of types within the same research project. A combination of these types ensures the possibility of several analyses from different perspectives.

The most renowned annual event of Hungarian educational sciences is the National Conference on Education (ONK). In 2012, participants of this conference had a chance to learn about the basic functions of Atlas.ti, MAXQDA, and NVivo during a symposium. In Hungarian educational sciences this was the first occasion that provided a forum for in-depth discussion about computer-assisted qualitative data analysis. In 2017, during the same conference, another symposium gave participants a chance to discuss the parallelisms and points of intersection between Grounded Theory and qualitative content analysis, and to illustrate their appearance in a computer-assisted environment. During this event, the most important ideas came from computer-assisted Grounded Theory (Denzin, 2007), and the work of Mayring (2015) and Kuckartz (2012) about qualitative content analysis.

4.2 The appearance of several software in the same qualitative analysis

In this segment, to explore pedagogical architecture, a subcode was used to focus on the relationship between GIS, Google Earth and cognitive maps. Another subcode was used during the study of teacher trainees' reflective thinking to show the relationship between the programs MAXQDA and VennMaker, and the unstandardized network card.

Besides this, Sántha's (2016b) paper also details possibilities of connecting georeferences, computer-assisted qualitative data analysis and triangulation of the data. When using geo-references, we can distinguish between direct and indirect geo-references. In the case of direct references, data can be assigned to a point in space defined by coordinates. For example, if we make an interview with a teacher about the school or its architecture, after entering the GPS-data of the school the software helps us visualize the building – the geo-link helps to connect textual and spatial data. The geo-link can make a connection between a text (or image) and a place defined by GPS-coordinates, using Google Earth. Indirect references link data to a defined part of space instead of a defined point: e.g. we can illustrate the population density of a county with a map. In education sciences, geo-references can provide information when we study, for example, links between students' performance and their permanent residence and type of settlement.

Geo-references help the triangulation of data in qualitative research methodology as they can provide a lot of background information, so they help minimize the occurrence of studies with too little information, and they soften the negative effect of subjective beliefs on the study.

When carrying out a study on pedagogical spaces involving Hungarian high school students, Vámos (2013) integrates the different methods and software packages – cognitive map, Quantum GIS, Google Earth – opening up a way of transferring these to MAXQDA. Sántha (2017b) in his analysis on teachers' reflective thinking and beliefs, also involved structured, unstandardized network cards. During the analysis he illustrated the simultaneous use of MAXQDA (to process the textual content of the cards) and VennMaker (to analyse the cards) in the same project. The VennMaker and the MAXQDA played a complementary role.

4.3 The relationship between courses in educational sciences and computer-assisted qualitative data analysis

Relationships between academic courses in educational sciences, PhD courses, and computer-assisted qualitative data analysis can be detected using two subcodes: course descriptions, and empirical studies.

There is also a well-known paper dealing with the principles and processes of incorporating computer-assisted qualitative data analysis in Hungarian MA or PhD courses, which also includes a course description based on illustrating the analysing methods of texts, images and photographs. This course can be implemented as a seminar, and it requires a basic understanding of qualitative research methodology. Its pedagogical and educational approach is based on the following elements of professional skill (Sántha, 2016a. 27.):

Knowledge: the student knows the characteristics of quantitative, qualitative, and combined paradigms, the possible interactions between triangulation and computer-assisted qualitative data analysis, and the role of deductive and inductive logic in quantitative data analysis.

Attitude, beliefs: the student has a drive to learn about the latest techniques of qualitative research methodology and computer-assisted qualitative data analysis. The student feels the urge to implement the latest methods in their own practical activities, and reflection gets an important role in their work.

Skills: the student can choose and implement methods that suit the given research objectives. They can choose and implement the adequate coding mechanisms, process the data, and present the findings in different professional forums.

The central element of the course is the illustration of computer-assisted qualitative data analysis in the case of textual and pictorial data. The course described above can be regarded as innovative in its subject matter and tools, and it can be a suitable asset for educating people in PhD courses and helping them become researcher teachers. In the academic year 2017/2018 there are no courses available either in Hungarian MA or PhD programmes or in teacher training and further training courses in educational sciences that let students get deeper insights about computer-assisted qualitative data analysis. Only a few elements of the topic can be found in the qualitative research methodology courses in Hungary in certain educational science doctoral schools – all held by the author of the present paper. In this respect, it is necessary to catch up with international trends as soon as possible as in Hungarian educational sciences qualitative data analysis is rarely supported by software. To alleviate the problem, since 2015 workshops have been held in several universities in Hungary for students and lecturers in teacher training and doctoral schools in education science to present the basic steps of using the MAXQDA software.

In case of Hungarian empirical studies, the beliefs of students in doctoral programmes of educational sciences about computer-assisted qualitative data analysis have been explored in a research by Sántha (2017a) – however, it only involved students of academic courses who expressed some kind of interest in computer-assisted qualitative data analysis. When speaking about the benefits of computer-assisted qualitative data analysis, the exploration of connections, the facilitation of transparency, as well as exact and quick work, and the versatility of the graphic interface are worth to be highlighted. As for the difficulties, students considered the following areas problematic: mastering the functions of the software, the time-consuming practise to put the program to good use, relatively unknown programs, the necessity of terminology, and lack of conscious use. It would be useful to continue the initiatives mentioned above, because computer-assisted qualitative data analysis, regarding its subject and theoretical and methodological basis, could be relevant not just in the process of getting a PhD degree, but also in the process of becoming a researcher teacher as it helps the processing of complex pedagogical situations and phenomena.

5 Conclusions

Pedagogical situations are complex and often unique, so multi-faceted analysis methods are indispensable. These methods can be complemented with software capable of analysing qualitative data. In our study, we collected the appearances of papers linked with computer-assisted qualitative data analysis in Hungarian education sciences. The summary of these findings can be found in Table 2.

Aspects of analysis	Summary of results, conclusions
Software functions	The basic functions (e.g. coding, memos, visualisation) are detailed, while special functions (e.g. geo-references) are known, but still need more actual use in empirical pedagogical studies.
Using several types of software in the same study	There is an effort to use several types of software in the same study, especially in the case of conference papers. In Hungarian qualitative studies in education sciences – similarly to international trends –, researchers use often the Atlas.ti, the MAXQDA and the NVivo programs.
Academic courses on computer-assisted qualitative data analysis	Need development, it would be useful to teach such data analysis methods during academic courses in education sciences. According to users, the software types make data more systematic and transparent, speed up analysis, but it is worth noting that the usefulness of all processes depends on the researcher's supervision and decisions.

Table 2: Summary of results.

The last fifteen years have witnessed a marked change in the assessment of qualitative methodology in qualitative pedagogical research methodology. An increasing number of researchers think that the qualitative paradigm can uncover new elements – sometimes also circumstantial ones –, and together with the quantitative paradigm, this can open up new horizons, see also mixed methods. To stabilize the role of international trends in the Hungarian qualitative methodology it would be beneficial to Hungarian universities to hold much more professional forums and workshops, as the interaction of theory and practice can contribute to the conscious use of qualitative research methodology by anyone interested.

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