DOI: 10.15804/tner.2023.72.2.19

The New Educational Review

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# Exploring the Reflective Thinking of Teachers with Structured Unstandardised Network Cards

## Abstract

This paper aims to use the methodological characteristics of ego-centred networks in studying teachers' reflective thinking. This qualitative research illustrates how structured unstandardised network cards, including text corpora and visual elements, can be used in exploring the reflective thinking of a long-serving, experienced teacher. Structured unstandardised network cards ensured the openness of analysis through three factors: the undefined number of circles, the free association of topics concerning teachers' activities, and comments on these topics. The basis of the analysis was a data-driven, inductive analysis of many concentric circles containing concepts and sectors and the text corpus of the commentary made during the creation of the network card. The reflections concerned the teacher's career, position, and tasks in the institution. The results discovered the content nodes of reflective thinking, disclosed individual beliefs, and indicated the diversity of pedagogical knowledge. The concepts of 'human', 'teacher', 'communication–cooperation', and 'renewal' were included in a complex system by the network card sectors of 'exercise', 'health', 'hobby', 'free time', 'soul', and 'family, friends, and colleagues'. Structured unstandardised network cards can explore teachers' reflective thinking and broaden the research methodology of the topic.

**Keywords:** *reflective thinking, structured unstandardised network cards, teacher evaluation, qualitative research*

## Introduction

When interpreting social reality excluding subjectivity, the aim can be setting up theories and formal models that attempt an interpretation of human reality using a mathematical apparatus. The environment thus construed is questionable, as the human world is not written in a mathematical language, and the empirical evidence in social situations cannot only be described in terms of mathematics. To understand them, we need to put phenomena into a context, knowing that contexts are not always made up according to unambiguous rules.

Network analysis is prominent in analysing the behaviour and personal attributes of people active in everyday pedagogy and social phenomena. Castells (1996) has shown that the relationship between society and the economy can be understood by discovering complex networks. He illustrates his thoughts by introducing the concept of network society. Sociology and psychology involve a keen analysis of mechanisms influencing personal relations and individual attributes, and all these bear relevant information for education sciences, too.

### Research Focus

This paper calls readers' attention to the relevance of networks in education sciences, shows the methodological characteristics of ego-centred networks in a complex empirical environment, and contributes to the enrichment of available methods when exploring teachers' reflective thinking. The paper is oriented towards a qualitative research methodology. It reflects on the role of network cards in the discovery of reflective thinking and detects the presence of multi-layered self-reflection in teachers' reflections. Thus, it connects reflective thinking with network analysis, especially the analysis of ego-centred networks.

## Theoretical Background

### Issues of Discovering Reflective Thinking

Specialists in education sciences do not agree on how teachers' reflective thinking can be measured. The scope of activity of the reflecting teacher changes as a function of in-service years and experience. Teachers striving to improve their teaching activities continuously reflect on their work and use the possibilities of collegial reflection in a suitable environment so their professional skills are systematised

based on their practical experience (Sántha, 2018; 2020). Today, several activities enhance reflective practice in teaching, and these can be used at every level of the teaching and learning process (Coleman & Flood, 2016).

Knowing these problems, it is right to ask how reflective competence can be most precisely grasped. Researchers have not agreed on this issue yet, qualitative, quantitative, and mixed methods are all used when investigating the topic. Wyss (2013) says that the reflective competence of teachers can be studied using various methods (e.g., questionnaires, stimulated recall, and matrices). It is supported by the study of Mirzaei et al. (2014), who analysed the reflective thinking of teachers using structured questionnaires and semi-structured interviews. Dammerer and Schwab (2019) used methods including quantitative and qualitative elements to analyse the reflections of beginners and their mentors. They used a questionnaire to examine the process of becoming a teacher and group interviews to discover reflections. Hoekstra and Korthagen (2011) used mixed methods in a longitudinal study to answer whether supervision makes any difference in the learning process of teachers. The study was done using one teacher. The results indicated the role of reflection and collegial reflection in enhancing teaching efficiency in professional development. Levin and Meyer-Siever (2018) emphasise that there are several methods for discovering and evaluating reflective competencies. However, all these must be improved because they are not fully capable of a hierarchical representation of reflective levels and thinking in main and subcategories. There is often criticism of the hierarchical structure of reflective levels, and the methodology used to discover reflections does not offer definitive explanations (Sántha, 2020). Choy and Pou (2012) think that further research has to be done on how good reflective practices can be introduced among teachers.

Choy and Pou (2012) detected a link between reflective thinking and critical thinking in their questionnaire research, assuming that reflective thinking is the forerunner of critical thinking. It has been found that most teachers did not reflect in a complex manner and did not try to discover cause-and-effect relationships. Compared to questionnaires, Tynjälä (1998) emphasises the importance of written work (e.g., reflective diary, lesson commentary) in discovering teachers' reflective thinking because these necessitate the integration and reorganisation of information while necessitating analytical thinking. A paper by Vinjamuri et al. (2017) also reflects the use of text corpora. In their paper, the authors discuss the advantages of reflective diaries using a retrospective overview of some tasks of students of social work. When discussing reflection, Rodek (2019) also saw textual data as important, as she analysed the components of efficient learning using essays and self-reflection of students. Portfolios and e-portfolios also necessitate analytical

thinking; they represent the process of becoming a teacher and the approaches to learning (Johnson et al., 2006). With their help, the thinking behind the text corpus can be mapped. Mayring (2019) stresses the self-reflective nature of research in education sciences and that reflective elements can best be captured in the form of text corpora. He emphasised that researchers usually only declare whether they used quantitative or qualitative analyses but do not discuss the text analysis methods used. Text analysis typologies are foregrounded in systematising qualitative content analysis (Kuckartz, 2019a; 2019b; Mayring, 2019). These also have a role in analysing reflective diaries and portfolios.

Other complex methods that use pictorial and visual elements besides textual ones have also appeared recently in the study of reflective thinking. It has been proven that reflective thinking can be discovered better thanks to the discussions following the video recordings of stimulated recall (Levin & Meyer-Siever, 2018; Messmer, 2015; Sántha, 2013), and cognitive maps help the discovery of teachers' reflections (Sántha, 2020). Zach and Ophir (2020) studied the effect of simulation on reflective thinking by recording and then discussing exchanges during lessons on video, and then they made text transcripts to carry out content analysis. Schönbächler and Michel (2020) also emphasised the role of pictorial information by making a model that highlights the role of visually aided reflections in analysing the teaching and learning process. Sántha (2017) published a paper extending the toolbox of the qualitative methodological analysis of reflective thinking, in which he explored the reflective thinking of teacher trainees using network cards, emphasising the role of network analysis when studying reflections.

## Social Networks: Possibilities for Reflection Analysis

Network analysis gives us a tool to systematically discover a specific network. In scientific discourse, the quantitative network analysis method got into the focus, thanks to the easy quantifiability of network elements, as a network can be described as a countable set of nodes (Jansen, 2003; Rehberg, 2015). Network analysis is strongly linked with graph theory – the first theses of graph theory appeared in 1736, when Leonhard Euler used it to solve the problem of the bridges of Königsberg – as it enables us to dichotomise the network structure and to visualise the analysis. Euler could not have thought in the 1700s that his work would be the foundation of one of the most interesting fields in mathematics, graph theory, nor did he know that in the 21st century, graph theory will be a central topic when discussing networks. László-Albert Barabási, a renowned physicist, stated many times in his work that networks are central elements not only in mathematics or

physics but in an interdisciplinary environment, they help the deeper discovery of other disciplines of science as well (Barabási, 2003; 2010). Sociology, psychology, and social work involve an analysis of mechanisms influencing personal relations and individual attributes, and all these bear relevant information for education sciences, too.

Network analysis focuses on systematically describing attributes of relationship patterns between network elements. When analysing social networks, the analyst started with the fact that the behaviour of specific actors influences social relationships and their structures. The analysis of social networks does not want to understand the behaviour of actors in the network based on personal attributes but on the structure of their relationships (Henning et al., 2012; Herz et al., 2015).

Several approaches have developed in network analysis. A macro-level approach focuses on understanding the statistical attributes of networks, with the analysis of network elements in its centre (nodes, relationships), and it uses quantitative methods and complex calculations. Meso-level (and scope) network analysis focuses on interaction and information transfer, doing analyses in a well-defined group, for example, in a classroom or a staffroom. This socio-centric approach discovers relationships and attributes only in a specific network. The results are thus valid only in that particular network. In the case of ego-centred networks, which focus on the characterisation of individuals, the focus shifts from a socio-centric approach to an egocentric one (Henning et al., 2012; Rehberg, 2015). In the case of ego-centred networks, one person's (ego, I) social network is discovered, e.g., if we speak about a school, it can be the social network of the form master with parents, colleagues, superiors, or pupils. These networks are case-centred and include aspects of qualitative research methodology and a combination of quantitative and qualitative approaches. In a quantifiable network structure, relations, data and nodes all play roles, the deep discovery of which is carried out with the help of qualitative methods (Diaz-Bone, 2007; Herz et al., 2015; Hollstein & Pfeffer, 2010; Jansen, 2003; Rehberg, 2015; Sántha, 2017). The qualitative analysis of social networks means using techniques that, besides a visual representation of networks, also use other techniques (Hollstein & Straus, 2006; Töpfer & Behrmann, 2021). One of these techniques is the network card, which can be combined with data-driven, inductive interview types (e.g., unstructured interviews). The version complemented with an interview is also known as a commented network card (Herz et al., 2015).

## Research Methodology

### General Background of Research

This qualitative research is based on an open question and problem, not on a hypothesis. The question asked was how the methodological aspects of ego-centred network analysis can be used to discover teachers' reflective thinking and how the network card, which enables the mixing of text corpora and visual elements, can be incorporated into the methodology of studying reflective thinking.

### Research Sample

The research participants were members of a university group (N=37) consisting of serving teachers who were taking part in a post-graduate course in mentoring during the first semester of the academic year 2020/2021. The sample was selected based on availability, as the participants were members of a pedagogy seminar group led by this paper's author. During the course, students learnt about qualitative methods of discovering and developing reflective thinking (reflective diary, cognitive map, stimulated recall, network card). The teachers chose from these four options. Then they analysed their own teaching practice using self-reflection with one of the four methods. Table 1 presents the choices of teachers concerning methods of discovering reflective thinking.

**Table 1.** Choosing methods to discover reflective thinking

| | Reflective diary | Cognitive map | Stimulated recall | Network card |
|---|---|---|---|---|
| N | 23 | 12 | 1 | 1 |

Based on Table 1, it can be stated that teachers preferred the well-known and commonly used methods (reflective diary, cognitive map), while they did not choose lesser known, unusual, or time-consuming methods even though in terms of research methodology, stimulated recall and network card are very complex methods that help the discovery of reflective thinking.

The empirical part of this paper is based on the self-reflection made by a therapeutic physical education teacher who used a structured unstandardised network card. There is no required sample number for qualitative analyses. The sample is based on research goals, questions, and ways of analysis (Malterud et al., 2016; Onwuegbuzie & Leech, 2007). These inquiries do not require representative-

ness. There are several studies involving only one person as the data source. In education sciences, Hoekstra and Korthagen (2011) studied the development of a teacher, while Sántha (2020) also studied the reflective thinking of a teacher in his qualitative research. The sample is satisfactory because structured unstandardised network cards have a special methodology, and the goals of the research also allow this. Although only one teacher was involved in the research, to keep gender neutrality, the pronoun "they" and its other forms are used throughout this paper.

## Ethical Framework

Ethical parameters were strictly observed during the qualitative research, and anonymity was assured. It was best to create an atmosphere of creative ethics where participants could pronounce their ideas and show themselves frankly, without limitations. The course was characterised by a free atmosphere and a continuous professional dialogue, which was a suitable basis for studying teacher activity.

## Instrument and Procedures

The teachers involved did their research papers at the end of the semester. The papers had no length limitations, and the teachers were allowed to use their associations freely during their work. The empirical part of this paper is based on self-reflection using a structured unstandardised network card. A structured unstandardised network card is halfway between unstructured and structured standardised cards, and it can be seen as an improved version of concentric circles (Kahn & Antonucci, 1980). To be able to see this, it is wise to understand how unstructured and structured cards work.

An unstructured network card means that subjects of the research only know the research topic, so they recall and visually represent their thoughts concerning the topic freely, without outer influence or help. Participants get a sheet of A4 or A3 paper with a circle on it, and they see the word "I" in the circle. The instruction is that people important to them should be put near "I", whereas less important ones should be farther, near the edge of the sheet. Participants comment on the information, and the researcher can also ask further questions to get information promoting the research. The explanations can be recorded on a dictaphone or a smartphone and later subjected to interpretative analysis procedures. The cards cannot be compared due to their unstructured nature. They do not help the researcher because there can be as many cards as many people involved in the research (Hollstein & Pfeffer, 2010).

Structured and standardised network cards significantly differ from unstructured network cards. These limit the room of the participants in their responses, but they facilitate analysis because – compared to the unstructured network card – they allow the comparison of the different cards (Hollstein & Pfeffer, 2010). In the case of structured and standardised network cards, the best-known method is the "hierarchical mapping technique" developed by Kahn and Antonucci (1980). In this method, participants get a piece of paper containing four concentric circles, and the word "I" is written in the innermost circle. The researcher asks participants to put the initials of persons who are important to them on the circles. Emotional distance can be shown by placing names further from "I", so, with the help of this method, the space around the "I" is structured by three concentric circles that illustrate emotional closeness and distance from "I" (Hollstein & Pfeffer, 2010). Similarly to unstructured network cards, interviews and commentaries can help to get more information from the people involved.

The empirical part of this paper focuses on a structured unstandardised network card. In the case of the structured unstandardised card, it is worth answering the question of what makes the network card structured but, at the same time, unstandardised. The concentric circles are a structuring element, but there is no fixed prescription concerning the number of circles. The participants must draw concentric circles on an A4 sheet around the word "I", which is in the innermost circle. Then they write the concepts they think are relevant to the topic in these circles. Another structuring element is the introduction of sectors, which serve as indicators of the main scenes of the "I" (e.g., family and work). There is no prescription concerning the number of sectors, but to be able to associate and analyse the information, the researcher must be careful and document everything very carefully. Assigning circles and sectors helps compare the relationships between "I" and the other persons, and, albeit with limitations, the different cards can also be compared (Hollstein & Pfeffer, 2010). Structured unstandardised network cards can be used together with interviews (commentaries). This method helps communication about networks and the represented relationships (Sántha, 2017).

## Data Analysis

The most important feature of the standardised unstandardised network card is that it is structured by certain elements (circles, sectors). The fact that participants can use an undefined number of circles gives some freedom to organise the data. Although the research methodology technologies helping network data analysis and visualisation are dynamically improving, in the analysis of social

networks, the status of qualitative data analysis techniques has not been clarified yet. For example, the qualitative elements to describe network cards are formal and focus on quantifiability (Diaz-Bone, 2007). There are promising ideas to eliminate this problem: the openness of qualitative analyses and the qualitative structural analysis suggested by Herz et al. (2015). Structured unstandardised network cards ensured the openness of analysis through three factors: the undefined number of circles and the free association of topics concerning teachers' activities. In addition, by commenting on the making of the network card, there are text corpora available, so for the sake of triangulation, we can use visual elements and textual data. The indicators of the quantitative focus of analysis were the number of concentric circles, concepts, and sectors indicated on the drawing, whereas the qualitative indicator was a data-driven inductive analysis based on the text corpus. The data-driven analysis was done without preconceptions and a priori theoretical limitations, only using the terminology used by the teacher involved.

## Results

Figure 1 shows the structured unstandardised network card of the teacher. The network card contains five concentric circles and four sectors. The concentric circles contain concepts (human, teacher, profession, communication-cooperation, renewal). Communication and cooperation are represented as coordinated and mutually present, so these were used as one concept during the analysis. The four sectors were built up from the segments of "exercise, health", "hobby, free time", "soul", and "family, friends, and colleagues".

There are no relations detectable in the commentary of the network card that destabilise the network. The reflective thinking of the teacher is coherent. No multiple relations are detectable either, as the relationships are set between the 'I' as a concept and the other concepts written on the network card.

## Discussion

### Discussion of Concentric Circles

The topic of concentric circles serves to discover which notions are present in which circle and why they have a similar place in the network.

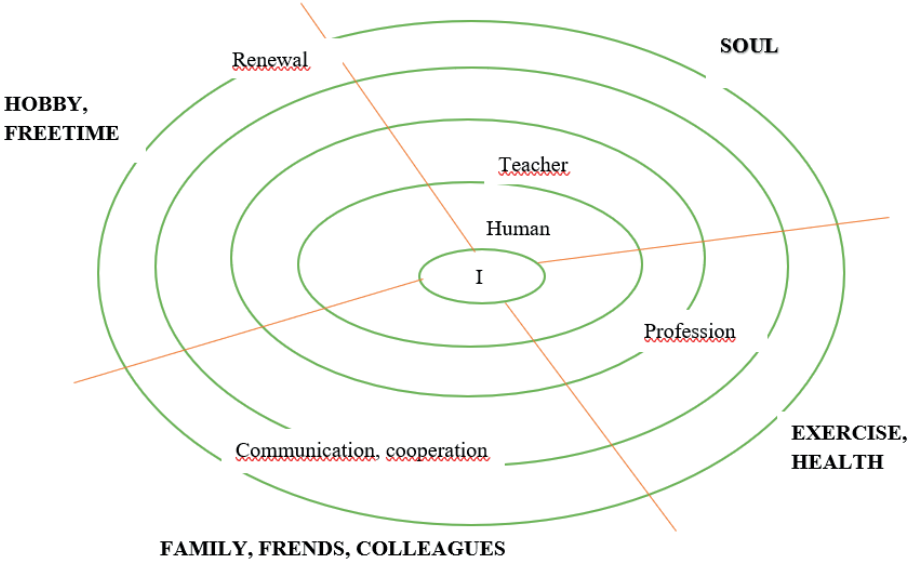


**Figure 1.** Structured unstandardised network card

The first circle contains the notion of 'human'. During the commentary, the teacher turned to several topics of educational philosophy and tried to answer the question of who and what a human is. Humans are independent creatures, organic parts of the surrounding world, conscious and creative: "the possibility of development pertains to all humans and is not a process controlled from the outside (…) with new experience, the person will change. A human is a conscious and creative being, characterised by freedom and self-determination (…) the aim of life is growth, becoming something, so people carry their own futures with them" – these are complex reflections that help the finding of the self. This is necessary for efficient pedagogical work. This reflection is complex: the teacher aimed at incorporating the "how" questions into the reflections, which suggests that his analytical thinking is complex.

On the second circle, the notion of 'teacher' is found. In the commentary, we have criteria of a good teacher, but there are no details about what a good teacher is ("first and foremost, I must be a good teacher"). Collecting the characteristics of a good teacher has been a focal point of analyses of teachers' personalities and general research. However, it has not been proven that teachers with the preferred

characteristics are more efficient. Compiling lists of the characteristics of good teachers gave a useful list of skills necessary for the profession. Some of these are good communication skills, rich and flexible behaviour, situational awareness, constructive conflict solving, cooperation, a capacity to analyse pedagogical situations, and mental health. The teacher listed professional skills, as well as education and personality development, as parts of being a good teacher. In this context, daily contact with principals, school doctors, parents, and colleagues is important.

The third circle contains the notion of 'profession'. This notion is closely connected to the notion of the teacher described above. Still, the teacher in the research separated it. The teacher found it very important for their professional work that they should be successful in their healing activity, too. Besides study groups, they also emphasized monitoring individual development. It also suggests continuous training, self-education, interest in the profession, and a degree of devotion.

The fourth circle contained the notions of 'communication and cooperation'. Communication and cooperation are important in every walk of life, so it is a part of working as a therapeutic physical education teacher. Meetings with colleagues, leaders, school doctors, and parents necessitate regular cooperation. Violence-free communication is important during all therapeutic physical education lessons, and also in other situations. It is worth developing and using in everyday life.

As prompted by the method of concentric circles, the circles carry notions farther and farther from the central "I" notion. Proceeding from the inside toward the outside, the way leads us to notions more peripheral to the profession. In the case of the teacher observed, this was not the case; the notion of renewal was placed on the fifth, last circle. The reflections suggest that this is, in fact, far from being peripheral. The teacher maintains that continuous innovation can prevent burnout, as professional development and a sense of achievement makes helping work more enjoyable. The teacher spoke about moral success: "The parents' recognition, their joy of seeing their child develop, and the emotional feedback from the children, as well as their bodily and mental development make me do my work even more efficiently".

## Discussion of Sectors

Commentaries help us to define the sectors present on the network card. When formulating the sectors, the best way is not to do it based on the places of notions on the concentric circles but to look at the content of the text corpora. It means we put in one sector notions between which we can detect cause-and-effect relations based on the text corpora. This general formula was unnecessary now, as the

teacher named in the commentary and marked the sectors they thought appropriate on the drawing. They made four sectors that link their main living spaces to concentric circles. The reflections gave evidence of complex reflective thinking. The teacher explained the way of formulating the sectors: "'I' is naturally present everywhere, and everything is linked with everything in some way, as the notions on the circles fall into sectors, but I tried to link the most important ones directly".

The sector of 'exercise and health' is connected with the teacher's profession. Therapeutic physical education teachers have to set good examples: "I can convey my ideas of good mental and physical health and a healthy way of life if I myself set a visible example and encourage others to do the same". They think that a healthy lifestyle is very beneficial for them too. Here, we can see the network-like relationships of reflections as the teacher referred to good mental and physical health. In the fifth section, they gave more details about mental health: "I think a healthy way of life is very beneficial to me, too, including eating, exercise, and mental and physical well-being". The complexity of pedagogical knowledge is visible here, the main content nodes (in this case, soul) that motivate activities and affect reflection.

The sector 'hobby and free time' is primarily connected to innovation and renewal. The reflections are manifold, the teacher suggested the profession itself could be linked with innovation, but they think differently as the "topic is broader than that". Free time activities are necessary in life because these help people derive joy, get some flow experience, and help people renew. Learning, practice, and repetition help people relive flow experiences or grant easier access to them. "Therapeutic physical education is linked to hobby because I see exercise as a source of joy, and I do it with pleasure in my own life too".

The 'family, friends, colleagues' sector is assigned to the notion of communication. The reflections here repeat the reflections about communication and cooperation on the fourth circle, which is proof of the coherent thinking of the teacher. Here, we can find reflections about colleagues and therapeutic helpers. However, the family gets a special role: "family and friends are the building blocks of healthy human life. In my case, the professionalism of communication is present when it comes to staying healthy.

The last section represented by the teacher is the soul, even though they think this is the most important: "This is the most important. This intertwines all aspects of our lives, and, as a therapeutic physical education teacher I must deal with this helping people who have bodily dysfunctions". Reflections turn to the soul of the self, the "I", and indicate the vulnerability of the system: "We must not forget that teachers and helpers are also humans, and our own souls are the most important because if the 'I' in the first circle is not a whole, it can very easily lose its integrity".

Reflection requires the teacher to be explicit, leading to a growing awareness of subjective theories (Sántha, 2018; 2020).

## Conclusions

One of the most promising methodological novelties of the past years is network research and network visualisation, which are efficient tools for describing sociological phenomena, not just natural ones. The case study in this paper presented a new, versatile tool for discovering teachers' reflective thinking and broadening the research methodology of the topic. The paper has shown that structured unstandardised network cards in research can explore teachers' reflective thinking while also fulfilling the requirements of methodological triangulation (Flick, 2014).

The network card helps discover and compare the content nodes of reflective thinking and can detect the similarities and differences between individual, subjective beliefs. The network card indicated the place, role, tasks, and collegial relations of the teacher involved in the study in their institution. The process was carried out using self-reflection. Using collegial reflection besides self-reflection enables us to map the operation of an organisation, not just that of an individual. Moreover, a network card can help visualise the differences between the activities of mentors and their debutante mentees, thus helping create an individual development plan. From a research methodology and data analysis perspective, the combined use in the same project of the VennMaker (Kronenwett & Schönhuth, 2014) software, which helps with the processing of network cards, and the Maxqda software (Rädiker & Kuckartz, 2019), which helps the qualitative processing of text corpora and commentaries can be very useful: these help visualisation and speed up processing, so they are relevant for projects that investigate reflective thinking with such a methodology.

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