

Patterns of publishing in German civic education research: a co-authorship network

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Abstract

Research as a social process suggests that the collective research agenda of a discipline is shaped by its structural features which thus helps to explain why we actually discuss what we discuss within an academic domain. This assumption also substantially informs publication patterns and co-authorship networks in German civic education research: Who are the most central researchers? What groups of collaborating researchers exist? How do these clusters diverge in their characteristics? The article addresses these questions by drawing on an encompassing dataset that considers multiple publication types including book publications, journal articles and chapters in edited volumes with more than 3000 contributions and 900 authors published between 2014 and 2020 in German civic education research. Using bibliometrics, different techniques of network analysis and consensus graph clustering methods, the analysis reveals patterns of co-authorship and presents the first systematic mapping of the discipline. In this way, the most important research clusters, their characteristics and the major researchers in the domain of civic education research in Germany are assessed.

Keywords: *Co-authorship, Network analysis, Publication patterns, Civic education research, Germany.*

Introduction

In hardly any other discipline than civic education, the demand to conduct research in an objective and balanced way is higher, since from the imperatives of the "Beutelsbach Consensus" can be deduced that not only the practice of civic education but also its research is subject to the dogmas of controversy and non-indoctrination (Widmaier & Zorn, 2016). Now, it would be naïve to assume that civic education research is devoid of social processes that impact the topics studied and the results obtained (Moody, 2004). As in any other discipline, both describing and explaining this social component of civic education research is important for gaining an understanding of why we actually discuss what we discuss within the domain. In this paper, I describe and explain the structure of German civic education research to get a better understanding of the interplay between most salient individuals, groups, preferred publication types and research topics that play a leading role in these social processes.

Research as a social process suggests that the collective research agenda of a discipline is informed by its structural features (Graf, 2008). In German civic education research, these

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structural features – at least at the surface – seem to have undergone substantial transformation in the past decade, as the research landscape and its actors have changed considerably. The "second generation" of civic education academics around researchers who shaped the discipline for many years, such as Georg Weißeno, Wolfgang Sander, Peter Massing, Dagmar Richter and Joachim Detjen, has retired. Now, a new generation is rising. Civic education research in Germany seems to be still developing as an autonomous discipline (Massing, 2021). So far, however, it is completely unknown how the (novel) landscape of civic education research is topographed in Germany. While the evaluation of publication patterns and collaboration networks is well established in other disciplines (for example in political science see Pehl, 2012; Plümper, 2003; Arzheimer & Schoen, 2009; Metz & Jäckle, 2013, 2017; Leifeld et al., 2017) similar studies do not exist for civic education research. It is the main goal of this paper to fill this gap.

In this article, I analyze current publication patterns in German civic education research. Drawing on an encompassing dataset that considers multiple publication types including book publications, journal articles and chapters in edited volumes, with more than 3000 contributions from over 900 authors published between 2014 and 2020, I extract a co-authorship network capturing the social structure of the German civic education research community. This is the first study that maps out how the individuals who comprise the profession actually collaborate and which research groups drive scientific progress within the discipline. By applying a comprehensive dataset, I consider the three outlets that dominate research in the discipline: book publications, edited volumes, and journal articles. Furthermore, the analysis includes not only German-language but also international contributions. I am thus able to draw a comprehensive picture of publication practices and collaboration patterns and to provide a detailed mapping of the recent research landscape in civic education research.

First, in terms of the number of publications, their types and language, the bibliometrics show a relatively strong constancy over time of the discipline's literature. Generally, the international orientation of the text corpus is low (< 10%). Second, using all three measures, degree centrality, closeness centrality and betweenness centrality the analysis identifies the most important researchers of the collaboration network, with Monika Oberle (University of Göttingen) alone holding a top position in all three measures. The identification of the most important research groups using consensus graph clustering methods shows, third, that the research landscape is very diverse in terms of topics, target groups and approaches, which speaks for the vitality of the discipline. However, a critical assessment regarding cross-institutional collaboration and international orientation in German civic education research

must be made.

The article is structured as follows: The next section provides some rationales as to why it is worth studying publication patterns and collaboration networks in civic education research. Next follows a description of the data and methods used before a detailed analysis and presentation of the results. The article concludes with a brief discussion about the limitations and implications of my findings for civic education research in Germany and beyond.

Why publication patterns and collaboration networks are important to be studied

Both individual "stars" in the field and collaborative groups of prominent scholars known as "invisible colleges" (Crane, 1972) are often what propel advancement in a scientific subject and the course that evolution takes. An "invisible college" is defined as a "network of productive scientists linking separate groups of collaborators within a research area" (Crane, 1972: 49). The leaders of a group of collaborators or a group of interacting researchers who collaborate closely but have little engagement with researchers outside their group make up the informal connections that constitute invisible colleges. As a result, invisible colleges bring together previously unrelated groups of colleagues (Crane, 1972; Kadushin, 1968). A scientific "star" is essential to both hidden colleges and the entire field since they are highly visible, frequently cited, have a successful track record, and provide connections with other academics (Moody, 2004).

Individual thoughts and ideas are influenced by those of the people they deal with due to the dynamics of homophily and social influence (McPherson et al., 2001). As a result, scientific practices and ideas within a discipline are influenced by interaction patterns a field's scientific social network provides and are roughly analogous to the network of interactions within German civic education research (Friedkin, 1998; Newman, 2004a). Therefore, examining groups of scholars who collaborate across groups and "star" academics in the field is essential for comprehending the outcomes of a discipline (Leifeld et al., 2017). I am interested in locating clusters and groups of collaborating scientists, as well as their "stars" and key characteristics, to advance our understanding of the social dynamics shaping civic education research in Germany.

In light of the aforementioned theoretical framework, the following three research topics can be derived:

1. What groups of collaborating researchers exist in German civic education research?
2. How do these clusters diverge in terms of research topics (or methods) and preferred publication types?

3. Who are the most important researchers in the German co-authorship network of civic education research?

Data and Methods

Data

To answer my research questions, I generated an encompassing data set incorporating book publications, journal articles and chapters in edited volumes in the domain of civic education research. Since there is no official, integral list of researchers in German civic education, I used the "Map of Research on Civic Education" of the "Fachstelle politische Bildung"² as a starting point. The Map of Research on Civic Education is a digital, geographic map that takes a broad approach to include scholars who conduct civic education in Germany. The Map of Research on Civic Education provides a comprehensive overview of the research landscape. Its goal is to promote exchange and cross-field collaboration between and within academic disciplines, as well as between academia and practice. It was developed by the "Fachstelle politische Bildung", a leading, independent and cross-sectional reference in civic education in Germany and is constantly updated.

From this digital map, I created a list of all names, their academic status and affiliation. As a next step, I collected for every researcher all of their publications in the period from 2010 to 2021 from their institutional or private homepages or their individual curriculum vitae (CV). These publications were then stored in a database with several variables like type of publication, year, co-author(s), and title to derive the publications' languages. The types of publications that were registered comprise journal articles, book publications, edited volumes, and "other items", where the latter category contains for example working papers, unpublished manuscripts, school books, book reviews and others.

The main part of the data collection process took place in summer 2021. The data set was updated in February 2022. To keep the data collection manageable, we opted not to include pre-PhD researchers in our initial list, as it can be assumed that they have a low publication rate, are relatively poorly interconnected, and would introduce a strong asymmetry towards researchers with a high seniority into the network. Overall, it seems reasonable to presume that they contribute little to the network and publication patterns (Leifeld & Ingold, 2016).

For my analysis, I limited the dataset in four ways: First, as mentioned above, I initially included only those researchers who held at least a doctoral degree at the time of data collection. Second,

² <https://transfer-politische-bildung.de/transfermaterial/forschungslandkarte/>

I excluded those researchers from my initial list, who had already retired at the time of data collection. Third, I focus my analysis on the publication types of book publications, journal articles, and chapters in edited volumes, as they are the most relevant for publication activities in German civic education research. This focus also warrants (at least to a certain degree) the scientific quality of the included publications in order not to jeopardize the reliability of the underlying data set of the study. Fourth, I narrowed the time period to the years 2014 to 2020. Going back further would have likely resulted in a bigger disadvantage for junior researchers because they did not have the same opportunity to publish in prior years, even if there would have been more data. Using more recent publications than from 2021 was considered problematic because it seems that many authors need more time to update their entries online, as the proportion of papers "in publication" or "in print" in the dataset was very high compared to previous years.

All in all, this data collection strategy provides us with a dataset of 3007 publications from 939 authors in German civic education research. Hence, while this data collection technique is as thorough as it can be, it does have some drawbacks. In particular, it misses the publication activity of some scholars who do not have readily available publication lists. However, this was only the case for four researchers. Some publications may have been included more than once since they were entered into the database multiple times throughout the data collection process and cited on the homepages or CVs of various co-authors. However, this has no impact on the analysis since the study just considers the link, not the weight of the connection.

To prepare the data to compute the co-authorship network I largely follow the approach presented by Leifeld et al. (2017). First, a rectangular 939×3007 matrix was created based on the dataset, with cell entries of 1 indicating authorship of the column publication by the row actor, and 0 otherwise. In a second step, this two-mode network matrix was converted into a one-mode network matrix by multiplying the original matrix by its transpose. The resulting square 939×939 one-mode network matrix was weighted, with cell entries indicating the number of publications any two researchers co-authored. Thus, in a third step, the cell entries of this co-authorship matrix were subsequently binarized. As such, I conceptualized the one-mode matrix as a network and opted to retain even those nodes that formed smaller components and hence were not connected to the main component of the network. I only deleted those authors who had no connection to any other researcher. For the computing of centrality scores, a subset of this matrix was retained by removing all researchers who were not connected with the giant component of the other researchers.

Methodology

My analysis is primarily concerned with ranking the most significant research clusters that are present in the network of collaboration. Once more, I follow Leifeld et al. (2017) in large part and use graph clustering approaches³ to find the twenty largest and most distinct groups of cooperating civic education scholars.

Community detection algorithms have a serious flaw: different measurements may yield somewhat different results despite working toward the same objective, and there is no way to tell which solution is accurate beforehand. I work around this issue by using consensus clustering to increase the findings' robustness. As advised by Leifeld et al. (2017), I employ five different graph clustering techniques⁴ and integrate the results into a single stable cluster solution. The aggregation rule states that any two researchers must be assigned to the same cluster by at least four out of five algorithms to be included in the same cluster. As a result, solid core clusters that other researchers can cluster around with less confidence start to develop. In other words, this aggregation excludes researchers whose affiliation with the cluster is ambiguous and only constructs the cores of the research clusters for easier interpretation.

Researchers share ideas and collaborate on projects by using the collaboration network and its subnetworks as a stand-in (Arzheimer & Schoen, 2009; Metz & Jäckle, 2013; Newman 2001, 2004a). Therefore, if a researcher occupies a key position within a network and connects otherwise challenging-to-reach portions of the network, this could be seen as evidence of academic influence on the rest of the (sub-)network (Leifeld et al., 2017). I use two methods to rank the most significant researchers in our field. I begin by evaluating the significance of researchers for the network's giant component, which may be seen as the primary network of collaboration for the field of civic education research. Second, I locate the key researchers inside the clusters found using the methodology described above.

Central nodes are visible to many other researchers, and their input filters down through (in-)direct channels to many more researchers in the network. As a result, we determine the centrality of every researcher in the main component as a gauge of their discipline's influence and list the top 10 below.

³ Graph clustering, often called to as community detection, refers to a range of methods for locating cohesive subgroups in networks, i.e., subgraphs with a high internal interconnection but low external connectivity (Girvan & Newman, 2002).

⁴ Edge-betweenness community detection (Girvan & Newman, 2002), fast and greedy community detection (Newman, 2004b), the Louvain algorithm (Blondel et al., 2008), the Walktrap algorithm (Pons & Latapy, 2006), and infomap community detection (Rosvall & Bergstrom, 2008) are the five community classifiers I employed. These techniques are among the most often used community detection algorithms for medium-sized networks (Fortunato, 2010; Orman et al., 2012), and they are included in the igraph software package (Csárdi & Nepusz, 2006).

Numerous centrality metrics are available (for an overview see Freeman, 1979). Here, mostly for theoretical reasons, we focus on three measures. Conceptually degree centrality is one of the simplest measures, which is defined as the number of links incident upon a node (i.e., the number of ties that a node has). In this sense, a researcher is important if he or she has many neighbors since this position potentially permits the researcher to strongly distribute his or her ideas within the network. Closeness centrality is a more sophisticated metric that, when standardized for network size, indicates the number of pathways a scientist must take to reach every other researcher in the network. Theoretically, this means that a researcher is close to everyone else, making them highly visible and impactful. Another structural centrality metric is betweenness centrality. It determines if the focal researcher links otherwise dissimilar parts of the network, serving as a bridge between other subgroups and sections of the network. It assesses the degree to which a researcher adopts the shortest pathways between other pairs of researchers (Leifeld et al., 2017).

Results

In this section, I present rationales to answer my three major research questions. First, I provide insightful bibliometrics and descriptives of the encompassing dataset. In subsection two I turn my focus on the co-authorship network as a whole, i.e. I analyze the distribution of centrality in the graph and identify the most central researchers from a more general perspective. Then in the third subsection, we zoom in in more detail and I will identify the most cohesive research clusters in German civic education research. In doing so, I first plot the locations (i.e., the convex hulls) of the twenty largest groups of collaborating researchers returned by the graph consensus clustering approach within the co-authorship network. Then I plot the respective clusters in more detail.⁵ Lastly, we shift our focus away from the authors and turn to publication patterns of the identified clusters. More specifically, I investigate how their composition varies based on different publication types.

Basic bibliometrics and descriptives

Before assessing the key clusters and most important researchers in German civic education research, I provide some descriptive findings from the comprehensive dataset. Let us first turn our attention to the publications. The first interesting question is whether there are dynamics in the volume of publications over time. As it turns out, this is rather constant over the observation period starting with 432 publications in 2014, an intermediate peak with 463 contributions in

⁵ A stress-minimization algorithm (i.e. a multidimensional scaling of graph-theoretical distances as implemented in the graph visualization software visone (Brandes & Pich, 2009)) determines the locations of the nodes in the visualizations.

2017, and the climax with 493 publications in 2020. The internationalization of the scientific text corpus in civic education research in Germany is very limited, as only 215 of the included 3007 contributions (7 %) are written in English, the lingua franca of international scientific exchange. The annual quota varies considerably between 2 % (2015) and 11 % (2019), but it does not show a systematic trend. About the three types of publications examined, contributions in edited volumes (1531; 50 %) dominate overall, ahead of journal articles (1109; 36 %) and book publications (438; 14 %). Their shares are quite constant over time and do not vary much, neither for book publications (between 12 % and 16 %) nor for contributions in edited volumes (between 46 % and 53 %) or journal articles (between 33 % and 41 %).

Table 1

Features of authorship in German civic education research (Top 25).

Most productive authors (N)	Most collaborating authors (Mean of authors per publication) ⁶
Scherr, Albert (134)	Abs, Hermann Josef (2,65)
Gläser, Eva (124)	Zick, Andreas (2,64)
Lange, Dirk (100)	Manzel, Sabine (2,59)
Becher, Andrea (96)	Zimenkova, Tatiana (2,50)
Engartner, Tim (88)	Marschall, Stefan (2,47)
Grammes, Tilman (78)	Klee, Andreas (2,44)
Oeftering, Tonio (78)	Kolleck, Nina (2,44)
Kolleck, Nina (77)	Lange, Dirk (2,38)
Mehring, Reinhard (77)	Partetzke, Marc (2,35)
Möller, Kurt (77)	Oberle, Monika (2,30)
Fereidooni, Karim (73)	Hahn-Laudenberg, Katrin (2,19)
Oberle, Monika (71)	Burth, Hans-Peter (2,18)
Bremer, Helmut (67)	Becher, Andrea (2,14)
Reinhardt, Volker (67)	Carrapatoso, Astrid (2,08)
Zick, Andreas (66)	Straub, Christophe (2,06)
Hedtke, Reinhold (63)	Gläser, Eva (2,06)
Abs, Hermann Josef (60)	Neumann, Dennis (2,05)
Besand, Anja (60)	Bremer, Helmut (2,05)
Achour, Sabine (59)	Gloe, Markus (2,04)
Eis, Andreas (59)	Kenner, Steve (2,04)
Thimmel, Andreas (59)	Lösch, Bettina (2,0)
Sturzenhecker, Benedikt (57)	Schelle, Carla (1,97)
Wohnig, Alexander (57)	Szukala, Andrea (1,97)
Goll, Thomas (56)	Boeser-Schnebel, Christian (1,95)
Manzel, Sabine (53)	Emde, Oliver (1,93)

⁶ Authors with at least 10 publications in the database.

A second perspective can be unfolded by looking at the authors. Table 1 provides insight into both central characteristics of authorship in German civic education research: productivity and collaboration. As Table 1 shows, there are at least three authors who have written more than one hundred contributions during the period under study: Albert Scherr (Freiburg University of Education), Eva Gläser (University of Osnabrück), and Dirk Lange (Leibniz University Hannover). Another ten authors published more than 70 articles between 2014 and 2020. Even if the quantity does not provide much information about the quality of the contributions, it can be assumed that high productivity has an impact on the scientific discipline.

In addition to productivity, the propensity to collaborate can be a metric to describe an author's impact on the scientific community. Looking at the most collaborative authors, the picture changes considerably. In the top 10 of both categories, there are only two overlaps, Nina Kolleck (University of Leipzig) and Dirk Lange (Leibniz University Hannover).

Researchers with central structural positions in the co-authorship network

Who are – very generally speaking – the most important scientists in the collaboration network of German civic education research? To answer this question, I will, first, in short, describe the entire co-authorship network extracted from the data (remember that I excluded all those researchers who did not have any connection to any other researcher), while in a second step focusing on the giant component, i.e. the part of the network where all researchers are interconnected in a way, to be able to compute all three, degree centrality, closeness centrality and betweenness centrality.

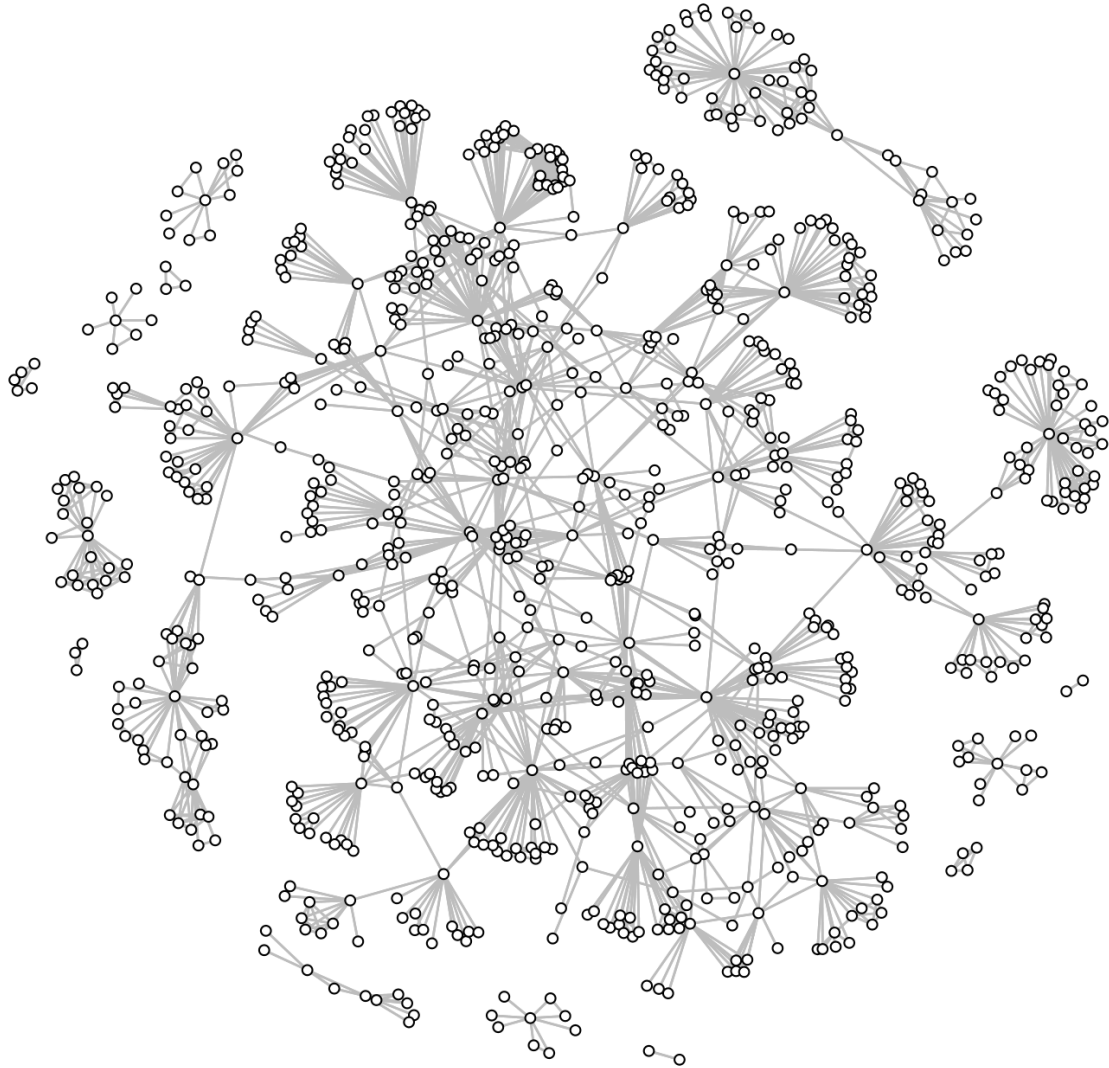
If we look at the co-authorship network in Figure 1, we can see that there is a large component at the center, in which a great number of researchers are connected to each other, and which we will look at in more detail below. However, we can also identify research groups that are detached from what we interpret as the main collaboration network in the civic education research community. For the most part, though, these are very small. Only one external component in the upper right quadrant of the graph consists of a large number of researchers grouped in a star shape around one scientist, literally the star of this cluster.

789 out of the 939 academics comprise the giant component, which may be seen as the primary network of collaboration in civic education research. The density of this network is 0.0060, whereas the density of the entire network is 0.0048. Density is the ratio of realized connections to possible connections. In contrast to many other networks found in the actual world, the network is sparse. The longest shortest-path distance between any two nodes, or the largest component, has a diameter of 13 steps. Because many publications have more than two authors, the clustering coefficient, or the likelihood of indirectly neighboring nodes being connected

directly, is 0.441, which is relatively high compared to a random graph of the same size and density (which would be roughly 0.005).

Figure 1:

Co-Authorship network of German civic education research.



Visual inspection of the graph also reveals that there are weaker and stronger connected regions within the giant component, where a large number of researchers are clustered around a few researchers. It can be assumed that these patterns allow identifying the scientific stars in the community in German civic education research. To do so, I focus - as already described above in the section "Methodology" - in a first step on three important centrality measures: degree centrality, closeness centrality and betweenness centrality.

Table 2 shows the top 10 researchers along the three centrality measures. I start my first assessment with degree centrality, conceptually one of the simplest measures, which is defined as the number of ties that a node has. A researcher in this position has many neighbors and thus the potential to strongly distribute his or her ideas within the network. In column 1 of Table 2, we see that four researchers share the top rank: Tim Engartner (Goethe University Frankfurt), Nina Kolleck (University of Leipzig), Dirk Lange (Leibniz University Hannover) and Monika Oberle (Georg August University Göttingen). Sabine Manzel (University of Duisburg-Essen), Karim Fereidooni (Ruhr University Bochum), Eva Gläser (University of Osnabrück), Helmut Bremer (University of Duisburg-Essen) and Tilman Grammes (University of Hamburg) follow in the subsequent places. All these researchers can be deemed to be quite popular in the German civic education research community.

Closeness centrality scores each node based on their "closeness" to all other nodes in the network and thus tells us those individuals who are best placed to influence the entire network most quickly. These good "broadcasters" of the co-authorship network in German civic education research (see column 2 in Table 2) are Kerstin Pohl (Johannes Gutenberg University Mainz), Sabine Achour (Free University Berlin), Klaus-Peter Hufer (University Duisburg-Essen), Reinhold Hedtke (University Bielefeld), Monika Oberle (Georg August University Göttingen), Dirk Lange (Leibniz University Hannover), Tilman Grammes (University of Hamburg), Matthias Busch (University Trier), Andrea Szukala (Westphalian Wilhelms University Münster) und Tim Engartner (Goethe University Frankfurt).

Lastly, we shift our attention to betweenness centrality, which measures how much a particular scholar connects other nodes in the network or various teams of cooperating scientists. This measure of a researcher is based on how many shortest paths there are between any two other researchers and where the focal researcher is located. Because it helps to discover the "bridges" between these clusters and other researchers within the collaboration network, it is a complimentary measure to the identification of clusters (which we will present in the next part). Nodes with a high betweenness centrality score have a greater influence since they can connect with the network's more remote areas. By doing so, they can manage how other people's impact

spreads among different research clusters, and in turn, they can affect those other clusters.

Table 2.

Top 10 most central scientists in German civic education research.⁷

degree centrality (score)	closeness centrality (score)	betweenness centrality (score)
Engartner, Tim (0.0114)	Achour, Sabine (0.2573)	Achour, Sabine (0.0474)
Kolleck, Nina (0.0114)	Pohl, Kerstin (0.2513)	Oberle, Monika (0.0446)
Lange, Dirk (0.0114)	Oberle, Monika (0.2462)	Hahn-Laudenberg, Katrin (0.0352)
Manzel, Sabine (0.0108)	Busch, Matthias (0.2415)	Lange, Dirk (0.0320)
Oberle, Monika (0.0108)	Hedtke, Reinhold (0.2473)	Lutter, Andreas (0.0277)
Gläser, Eva (0.0092)	Grammes, Tilman (0.2484)	Abs, Hermann J. (0.0268)
Fereidooni, Karim (0.0089)	Szukala, Andrea (0.2410)	Engartner, Tim (0.0255)
Bremer, Helmut (0.0075)	Lange, Dirk (0.2353)	Pohl, Kerstin (0.0250)
Grammes, Tilman (0.0075)	Hahn-Laudenberg, Katrin (0.2337)	Birke, Franziska (0.0239)
Abs, Hermann J. (0.0071)	Partetzke, Marc (0.2322)	Wohnig, Alexander (0.0225)

The most betweenness-central node in the co-authorship network of German civic education research is Sabine Achour (Free University Berlin) followed by Monika Oberle (Georg August University Göttingen) and Katrin Hahn-Laudenberg (University of Leipzig). Other researchers who have a high score in this category are Dirk Lange (Leibniz University Hannover), Andreas Lutter (Christian Albrecht University Kiel), Hermann J. Abs (University Duisburg Essen), Tim Engartner (Goethe University Frankfurt), Kerstin Pohl (Johannes Gutenberg University Mainz), Franziska Birke (University of Education Freiburg) and Alexander Wohnig (University Siegen).

Based on these three measures of centrality, it can be assumed that Monika Oberle (Georg August University Göttingen), as well as other highly central researchers like Sabine Achour (Free University Berlin) and Dirk Lange (Leibniz University Hannover), seem to be the visible and potentially highly influential academic “stars” of German civic education research.

Identifying research cluster and their characteristics in the co-authorship network of civic education research in Germany

The locations of the 20 largest groups of cooperating researchers within the cooperation network are depicted in the Annex Figure A1. The clusters' core members and their mutual ties are highlighted in turquoise, while all other researchers are displayed in white. The convex hull of these core members, denoted by a shaded polygon, is the smallest area inhabited by the nodes recognized as core members of the research cluster. In the following, I will illustrate each cluster in turn. For all figures, square-shaped nodes denote professors, and circles denote postdoctoral

⁷ Authors with at least 10 publications in the database.

or other non-professorial research staff.

Figure 2 shows the largest group of researchers in detail. Cluster 1 consists of 44 researchers grouped in a star shape around its "star", Andreas Zick (Bielefeld University). The peculiarity of this cluster is that it is completely detached from the giant component, which we interpret as the main collaboration network. In the world of civic education research, there seems to be a parallel universe that collaborates internally but has no external connection to the rest of the world. The collaboration within the Institute for Interdisciplinary Research on Conflict and Violence at Bielefeld University is very intense. In addition, there is cooperation with various departments of the University of Bielefeld at the professorial level (especially sociology). Also noteworthy is an international subcluster with professorial cooperation with Jim Sidanius (Harvard University) and Jonas Kunst (University of Oslo) centered on psychological research issues. The research focus of cluster 1 is on prejudices, racism, group-focused enmity, radicalization, extremism, conflicts and violence between groups, migration and acculturation.

Figure 2

Research Cluster 1



Cluster 2 is constituted by Nina Kolleck (University of Leipzig), around whom 41 researchers are grouped (Figure 3). This cluster is also largely decoupled from the rest of the giant component of civic education research, with connections between Mareike Well, Astrid Carrapatoso, and Franziska Birke as gatekeepers providing at least an indirect weak link. Largely separate from the general civic education research community, Nina Kolleck has built a research cluster whose thematic foci are democracy education, global citizenship education, educational equity, education for sustainable development, climate education, heterogeneity and inclusion, international public administration, and public health. The research group is further distinguished by its methodological approach, which is dominated by quantitative research methods, particularly social network analysis techniques. Most of the co-authors do not come from the core area of civic education, but from faculties of educational sciences. Intensive work with colleagues from the Free University in Berlin and the University of Bielefeld is particularly noticeable, although the cooperation at the professorial level spans 10 different (international) universities.

Figure 3

Research Cluster 2

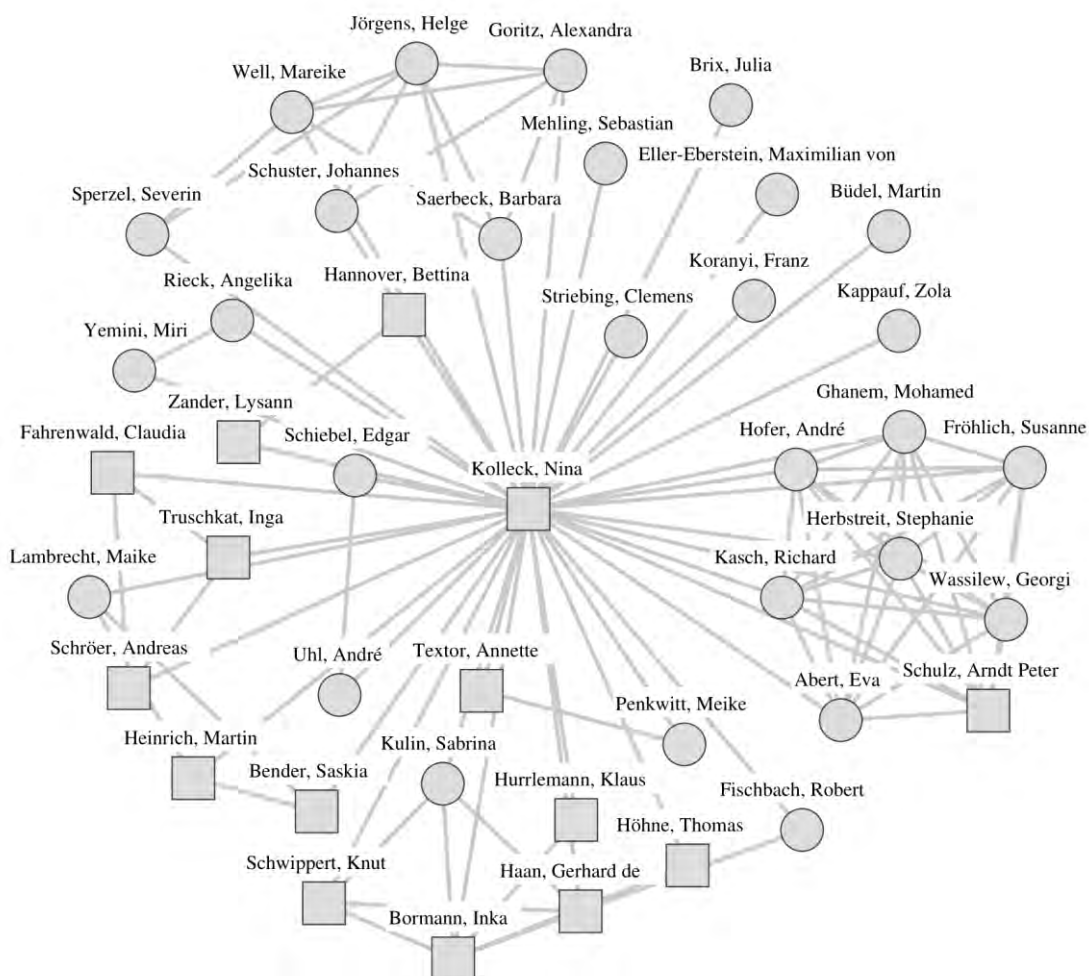
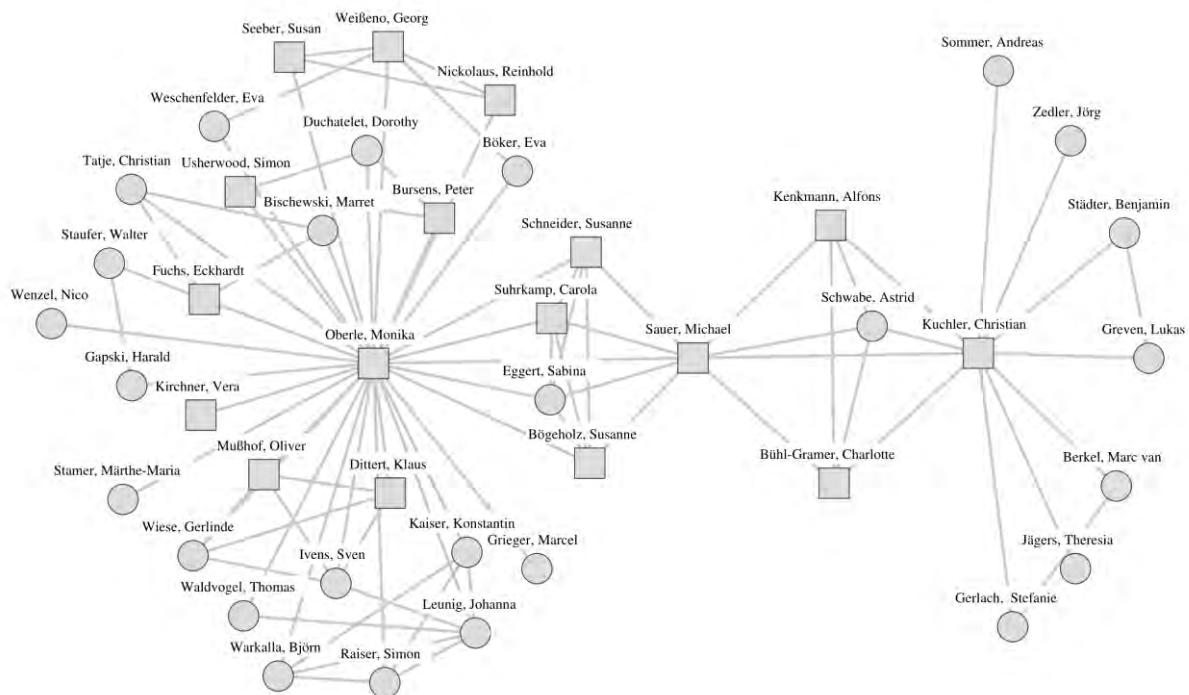
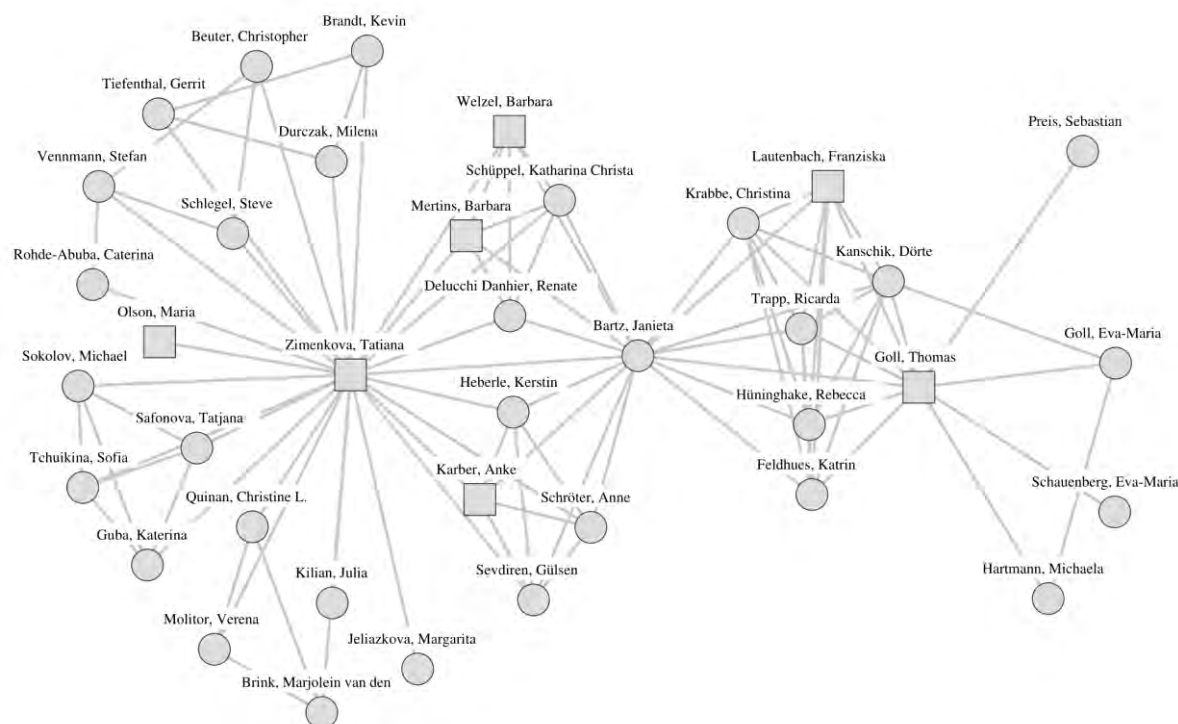


Figure 4*Research Cluster 3*

Cluster 3 presents the first group of researchers located at the core of the co-author network. Consequently, it can be considered the most important cluster within the giant component. The formative researcher of this cluster is Monika Oberle (University of Göttingen), who forms a cluster with 41 researchers around her (Figure 4). Again, this cluster is characterized by a pronounced collaboration within the "star's" own university. On the professorial level, this takes place between different faculties, while non-professorial cooperation occurs in particular within the Department of Political Science. However, there are also numerous collaborations with external scientists from other universities, but the internationality is only slightly developed. The authoring activities with non-academic partners (e.g. planpolitik GbR Berlin) seem to be remarkable. This cluster is characterized methodologically by a systematic empirical research approach, in which both qualitative and especially quantitative methods (e.g. structural equation models, regression analyses) are used. Consequently, the research centers on the systematic-empirical investigation of different factors of teaching-learning processes in civic education. The focus is on political competencies, their development, and prerequisites among students and teachers. In terms of content, special emphasis is placed on political education about the European Union. With regard to the methods of civic education, digital and analogue simulation games are intensively researched.

Figure 6*Research Cluster 5*

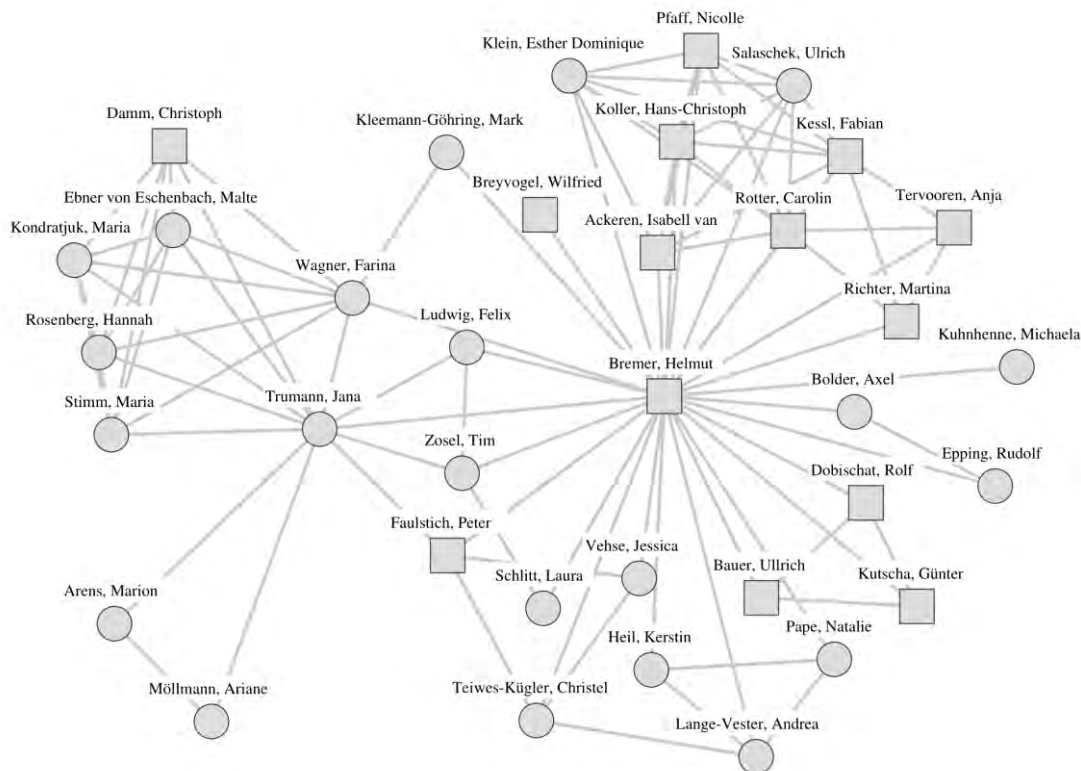
Cluster 5 consists of a total of 37 researchers (Figure 6) but is essentially dominated by three individuals. Tatiana Zimenkova (Rhine-Waal University of Applied Science) is the most important researcher and forms a subnetwork with 17 other researchers. In addition, Thomas Goll (TU Dortmund) and his closest colleagues are constitutive for cluster 5. These two subclusters show essential overlaps in composition, with Janieta Bartz (TU Dortmund University) in particular providing the link. While the research led by Thomas Goll is characterized by intensive internal collaboration at the TU Dortmund, Zimenkova's research group has several international connections. The research foci of this heterogeneous cluster are diverse. The group led by Tatiana Zimenkova is particularly concerned with issues of diversity in schools, society, and the police. Inclusion and diversity in teacher education and higher education then also form the thematic connection to Thomas Goll's research group, a link personified by Janieta Bartz. Furthermore, the focus of Thomas Goll's research group is on the didactics of civic education in general and on research in elementary and primary education in particular.

Cluster 6 (Figure 7) consists of 36 researchers who are connected to each other mainly through Helmut Bremer (University of Duisburg-Essen). This cluster differs from the previous ones in that it focuses on the political education of adults in its research and works in particular with qualitative methods of empirical social research. Internal cooperation at the Faculties of Education and Educational Science is particularly pronounced here. Connections to researchers

from other universities are relatively rare.

Figure 7

Research Cluster 6



The composition of cluster 7, which is made up of a total of 35 researchers, is again determined by several individuals (Figure 8). The most important researcher is Andreas Eis (University of Kassel). In addition, Bernd Overwien (University of Kassel), Oliver Emde (Foundation University of Hildesheim), and Bettina Lösch (University of Cologne) are crucial for the constitution of this research group. Together, the scholars in this cluster represent a critical approach to civic education research. Here, critical analyses of global learning, as well as sustainability and (inter-)cultural learning, are in focus mostly in theoretical examination of the research subjects. It is noteworthy that this group includes not only academic researchers, but also activists from education and arts, and thus the backgrounds are diverse.

Figure 8

Research Cluster 7

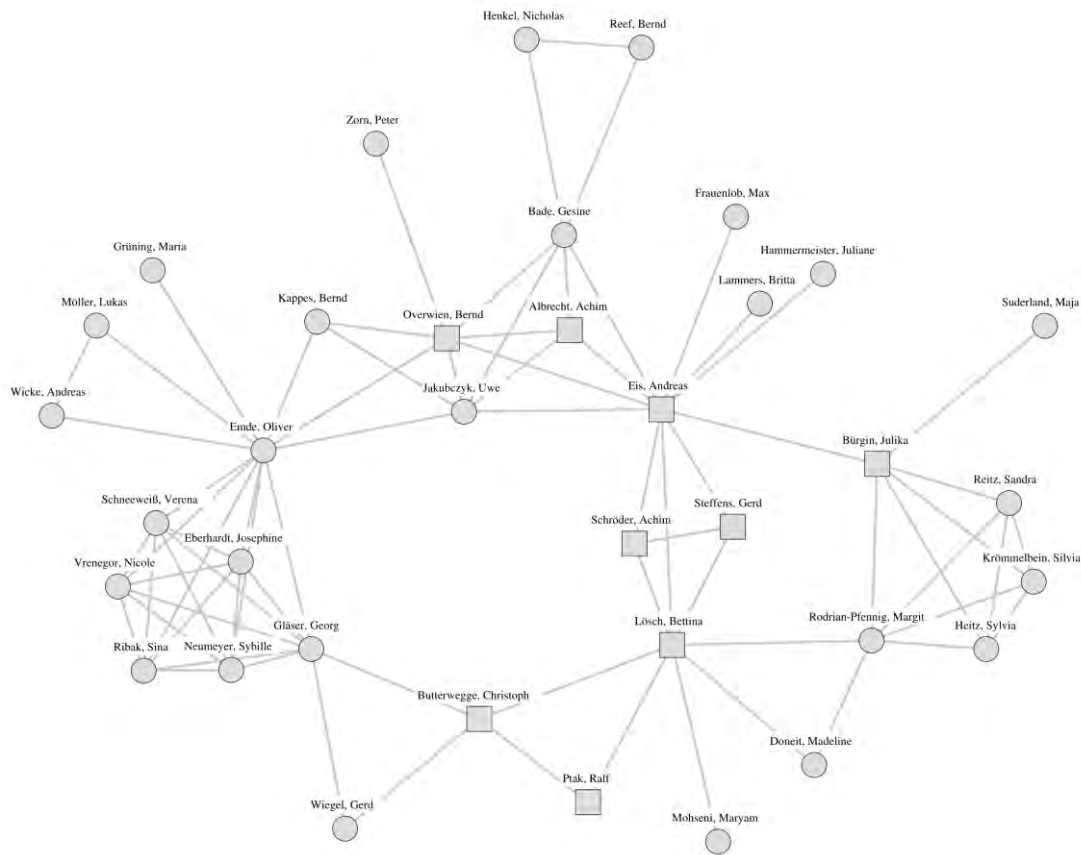
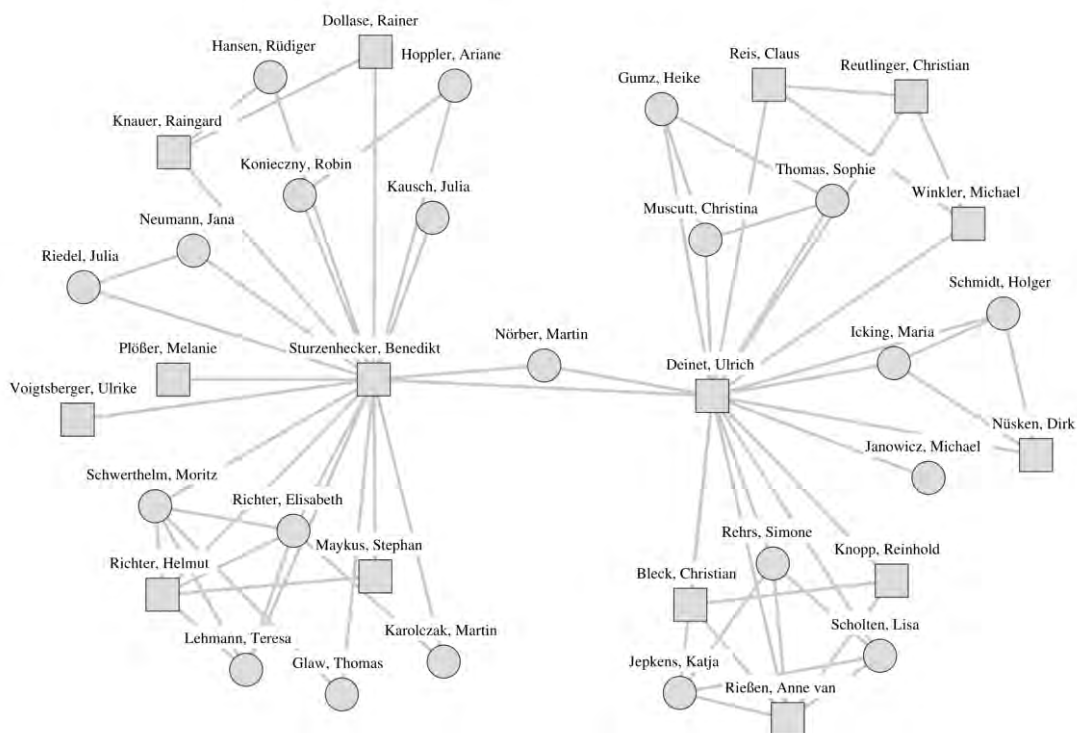


Figure 9

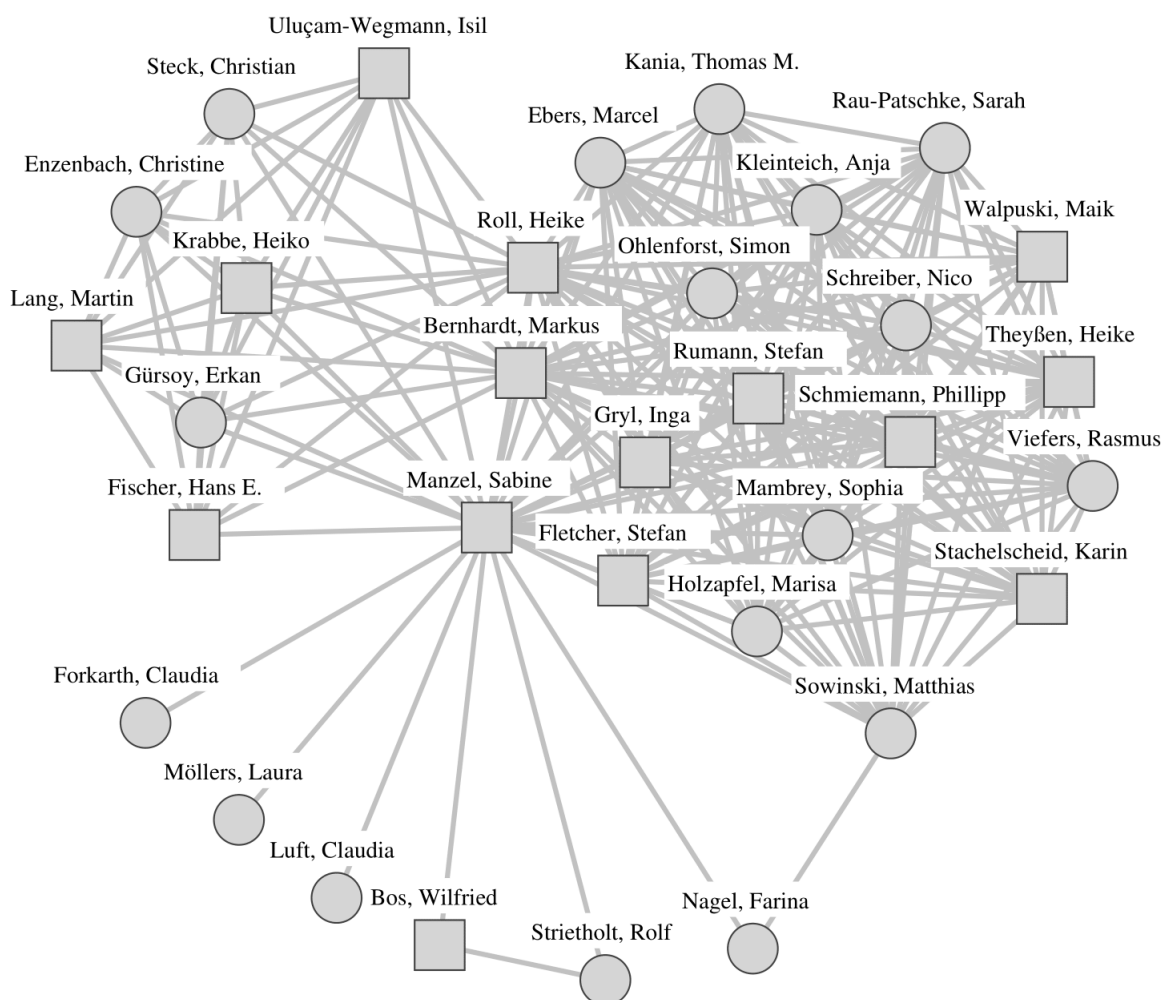
Research Cluster 8



Cluster 8 consists of two subgroups linked by Benedikt Sturzenhecker (University of Hamburg) and Ulrich Deinet (Düsseldorf University of Applied Sciences). Thus, they both are the most influential researchers of this cluster (Figure 9). The focus of this research group is the connection of political education with socio-pedagogical approaches, especially in open child and youth work. Accordingly, the members of the cluster do not come from classical departments of political didactics, but from social, educational and cultural sciences, and here, too, the individual backgrounds are very diverse. As in most of the previous clusters, no international orientation can be discerned.

Figure 10

Research Cluster 9



Sabine Manzel (University of Duisburg-Essen) is the most important researcher for the composition of cluster 9 (Figure 10). She groups 32 professorial and non-professorial researchers around her. Besides intensive co-authorships with colleagues from political didactics, language education from an interdisciplinary perspective stands out as a major

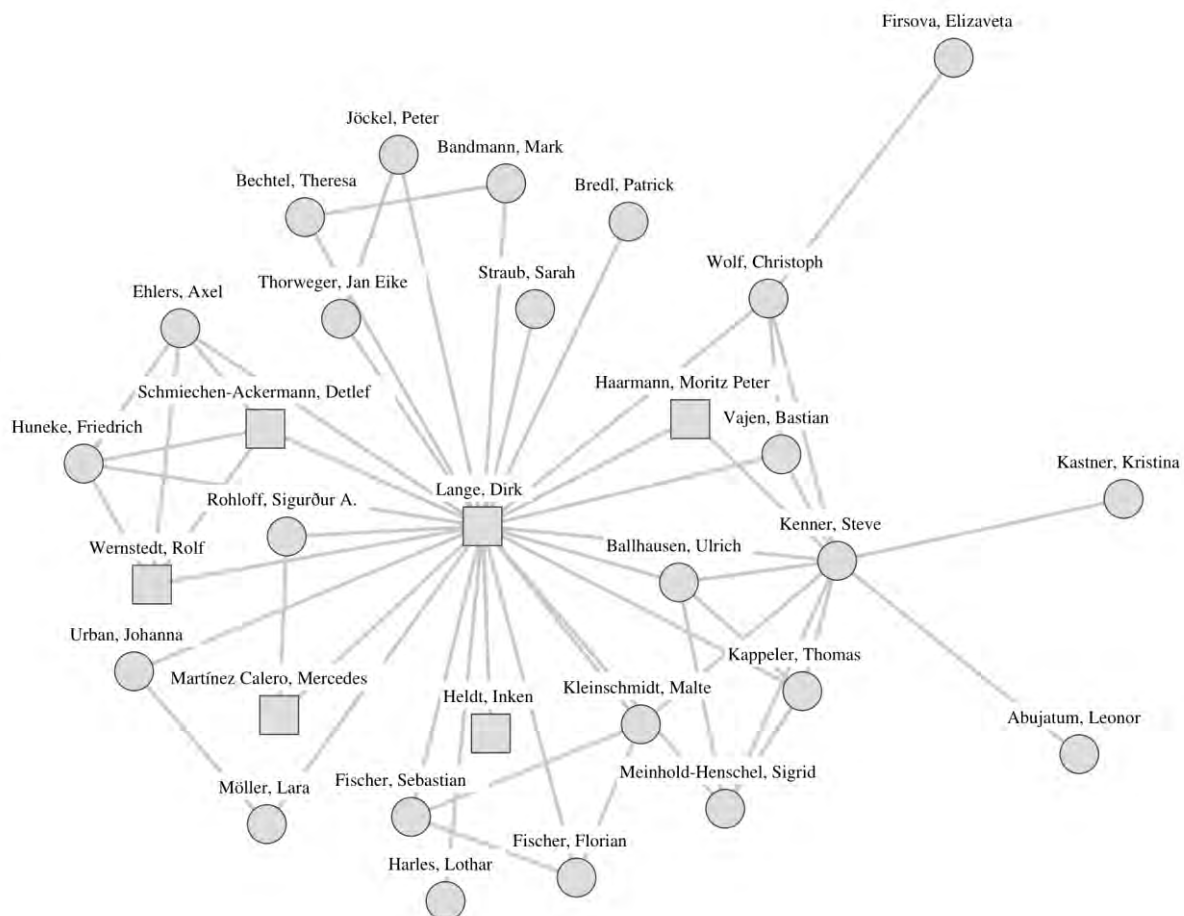
research focus. The cluster is characterized by intensive cooperation between very different departments of the University of Duisburg-Essen, e.g. chemistry, physics, biology, Turkish studies, engineering, or German as a second and foreign language. External links to other Universities are few and far between.

Cluster 10 groups 32 researchers around Karim Fereidooni (Ruhr-Universität Bochum). A special feature of this cluster (Figure 11) is that it consists overwhelmingly of non-professorial members and many of the authors have not pursued an academic career in the long run, but rather are in educational practice. The overarching theme of this cluster is the critique of racism in the discourse of civic education.

Figure 11

Research Cluster 10

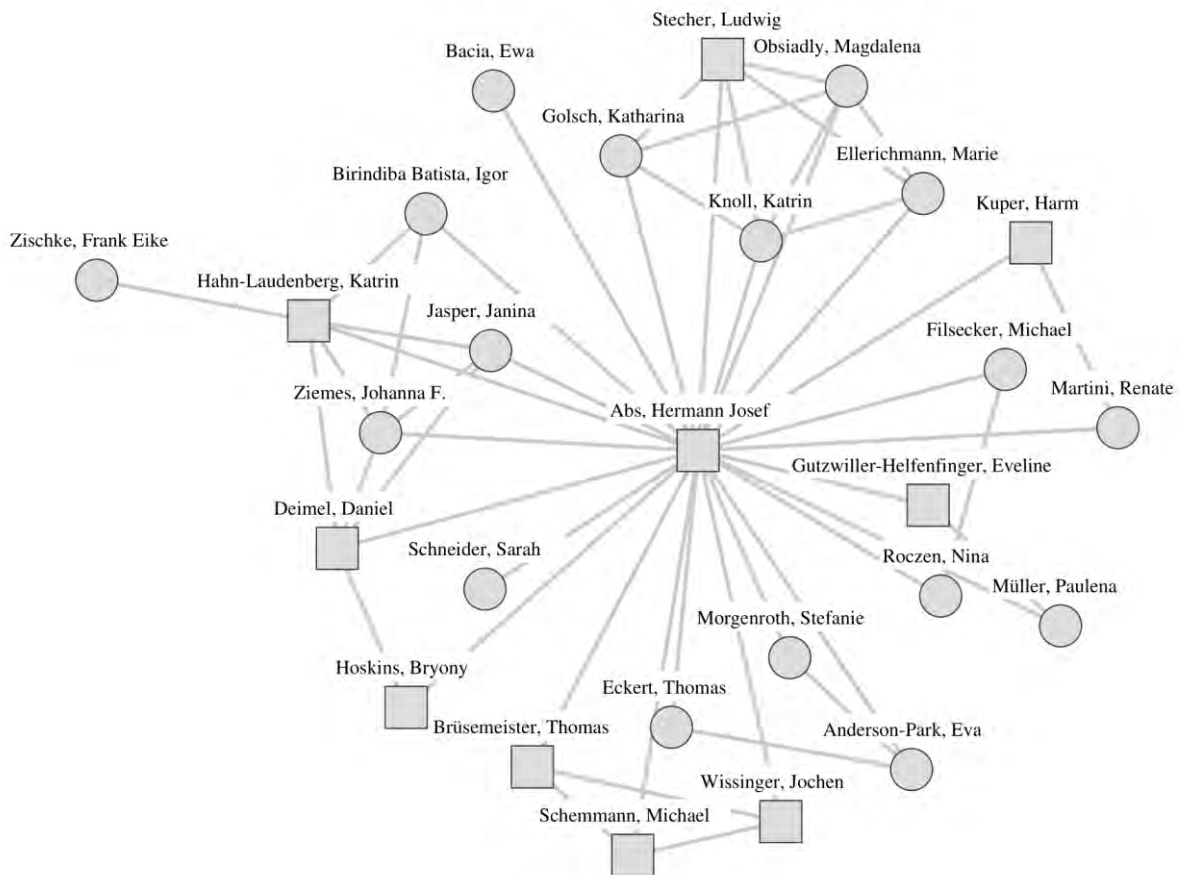


Figure 12*Research Cluster 11*

For cluster 11, Dirk Lange (Leibniz University Hannover) is the outstanding researcher. He is flanked by his colleague Steve Kenner (Leibniz University Hannover), who also occupies a somewhat bridging position (Figure 12). This cluster comprises a total of 30 researchers and is characterized to an outstanding degree by intra-university cooperation with few connections to other university institutions in Lower Saxony (Leuphana University, HAWK Hildesheim). International cooperation can be found with the University of Vienna. The cluster's research focuses on participation in general and citizenship education in particular, the democratic challenges of populism, extremism, and nationalism, but also diversity and inclusion, migration and globalization.

Figure 13*Research Cluster 12*

Tim Engartner (University of Cologne) is the star of cluster 12, which comprises a total of 28 researchers (Figure 13). In this research group, too, co-authorship is mainly achieved through intra-institutional cooperation within and between different departments of the Goethe University Frankfurt, where Tim Engartner held the professorship for the didactics of social sciences for several years until recently. The research focus of this cluster is on socio-economic education. Methodologically, a focus on simulation games can be identified. Recently, the topic of digitalization in the context of political and socio-economic education was added.

Figure 14*Research Cluster 13*

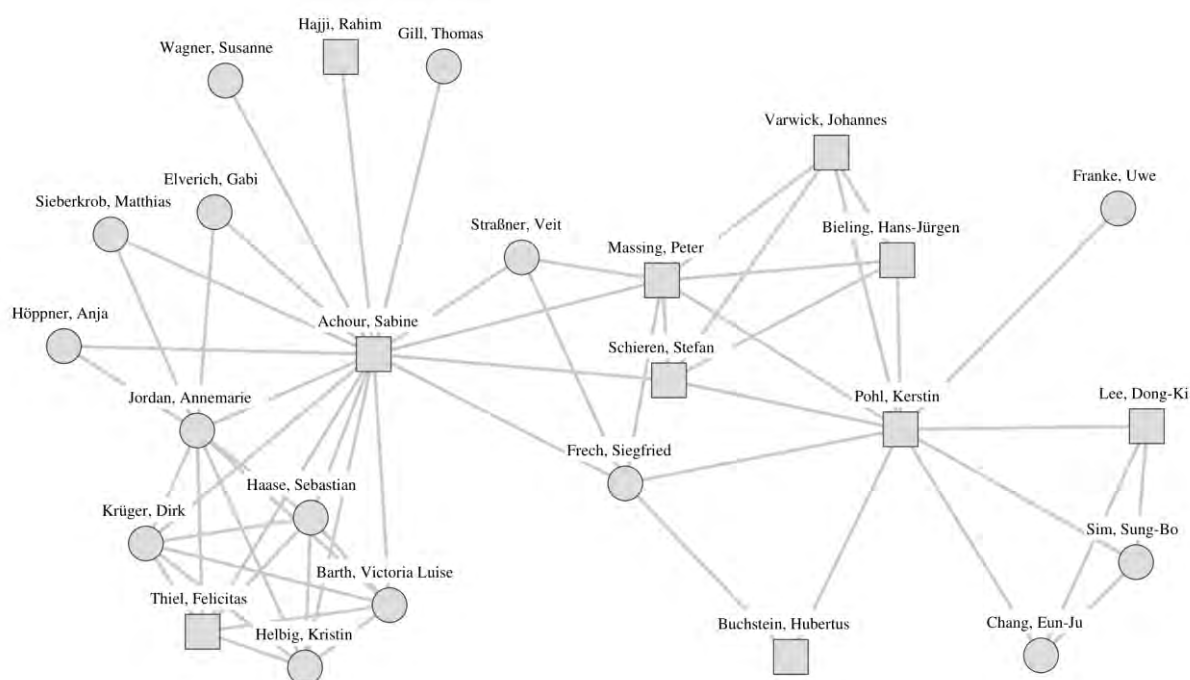
Cluster 13 consists of 27 researchers, centered on Hermann Josef Abs (University of Duisburg-Essen). Even though this cluster (Figure 14) is also dominated by intra-institutional cooperation within and between different departments, some external links can be discerned (especially Justus Liebig University Giessen). The topics covered by this research group are diverse, but a clear focus is empirical work based on data from the International Civic and Citizenship Education Study (ICCS), for which Abs and colleagues in Germany are responsible.

Cluster 14, which includes a total of 25 researchers, has a somewhat more complex structure (Figure 15), consisting of two subclusters linked by Peter Massing (Freie Universität Berlin), Stefan Schieren (Catholic University of Eichstätt-Ingolstadt), and Sigfried Frech (State Agency for civic education, Baden-Württemberg). The star of the larger subcluster is Sabine Achour (Free University Berlin). The work of this research group focuses on questions about the challenges for pluralistic democracy in the face of increasing diversity, flight and migration, inclusion, inclusive language education, and religious plurality - and this is about learners and teachers. The star of the second research group is Kerstin Pohl (Johannes Gutenberg University Mainz), who unites seven other researchers around her. What is striking here is, on the one

hand, the range of professorial collaboration beyond her own institution as well as research activities with colleagues from South Korea (Gangneung-Wonju National University Korea). The focus of this subgroup is more on the general foundations of political didactics and the associated controversies. The interview technique stands out as a methodological approach.

Figure 15:

Research Cluster 14



Three people are of outstanding importance for the composition of cluster 15 (Figure 16): Reinhold Hedtke (University of Bielefeld), Julia Oppermann (Leuphana University of Lüneburg) and Klaus-Peter Hufer (University of Duisburg-Essen). 16 of the 25 researchers are grouped around Reinhold Hedtke. For this subcluster, a pronounced cooperation on the professorial level is evident, whether intra-institutional (e.g. Bettina Zurstrassen) or cross-institutional (e.g. Gerd Famulla, University of Flensburg). The thematic focus is on socio-economic and vocational education. Julia Oppermann acts as a hinge in this cluster, connecting Hedtke's research group with a subcluster centered on Klaus-Peter Hufer. The thematic kit between the two subclusters is extracurricular political education for young people and adults, with the latter in particular being intensively pursued by Hufer's research group. Institutional diversity is pronounced here - a total of 15 research institutions and universities are represented with various departments.

Figure 16

Research Cluster 15

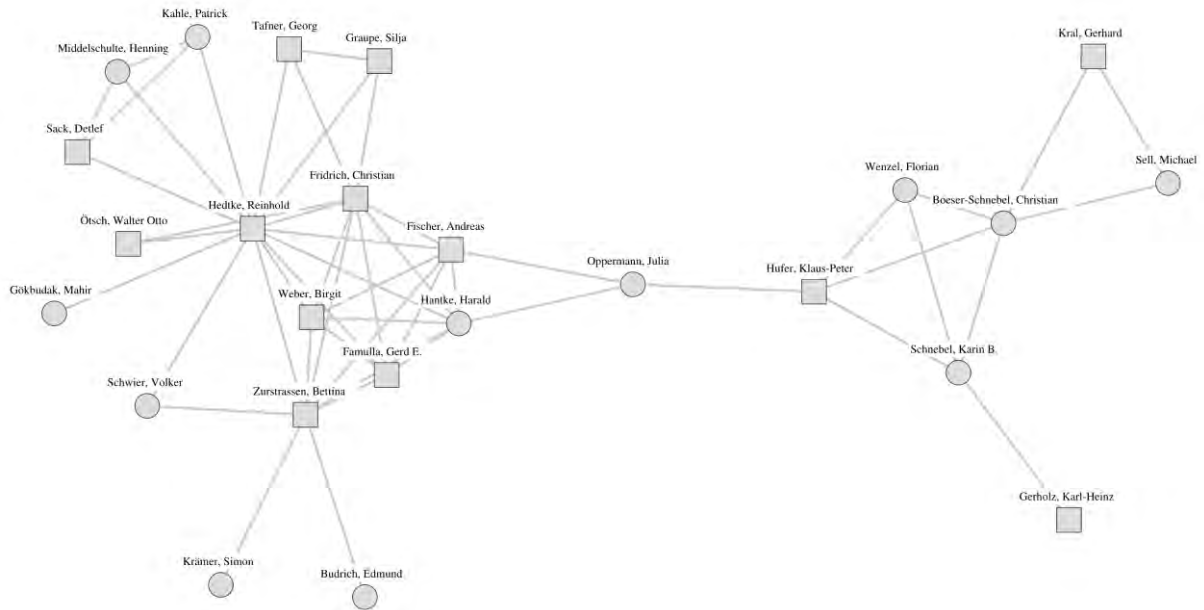
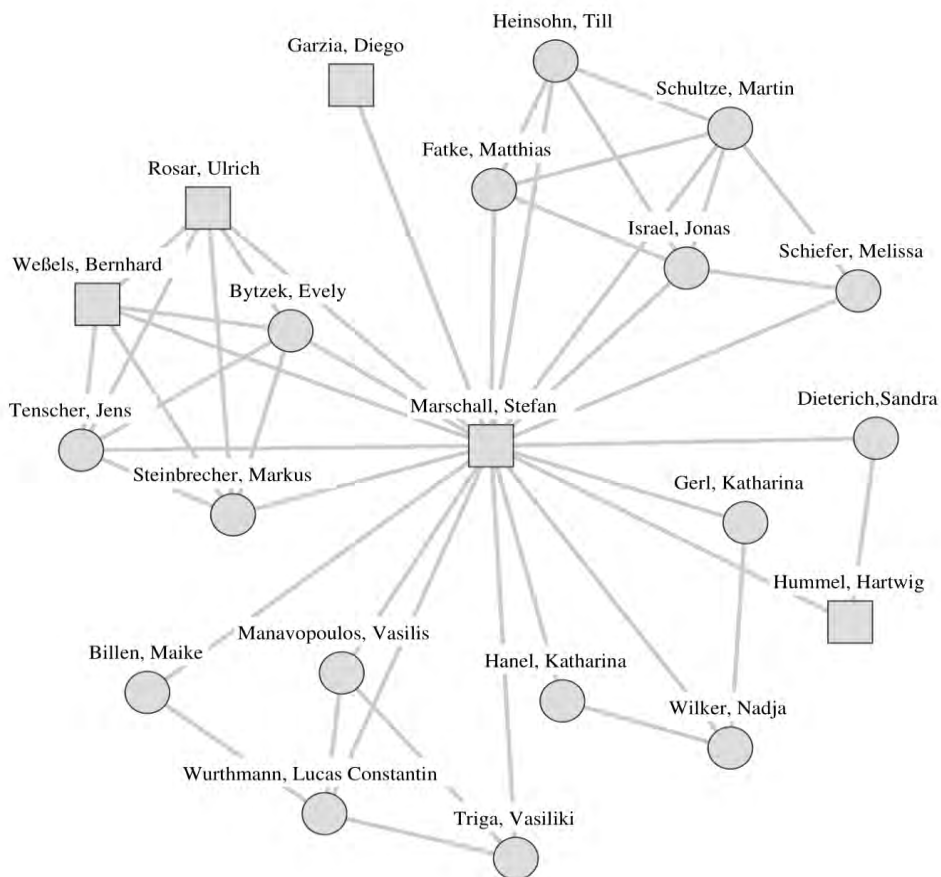


Figure 17

Research Cluster 16

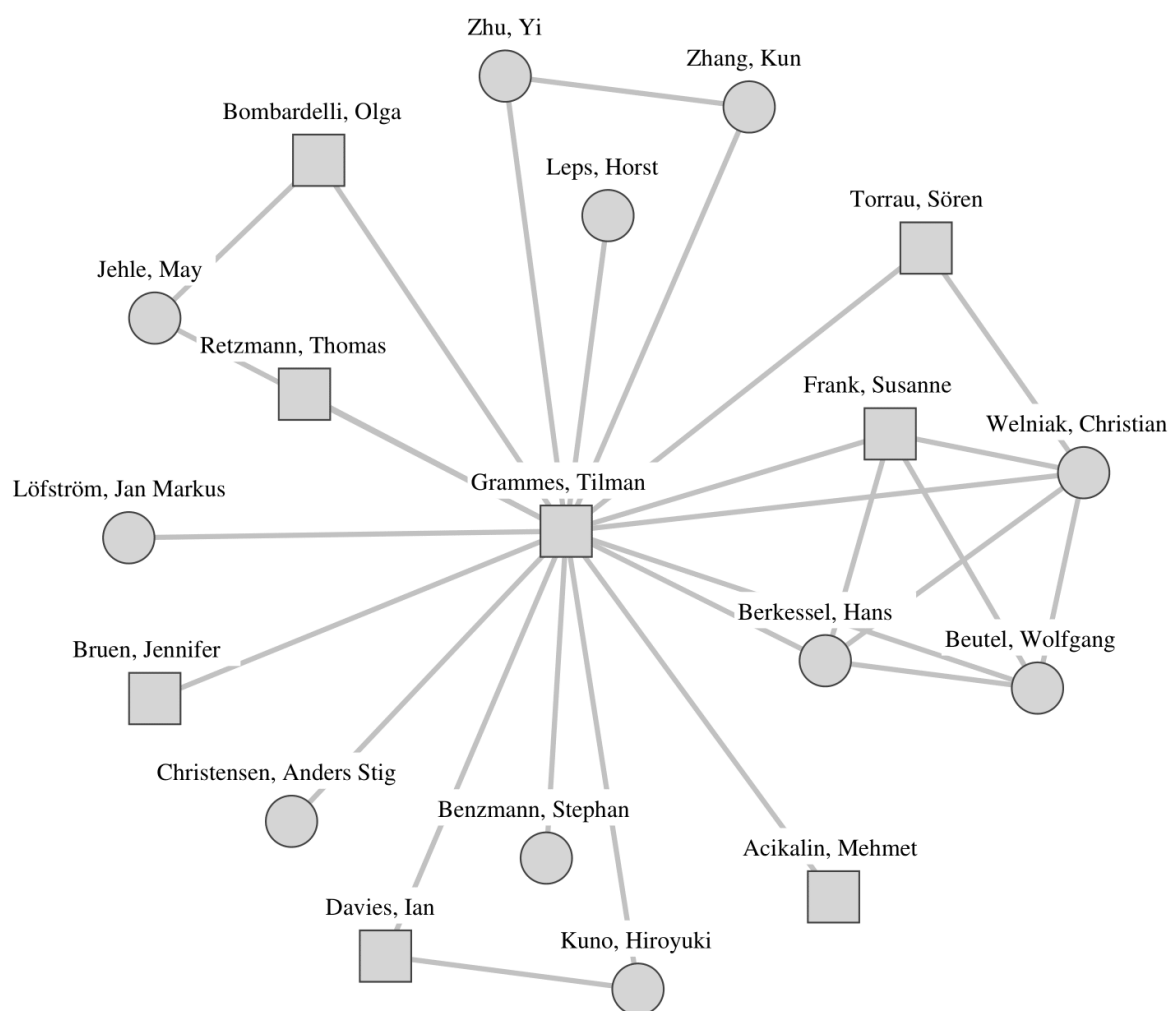


Cluster 16, consisting of a total of 21 researchers, is essentially held together by Stefan

Marschall (Heinrich Heine University Düsseldorf). With regard to the individual researchers, this cluster (Figure 17) is rather to be assigned to political science than to political didactics. The predominant topic of this cluster with regard to political education is the investigation of the effect and implementation of Voting Advice Applications (VAA) such as the Wahl-O-Mat, a research strand that the group around Stefan Marschall has established in the past two decades not only in Germany but internationally, without, however, pursuing a research approach of political didactics in the classical sense. Compared to the others, the research cluster has a stronger cross-institutional and also international orientation.

Figure 18

Research Cluster 17



Cluster 17 is grouped around Tilman Grammes (University of Hamburg) and consists of a total of 19 persons (Figure 18). Here, too, it is striking that the group is characterized less by intra-institutional cooperation than by cross-institutional co-authorships and has a distinctly international orientation. The thematic focus is very broad. In addition to general questions of

political didactics, there is a focus on the comparative analysis of cultures of citizenship education, on historical learning, and on interpretative classroom research.

Figure 19

Research Cluster 18



The star of Cluster 18 is Marc Partetzke (Hildesheim University Foundation). He groups a total of 18 other researchers around him (Figure 19). It is striking that these almost exclusively have a non-professorial level (exception e.g. Sophie Schmitt, Justus Liebig University Giessen) and in some cases have also not permanently pursued an academic career. Cross-institutional collaboration is more pronounced relative to the size of the overall group, whereas no international orientation is evident. Formative for the work of this research cluster are approaches from hermeneutic political didactics, (auto)biographical research, and narrative-based political education, but also research on political culture, often with a focus on historical-political education.

Cluster 19 is formed around Michael May (Friedrich Schiller University Jena), who gathers a total of 18 other researchers around him (Figure 20). The cluster is essentially characterized by intra-institutional co-authorships at both professorial and non-professorial levels. The thematic

focuses are diverse and range from classical questions of political didactics (e.g., political judgment formation) to reconstructive classroom research and teacher education.

Susann Gessner (Philipps-University Marburg) and Stefan Müller (Frankfurt University of Applied Sciences) are the main actors of cluster 20 (Figure 21). The 16 other actors mostly come from different institutions, i.e. cross-institutional cooperation is widely developed. The methodological focus of this research group is on qualitative research approaches and grounded theory methodology. The target is primarily political education in schools, especially against the background of the challenges and opportunities for civic education in the migration society.

Figure 20

Research Cluster 19

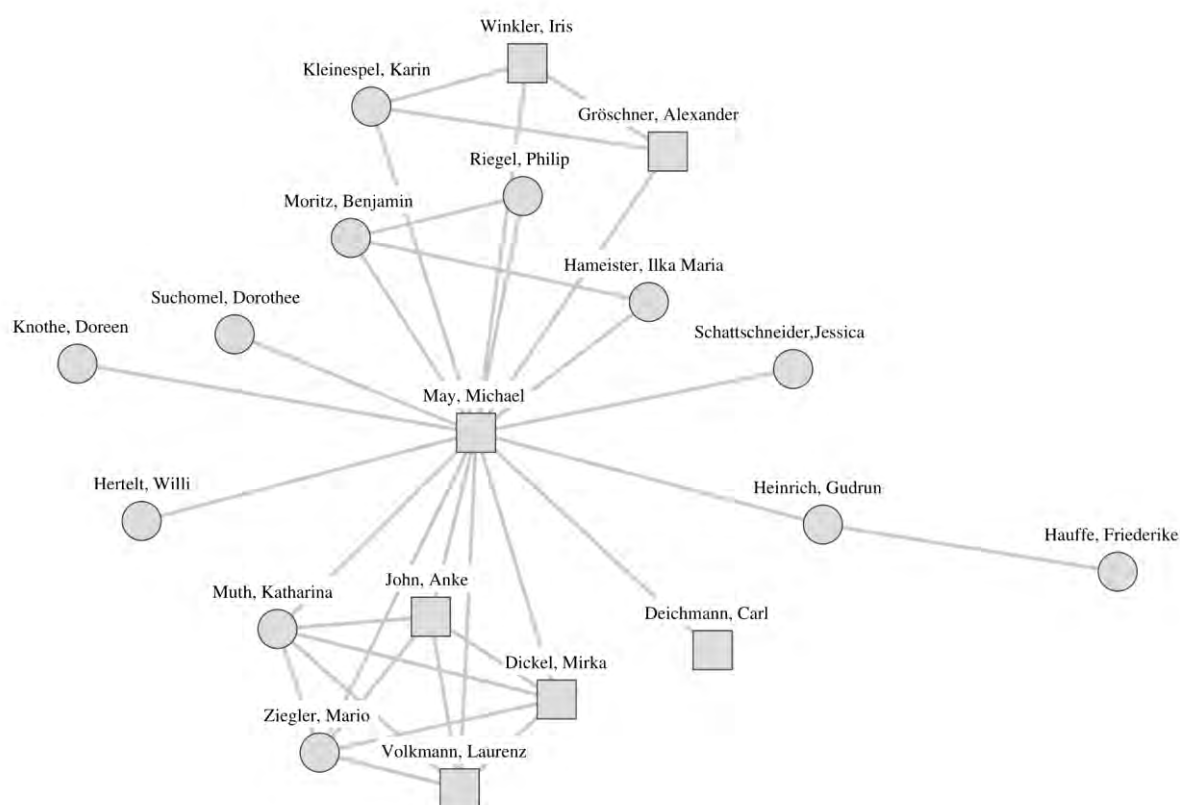
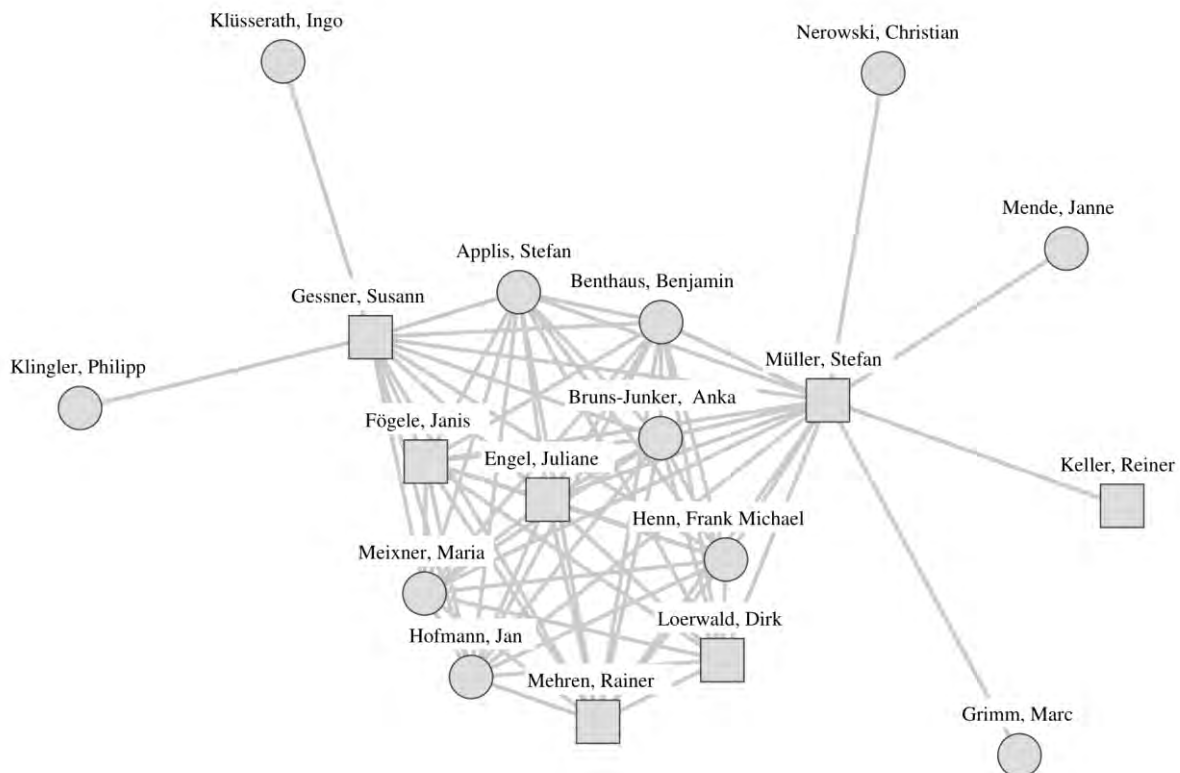


Figure 21:*Research Cluster 20*

Several intriguing features may be found in this description of the twenty greatest research clusters. First, civic education research in Germany appears to be a diversified discipline. We find different thematic foci, different target groups and methodological approaches. Second, it is noteworthy that alongside the giant component two comprehensive clusters are developing largely detached from the central community. Whether these parallel universes will last in the world of civic education research or become more integrated into the core of the network through collaboration in the future is an intriguing question. Third, invisible colleges are described by Crane (1972) as various teams of collaborators with (informal) cross-institutional collaboration linkages and a star-like pattern from more senior to more junior academics. Except for clusters 7 and 20, this structural feature applies to nearly all research groups. However, fourth, the identified groups of collaborating researchers are mainly defined by inner-institutional connections. While collaborations with researchers from other universities in Germany are not uncommon, the degree of internationalization is in nearly all clusters sparse or even nonexistent. Fifth, the discipline in Germany is not that well interconnected compared to the world of political science (Leifeld et al., 2017), with a diameter of 13 in the giant component, although there are 789 members in it.

Thus, institutional closeness and assortativity (i.e., homophily and/or social influence) in terms

of topic or scientific approaches appear to affect the co-authorship network of scientists in German political education research, as well as the clusters that arise within this network. The preferred publishing types are another factor that is expected to differ among the found clusters due to homophily and social influence. To evaluate the composition of clusters by publication type, Figure A2 in the Annex visualizes the twenty clusters for each publication type separately. As can be seen, the different clusters have different publication strategies. Although in no case does a publication type fully capture a research group, it can be stated that the compositions of clusters 2, 3, 9, 12, 16 and 20 are characterized by journal articles. Book publications are characteristic of clusters 4, 6 and 15, whereas clusters 5, 10, 13 and 19 collaborate particularly within chapters for edited volumes. No clear pattern can be discerned for research clusters 1, 7, 8, 11, 14, 17 and 18 about publication type.

Conclusion and Implications

Based on the assumption that social relations in research substantially shape the development of a discipline (Moody 2004), in this contribution, I present the first mapping of civic education research in Germany based on more than 3000 contributions from more than 900 authors between 2014 and 2020. Based on this database, I provide a variety of insights into the topography of the research landscape with the help of different approaches. First, in terms of the number of publications, their types and language, the bibliometrics show a relatively strong constancy over time of the discipline's literature. In all dimensions, little systematic development can be discerned. Most strikingly, the international orientation of the text corpus is very low, with the quota of English texts as the lingua franca of research almost consistently below 10 percent. An initial look at both the authors' productivity and tendency to collaborate with other researchers reveals, second, that there is little overlap between these two dimensions; thus, they seem to potentially impact the research community in different ways. In Crane's (1972) model of scientific growth, invisible colleges shape the development of a research area in a phase of exponential growth (see an equivalent concept by Kuhn (1970), a phase he labels "normal science"). Based on these first insights it might be doubted whether civic education research in Germany operates in a phase of dynamic growth or rather remains in a period of consolidation. Third, using all three measures, degree centrality, closeness centrality and betweenness centrality I identify the most important researchers of the collaboration network, with Monika Oberle (Universität Göttingen) alone holding a top position in all three measures. The identification of the most important research groups using consensus graph clustering methods shows, fourth, that the research landscape is very diverse. Interestingly, two teams

with their stars (Andreas Zick, Bielefeld University and Nina Kolleck, University of Leipzig), acting largely decoupled from the giant component, which we assume to be the core of the collaboration network, form the most coherent research groups. For the further development of research in civic education in Germany, it could be decisive to what extent these parallel universes will continue to exist in the world of political didactic research, or whether they will move more into the center through more intense cooperation. Moreover, it is somewhat remarkable that it is not primarily those research groups that focus on civic education in higher education that dominate the top 10 clusters (as an exception see Cluster 3). Rather, the foci are diverse in terms of target groups, ranging from primary education in schools to social pedagogical approaches in adult education. Here, a shift from the traditional focus on secondary education to other target groups might be indicated for future research. But also with regard to topics and methodological approaches, the twenty largest research groups are characterized by a great diversity, which speaks for the vitality of the discipline.

However, with the collaboration network in mind, fifth, a critical assessment of cross-institutional collaboration and international orientation must be made. Both of these are generally not very pronounced in the research groups, but they are very relevant for the further development of a scientific discipline, as at least a look at political science points in this direction (Leifeld et al., 2017). In comparison and competition with other sub-disciplines of e.g. political science, social science and education research, where the professorships of political didactics are mostly located, there is a need to catch up or, positively speaking, open potential. For a reflexive, conscious and systematic development of civic education research, academic research in Germany should broaden its own horizon in collaboration with cross-institutional and international partners. This could be done, for example, first, by establishing and strengthening international funding and research projects, second, by holding internationally oriented conferences that go beyond national traditions and approaches and rather consider the multiple perspectives and paths of civic education from different contexts, and, third, by strengthening publication platforms that are committed to an international and interdisciplinary perspective on civic education.

Taking this as a reference point, it seems worthwhile for future research on publication patterns and collaboration networks in research on civic education in Germany to make a comparison with sub-disciplines of its reference sciences (social sciences, economics, historical sciences, education sciences, etc.). This would create a mirror that might help reflect on the development of the own discipline and could also promote the linking of different sub-disciplines of political didactics. A benefit could not only be a comparison with other sub-disciplines of (social)

science research in Germany but also in an international perspective in terms of civic education research in other countries to better assess different routes of development and the own position within the international landscape of civic education research. These approaches would serve the potential to contribute to a more reflexive, conscious and systematic development of the research discipline in civic education in Germany in the future.

References

- Arzheimer, K., & Schoen, H. (2009). Isoliert oder gut vernetzt? Eine vergleichende Exploration der Publikationspraxis in der PVS. *Politische Vierteljahresschrift*, 50(3), 604-626. <https://doi.org/10.1007/s11615-009-0149-y>
- Blondel, V. D., Guillaume, J. L., Lambiotte, R., & Lefebvre, E. (2008). Fast unfolding of communities in large networks. *Journal of statistical mechanics: theory and experiment*, 2008(10), P10008. <https://doi.org/10.1088/1742-5468/2008/10/P10008>
- Crane, D. (1972). *Invisible Colleges: Diffusion of Knowledge in Scientific Communities*. University of Chicago Press.
- Csárdi, G., & Nepusz, T. (2006). The igraph software package for complex network research. *InterJournal, complex systems*, 1695(5), 1-9.
- Fortunato, S. (2010). Community detection in graphs. *Physics reports*, 486(3-5), 75-174. <https://doi.org/10.1016/j.physrep.2009.11.002>
- Freeman, L. C. (1978). Centrality in social networks conceptual clarification. *Social networks*, 1(3), 215-239.
- Friedkin, N. (1998). *A Structural Theory of Social Influence*. Cambridge University Press.
- Girvan, M., & Newman, M. E. (2002). Community structure in social and biological networks. *Proceedings of the national academy of sciences*, 99(12), 7821-7826. <https://doi.org/10.1073/pnas.122653799>
- Graf, E. O. (2008). *Forschen als sozialer Prozess. Zur Reflexion von Momenten der Forschung in sozialwissenschaftlicher Forschung*. Verlag an der Reuss.
- Kadushin, C. (1968). Power, influence and social circles: A new methodology for studying opinion makers. *American Sociological Review*, 685-699. <https://doi.org/10.2307/2092880>
- Kuhn, T. (1970). *The Structure of Scientific Revolutions* (2nd ed.) University of Chicago Press.
- Leifeld, P., & Ingold, K. (2016). Co-authorship networks in Swiss political research. *Swiss Political Science Review*, 22(2), 264-287. <https://doi.org/10.1111/spsr.12193>

- Leifeld, P., Wankmüller, S., Berger, V. T., Ingold, K., & Steiner, C. (2017). Collaboration patterns in the German political science co-authorship network. *PloS one*, 12(4), e0174671.
- Massing, P. (2021). *Politische Bildung in der Bundesrepublik Deutschland: Grundlagen-Kontroversen-Perspektiven*. UTB.
- McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual review of sociology*, 415-444.
- Metz, T., & Jäckle, S. (2013). Koautorenschaften in der deutschsprachigen Politikwissenschaft - Eine Netzwerkanalyse auf Basis von Fachzeitschriftenartikeln. *Politische Vierteljahresschrift*, 256-291.
- Metz, T., & Jäckle, S. (2017). Patterns of publishing in political science journals: an overview of our profession using bibliographic data and a co-authorship network. *PS: Political Science & Politics*, 50(1), 157-165. <https://doi.org/10.1017/S1049096516002341>
- Moody, J. (2004). The structure of a social science collaboration network: Disciplinary cohesion from 1963 to 1999. *American sociological review*, 69(2), 213-238. <https://doi.org/10.1177/000312240406900204>
- Newman, M. E. (2001). The structure of scientific collaboration networks. *Proceedings of the national academy of sciences*, 98(2), 404-409. <https://doi.org/10.1073/pnas.98.2.404>
- Newman, M. E. (2004). Coauthorship networks and patterns of scientific collaboration. *Proceedings of the national academy of sciences*, 101(suppl_1), 5200-5205. <https://doi.org/10.1073/pnas.0307545100>
- Newman, M. E. (2004). Fast algorithm for detecting community structure in networks. *Physical review E*, 69(6). <https://doi.org/10.1103/PhysRevE.69.066133>
- Orman, G. K., Labatut, V., & Cherifi, H. (2012). Comparative evaluation of community detection algorithms: a topological approach. *Journal of Statistical Mechanics: Theory and Experiment*, 2012(08). <https://doi.org/10.1088/1742-5468/2012/08/P08001>
- Pehl, M. (2012). The study of politics in Germany: A bibliometric analysis of subfields and methods. *European Political Science*, 11(1), 54-70. <https://doi.org/10.1057/eps.2011.38>
- Plümper, T. (2003). Publikationstätigkeit und Rezeptionserfolg der deutschen Politikwissenschaft in internationalen Fachzeitschriften, 1990–2002. Eine bibliometrische Analyse der Veröffentlichungsleistung deutscher politikwissenschaftlicher Fachbereiche und Institute. *Politische Vierteljahresschrift*, 44(4), 529-544.
- Pons, P., Latapy, M. (2006). Computing Communities in Large Networks using Random Walks. *Journal of Graph Algorithms and Applications*, 10(2): 191–218.
- Rosvall, M., & Bergstrom, C. T. (2008). Maps of random walks on complex networks reveal community structure. *Proceedings of the national academy of sciences*, 105(4), 1118-1123. <https://doi.org/10.1073/pnas.0706851105> PMID: 18216267

Widmaier, B., Zorn, P. (2016). Konsens in der politischen Bildung? Zur Einführung. Brauchen wir den Beutelsbacher Konsens - Eine Debatte der politischen Bildung. In B. Widmaier & P. Zorn (Eds.), Brauchen wir den Beutelsbacher Konsens? (pp. 9-13). Bundeszentrale für Politische Bildung.

Annex

Figure A1: Co-authorship network with 20 largest cohesive subgroups in the network.

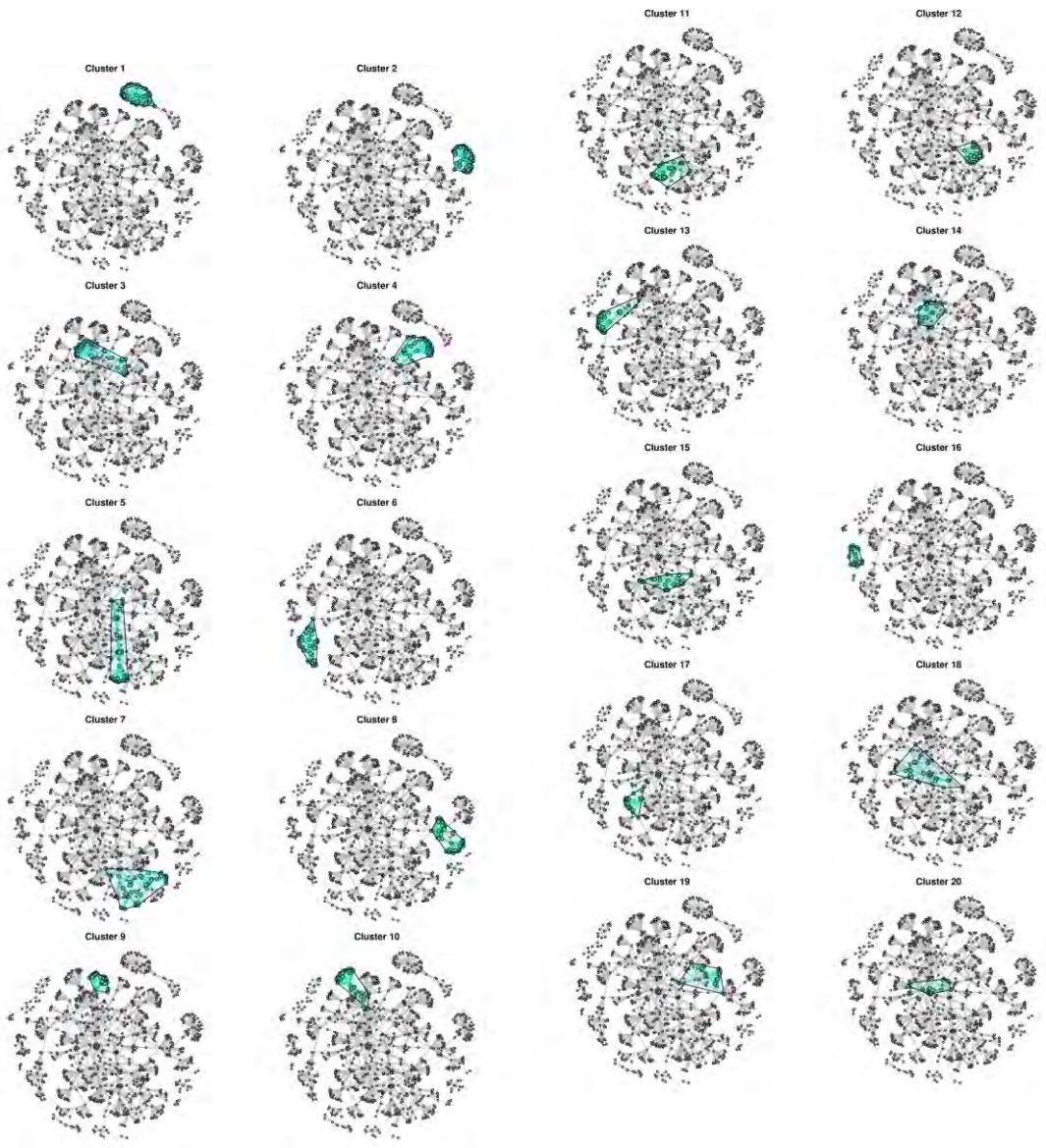


Figure A2: Research clusters and their composition by publication types.

