Mapping inclusive education 1980 to 2019: A bibliometric analysis of thematic clusters and research directions

Michael Methlagl
University of Vienna, Austria, and University of Applied Sciences Wiener Neustadt, Austria

The importance of inclusive education receives global acceptance. The current paper presents a bibliometric analysis of 8398 papers dealing with inclusive education between 1980 and 2019. The research aim is to gain information on scientific productivity, international collaboration activities, and the conceptual structure of this research field. Descriptive analyses, co-authorship collaboration analysis and co-word analysis were conducted to obtain a comprehensive knowledge map of inclusive education research. The results show a fast growing body of research in inclusive education over the years with intensive international collaboration patterns. Six research clusters could be identified. Major and intensively studied research themes are disability issues, teacher professionalisation, teacher practices, attitudes towards inclusive education, social processes, support, curricular issues, student perspective, parent perspective, intercultural education, policy, etc.. Research addressing inclusive education from a queer perspective, bullying, stigmatisation, digital education and emerging technologies in inclusive settings are under-represented and should be intensified in future studies.

Introduction

Since the Salamanca Statement (UNESCO, 1994) inclusion and inclusive education are seen as major key concepts for research, practice and education systems (Amor et al., 2019; Armstrong, Armstrong & Spandagou, 2011). The United Nations (UN) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) have described inclusion as a core principal for education systems (Armstrong et al., 2011; UNESCO, 2016). This new vision for education towards the year 2030 includes quality education, gender equality and lifelong learning opportunities for all (UNESCO, 2016). "This new vision is fully captured by the proposed SDG 4 ´Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all´ and its corresponding targets" (UNESCO, 2016, p. 7). So just placing students with special educational needs in classrooms with children without special educational needs is not enough to meet the criteria of inclusive education and to reach the goals for 2030 proposed by the UNESCO. Research in inclusive education helps to meet these goals and helps to professionalise inclusive education.

Once a scientific discipline is growing and producing a lot of research, the need for reviews of research activities also grows (Linnenluecke, Marrone & Singh, 2019). In the case of inclusive education research, systematic literature reviews (Amor et al., 2019; De Vroey, Struyf & Petry, 2016; Qi & Ha, 2012; Roberts & Simpson, 2016; Singal, 2005; Van Mieghem, Verschueren, Petry & Struyf, 2018) and meta-analyses have been conducted (Oh-Young & Filler, 2015; Szumski, Smogorzewska & Karwowski, 2017; Watkins, Ledbetter-Cho, O'Reilly, Barnard-Brak & Garcia-Grau, 2019). Besides these, science mapping is another method that can describe the cognitive structure and dynamics of a

scientific field, using bibliometric analysis (Zupic & Čater, 2015). The aim of this paper is to conduct a bibliometric analysis of inclusive education research with a view to presenting a comprehensive investigation of this field, by identifying major research themes and future research directions.

Reviews on inclusive education

Van Mieghem et al.'s (2018) current meta-review identified major research themes (attitudes towards inclusive education, teachers' professional development, inclusive practices, critical reflections, and student participation) in inclusive education. Research in the field of inclusive education often has focused on *attitudes* and *perspectives of parents* (de Boer, Pijl, & Minnaert, 2010; Kalyva, Georgiadi, & Tsakiris, 2007), *peers* (de Boer, Pijl, & Minnaert, 2012; Freitag & Dunsmuir, 2015), *children with special educational needs* (Roberts & Simpson, 2016), *teachers* (Avramidis & Norwich, 2002; de Boer, Pijl, & Minnaert, 2011; Varcoe & Boyle, 2014), *professional development* through training programs (Kurniawati, De Boer, Minnaert & Mangunsong, 2014; Parkhouse, Lu & Massaro, 2019; Waitoller & Artiles, 2013), *social participation* of children with special educational needs (Bossaert, Colpin, Pijl & Petry, 2013), different *inclusive practices* and *support issues* (De Vroey et al., 2016; Kaya, Blake & Chan, 2015; Roberts & Simpson, 2016).

Attitudinal research is important because teachers play a crucial role in the implementation of inclusive education (Van Mieghem et al., 2018) and positive attitudes of teachers towards inclusive education can be seen as one of the most important impact factors on successful inclusive education (Lautenbach & Heyder, 2019). The majority of studies on teacher attitudes report neutral or negative attitudes towards inclusive education of teachers (de Boer et al., 2011; Van Mieghem et al., 2018). To change teachers' attitudes and to foster social acceptance and participation among students, professional teacher education and training programs are beneficial (Kurniawati et al., 2014). Co-teaching, cooperative learning and peer tutoring are important support elements of effective inclusive education (Van Mieghem et al., 2018). Current research activities also focus on parents and their role in inclusive education. A review by de Boer et al. (2010) reports that parents in general hold neutral to positive attitudes towards inclusive education. Further papers deal with special settings like physical education (Hutzler, Meier, Reuker & Zitomer, 2019; Qi & Ha, 2012; Rekaa, Hanisch & Ytterhus, 2019). Reviews also indicate a relatively high amount of theoretical and descriptive articles, a lack of intervention and evidence-based practice studies (Amor et al., 2019).

To sum up, more evidence-based practice and empirical research concerning the application of inclusive models in different cultures and settings should be addressed by future research (Amor et al., 2019). Due to a strong dominance of studies dealing with disability (Amor et al., 2019), research should also focus on students who might experience marginalisation (Messiou, 2017). Implementation of professional development activities of teachers at the workplace (e. g. interventions to promote inclusive practice, positive attitudes of peers, social acceptance and participation) (Amor et al., 2019; de Boer et al., 2012; De Vroey et al., 2016; Harrison, Soares & Joyce, 2019; Van Mieghem et al.,

2018), financial resources and necessary infrastructure for the implementation of inclusive education (Van Mieghem et al., 2018) are further research gaps identified in current reviews.

The overall aim of this paper is to widen the view on inclusive education research by identifying major research themes that are missing in current reviews and directions for future research activities, using bibliometric methods.

Bibliometric analysis

Bibliometric techniques use bibliographic data to get information about scientific productivity and performance by citation analysis (Cobo, López-Herrera, Herrera & Herrera-Viedma, 2012; Garfield, 1979; van Raan, 2005). Furthermore, these techniques are used to synthesise research in a special field or topic called *science mapping* (Börner, Chen & Boyack, 2003; Cobo, López-Herrera, Herrera-Viedma & Herrera, 2011; Zupic & Čater, 2015). Science maps visualise the cognitive structure of a research field (Cobo et al., 2011; Small, 1999).

Bibliometric analyses are widely used in different fields like business and management research (Cuccurullo, Aria & Sarto, 2016; Zupic & Čater, 2015), educational psychology (Jones et al., 2010; Z. Liu, 2007), teacher education (Özçınar, 2015), social-emotional learning (Cristóvão, Candeias & Verdasca, 2017), higher education (Kosmützky & Krücken, 2013), school psychology (Begeny, Levy, Hida & Norwalk, 2018; Frisby, 1998; Jennings, Ehrhardt & Poling, 2008; Price, Floyd, Fagan & Smithson, 2011) and educational administration (Hallinger & Kovačević, 2019).

To extend this line of research the aim of this paper is to analyse the conceptual structure of inclusive education research from 1980 to 2019. Conceptual structure refers to a network of major research themes in a domain (Börner et al., 2003; Zupic & Čater, 2015). For this purpose co-word analysis (Callon, Courtial & Laville, 1991) was conducted. Co-word analysis "is a content analysis technique that uses the words in documents to establish relationships und build a conceptual structure of the domain" (Zupic & Čater, 2015, p. 435). In co-word analysis the unit of analysis is a scientific concept. Papers which have similarities in their keywords (co-occurrences of keywords) are similar in their content. The frequency of similar keywords in a research field reflects the importance of these research concepts in this field (Dehdarirad, Villarroya & Barrios, 2014). Therefore different types of words (e. g. keywords provided by the author, *KeyWords Plus*, keywords extracted from titles or abstracts) can be used to build a semantic map to obtain information on their cognitive structure (Aria & Cuccurullo, 2017; Ding, Chowdhury & Foo, 2001; Zupic & Čater, 2015).

In this study co-word analysis is used together with descriptive indicators, collaboration and performance analysis. The research questions are:

- Which are the most important journals and who are the most productive authors in inclusive education research?
- What is the annual publication growth in inclusive education research?
- What does international collaboration in inclusive education research look like?
- What are the main research topics (conceptual structure) in inclusive education research?
- Which future research themes can be derived from the analyses?

Method

Zupic and Čater (2015) described a workflow for conducting science mapping consisting of five steps named *research design* (including research question and bibliometric methods), *data collection* (selection of a database to receive bibliographic data e. g. Scopus, Web of Science, search criteria etc.), *data analysis* (cleaning and analysing the data), *data visualisation* (using visualisation methods like multiple correspondence analysis, network analysis) and *interpretation*.

Data collection and data cleaning

For this study bibliographic data from the Clarivate *Web of Science* (WoS Core Collection) and *Scopus* database were collected using "inclusi* education", "inclusi* school" and "special education* need" and "education" as search terms in the topic field (title, abstract, author keywords, *KeyWords Plus*). *Web of Science* and *Scopus* were chosen because these databases show great coverage of social science literature (Norris & Oppenheim, 2007).

Bibliographic data were exported in *Bibtex* format and cleaned (deletion of duplicate data sets, standardisation of author names, all characters were transformed to lower). Keywords can occur in different forms (e. g. education, educate). To deal with this issue keywords were lemmatised using the *textstem* (Rinker, 2018) *R* (R Core Team, 2017) package. Lemmatisation is a similar technique to stemming. Stemming cuts off the end of a word or term. In lemmatisation different terms are replaced by their lemma using a dictionary (Welbers, Van Atteveldt & Benoit, 2017). If keywords provided by the author were missing, keywords extracted from the title were used. Different keywords representing the same broader construct were merged to broader categories (e. g. disability: disabled student, person with disability, etc.; teacher perspective: teacher voice, teacher perception, view of teacher). Terms like "inclusive education" were excluded from the dataset because these terms were used for the database search. All terms dealing with research designs/analyses (e. g. cluster analysis, interview, online survey) as well as countries and other words which are not considered significant to identify research themes were also excluded (e. g. Spain, moderate).

Data analysis and visualisation

To answer the research questions, descriptive analyses (e. g. most relevant journals, author productivity, annual growth rate), content analysis (co-word analysis) and network analysis

(co-authorship collaboration, keyword co-occurrence) were conducted. Therefore the *R* (R Core Team, 2017) packages *bibliometrix* (Aria & Cuccurullo, 2017) and *ggplot2 (Wickham, 2016)* were used. Country collaboration networks (co-authorship) and keyword co-occurrence networks (with a publication year overlay) were visualised using *Vosviewer* software (van Eck & Waltman, 2010). To draw the conceptual structure and identify common concepts multiple correspondence analysis (MCA) applied to a document x keyword matrix and K-means clustering was performed and visualised on a two-dimensional map (Aria & Cuccurullo, 2017).

Results and discussion

Descriptive analysis

A total number of 8398 documents from 13520 authors published between 1980 and 2019 was included in the analysis. The average citation per document is 6.467 (Table 1). Figure 1 illustrates the distribution of the documents by year showing a continuous increase of published papers dealing with inclusive education over the years with a strong increase since 2008. The annual growth rate of publications is 19.6%.

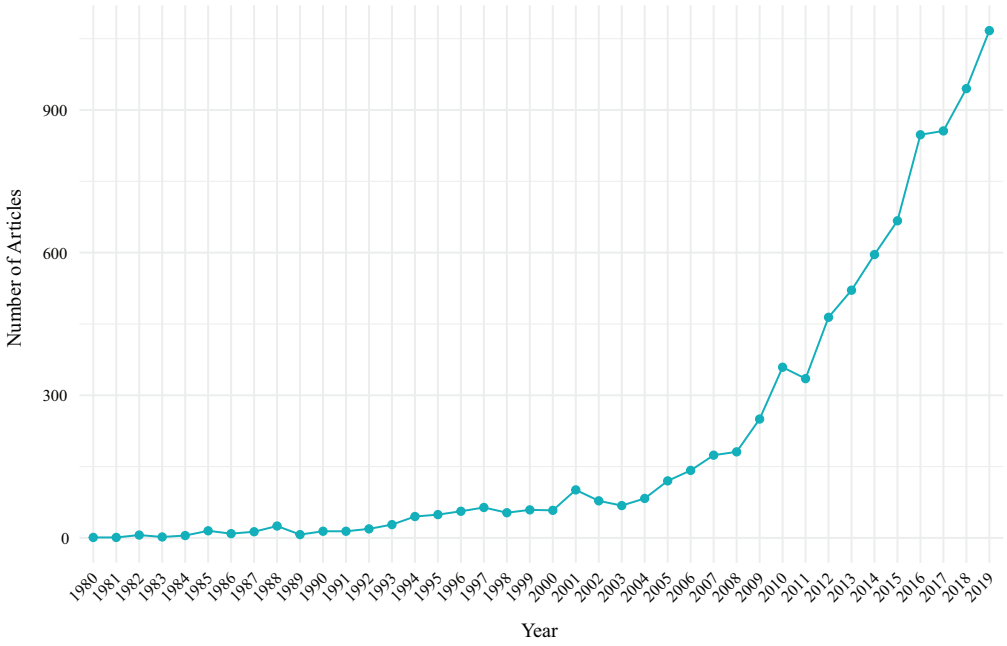

Figure 1: Annual scientific productivity by number of published inclusive education articles per year (1980-2019) (use PDF reader 'zoom in' function to facilitate reading; or see Appendix)

Table1: Main information of the dataset

Description	Results
Number of documents	8398
Number of sources	2038
Number of authors	13520
Average citations per document	6.467
Time period	1980-2019
Annual percentage growth rate	19.58

The 8398 papers were published in 2038 sources. The highest number of published articles in the dataset (see Table 2) can be found in the *International Journal of Inclusive Education* (550 documents) followed by *European Journal of Special Needs Education* (266 documents), *British Journal of Special Education* (244 documents), *Journal of Research in Special Educational Needs* (170 documents) and *Revista de Education Inclusiva* (143 documents). Sharma U. (58 papers) published the highest number of papers followed by Forlin C. (45 papers), Pijl S. L. (40 papers), Norwich B. (35 papers) and Carrington S. (28 papers) (Table 3). Scientific production of the 10 most productive authors over the time is shown in Figure 2.

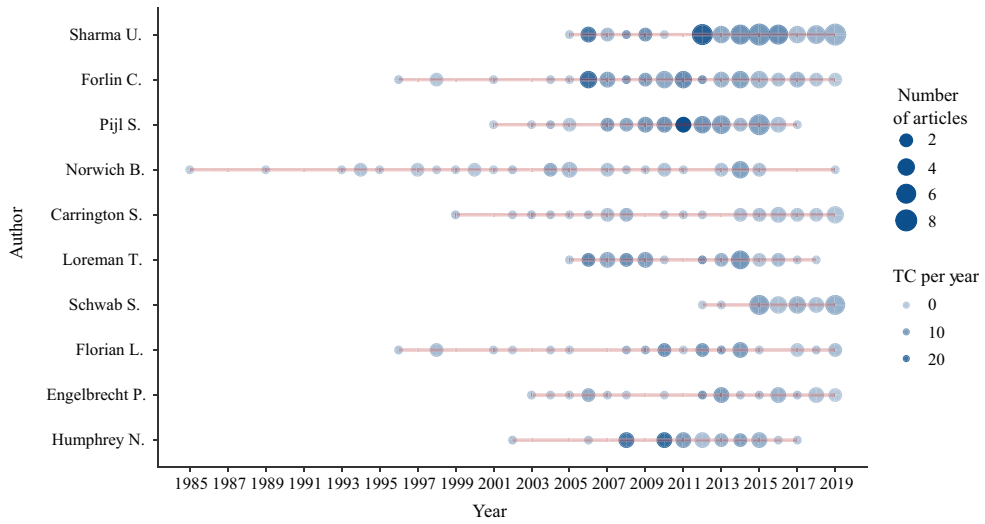

Figure 2: Top 10 authors' production over time (1980-2019); TC=total citations (use PDF reader 'zoom in' function to facilitate reading; or see Appendix)

Table 1: Top 10 journals with the highest number of published inclusive education articles in the dataset (1980-2019)

Journal	No. inclusive education articles (1980-2019)
International Journal of Inclusive Education	550
European Journal of Special Needs Education	266
British Journal of Special Education	244
Journal of Research in Special Educational Needs	170
Revista de Educacion Inclusiva	143
International Journal of Special Education	114
Support for Learning	107
Revista Brasileira de Educacao Especial	98
International Journal of Disability Development and Education	88
Disability & Society	71

Table 3: Top 15 most productive authors (1980-2019)

Author	No. inclusive education articles (1980-2019)
Sharma U.	58
Forlin C.	45
Pijl S. L.	40
Norwich B.	35
Carrington S.	28
Loreman T.	26
Schwab S.	25
Florian I.	24
Engelbrecht P.	23
Humphrey N.	23
Lindsay G.	23
Slee R.	22
Morina A.	21
Shevlin M.	21
Walton E.	21

Country collaboration

Figure 3 shows intensive co-authorship collaborations between countries. The size of the nodes indicates the number of co-authorship collaborations a nation has with another country, thickness of the lines between the countries represents the frequencies of collaboration between these countries. Network statistics (Nita, 2019; Nita et al., 2019) like degree centrality (number of collaboration links of a country), eigenvector centrality (influence of the country; tendency to collaborate with other countries) and betweenness centrality (displays the position of the node in the network: countries with high values play a significant role in information flow) are displayed Table 4.

Table 4: Network statistics of the country collaboration network

Country	Centrality			Centrality rank		
	Degree	Eigen-vector	Between-ness	Degree	Eigen-vector	Between-ness
USA	0.5275	1	0.2349	1	1	1
UK	0.4882	0.9058	0.2241	2	2	2
Australia	0.3386	0.7562	0.0861	3	3	3
Germany	0.2283	0.6797	0.0302	4	4	6
Spain	0.2283	0.6667	0.0243	5	5	8
Portugal	0.2047	0.6029	0.0322	6	6	5
Canada	0.1811	0.5111	0.0253	7	12	7
Belgium	0.1811	0.5434	0.0069	8	9	19
Finland	0.1732	0.5380	0.0082	9	10	16
Norway	0.1732	0.5180	0.0069	10	11	20
South Africa	0.1653	0.4575	0.0134	11	15	11
Netherlands	0.1653	0.5517	0.0067	12	7	22
Ireland	0.1575	0.5489	0.0033	13	8	29
China	0.1496	0.4134	0.0068	14	21	21
Colombia	0.1417	0.3433	0.0727	15	26	4
Sweden	0.1417	0.4941	0.0064	16	14	23
Denmark	0.1417	0.5053	0.0049	17	13	26
Czech Repub.	0.1338	0.4349	0.0060	18	18	24
Switzerland	0.1338	0.4560	0.0027	19	16	33
Latvia	0.1338	0.4466	0.0032	20	17	32
France	0.1259	0.3953	0.0049	21	23	25
Brazil	0.1181	0.4224	0.0033	22	19	31
Poland	0.1181	0.3702	0.0083	23	24	15
Italy	0.1102	0.4181	0.0012	24	20	41
Austria	0.1024	0.3961	0.0044	25	22	27
Cyprus	0.1024	0.3608	0.0013	26	25	39
Greece	0.0945	0.3204	0.0120	27	28	13
Egypt	0.0945	0.3133	0.0104	28	29	14
Russia	0.0866	0.2591	0.0173	29	31	9
Ghana	0.0866	0.3209	0.0016	30	27	37

Note: *Degree centrality* = number pf collaboration links; *Eigenvector centrality* = tendency to collaborate with other countries; *Betweenness centrality* = position of the node in the network, high values indicate that the country plays a significant role in information flow

Due to degree centrality USA, United Kingdom, Australia, Germany and Spain show the highest number of collaborations. Further extensively collaborating countries are Portugal, Canada, Belgium, Finland, Norway, South Africa and the Netherlands. The five most influential countries (eigenvector centrality) are USA, United Kingdom, Australia, Germany and Spain. USA, United Kingdom, Australia, Colombia, Portugal and Germany also show the highest betweenness values. These countries play an important role in information flow by triggering collaborations or disseminating information between nations (see Table 4 and Figure 3).

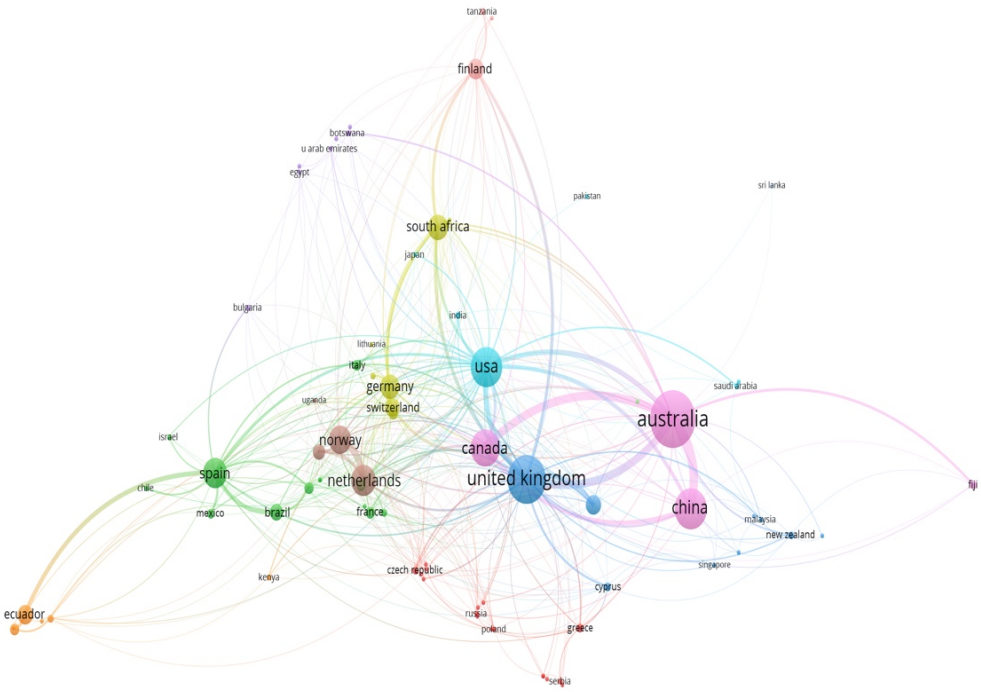

Figure 3: Country collaboration network; node size indicates the number of co-authorship collaborations; thickness of the lines between the countries represents the frequencies of collaboration between these countries (use PDF reader 'zoom in' function to facilitate reading; or see Appendix)

Conceptual structure

To identify the conceptual structure and major research themes in a set of keywords MCA was used. Only keywords with a minimum occurrence of 15 times were included in the analysis. The keywords are plotted on a two-dimensional space (Figure 4) and interpreted due to the relative positions of the keywords in the plot (Aria & Cuccurullo, 2017). Keywords which are close to each other represent research themes which are treated together in a large number of papers. In the centre of the map major core research themes are displayed, meaning that a large number of papers use these keywords (Cuccurullo et al., 2016). Keywords are further grouped by K-means clustering (Aria & Cuccurullo, 2017). Six clusters were identified using the dendogram. To label the (sub)clusters the frequencies of the keywords (Table 5) are taken into account.

Cluster 1 (red)
Most of the keywords are grouped in cluster 1, which is located in the centre of the map and represents the core topics in inclusive education literature containing various heterogenous subtopics. Representative keyword categories with the highest frequencies are *disability* (f=1826), *teacher* (f=851) and *teacher education* (f=700).

The first subtopic can be labelled *disability* (e. g. disability, autism, deaf, visual impairment, ADHD disorder) and shows a strong research focus on people with disabilities, impairments and special educational needs (e. g. Humphrey & Lewis, 2008). Another subtopic summarises research activity on *professional teacher development/education* and *teachers' practice* (e. g. teacher, teacher education, teaching practice, best practice, professional development, teacher perspective, quality of education, reflective practice) and *attitudes* Another subtopic groups keywords associated with *social and support issues* (e. g. social relation, integration, collaborative approach, classroom, peer, cooperation, communication, social competency, support, teacher assistant, mentoring) (e. g. Locke, Kang-Yi, Pellecchia, & Mandell, 2019; Nevin, Thousand & Villa, 2009). Especially social relations and collaborations between teachers, students, parents, and peers as well as different forms of student/teacher support (Table 5) constitute a significant research focus in inclusive education literature (Bossaert et al., 2013; De Vroey et al., 2016). These research streams are connected to learning and psycho-pedagogical development processes (e. g. competency, learning environment, participation, assessment, integration,

Figure 3: Conceptual map and keyword clusters; MCA plot
(use PDF reader 'zoom in' function to facilitate reading; or see Appendix)

emotion, professional development). Research on c*urricular issues, inclusive education in different contexts and education levels (*e. g. curriculum, primary education, higher education, mainstream education, secondary education, transition phases, vocational education, mathematics, physical education, foreign language learning, contextual factors) is also located in cluster 1(e. g. Haigh, 2002; Norwich & Lewis, 2007). Further central, well-studied core topics are *barriers* and *challenges* in the implementation and practice of inclusive education (e. g. Pivik, McComas & Laflamme, 2002). The last subtopic deals with system and international perspectives of inclusive education (e. g. Ainscow, 2005; Armstrong et al., 2011). To summarise, the topics of cluster 1 are generally in line with current reviews and meta-analyses in inclusive education (e. g. Amor et al., 2019; De Vroey et al., 2016; Van Mieghem et al., 2018).

Table 5: Keyword frequencies

Keyword	*f*	Keyword	*f*
disability	1826	collaborative approach	212
teacher	851	higher education	209
teacher education	700	challenge	208
policy	566	participation	208
support	430	assessment	203
teaching practice	422	development	186
attitude	401	mainstream education	180
best practice	353	need	177
diversity	323	deaf	173
professional development	314	secondary education	173
autism	285	right	171
social relation	273	visual impairment	160
integration	269	competency	158
primary education	248	change	152
teacher perspective	243	learning environment	149
curriculum	241	parent	149
accessibility	234	gender	143
intercultural	226	math	137
quality of education	222	culture	136
practice	221	leadership	135

Cluster 2 (blue)

Cluster 2 is comprised of papers addressing *diversity* and *intercultural issues* (e. g. diversity, intercultural, culture) (e. g. Tarozzi, 2014) as well as *policy* and *justice research* (e. g. policy, rights, participation, equality, social justice, equity, political issue, legal issue, democracy, United Nations convention, ethic, education reform, change) (e. g. Arnesen & Lundahl, 2006; Vlachou, 2004). This line of research focuses on marginalisation, discrimination, social justice and specific groups like *immigrants* and *minorities*. These research streams are discussed in detail in different reviews and can be seen as core themes in inclusive education research (Mills & Ballantyne, 2016; Parkhouse et al., 2019). This cluster also

summarises research dealing with *student perspective* and *participation* (e. g. Shevlin & Rose, 2008), which is in line with the results of Van Mieghem et al. (2018). In addition, this cluster addresses research from *organisational, global and critical perspectives* like school development, different education systems in different countries (e. g. Ainscow & Sandill, 2010; Göransson, Nilholm & Karlsson, 2011).

Cluster 3 (green)
Cluster 3 summarises research on *gender, adolescents, religious issues, ethnicity, stereotypes, stigmatization, bullying* and *empowerment* (e. g. De Monchy, Pijl & Zandberg, 2004; Norwich & Kelly, 2004; Okkolin, Lehtomäki & Bhalalusesa, 2010). It has to be mentioned that most research in this cluster addresses *gender* issues. There are fewer documents dealing with *bullying, stereotypes* and *stigmatisation*. The keyword co-occurrence network plot shows that bullying is mostly studied together with disability and gender issues. Taking into account that antisocial behaviour like bullying has a significant influence on students' mental health, psychosocial development and learning process (Haner & Lee, 2017; Holt & Espelage, 2003; Viding, McCrory, Blakemore & Frederickson, 2011), research on these issues from an inclusive perspective should be intensified in different contexts (e.g. intercultural education, digital education, teacher education). Future research should broaden our knowledge of implementation and evaluation of evidence-based practice interventions (Menesini & Salmivalli, 2017), inclusive key principals, specific teacher trainings and support services to prepare teacher for this major challenges (also due to cyber bullying) (Huang & Chou, 2013) and to foster students' psychosocial development (Humphrey & Symes, 2010; Norwich & Kelly, 2004; Rowley et al., 2012).

Cluster 4 (violet)
Cluster 4 group research focuses on *accessibility*, and *emerging technologies in inclusive education* (e. g. technology, assistive technology, e-learning, digital education, digitalisation, education technology, human computer interaction, smart technology) (e.g. Del Cerro Velázquez & Morales Méndez, 2018; Hatlevik & Christophersen, 2013).These technology issues show connections to disability and teacher education issues and less connections to other topics like intercultural education or policy issues (Figure 5). The development of digital competencies in school is an important issue to prepare students for a digitalised world and ensure equal access to digital information for all stakeholders. Stopar and Bartol (2019) reported that digital literacy studies are mostly conducted in higher education settings and to a lesser extend at lower education levels. Research (Hatlevik & Christophersen, 2013) also indicated that digital competencies vary between different schools and within schools. Moreover, family background and cultural and language issues have also to be taken into account. Due to the heterogeneity of digital competencies in education, student-centred, need-based programs are required to build these competences (Hatlevik & Christophersen, 2013). Relatively little research examines technologies and its application in inclusive education (e. g. Del Cerro Velázquez & Morales Méndez, 2018; Freire, Linhalis, Bianchini, Fortes & Pimentel, 2010). Thus, future research directions in inclusive education settings could focus on the potential and barriers to learning supportive interactive technologies and online learning environments (X. Liu, Liu, Lee & Magjuka, 2010) including appropriate human computer interfaces as well as usability issues. Educational data mining (Baker & Yacef, 2009) and social learning analytics

(Buckingham Shum & Ferguson, 2012) approaches could help to improve learning outcomes in inclusive settings.

Cluster 5 (orange)
Cluster 5 joins keywords focusing on *sexual orientation and queer perspectives and violence* (e. g. Grossman et al., 2009). Research on LGBTQ perspectives, sexism, homophobia, sexual violence, and sexual orientation prejudice (Dessel, 2010; Gowen & Winges-Yanez, 2014; Grossman et al., 2009; Scandurra, Picariello, Valerio & Amodeo, 2017) is not as highly developed in comparison to core topics in the present analysis. The keyword network plot (Figure 5) shows only a few connections of these nodes to other nodes, which means that these issues are studied relatively isolated.

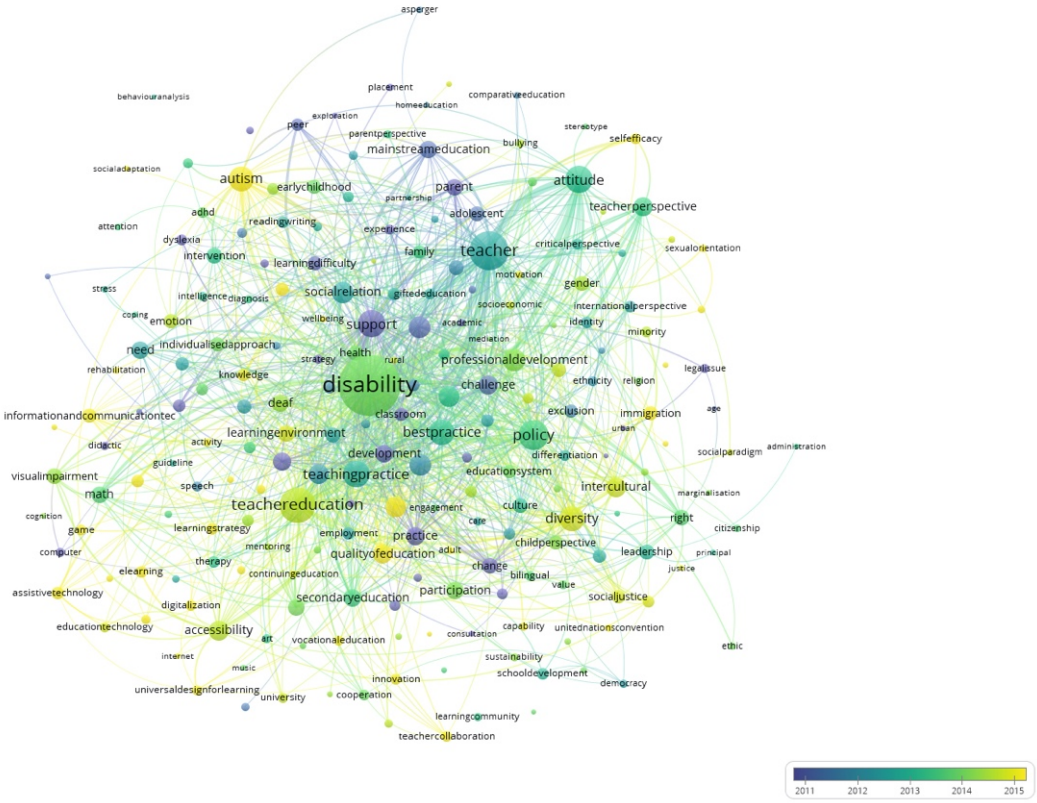

Figure 4: Keyword co-occurrence network with average publication year overlay; circle size represents the frequency of the keyword; lines between the nodes represent the co-occurrences between these keywords
(use PDF reader 'zoom in' function to facilitate reading; or see Appendix)

Cluster 6 (brown)
The last cluster group of keywords deal with teachers´ *stress, coping strategies and burnout* in inclusive settings (e. g. Brackenreed, 2011; Engelbrecht, Oswald, Swart & Eloff, 2003; Male & May, 1997). Similar to cluster 5 this cluster seem to be a separate research line

with less connections to the other topics. Thus, future studies could draw connections between teacher strain and coping patterns in using digital educational technologies, teaching diverse groups of students and the role of education systems, school culture and different school leadership practices.

The average publication year overlay keyword co-occurrence network (Figure 5) is used to visualise current research streams in the last years. The plot shows that in the last 4-5 years, issues from cluster 4 (emerging technologies) and 5 (LGBTQ perspective) as well as autism, quality of education, teacher collaboration, inclusive higher education and immigration are currently discussed and studied in inclusive education research.

Conclusion

This paper presents the results of a bibliometric study of 8398 papers on inclusive and special education to retrieve information on the scientific productivity, major research topics and under-represented topics in inclusive education literature between 1980 and 2019. Inclusive education research is growing fast (annual growth rate of 19.6%) with intensive international collaboration activities.

The results show that inclusive education addresses a wide range of topics (e. g. teacher education, teacher practice, attitudes towards inclusive education, support, curricular issues, barriers, policy, culture) and different groups of people (e. g. disabled students, immigrants, ethnic minorities) within different contexts (e. g. primary education, secondary education, higher education). Even though there is a strong dominance of research dealing with disability in inclusive education and teacher perspective, inclusive education research also considers the perspective of parents and diverse student groups. The dominance of studies dealing with children with disabilities can be explained by the different definitions of inclusion over the years and the inclusion of research from disciplines dealing with different disabilities in the analysis. The view of inclusion was widened over the years by including children from other disadvantaged groups. Further major research lines investigate policy, legal issues, education systems, educational change, and international comparisons. All these research lines are important to reach the SDG 4 of the UNESCO aiming to promote "learning opportunities for all" (UNESCO, 2016, p. 6). Most of these research topics are in line with the results of current systematic reviews and meta-analyses (Amor et al., 2019; Bossaert et al., 2013; de Boer et al., 2010, 2011, 2012; De Vroey et al., 2016; Harrison et al., 2019; Van Mieghem et al., 2018).

Inclusive education research dealing with antisocial behaviour like bullying, cyber bullying, sexism, violence, homophobia and sexual orientation prejudice is limited. As a consequence, more evidence-based practice interventions and guidelines should be constructed, evaluated and implemented to address these issues in different contexts. Future research should also address inclusive sexuality education and sexual identities of LGBTQ and non LGBTQ students (Gowen & Winges-Yanez, 2014).

Another research topic summarises papers dealing with digital education and digital educational technologies. Even though there is a growing body of research in the last years, future research on digital literacy should be intensified at different education levels/contexts (e. g. secondary education, intercultural education) and from different perspectives (e. g. teacher, special education needs students, non-special education needs students, policy). Emerging technologies like smart technologies, mobile learning or virtual learning environments are becoming more and more important in our world and should be used for educational aims. Learning analytics approaches (Buckingham Shum & Ferguson, 2012) and educational data mining (Baker & Yacef, 2009) are useful to understand and optimise learning in inclusive digital environments. The preparation of teachers in using these technologies including further teacher training is necessary to exploit the potential of these technologies. To optimise the use of digital technologies in inclusive education, technology acceptance and usability should be taken in to account (Al-Emran, Mezhuyev & Kamaludin, 2018; Cheung & Vogel, 2013).

Limitations

There are limitations of the study that has to be mentioned. Even though Web of Science and Scopus are appropriate databases for bibliometric analysis, further databases could be considered in future studies (Google Scholar, ERIC, etc.) to incorporate further papers which are not covered by Web of Science and Scopus. Another point is that non-English papers were not included in the analysis. Incorporating non-English papers would be very challenging because of translation issues. The availability and accessibility of appropriate bibliometric information in different databases and other sources must be considered and will be very challenging regarding data collection and preparation.

Declaration of interest statement

No potential conflict of interest was reported by the author

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Appendix

High resolution versions of Figures 1 to 5 may be obtained from the file 'methlagl-figures1-5-hires.zip' (about 1.4 MB) at http://www.iier.org.au/iier32/methlagl-figures1-5-hires.zip

Michael Methlagl *PhD* is a lecturer in the Department of Sport Science at the University of Vienna and a scientific staff member at the University of Applied Sciences Wiener Neustadt, Training and Sports Sciences.
ORCID: https://orcid.org/0000-0001-5110-4473
Email: michael.methlagl@univie.ac.at

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