Conducting systematic reviews in the field of EdTech: Reflection and Praxis

EDEN PhD Symposium

18 June 2023

Participation

Workshop Materials

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Workshop schedule

1. Introduction, what are systematic reviews and why are they important?
2. Our backgrounds, benefits and challenges of reviews
3. What do we know about the field of EdTech so far? What are the gaps?
4. What are the steps of conducting a systematic review?
    - search strategy
    - screening and quality assessment
    - data extraction and synthesis
5. Software to assist with reviewing
6. Q&A session

What are SRs and why are they important?

- “Rather than looking at any study in isolation, we need to look at the body of evidence” [1]

Galaxy Messier 101, Credit: NASA/JPL-Caltech/STScI

1. Nordenbo (2009, p. 22)
2. Gough et al.l (2012, p. 2)

What are SRs and why are they important?

- “Rather than looking at any study in isolation, we need to look at the body of evidence” [1]

- "a review of research literature using systematic and explicit, accountable methods“[2]

  - Transparent and explicit
  - Replicable and updatable
  - Identify gaps, contradictions or (in)consistencies

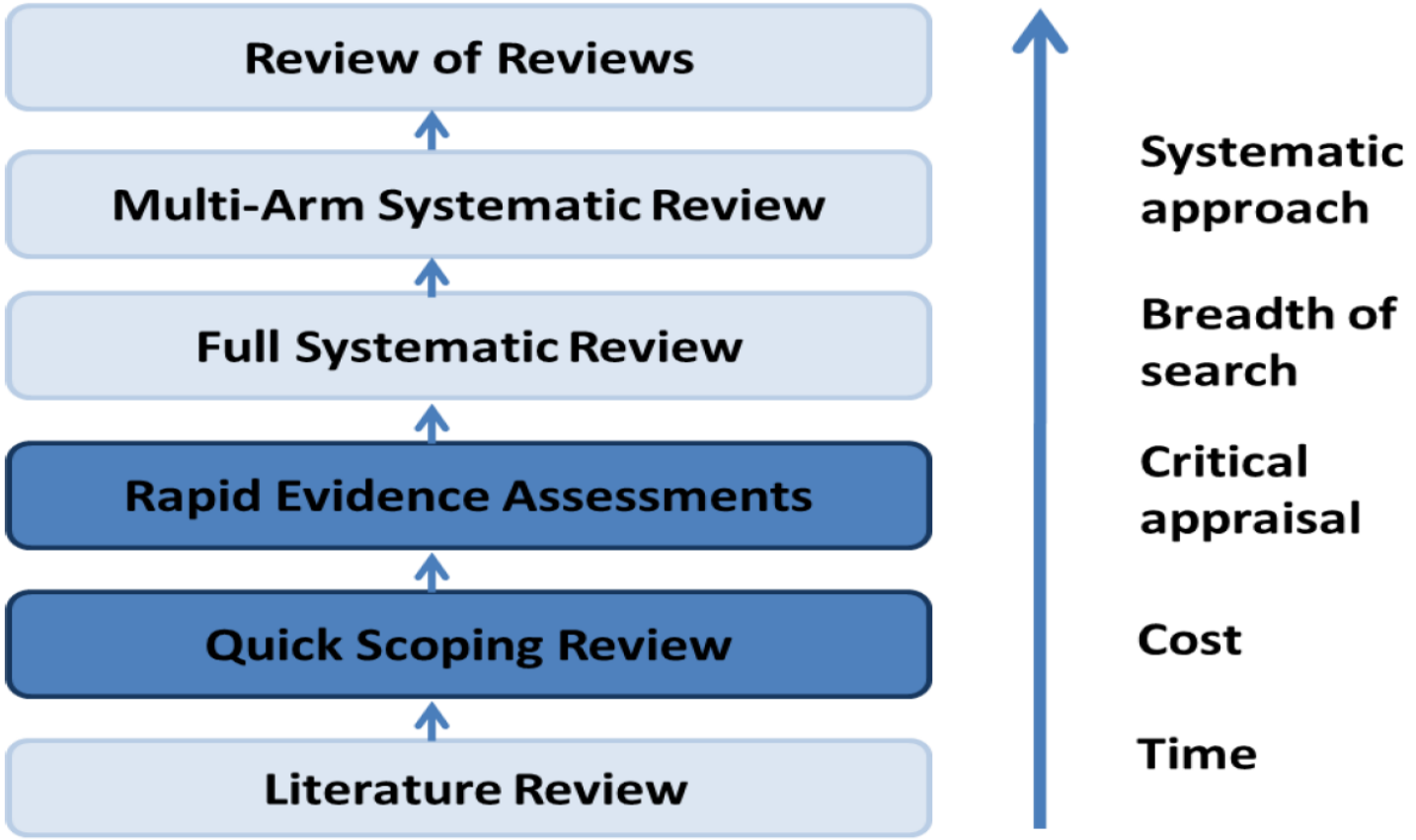
1. Nordenbo (2009, p. 22)
2. Gough et al.l (2012, p. 2)

Review Family

Traditional review family	Systematic review family	Review of review family	Rapid review family	Qualitative review family	Mixed methods review family	Purpose specific review family
• Critical review • Integrative review • Narrative review • Narrative summary • State of the art review	• Meta-analysis • Systematic review	• Review of reviews • Umbrella review	• Rapid reviews • Rapid evidence assessment • Rapid realist synthesis	• Qualitative evidence synthesis • Qualitative meta-synthesis • Meta-Ethnography	• Mixed methods synthesis • Narrative synthesis	• Content analysis • Scoping review • Mapping review

Sutton et al. (2019)

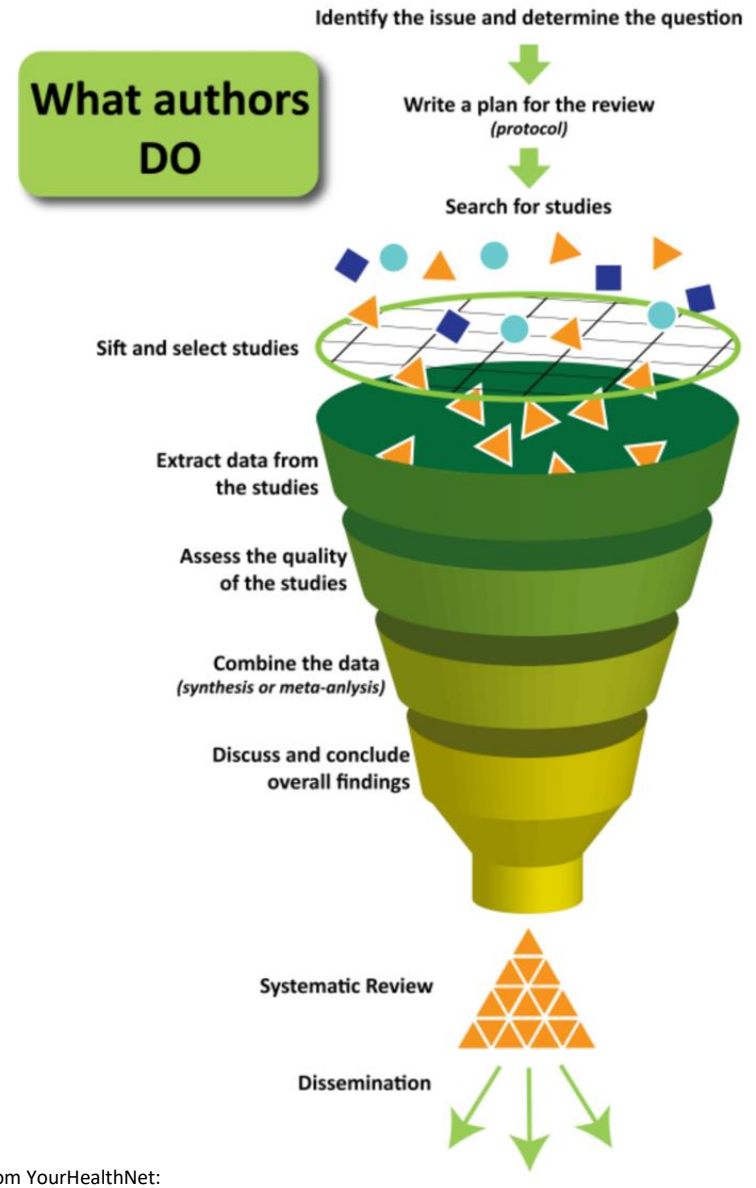
What are SRs and why are they important?



Collins, Coughlin, Miller, & Kirk (2015, p. 1)

Systematic review process

- Review question and conceptual framework
- Search strategy: search string and selection criteria
- Study screening
  - Title & Abstract
- Study retrieval
- Screen on full text
- Data Extraction
- Quality assessment
- Synthesis
- Report



Retrieved from YourHealthNet: http://navigatingeffectivetreatments.org.au/exploring_systematic_reviews.html (12 Feb, 2019)

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Dr Melissa Bond

- Born and raised in South Australia
- High school teacher (10 years)

  > German, Humanities, IT, English, Drama, Music...

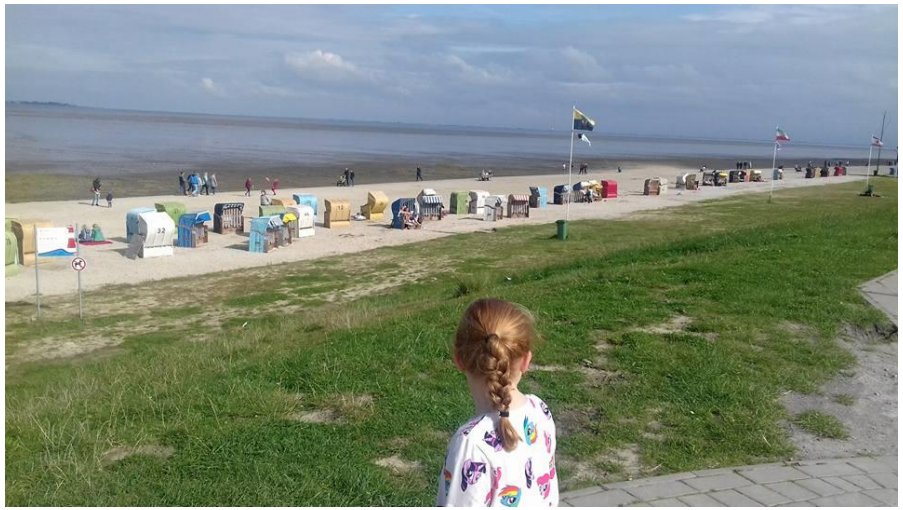
My background

- Research Associate

  > CvO Universität Oldenburg, 2017-2020

  > ActiveLearn project

  > PhD, 2020 – *Facilitating student engagement through educational technology: Current research, practices and perspectives*



My background

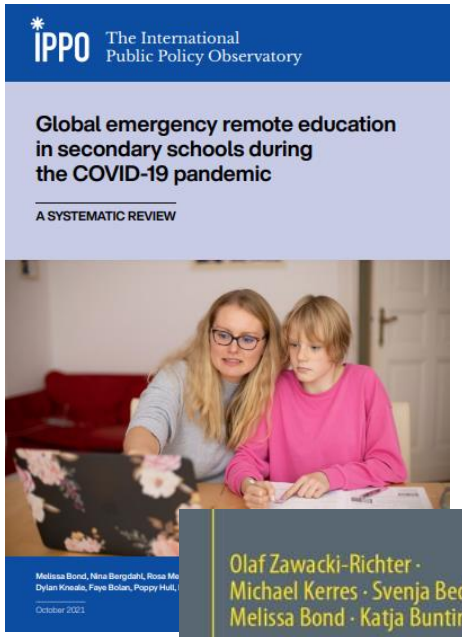
- EPPI-Reviewer Support Officer
  - > University College London
  - > since Feb 2020
- Systematic & mapping reviews
  - > T&L during COVID-19
  - > Methodological support

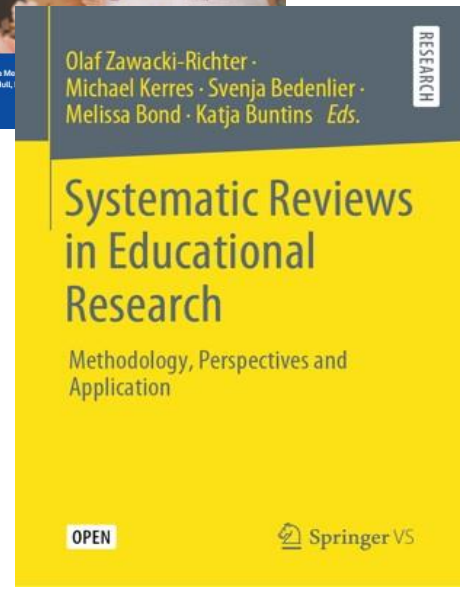
Current positions

- Research Fellow, EPPI Centre (UCL, UK)
- Adjunct Associate Professor (University of Stavanger, Norway)
- Research Fellow (National Institute of Teaching, UK)

Evidence synthesis

- Student engagement and educational technology in higher education
- Student engagement and the flipped learning approach (K-12)
- Artificial Intelligence in Higher Education
- Systematic Reviews in Educational Research (co editor)
- COVID-19 studies on teaching and learning in K-12 (rapid review)
- COVID-19 studies on teaching and learning in higher education
- Teaching and learning in secondary schools during COVID-19





Current reviews include…

- Artificial intelligence in education – meta review
- Language bias & methodological approaches to evidence synthesis – meta review
- Mothers undertaking doctoral studies – systematic review
- Disabled pre-service teachers – scoping review
- Programming and computational thinking in K-12 – meta review

Benefits

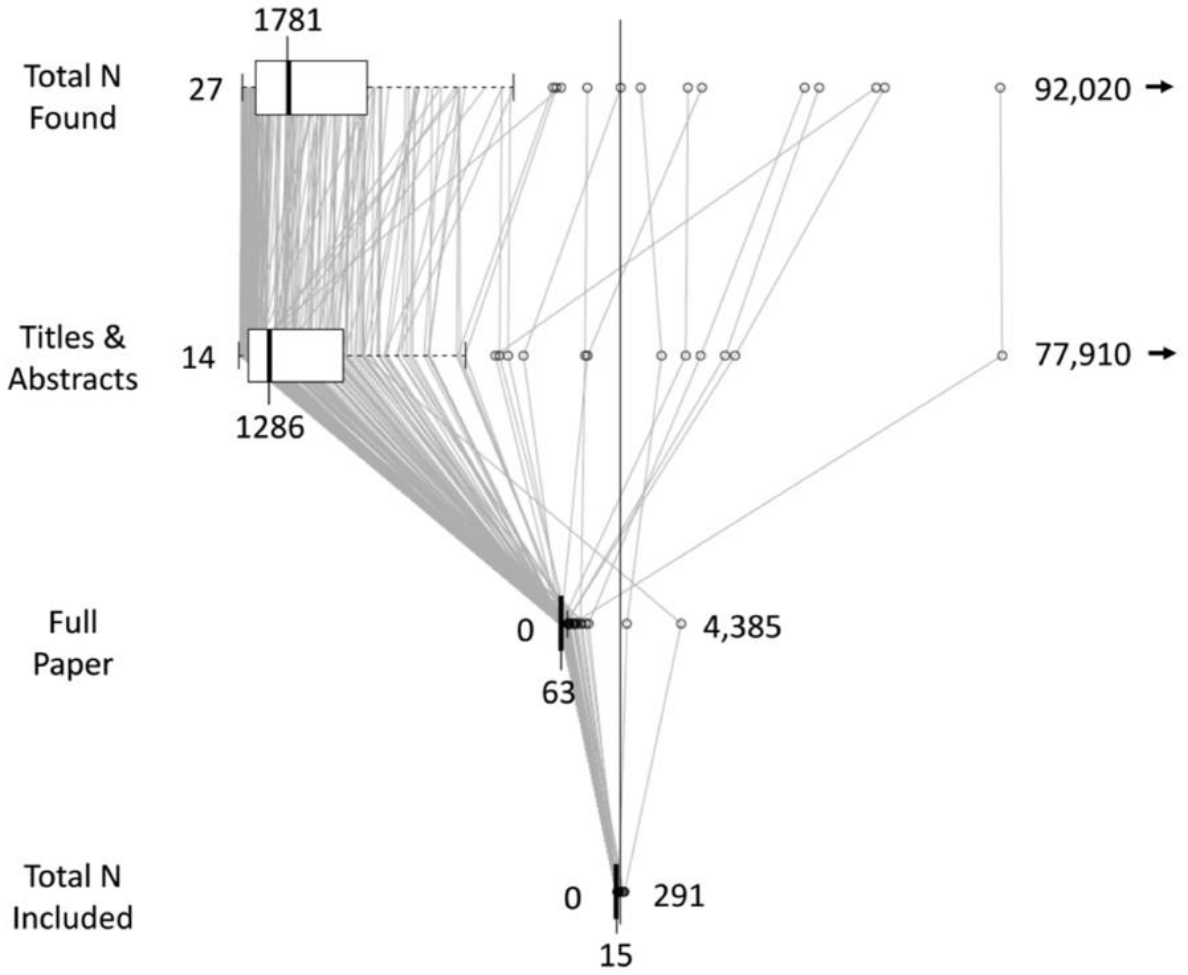
- Search and retrieval skills
- Exposure to many research & writing styles
- Broad understanding of a topic
- Identification of research gaps

Challenges

- Understanding of method
- Software
- Scope and retrieval
- Resources (time and people)

Systematic reviews as a time and labour-consuming undertaking

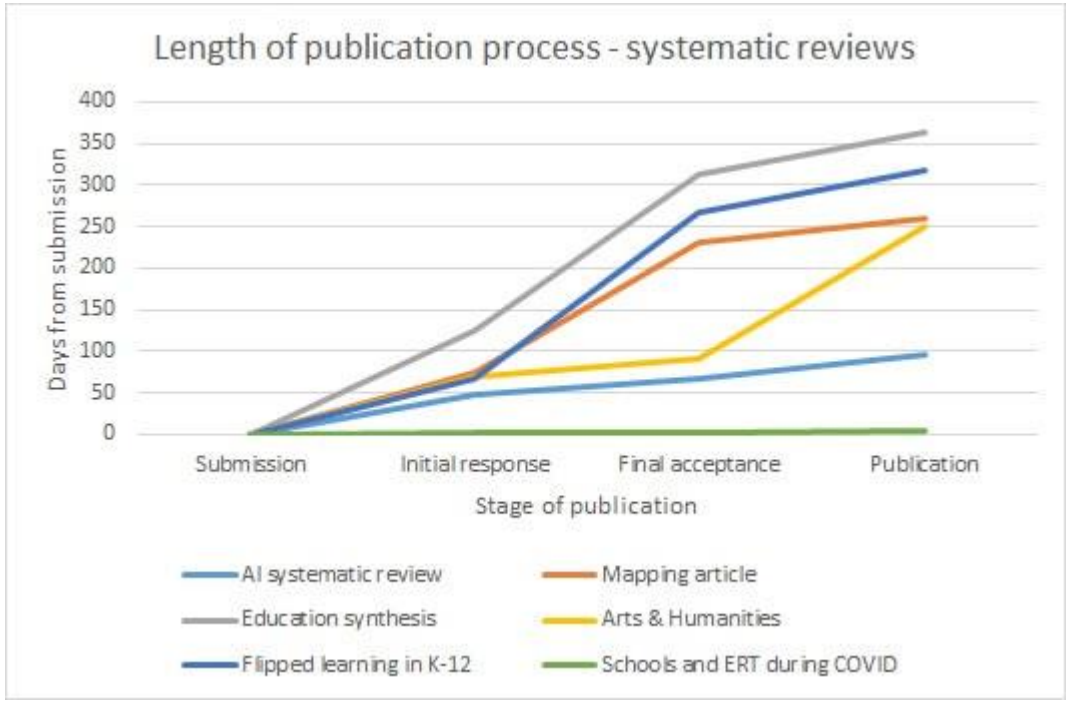
- average of 67 (SD = 31) weeks to conduct and publish a review
- reviews that reported funding took longer (42 vs 26 weeks) and involved more team members (6.8 vs 4.8 persons) than reviews that reported no funding
- final average yield rate below 3%

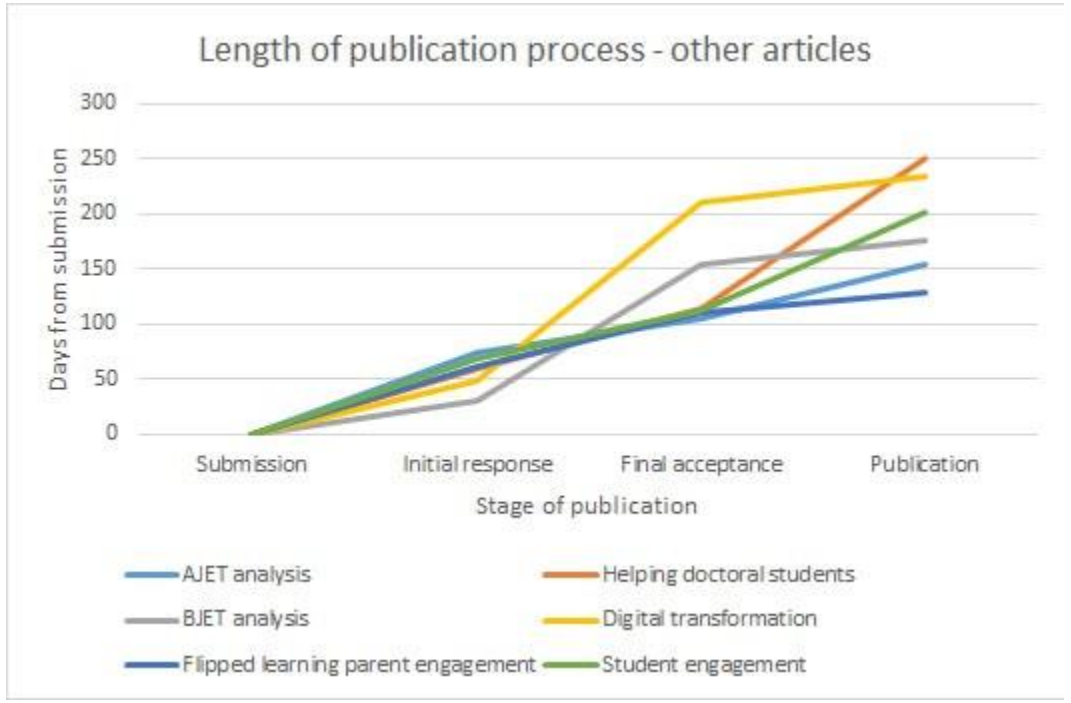


Borah et al. (2017, p. 4), N=195

	Tai et al.	Bedenlier et al.	Lo et al.	Goagoses & Koglin	Zawacki-Richter et al.
Topic	conceptualization and measure-ment of student engagement	student engage-ment and edu-cational techno-logy in higher education	flipped and video-based learning in various subject areas in higher education	social goals and academic success	AI in higher education
Duration	18 months	24 months	1 – 4 months	11 months	9 months
No of team members	4 authors, 1 research assistant	5 authors, 2 research assistants	1 – 3 authors	2 authors	3 authors, 1 research assistant
Initial references	4,192	77,508	936 – 4,053	2,270	2,656
Final references	186	243	5 – 61	26	146
Yield rate	4.44 %	0.31 %	0.05 – 1.51 %	1.14 %	5.50 %
Databases searched	PsycINFO, ERIC, Education Source, and Academic Search Complete were accessed via Ebscohost, Scopus, Web of Science	ERIC, Web of Science, PsychINFO, and SCOPUS	Academic Search Complete, TOC Premier, and ERIC, PubMed, PsycINFO, CINAHL Plus, and British Nursing Index	Web of Science Core Collection, Scopus, and PsychINFO	EBSCO Education Source, Web of Science, and Scopus

Are systematic reviews 'harder' to get published? (blog)





	Submission to initial response	Initial response to final acceptance	Final acceptance to publication	Entire process
Minimum	3 days (outlier)	1 day	1 day	4 days
Maximum	124 days	201 days	159 days	363 days
Average	64 days (76 removing outlier)	99 days (118 removing outlier)	52 days (63 removing outlier)	215 days (257 removing outlier)

	Submission to initial response	Initial response to final acceptance	Final acceptance to publication	Entire process
Minimum	30 days	31 days	17 days	128 days
Maximum	75 days	163 days	136 days	251 days
Average	57 days	78 days	56 days	191 days

On average, 19 days longer to receive an initial response to a systematic review article, and 40 days longer to final acceptance, with the overall process taking 66 days longer on average for the entire publication process.

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COER
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What I do

Before:

- Masters in Curriculum and Instruction
- English Lecturer & Curriculum Developer for six years

Image credit: https://www.whereig.com/turkey/ankara-location-map.html

Present:

- PhD candidate
- Research Associate
- COER Coordinator
  - https://uol.de/coer

Image credit: https://ontheworldmap.com/germany/city/oldenburg/

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Academic Interests

- Thesis:
  - Student Support in Digital Higher Education
  - Supervisor: Prof. Dr. Olaf Zawacki-Richter
- Interests: Dropout, proactive support mechanisms, AI supported support, digital feedback, online communities
- Teaching:
  - Digital Learning Materials: Design, Development & Evaluation
  - Systematic Reviews in Educational Technology
  - OTL: Mentor
    - Design of TEL Environments
    - International and Transnational Educational Issues in Higher Education

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Umbrella Review in ODDE

Olaf Zawacki-Richter,
Berrin Cefa Sari, John Y. H. Bai

EDEN Conference (Dublin), Ireland
June 18, 2023

EUROPE EDEN DIGITAL LEARNING

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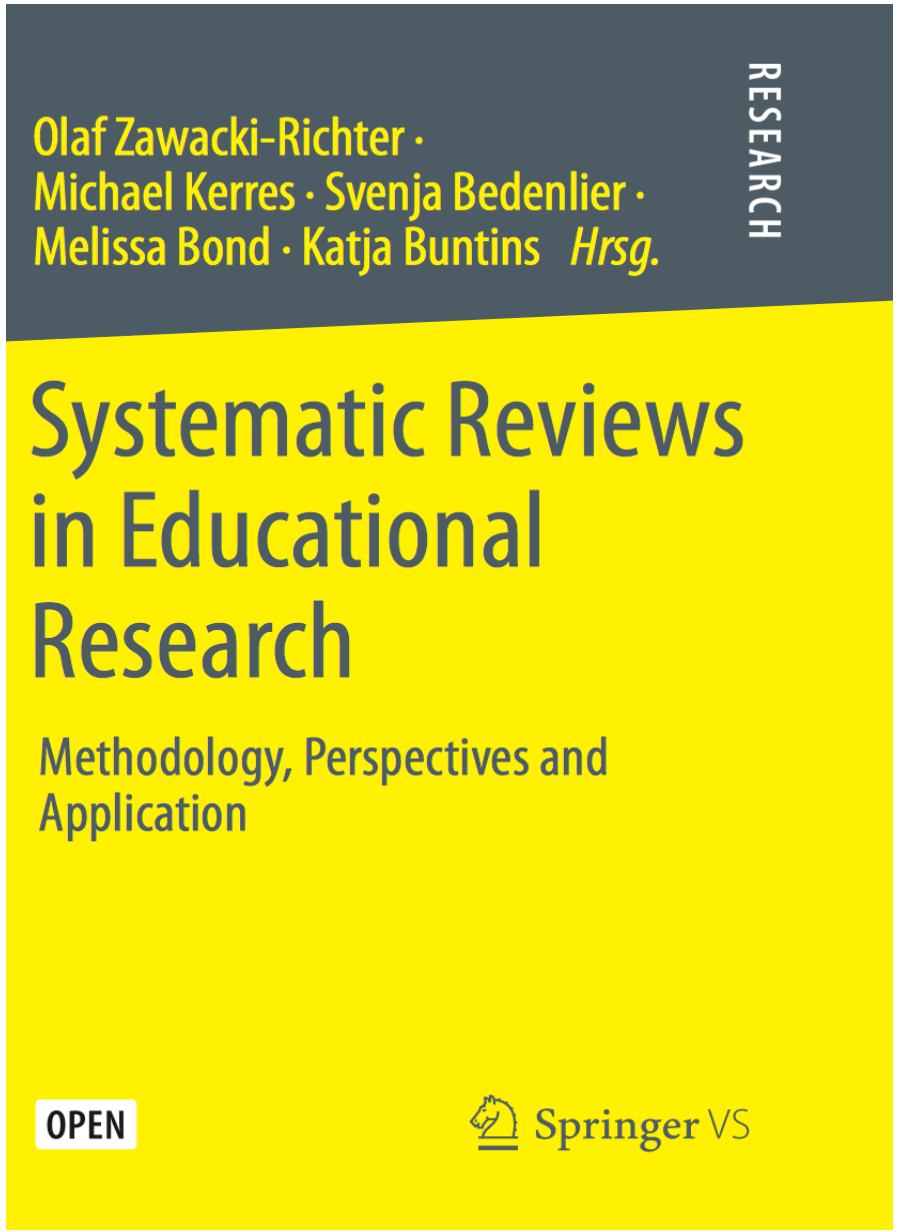
Umbrella Reviews

"However, as systematic reviews become more plentiful, there is the potential for greater use of such overarching reviews as a mechanism for aggregating findings from several reviews that address specific questions." (Grant & Booth, 2009, p. 103)

Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies: A typology of reviews. *Health Information & Libraries Journal*, *26*(2), 91–108. https://doi.org/10.1111/j.1471-1842.2009.00848.x



http://link.springer.com/10.1007/978-3-658-27602-7

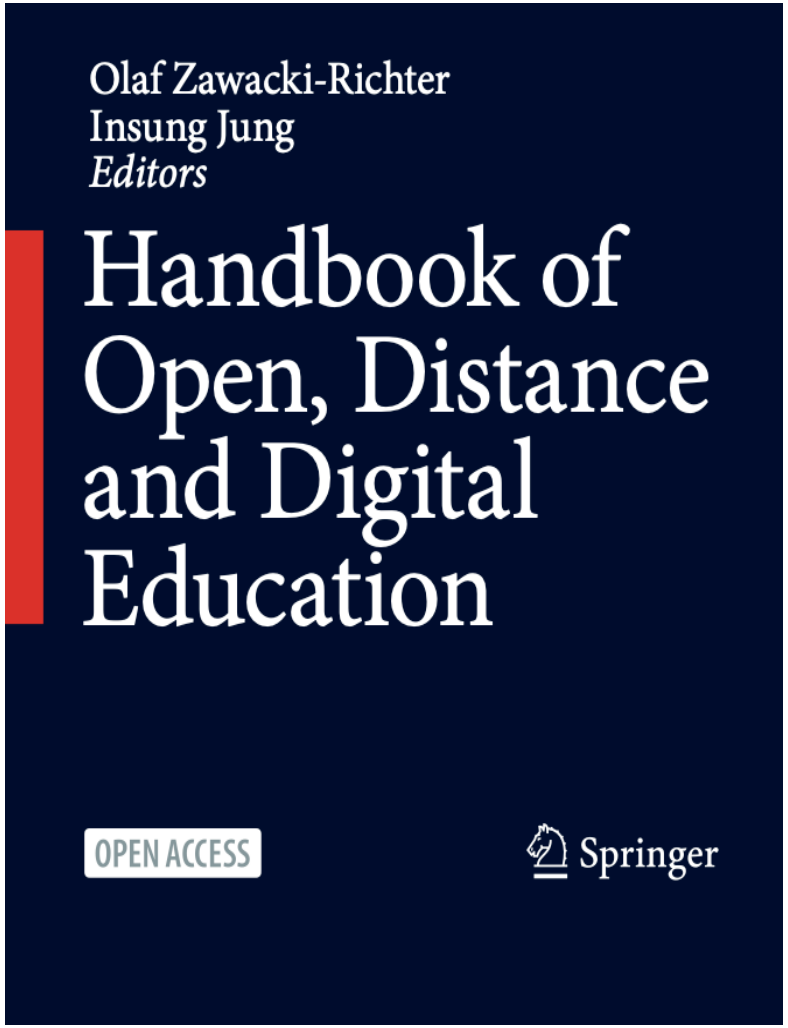
Aims of the Umbrella Review

- identify best practices of SR in ODDE
- develop a quality index for SR in ODDE
- compare SR quality between journal groups (scope and impact)
- provide an overview of quality standards/tools
- explore major topics covered in the SR

↷ umbrella *mapping* review that aims to provide an overview of the systematic review landscape in ODDE

ODDE

We conceptualize ODDE as an overarching term to refer to all kinds of learning and teaching processes in which knowledge and skill base of educational technology, digital media, and tools are used to present and deliver content, as well as facilitate and support communication, interaction, collaboration, assessment, and evaluation. Thus, ODDE is not monolithic in form. It includes various types, from technology-enhanced education, to flipped learning and blended learning, and to fully online education. (p. 6)



Zawacki-Richter, O., & Jung, I. (2022). Shaping the Field of Open, Distance, and Digital Education: An Introduction. In *Handbook of Open, Distance and Digital Education* (pp. 3–12). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-0351-9_94-1

https://link.springer.com/referencework/10.1007/978-981-19-0351-9

Search Strategy

Table 1: Search string

Topic	Search terms
Context	(distan* OR online OR open OR technology-enhanc* OR digital) W/3 (educat* OR learn* OR teach*)
AND	
Review type	systematic W/2 review

Table 2: Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Publication year	2018 – 2022	before 2018
Language	English	Not in English
Education level	Any level in ODDE, including K-12, HE, LLL, TVET	Not ODDE, informal, non-formal
Methodology	Systematic reviews*	Non-systematic reviews
Publication type	Peer-reviewed academic journal articles indexed in Scopus, WoS, and Education Source	Not a journal article (e.g., books, editorials, notes)

* Papers that claim to conduct systematic review in title or abstract have all been included.

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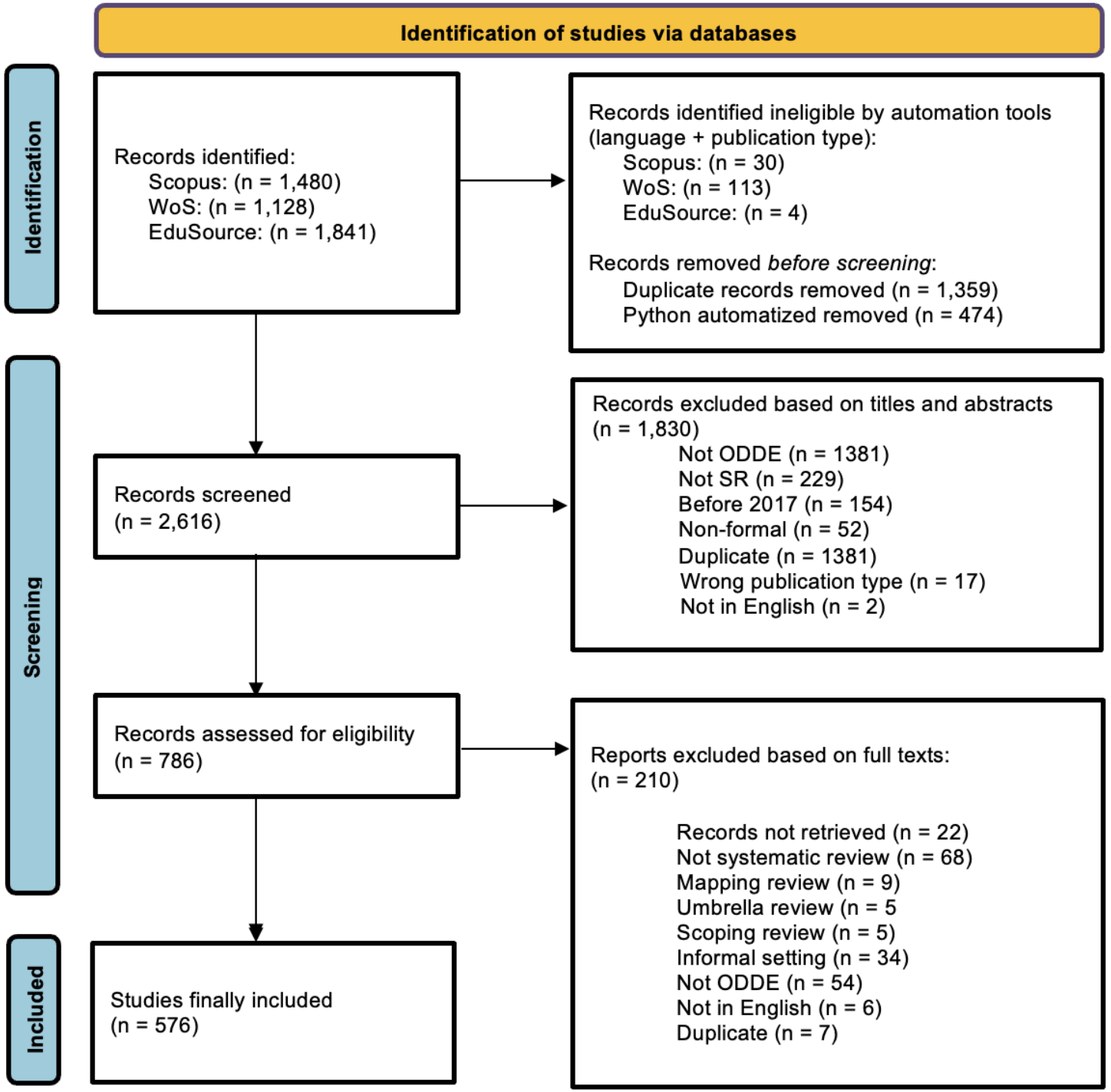
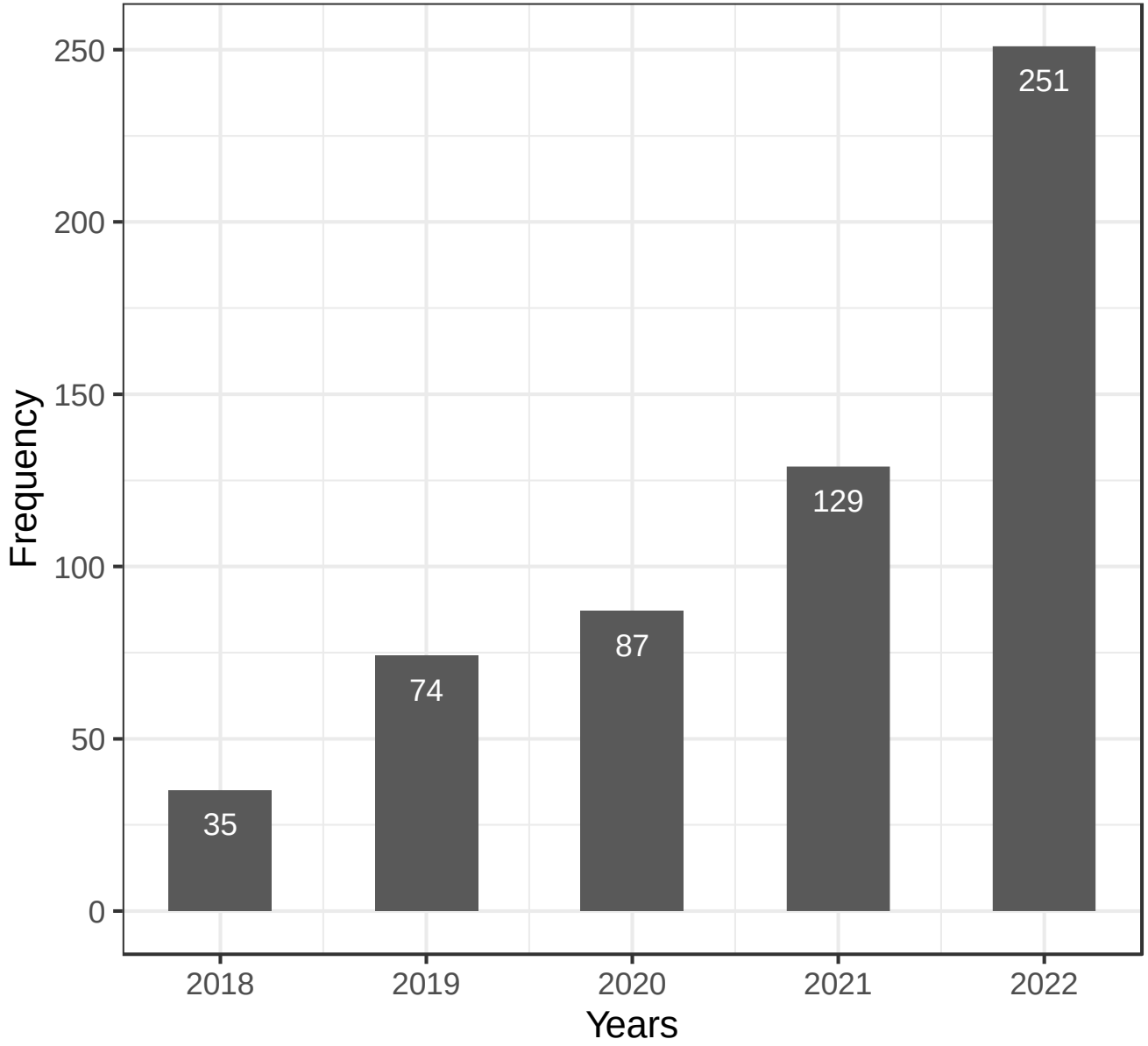
PRISMA



Systematic Reviews per Year



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Journals (N = 260)

Table 3: Number of included articles by journal

Rank	Journal	n
1	Computers & Education	27
	Education & Information Technologies	27
2	Sustainability (Switzerland)	19
3	Interactive Learning Environments	14
	Journal of Medical Internet Research	14
4	Education Sciences	12
5	Nurse Education Today	11
6	British Journal of Educational Technology	10
	Journal of Computer Assisted Learning	10
7	Australasian Journal of Educational Technology	9
	International Journal of Emerging Technologies in Learning	9
8	BMC Medical Education	8
	Int. Journal of Educational Technology in Higher Education	8
9	IEEE Access	7
	Journal of Research on Technology in Education	7
10	Applied Sciences (Switzerland)	6
	Computer Assisted Language Learning	6
	Turkish Online Journal of Distance Education	6
11	Educational Research Review	5
	Frontiers in Psychology	5
	International Review of Research in Open & Distributed Learning	5
	Medical Education	5
	Nurse Education in Practice	5
	Technology, Knowledge and Learning	5
	236 other journals	336
	Total	576

Countries (N = 70)

Rank	Country	n	Cum %	Rank	Country	n	Cum %
1	China	58	10.1	14	Netherlands	9	75.3
2	USA	49	18.6		New Zealand	9	76.9
3	Spain	37	25.0	15	Finland	7	78.1
4	Malaysia	35	31.1		Norway	7	79.3
5	UK	32	36.6		Pakistan	7	80.6
6	Australia	31	42.0	16	Belgium	6	81.6
7	Iran	19	45.3		South Korea	6	82.6
	Turkey	19	48.6		South Africa	6	83.7
8	Canada	18	51.7		UAE	6	84.7
	Germany	18	54.9	17	France	5	85.6
	Singapore	18	58.0		Oman	5	86.5
9	India	17	60.9	18	Mexico	4	87.2
	Taiwan	17	63.9		Cyprus	4	87.8
10	Saudi Arabia	14	66.3		Greece	4	88.5
11	Indonesia	12	68.4		Thailand	4	89.2
12	Brazil	11	70.3				
13	Colombia	10	72.0		other	62	100.00
	Portugal	10	73.8				

Some descriptive results

- Mean no. of authors = 3.6 (*SD* = 2.2) – work in a team!
- Mean no. of databases = 4.5 (*SD* = 3.2), max = 35 (!)
- Median no. of finally included records = 33.5, max = 1986, min = 0 (!!!)
- Yield rate: Mean = 14.7 %, Median = 6.5 %

Stracke, C. M. (2019). Quality frameworks and learning design for open education. *International Review of Research in Open and Distance Learning*, *20*(2), 180–203. https://doi.org/10.19173/irrodl.v20i2.4213

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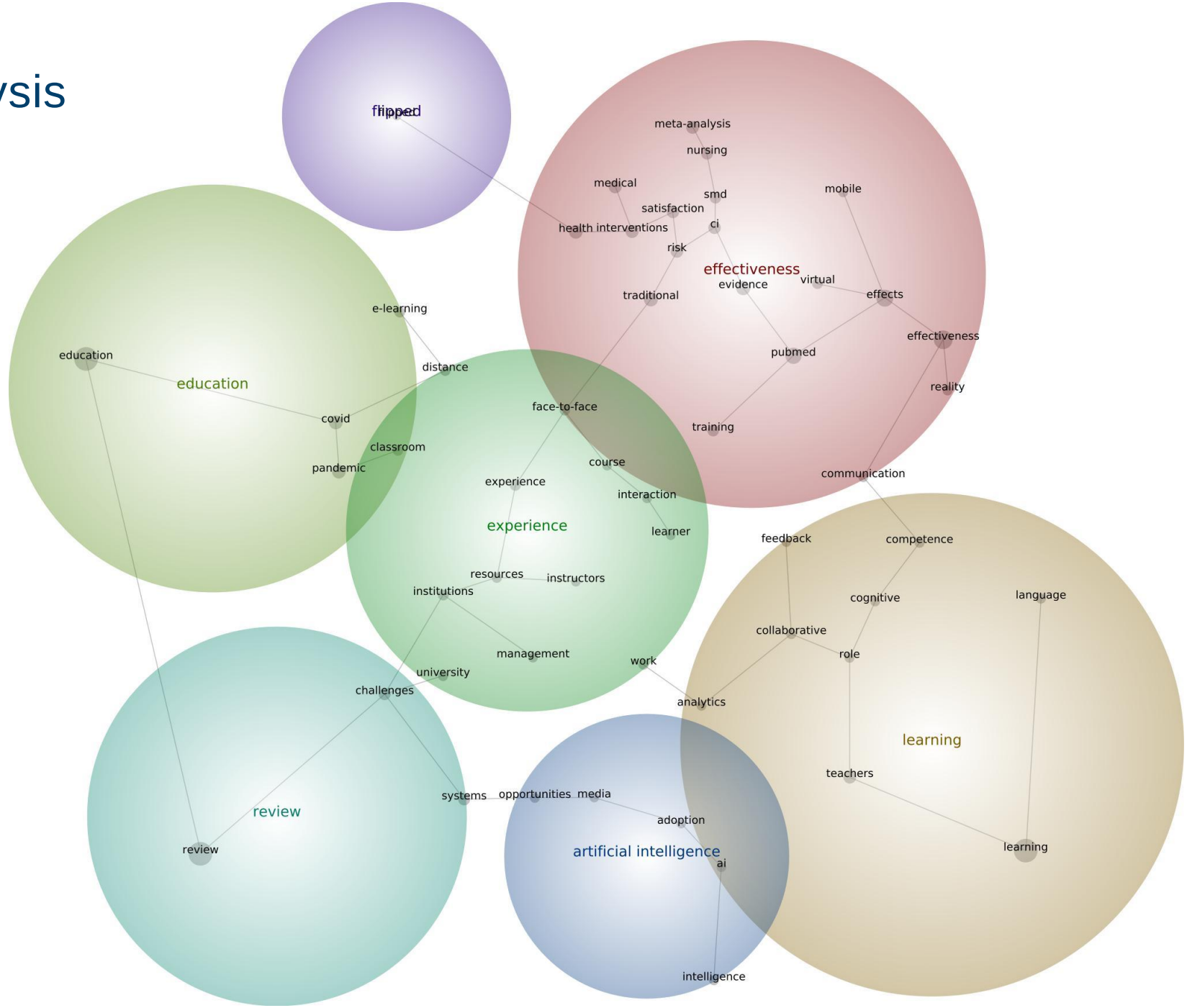
Content analysis



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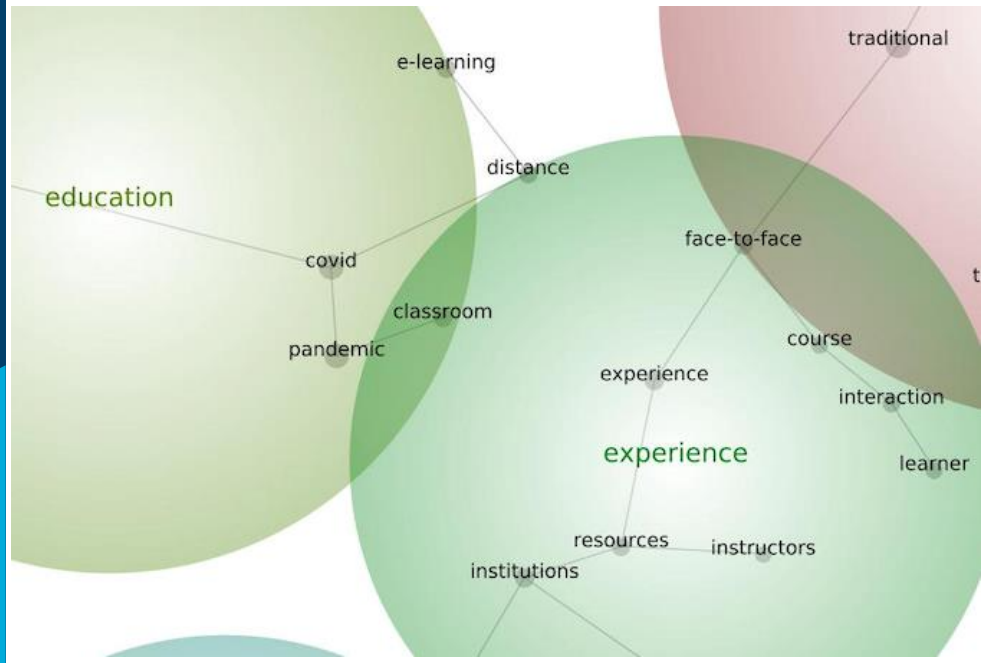
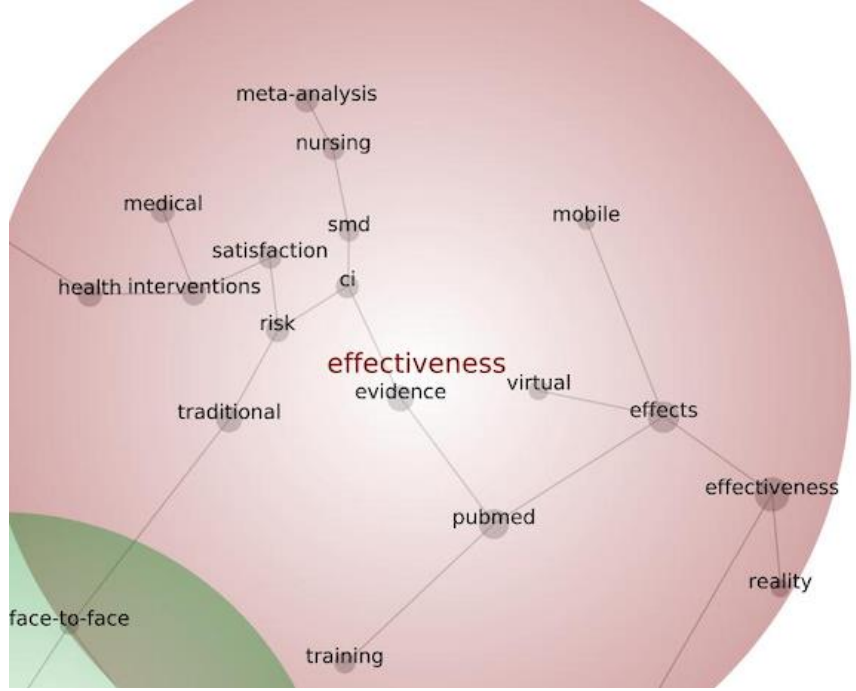
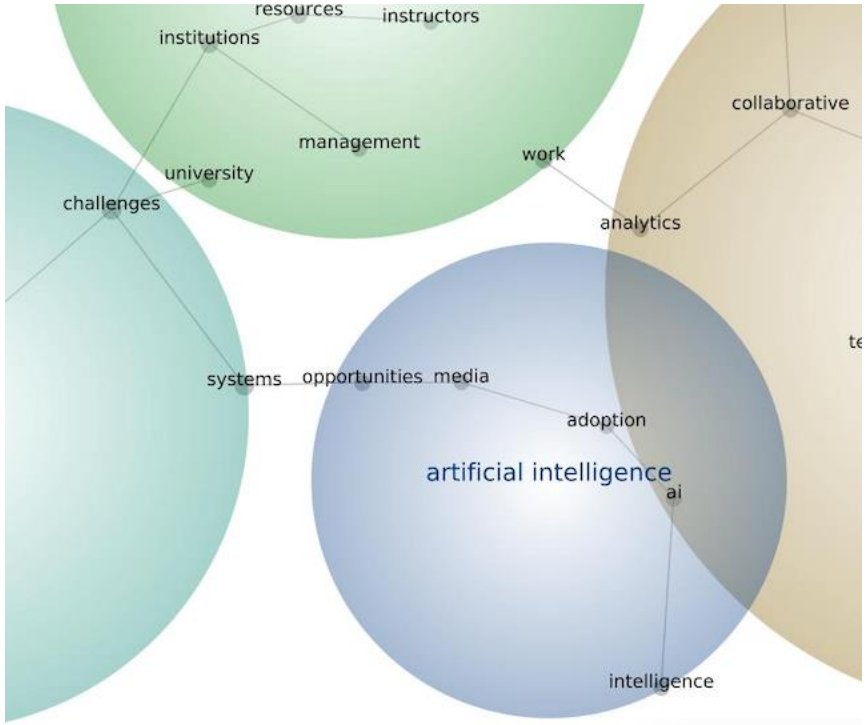
Content analysis







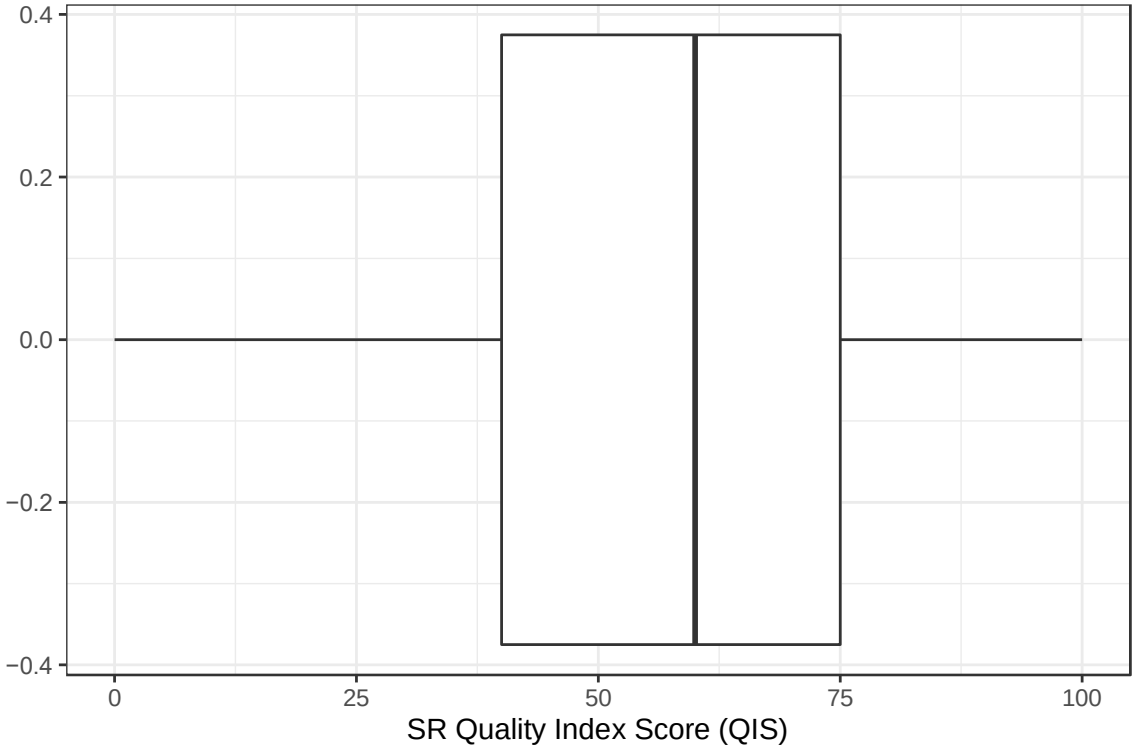
Systematic Review Quality Index Score (QIS)

- QIS ranges between 0 and 100
- Dichotomous variables (1 = yes, 0 = no)
- Elements that ensure the reproducibility of a SR are weighted more

```
umbrella_index, score100 =
  10*(2*string + 2*criteria + 2*prisma + irr + qualapp + 0.5*protocol + 1.5*limits)
```

- 34.7 % did not report the full search string
- 34.0 % did not include a PRISMA flow chart
- 37.8 % did not discuss any limitations
- 73.4 % did not conduct a quality appraisal
- 80.7 % did not disucss the issue of interrater-reliability

Distribution of QIS Index

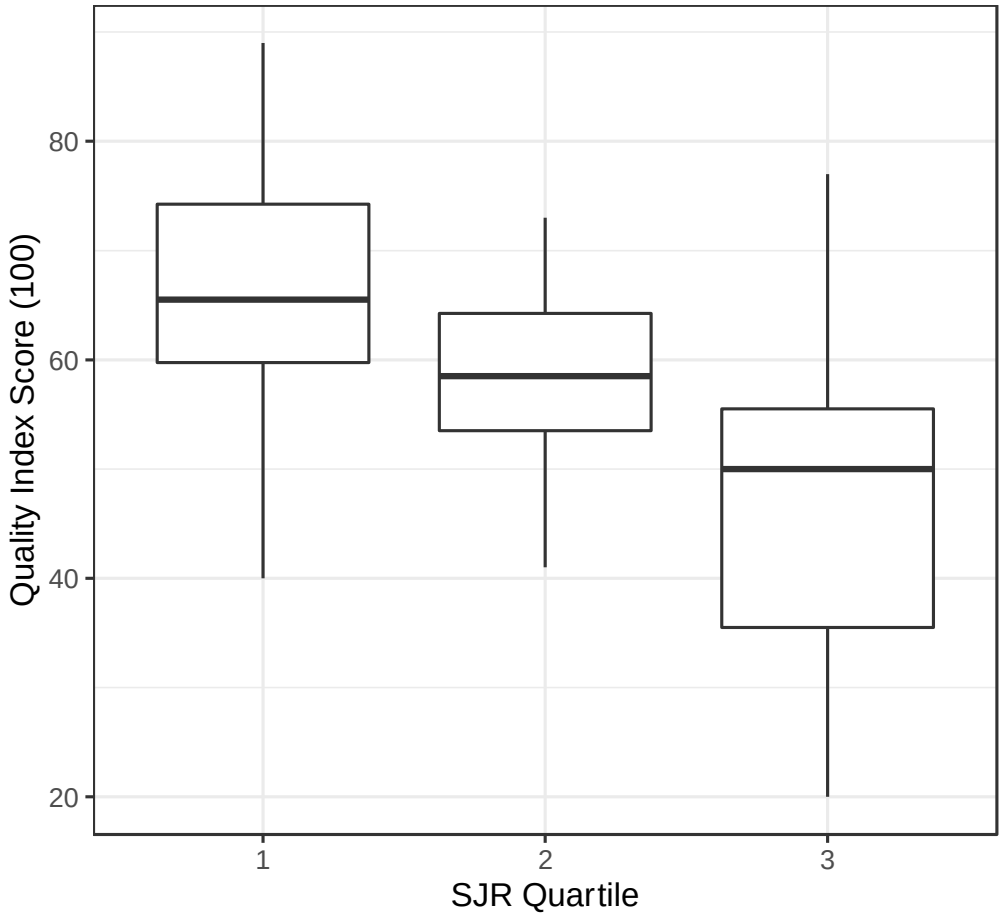


QIS	n	%	Cum. %
0	33	5.7	5.7
5	0	0.0	5.7
10	0	0.0	5.7
15	4	0.7	6.4
20	41	7.1	13.5
25	0	0.0	13.7
30	6	1.0	14.6
35	29	5.0	19.6
40	52	9.0	28.6
45	6	1.0	29.7
50	14	2.4	32.1
55	62	10.8	42.9
60	48	8.3	51.2
65	29	5.0	56.3
70	23	4.0	60.2
75	95	16.5	76.7
80	6	1.0	77.8
85	81	14.1	91.8
90	18	3.1	95.0
95	18	3.1	98.1
100	11	1.9	100.0

- Median = 60
- 33 with QIS = 0; 74 with QIS <= 20
- Only 8.1 % with QIS >= 90

Association between Journal Impact Rank and QIS Index

- Based on SCImago Journal Rank (SJR)
- Journals with at least three systematic reviews (*n* = 49)
- The lower the journal impact rank (Q1 to Q3), the lower the quality of the systematic reviews they publish.



Top QIS 100

Authors/Year	Topic	Journal
Arqub, et al. (2022)	Technology-enhanced learning in orthodontics' education	European Journal of Dental Education
Du et al. (2022)	Blended vs. traditional learning in nursing education	Nurse Education in Practice
Gao et al. (2022)	Acceptance of online learning in medical education	Journal of Xiangya Medicine
Grafton-C. et al. (2022)	Online in clinical work-based learning	Medical Teacher
Nowell et al. (2022)	Online education to develop students Remote caring skills and practices	Medical Education Online
Law & Heintz (2021)	Augmented reality applications for k-12 education	International Journal of Child-Computer Interaction
Noetel et al. (2021)	Video-based learning in higher education	Review of Educational Research
Xu et al. (2021)	Psychological interventions of virtual gamification	Journal of Affective Disorders
Youhasan et al. (2021)	Flipped classroom in undergraduate nursing education	BMC Nursing
Adams et al. (2019)	Online learning for university students on the autism spectrum	Australasian Journal of Educational Technology
Liaw et al. (2018)	Virtual worlds in healthcare education	Nurse Education Today

Conclusion – the SR crisis in ODDE

- Many reviews claim to be "systematic"
- In fact, they do not follow the steps in the review process at all!
- Dramatic lack of quality
- They are not systematic, not reproducible – should not get published!
- Urgent need for a better understanding of the SR method in education/ODDE to improve the quality

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Thanks for your attention!

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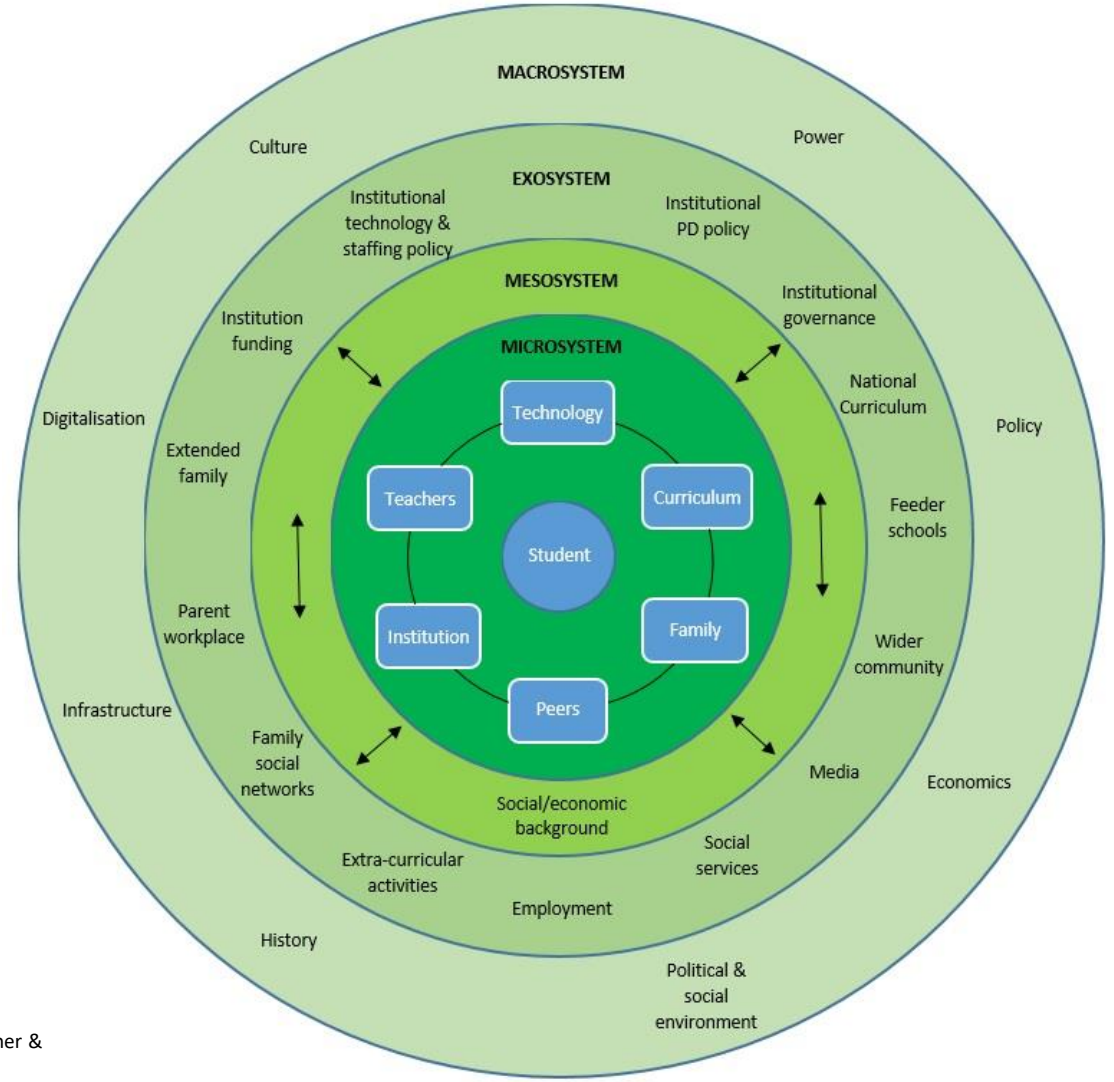
Emergency remote teaching in higher education: Mapping the first global online semester

Research questions

1. Where, when and by whom has research on teaching and learning in higher education during the COVID-19 pandemic been published?
2. What are the characteristics of, methods used, and topics studied in teaching and learning research in higher education during the COVID-19 pandemic?
3. What technology has been used during emergency remote teaching in higher education?

https://doi.org/10.1186/s41239-021-00282-x

Bioecological Student Engagement Framework



Bond (2020), Adapted from Bronfenbrenner (1979; 1986) & Bronfenbrenner & Ceci (1994)

Teaching & Learning in HE during COVID

METHOD

Systematic review

- Mapping review using EPPI-Reviewer
- ERIC, Web of Science, Scopus, PsycINFO, Google Scholar, Microsoft Academic Graph, ProQuest, EBSCOHost, COVID-19 living map

Inclusion criteria

- During COVID-19 pandemic
- Higher education
- English, Spanish or German
- Teaching and learning
- Published after Jan 2020
- Primary, empirical research
- Students, educators or administrators as units of analysis

Search	Screening T&A	Screening full text	Quality appraisal	Synthesis
11,686 studies	9,946 studies	661 studies	284 studies	282 studies

Key Findings

Continent	N	%
Asien	78	27,7%
Europa	77	27,3%
Nordamerika	64	22,7%
Naher Osten	40	14,2%
Süd- und Mittelamerika	18	6,4%
Afrika	17	6,0%
Oceanien	6	2,1%

- Mostly focused on undergraduates (46.1%)
- Health & Welfare (27.3%)
- Natural Science, Maths & Stats (24.1%)
- Education (16%)

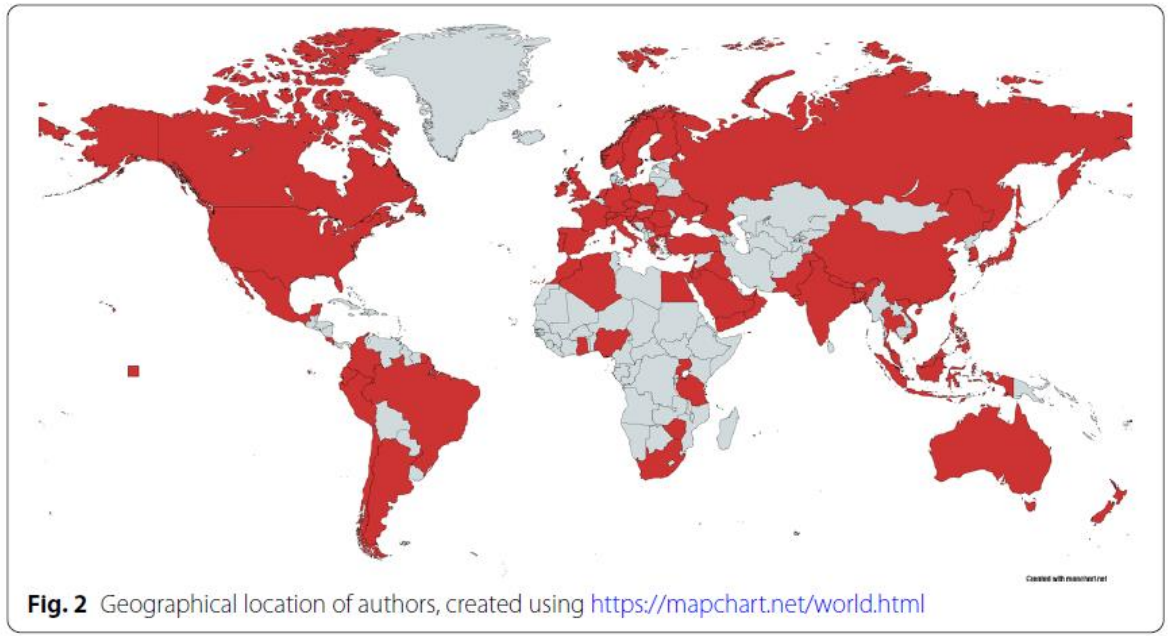


Fig. 2 Geographical location of authors, created using https://mapchart.net/world.html

Table 7 Top five topic focus of studies ($n = 282$)

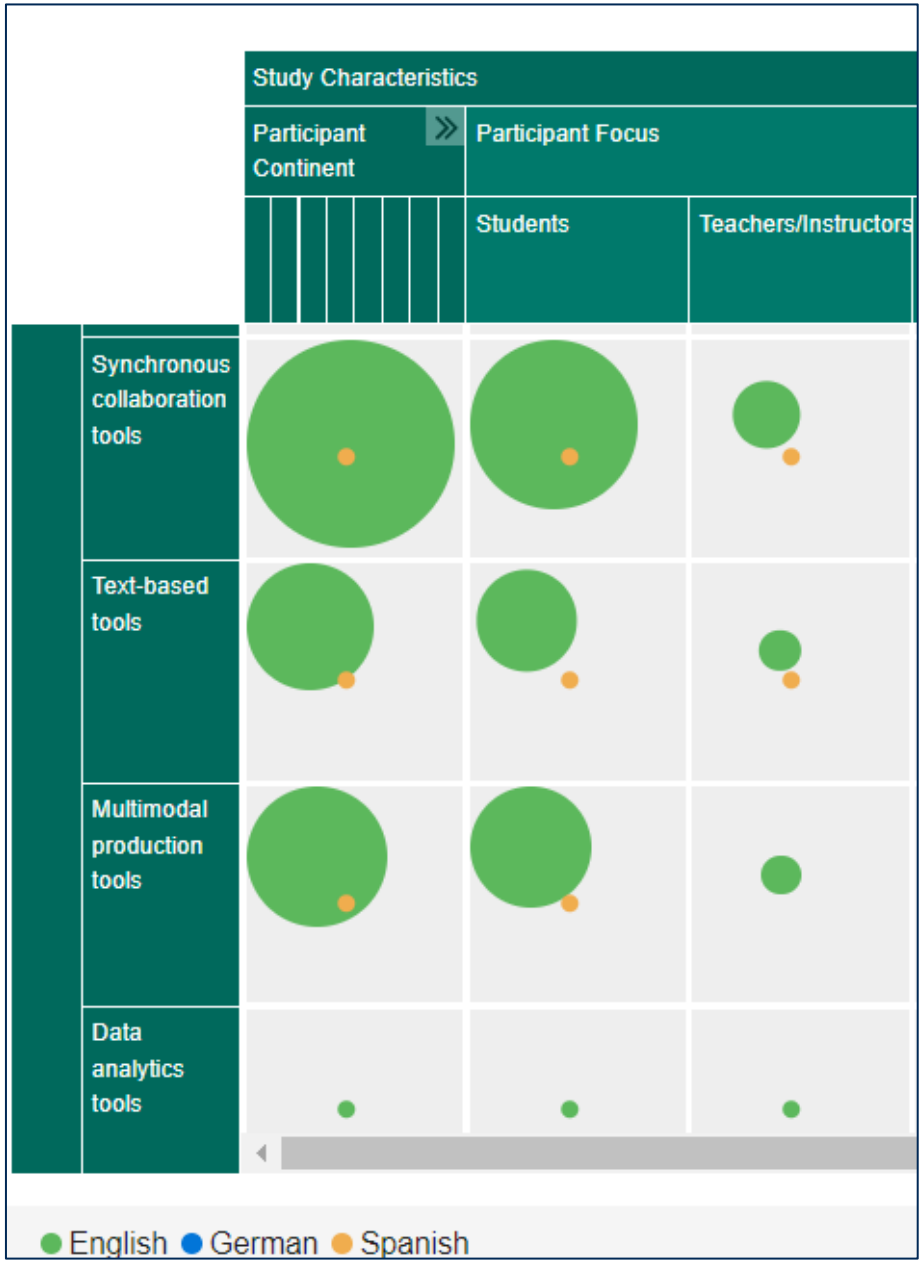
Area of focus	*N* studies	*N* studies [%]
Student perceptions of online learning	171	60.6
Impact of shift to online learning	84	29.8
Teacher perceptions of online learning	54	19.1
Students' technical equipment	38	13.5
Course redesign	31	11.0

Top 3 tools used

1. Synchronous collaboration tools (52%)
2. LMS (41%)
3. Multimodal production tools (35%)

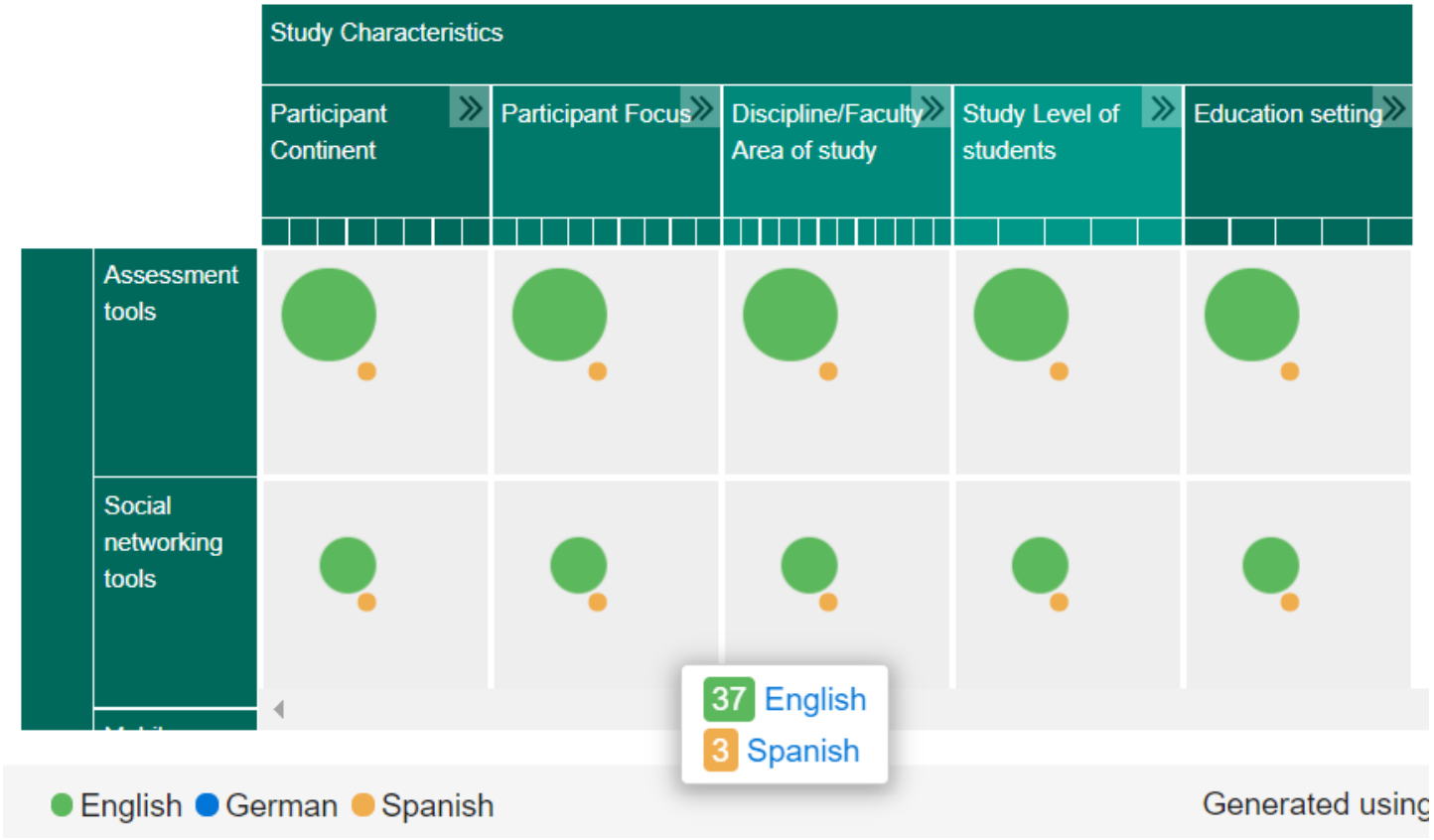
Approach

- Quantitative (53.6%)
- Mixed methods (30.1%)
- Qualitative (16.3%)



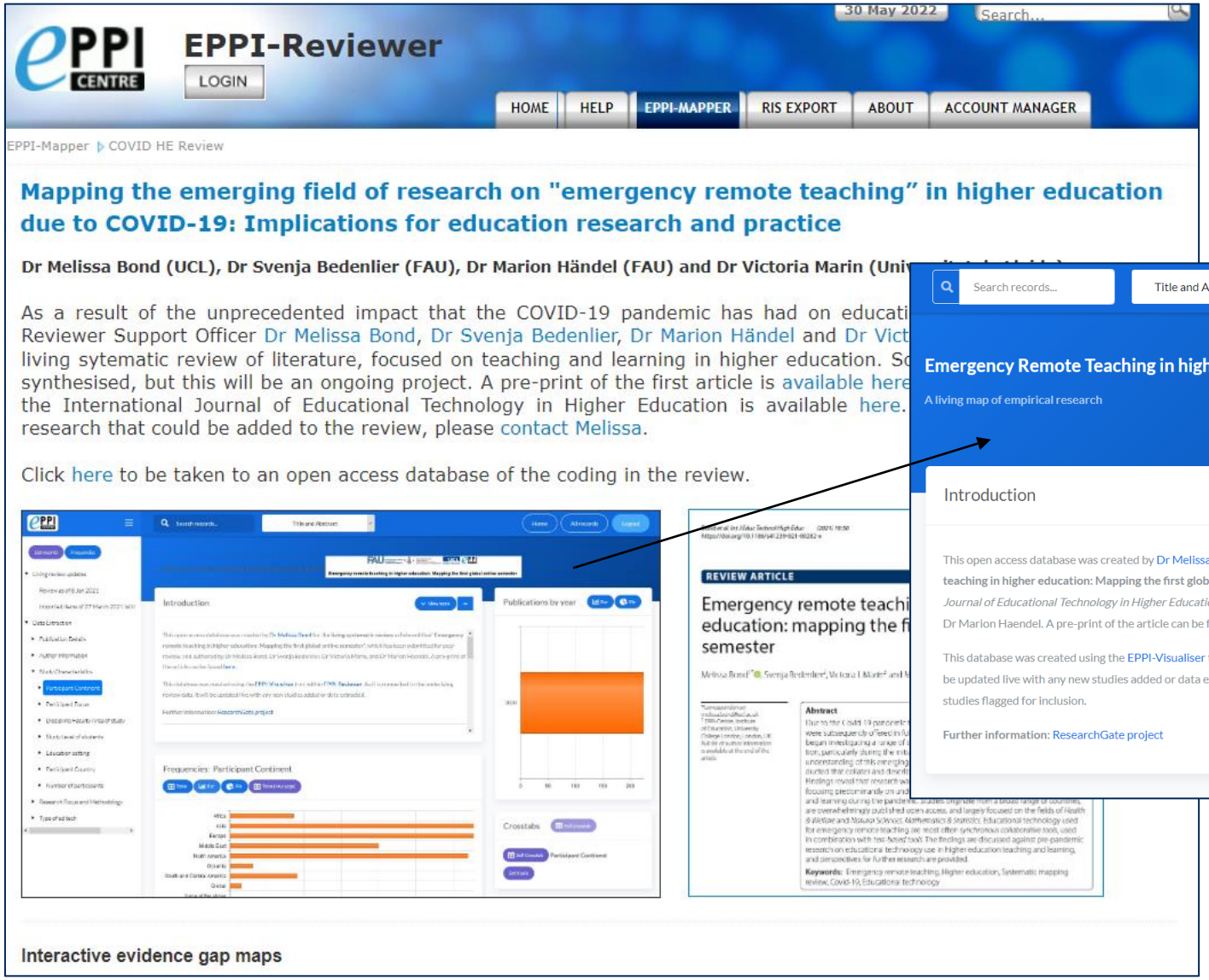
Blindspots

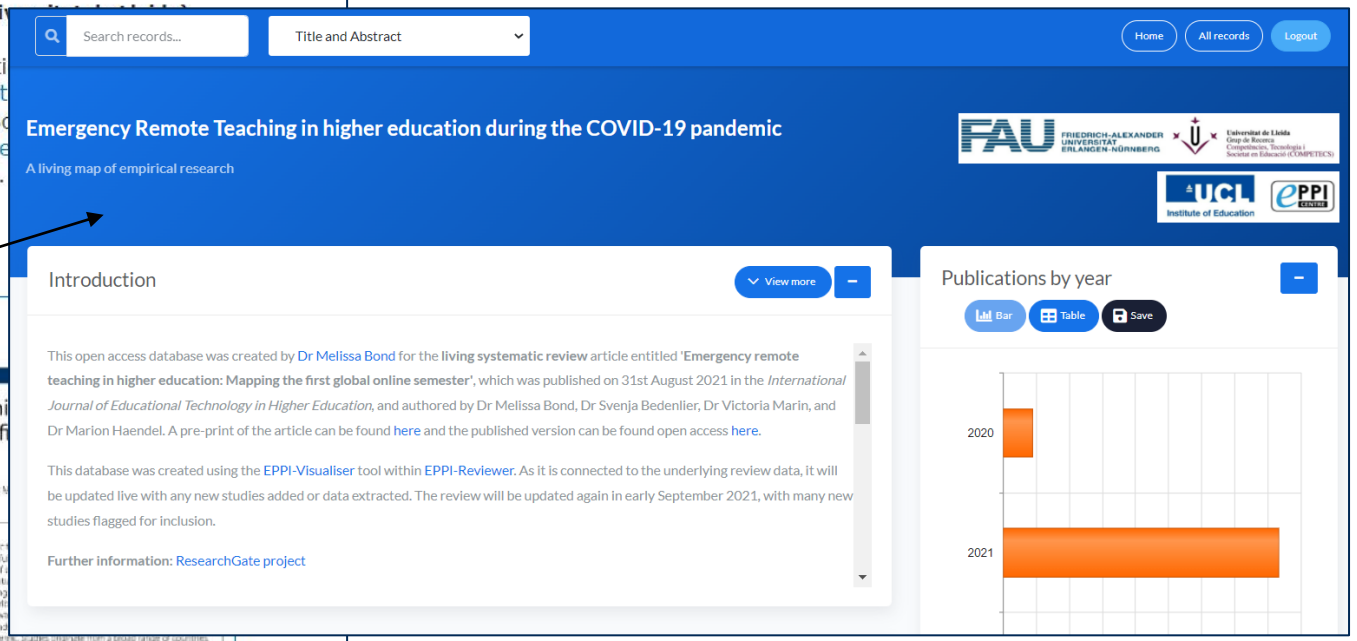
- Ethics? Vulnerable groups? Students in their personal environments?
- Greater detail in study design needed, esp. how tech was used.
- Data analytics, assessment tools, social networking tools.
- Postgraduate students far less researched.
- Unbalanced distribution of countries, authors and participants



https://eppi.ioe.ac.uk/CMS/Portals/35/COVID%20HE%20EGM%20-%20RQ3.html

Reporting example





https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3802

Review questions

- Identify and clearly define the question/s your review will address.
  - PICOTS framework (see Boland et al., 2017):

Review questions

- Identify and clearly define the question/s your review will address.
  - PICOTS framework (see Boland et al., 2017):
    - **P**opulation (e.g. the types of students)
    - **I**ntervention (e.g. the specific technology)
    - **C**omparator (e.g. compared to traditional classrooms)
    - **O**utcome/s (e.g. student engagement)
    - **T**iming (e.g. between 2012 and 2019)
    - **S**etting (e.g. Africa) OR **S**tudy design (e.g. RCTs)

Chen, Lui, & Martinelli (2017)

1. What is the scope of the studies that have been published on flipped classrooms in medical education?
2. What is the research quality of the studies examined?
3. What are the effects of the flipped classroom, as reported by controlled studies?
    - **P**opulation:
    - **I**ntervention:
    - **C**omparator:
    - **O**utcome:

Developing search strings

- Your search string combines the key concepts of your question, in order to retrieve accurate results.
- Each database is different, so it's best to begin with a master list of terms.
- According to Bramer et al. (2018), it is important to:
  - Identify example articles that can answer your question.
  - Decide which key concepts address the different elements of the question.
  - Decide which elements should be used for the best results.
  - Choose an appropriate database to begin with (e.g. WoS).
  - Use the thesaurus feature of the database to identify synonyms.

Brainstorming search terms

	Concept 1	Concept 2	Concept 3	Concept 4
Key concepts	Identify the key concept of your review question/s			
Free text terms	Brainstorm synonyms, acronyms/abbreviations, use a thesaurus or Google, look at words in titles/abstracts			
Author keywords/ keywords plus	Do a quick search in WoS using your concepts and write down relevant author keywords/keywords plus			

Brainstorming search terms

Key c				
Free t				
Author keywords/ keywords plus				

Learning the basic concepts of programming and its foundations is considered as a challenging task for students to figure out. It is a challenging process for lecturers to learn these concepts, as well. The current literature on programming training abounds with the examples of a wide range of methods employed. Within this context, one of the prominent approaches in programming training is flipped classroom (FC) model. This article has sought to illuminate the effect of cognitive flexibility, problem-solving skills (PSS), and flipped learning readiness (FLR) levels on students' programming achievements in programming training through FC model. A total of 149 freshmen computer science students studying in a state university in Turkey were recruited for this study. In this study, designed as a relational screening model, a personal form, an achievement test, and three different data collection instruments were employed to collect data. For the data analysis, structural equation modeling, a multivariate statistical analysis technique, was used to reveal a model explaining and predicting the relations between programming achievement and different variables. The findings clearly indicate that FLR is the most important predictor of the programming achievements of students in FC. Other important predictors were found as PSS and cognitive flexibility. The research model demonstrates that an increase or development in FLR, PSS, and cognitive flexibility levels in FC will enhance the achievements of students in programming.

Keywords

Author Keywords: programming training; App Inventor; flipped classroom; cognitive flexibility; problem-solving skills; university students

KeyWords Plus: COGNITIVE FLEXIBILITY; SELF-EFFICACY; LANGUAGE; STUDENTS; IMPACT; EDUCATION; DESIGN; PERSPECTIVES; ACHIEVEMENT; RELIABILITY

Cited References

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Web of Science Usage Count

3	3
Last 180 Days	Since 2013

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This record is from:
Web of Science Core Collection
- Social Sciences Citation Index

Do a quick search in WoS using your concepts and write down relevant author keywords/keywords plus

Example search strings

Topic	Search terms
Artificial intelligence	"artificial intelligence" OR "machine intelligence" OR "intelligent support" OR "intelligent virtual reality" OR "chat bot*" OR "machine learning" OR "automated tutor" OR "personal tutor*" OR "intelligent agent*" OR "expert system" OR "neural network" OR "natural language processing"
AND	
Education level	"higher education" OR college* OR undergrad* OR graduate OR postgrad* OR "K-12" OR kindergarten* OR "corporate training*" OR "professional training*" OR "primary school*" OR "middle school*" OR "high school*" OR "elementary school*" OR "vocational education" OR "adult education"
AND	
Learning setting	learn* OR student*

Example search strings

"emergency remote teaching" OR "student-centred remote teaching" OR "emergency remote education" OR "student-centered remote teaching" OR "COVID-19" OR "COVID19" OR pandemic OR "Corona virus" OR "online pivot"

AND

"K-12" OR kindergarten OR kindy OR "primary school" OR "middle school" OR "secondary school" OR school OR "high school" OR "reception" OR "R-12" OR "junior primary" OR "elementary school" OR "middle primary" OR "upper primary" OR "senior school"

NOT

"public health" OR nonpharmaceutical OR energy OR pharmaceutical OR pharmacy OR clinic* OR pathology OR telemedicine OR inflammation OR patient* OR neurolog* OR telehealth OR surgery OR universit* OR "higher education" OR postgrad* OR undergrad* OR "tertiary education" OR college

Figure 3. Search string

Brainstorming search terms

	Concept 1	Concept 2	Concept 3	Concept 4
Key concepts	Higher education students	Science, Engineering, Technology	African context	Mobile learning
Free text terms	• higher education • Undergraduate • Postgraduate • university	• Science • Engineering • Technology • STEM	• Africa	• mobile learning • mLearning • m-learning
Author keywords/ keywords plus				mobile devices

Record keeping log

Database searched	**Web of Science**
Search Set	1 and 2
Date of search	10/7/2017
Person searching	Melissa Bond and Svenja Bedenlier
Database settings	Refined by: LANGUAGES: (ENGLISH) AND DOCUMENT TYPES: (ARTICLE) Timespan: 1995-2017. Indexes: SCI-EXPANDED, SSCI, A&HCI, ESCI.
No. Of records obtained	9,517
Search string	TS=(learner* or student*) AND TS=("higher education" OR universit* OR college* OR undergrad* OR graduate OR postgrad*) AND TS=(“educational technolog*” or “learning technolog*” OR “digital learning” OR “digital education” OR "app" OR “digital technolog*” OR “digital media” OR “social media” OR “social network*” OR “social web” OR vodcast* OR podcast* OR “digital broadcasting” OR blog* OR weblog* OR “electronic publishing” OR microblog* OR “interactive whiteboard*” OR simulation* OR forum* OR "computer-mediated communication” OR “computer * network*” OR ePortfolio OR e-Portfolio OR eAssessment OR e-Assessment OR “computer-based testing” OR “computer-assisted testing” OR OER OR “open educational resource*” OR “open access” OR “open source*” OR “information and communication technolog*” OR “information technolog*” OR “social tagging” OR tablet* OR “handheld device*” OR “mobile device*” OR "smart*phone*" OR “electronic book*” OR eBook*) NOT TS=("K-12" OR kindergarten* OR "corporate training*" OR "professional training*" OR "primary school*" OR "middle school*" OR "vocational education" OR "adult education")

Search strategy

1. Decide what types of studies and data will answer your question.
   - ➢ Empirical research only?
   - ➢ Grey literature?
   - ➢ Both quantitative and qualitative data?

2. Which databases/platforms will you search in?*
   - ❑ Web of Science
   - ❑ EBSCO Host (e.g. ERIC)
   - ❑ Scopus
   - ❑ PsycINFO
   - ❑ ProQuest
   - ❑ Teacher Reference Center
   - ❑ Science Direct

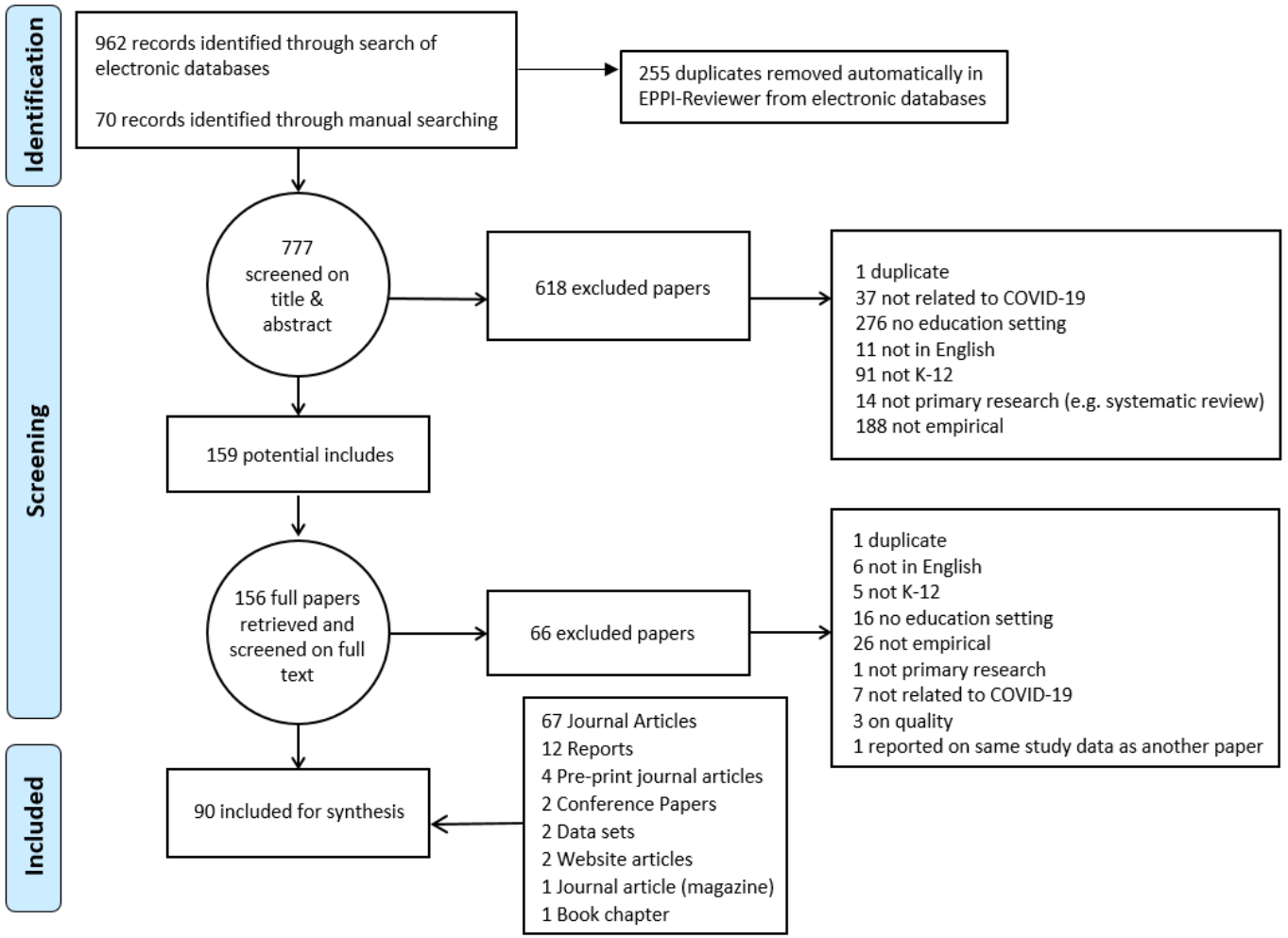
* Gusenbauer & Haddaway (2019)

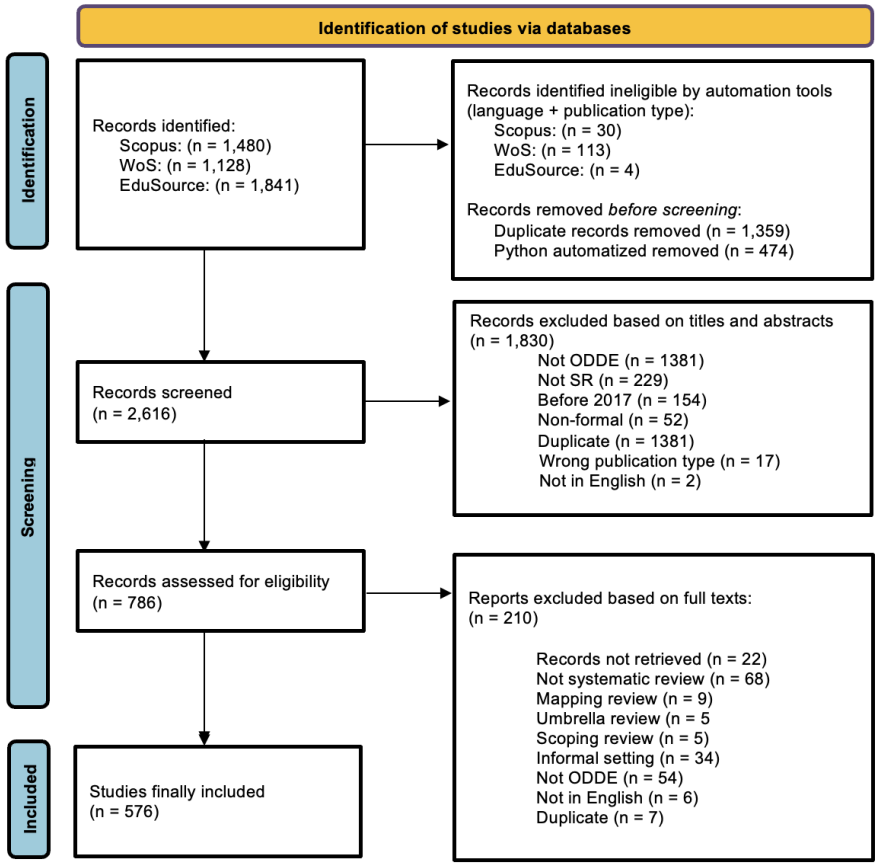
Search strategy

3. Decide on the study inclusion/exclusion criteria
   - For example:

Include	Exclude
Published between 2007-2016	Published before 2007 or after 2016
English language	Not in English
Primary, empirical research	Reviews or theoretical articles
Journal articles	Grey literature
Higher education	Schooling or further education
Educational technology	Description of a tool or evaluation
Student engagement	No educational technology
In an educational setting	No student engagement
	No learning setting

PRISMA reporting guidelines





Page et al. (2021) - https://doi.org/10.1136/bmj.n71

Title & Abstract Screening

Sensivity vs Specificity

- Include rather than exclude

- Visiting Inclusion and Exclusion Criteria
- Setting the screening process

Interrater Reliability

- e.g. Cohen's Kappa (1960)
- Fleiss Kappa

Quality Appraisal

- Critical Appraisal
  - (Petticrew and Roberts 2005)

Inter-rater Reliability

- Cohen's kappa: a measure for the agreement between two raters
  - The hypothetical probability of agreement by chance.
  - Simple relative agreement would overestimate agreement that can occur by change
    - e.g. 19 out of 20 = 95 % agreement
- see Cohen's kappa free calculator: https://idostatistics.com/cohen-kappa-free-calculator/
- Aim: k > .70

- Quality Appraisal (Gough 2007)
  - Is the study design appropriate to my research/review question(s)?
  - How is the quality of study methods?
  - Is the study relevant to my research/review question(s)?
- Roots in “medicine” studies
  - **CASP Checklists -** Critical Appraisals Skills Programme
    - Systematic Reviews, Randomized Controlled Trials, Cohort Studies, Case Control Studies, Economic Evaluations, Diagnostic Studies, Qualitative studies and Clinical Prediction Rule
  - **GRADE -** Grading of Recommendations, Assessment, Development and Evaluations
  - **JBI Critical Appraisal Tools -** Joanna Briggs Institute, trustworthiness, relevance and results

Data extraction

1. Decide what data you want to extract
   - Look at previous SRs as to what should be included
   - Descriptive (e.g. study and participant characteristics)
   - Analytical (e.g. outcomes)
   - Keep it relevant
   - Conceptual framework
2. Decide how and where you will store extracted information
   - SR software does this for you
3. Highlight where in articles the data comes from (page number)

Synthesis

Ask yourself the following questions:

1. How can you pull the results together?
   - Why choose that method?
   - Does it accurately represent what was found?
2. Overall, what is the research suggesting in relation to the question?
3. How can you best describe and represent what the research is saying?
4. How clearly or confidently can the review question be answered?

Meta analysis

A statistical technique to combine results from multiple studies to give an overall measure.

Table 3
Results of the univariate random-effects meta-analyses.

Dependent variable	*k* (#students)	*g* (*p*)	*SE*	95% CI	*Q* (*p*)	df_q	τ^2 (*SE*)	I^2
Assessed learning outcomes	114 (20318)	0.36 (< .001)	0.04	[0.28, 0.44]	1221.86 (< .001)	113	0.14 (0.02)	88%
Perceived learning outcomes	8 (953)	0.36 (.13)	0.21	[-0.13, 0.85]	39.45 (< .001)	7	0.28 (0.18)	87%
Student satisfaction	22 (3501)	0.05 (.73)	0.13	[-0.23, 0.32]	181.99 (< .001)	21	0.33 (0.12)	92%

Note. *k* = number of studies; # students = total number of participants; *g* = mean weighted effect size in Hedges' *g*; *SE* = standard error; CI = confidence interval; *Q* = Cochran's heterogeneity test; df = degrees of freedom Q-test; τ^2= between-study variance; I^2 = percentage of variation between studies that is due to heterogeneity rather than sampling error.

Van Alten et al. (2019, p. 10)

Narrative Synthesis

A valid method to analyse and assemble evidence (Petticrew & Roberts, 2006).

1. A narrative description of the study and participant characteristics.
2. A summary of key results, preferably informed by the theoretical framework.
3. Tabulation of the studies, providing an overview of the study setting, methods, participants, intervention and study findings.

Narrative Synthesis – Tabulation example (Bond, 2020)

Appendix G *List of studies in the corpus (n = 107)*

Dissertations (n = 26)

Author	Year	Institution	Subject	Grade	School Type	Study Duration	Approach	Participants	Ed Tech	BE	AE	CE	BD	AD	CD	Ach
Johnson & Renner	2012	Uni. of Louisville	ICT	9 – 11	HS	12 weeks	Quasi-Exp.	S, T		X	X	X	X	X	X	
Howell	2013	Gardner-Webb Uni.	Science	9	HS	11 weeks	Quasi-Exp.	S, T, P		X	X	X	X		X	
Wiginton	2013	Uni. of Alabama	Maths	9	HS	16 weeks	Case Study	S, T		X	X	X	X	X	X	
Saunders	2014	Liberty Uni.	Maths	11	HS	9 weeks	Quasi-Exp.	S								X
Collins	2015	The Sage Colleges	Multiple	5 – 9	MS	N/S	Phenomenology	T, SL		X	X	X	X		X	
Huereca	2015	Uni. of Texas	Maths	N/S	HS	1 year	Narrative Inq	T		X			X	X	X	
Ramaglia	2015	Kansas State Uni.	Maths	7 – 12	MS / HS	N/S	Quasi-Exp.	S, T		X	X	X	X	X		
Ripley	2015	Uni. of Nevada	Maths	6	PS	1 year	Quasi-Exp.	S, T		X	X	X		X		
Speller	2015	Uni. of Toledo	Maths	N/S	MS / HS	9 weeks	Phenomenology	T		X	X	X	X			
Wiley	2015	Uni. of Minnesota	Maths	5	PS	32 classes	CCMM	S, T		X	X			X	X	
Duffy	2016	Wilkes Uni.	Science	8	MS	3 weeks	Quasi-Exp.	S		X						X
Hunley	2016	East Tennessee State Uni	Multiple	9 – 12	HS	N/S	Phenomenology	S, T		X	X	X	X	X	X	
Oyola	2016	Missouri Baptist Uni.	Multiple	N/S	K / PS	N/S	Case Study	T		X	X	X				
Perrella	2016	Hofstra Uni.	Foreign Lang.	9 – 11	MS	28 weeks	Experimental	S								X
Sharpe	2016	Regent Uni.	Maths	9 – 11	HS	8 weeks	Experimental	S		X	X		X	X	X	
Strohmyer	2016	Walden Uni.	Maths	12	HS	2 weeks	Phenomenology	S		X	X	X	X	X		
Tarazi	2016	Northcentral Uni.	Maths	11	HS	4 months	Quasi-Exp.	S								X
Bergstresser	2017	Northcentral Uni.	Multiple	5 – 12	5-12	1 year	Quasi-Exp.	S		X		X		X		
Caverly	2017	New Jersey City Uni.	Maths	11 - 12	HS	2 weeks	Quasi-Exp.	S		X	X	X		X	X	
Leo	2017	Uni. of South Carolina	Maths	7	MS	6 weeks	Action Res.	S, T		X	X	X		X	X	
Carlisle	2018	Trevecca Nazarene Uni.	Maths	9 – 12	K-12	1 year	CSMM	S		X	X					
Lazarus	2018	Arizona State Uni.	SS	12	HS	1 semester	Action Res.	S		X	X	X				
Parham	2018	Uni. of South Carolina	Maths	12	HS	4 weeks	Action Res.	S		X	X	X	X	X		
Ronnebaum	2018	Uni. of Kansas	Maths	9	HS	9 months	Quasi-Exp.	S, T		X			X			
Weidmann	2018	Liberty Uni.	Multiple	7 - 12	HS	N/S	Phenomenology	T		X	X	X		X		X
Weiss	2018	Trevecca Nazarene Uni.	Biology	9	HS	1 semester	Quasi-Exp.	S		X	X		X	X	X	

Note: ELA = English Language Arts, SS = Social Studies, MS = Middle School, PS = Primary School, HS = High School, K = Kindergarten, S = Students, T = Teachers, P = Parents, SL = Principals, N/S = Not specified, BE = behavioural engagement, AE = affective engagement, CE = cognitive engagement, BD = behavioural disengagement, AD = affective disengagement, CD = cognitive disengagement, Ach = Achievement, CCMM = Convergent Concurrent Mixed Methods, CSMM = Cross-sectional Mixed Methods,

= Videos created by others, = Quizzes, = Teacher-created videos, = LMS, = YouTube, = PowerPoint, = Khan Academy, = Edmodo, = Google Forms, = Google Classroom, = Moodle, = Videos (uncertain), = Edpuzzle, = Google Docs, = Twitter

All icons obtained from www.flaticon.com with the exception of Khan Academy (https://www.youtube.com/user/khanacademy), Edmodo (https://www.amazon.com/Edmodo-Inc/dp/B0072LOXCO), Google Classroom (https://classroom.google.com), Google Docs (https://en.wikipedia.org/wiki/Google_Docs), Edpuzzle (https://www.youtube.com/channel/UC-wRQQ_gfvSomuZJaBLRshQ), Moodle (https://tracker.moodle.org), PlayPosit (https://iteachu.uaf.edu/playposit-interactive-video-tool/), Blendspace (https://www.tes.com/lessons), Socrative (https://socrative.com/) and Zmaker (http://zmaker.emaghome.com/).

Content analysis

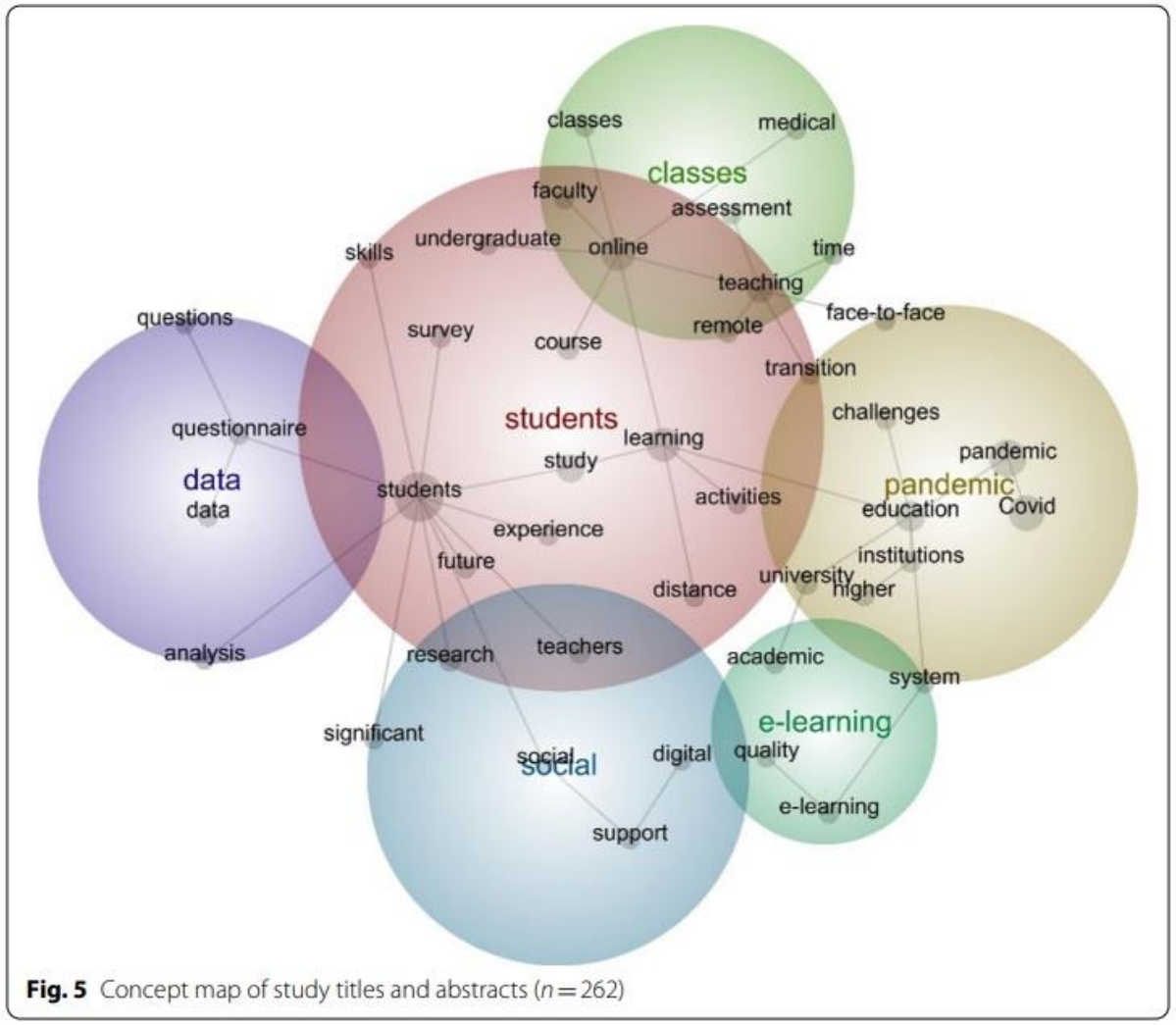


Fig. 5 Concept map of study titles and abstracts ($n = 262$)

Co-occurrence analysis

	Sum all	Sum Quanti	Sum Mixed	Sum Quali	LMS	MPT	TBT	AT	SNT	KO&S	VW	MOOCs	WCT	DAT	ML	GAMES
SCT	146	72	47	27	0.68	0.81	0.86	0.70	0.77	0.72	0.60	0.33	0.60	0.50	1	1
LMS	117	52	43	22		0.62	0.64	0.57	0.65	0.61	0.26	0.33	0.60	1	1	1
MPT	98	45	36	17			0.60	0.59	0.57	0.61	0.47	0.33	0.60	1	1	1
TBT	90	37	33	20				0.48	0.48	0.67	0.40	0.33	0.40	0.50	0.50	0
AT	63	33	26	4					0.20	0.33	0.33	0	0.40	1	0	1
SNT	40	21	15	4						0.33	0.06	0	0.60	0	1	0
KO&S	18	11	4	3							0.13	0.17	0.40	0	0.50	0
VW	15	6	9	0								0.17	0.20	0	0	0
MOOCs	6	1	2	3									0	0	0	0
WCT	5	2	3	0										0	0.50	0
DAT	2	1	0	1											0	0
ML	2	0	2	0												0
Games	1	0	1	0												

Fig. 6 Co-occurrence of tools across the sample ($n = 282$). Note: Quanti = Quantitative, Quali = Qualitative, SCT = synchronous collaboration tools, LMS = learning management system, MPT = multimodal production tools, TBT = text-based tools, AT = assessment tools, SNT = social networking tools, KO&S = knowledge organisation & sharing tools, VW = virtual worlds, WCT = website creation tools, DAT = data analysis tools, ML = mobile learning

Bond et al. (2021)

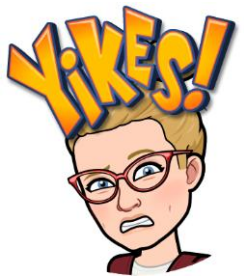
Facing Facts

Mel is currently conducting a **Scoping Review of AIEd reviews, with 257 coded so far**…

Although it has been found to make the process more efficient, especially when using machine learning tools[1],

- 55.6% of reviews didn't report which technology was used to conduct the review.

- Of those that did report it…
  - 15.2% used Excel
  - 13.2% used reference management software (e.g. EndNote)
  - Only **5% of AIEd reviews** used tailored systematic reviewing software
    - Rayyan[2] (*n* = 6)
    - EPPI-Reviewer (*n* = 3)
    - Covidence[3] (*n* = 3)
    - DistillerSR[4] (*n* = 1)



1. Cowie et al. (2022), Harrison et al. (2020), Kebede et al. (2022), Marshall & Wallace (2019), Tsou et al. (2020)
2. https://www.rayyan.ai/
3. https://www.covidence.org/
4. https://www.distillersr.com/products/distillersr-systematic-review-software

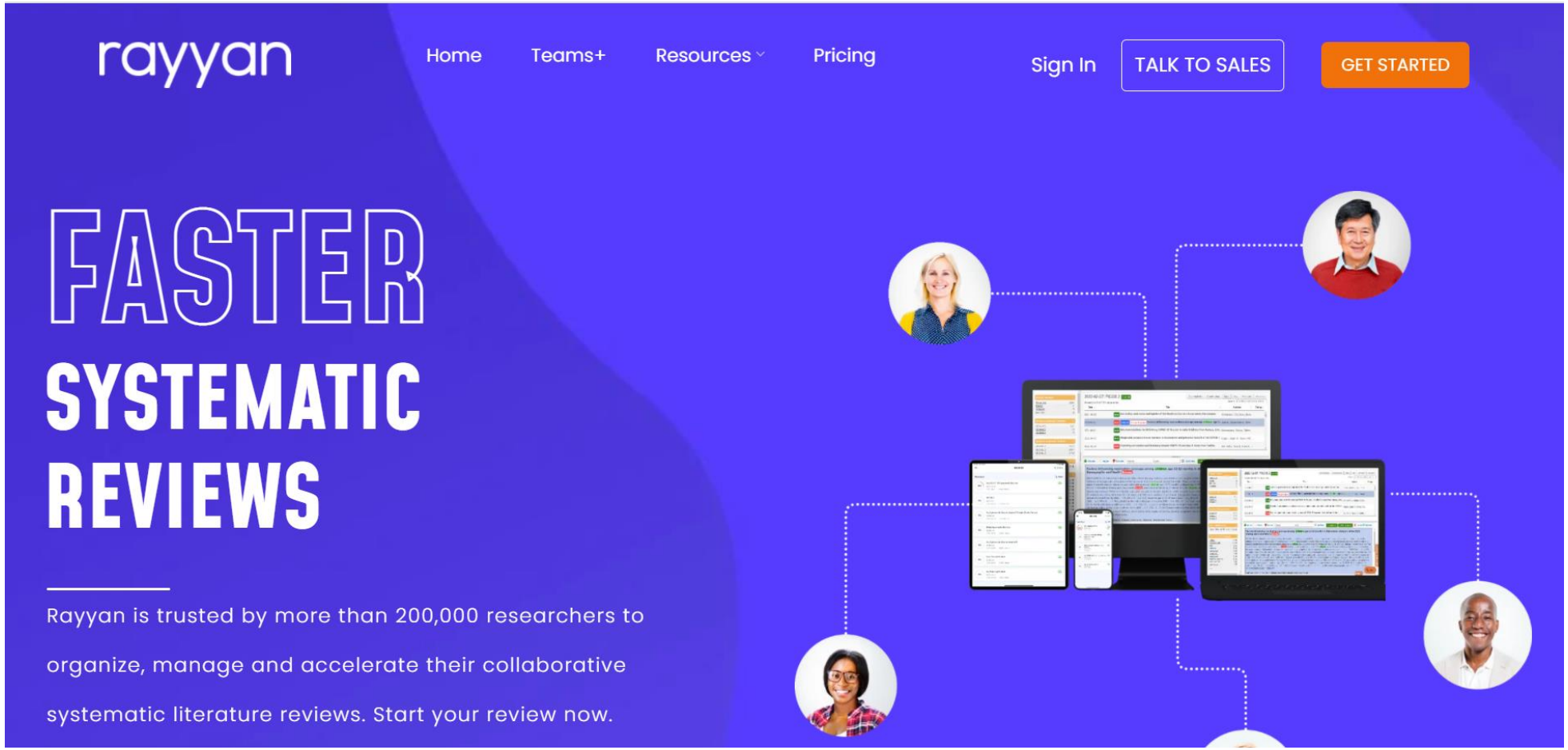
Tools to Assist Systematic Reviews

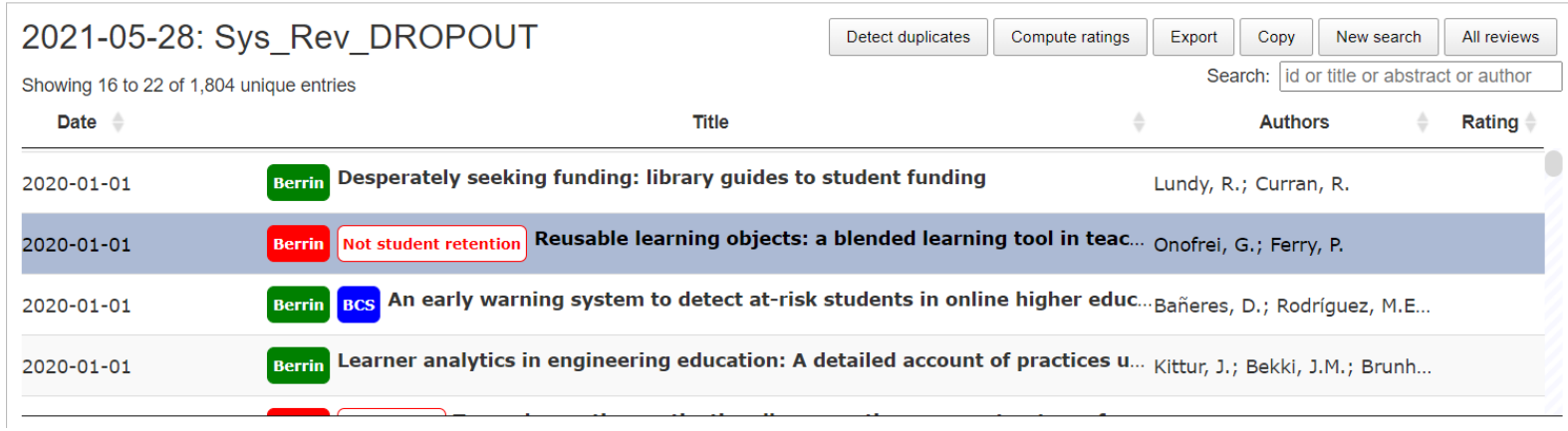
rayyan

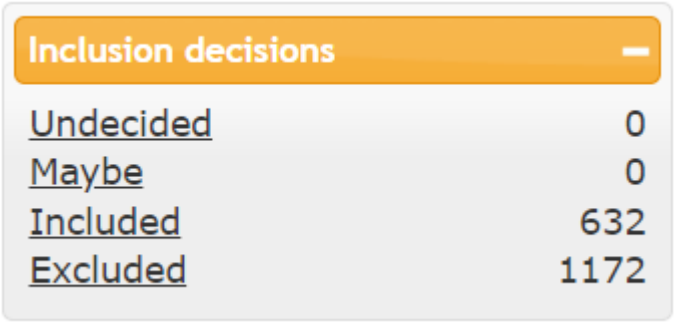
Leximancer

VOSviewer
Visualizing scientific landscapes

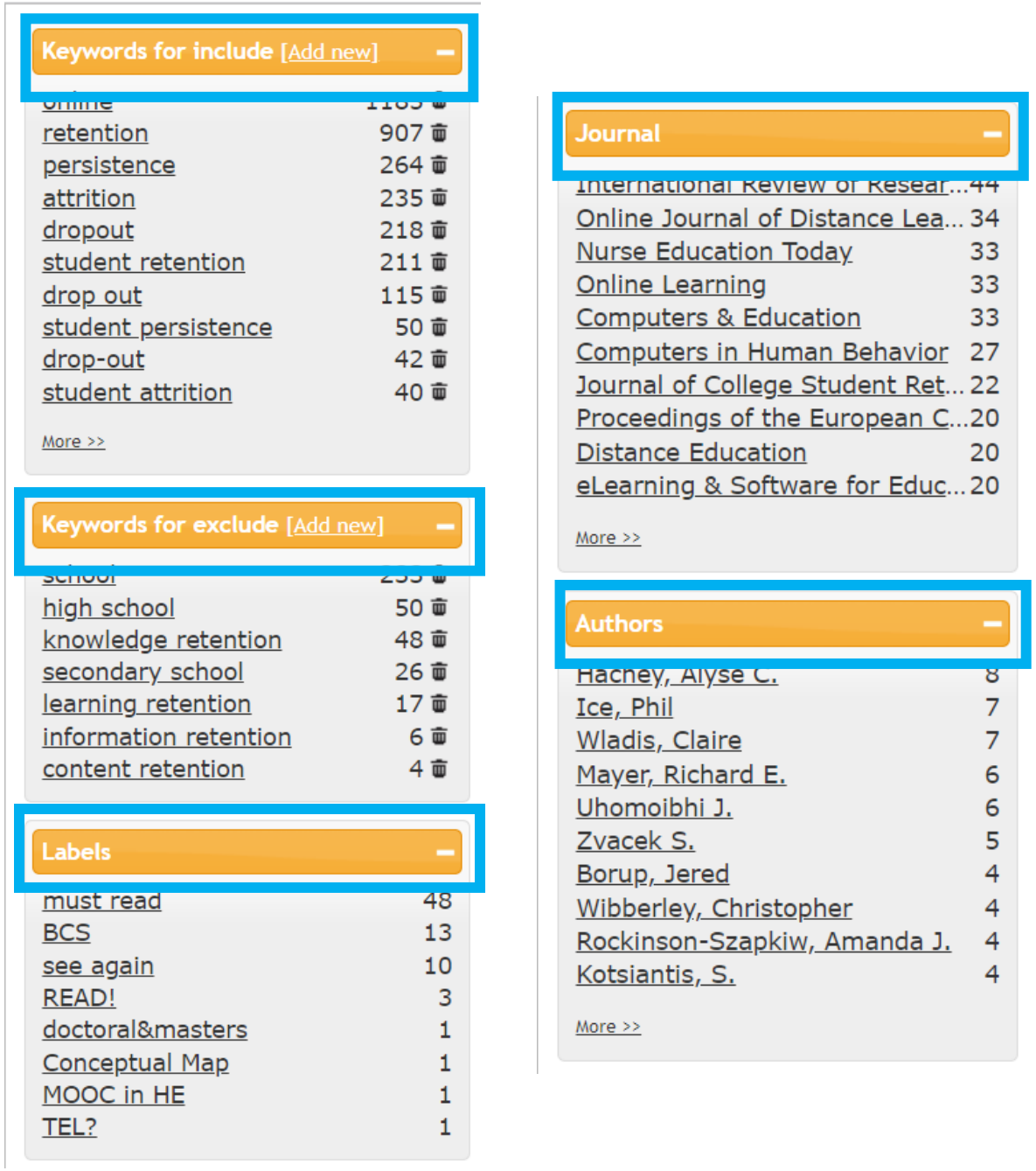
Tools to Assist







2020-01-01 Berrin see again wrong population **Factors affecting student dropout in MOOCs: a caus...** Aldowah, H.; Al-Samarraie, ...



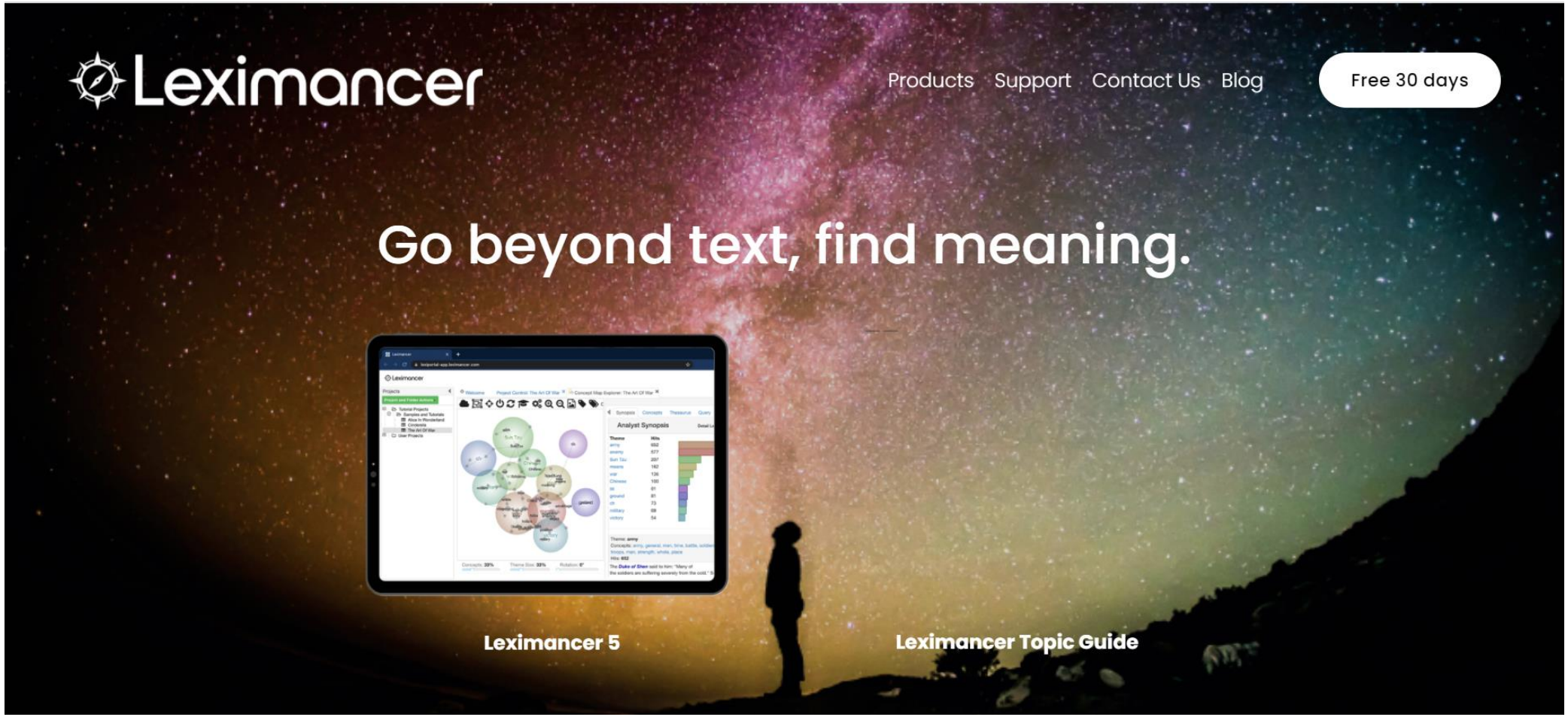
- Keywords to ease spotting irrelevant studies
- Labels to enrich your library
- Overview of the descriptive data

Carl von Ossietzky Universität Oldenburg
COER
Center for Open Education Research

Rayyan

- Sign-up to Rayyan account: https://www.rayyan.ai/
- Set-up a new systematic review
- Import your RIS file
- Invite collaborators

Tools to Assist



Leximancer

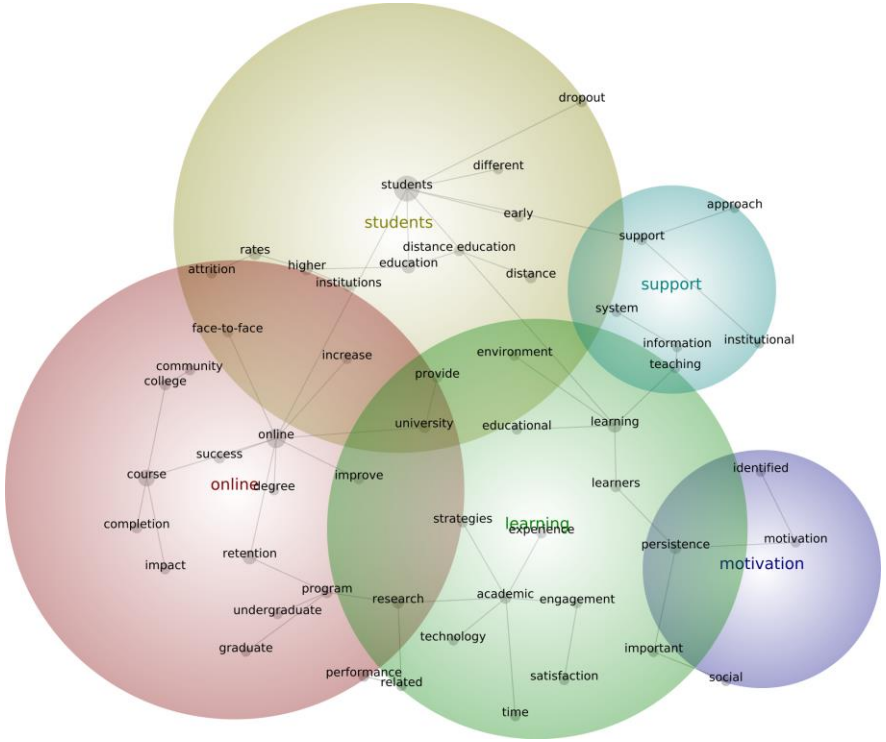
- Content analysis/text mining
- Semantic relations
- Concept mapping

- Online portal

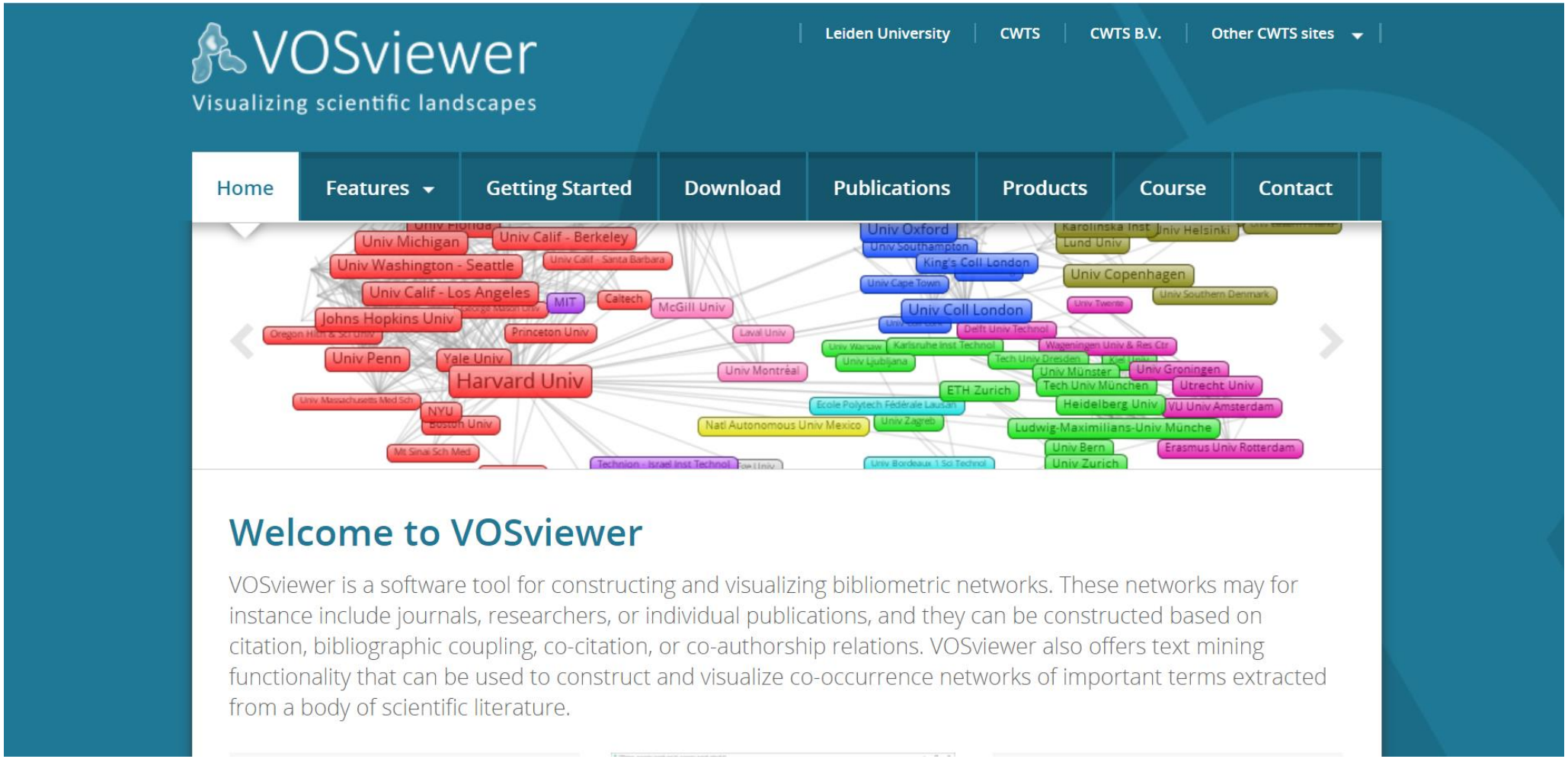
Not free

- Free webinars

- Visit: https://www.leximancer.com/

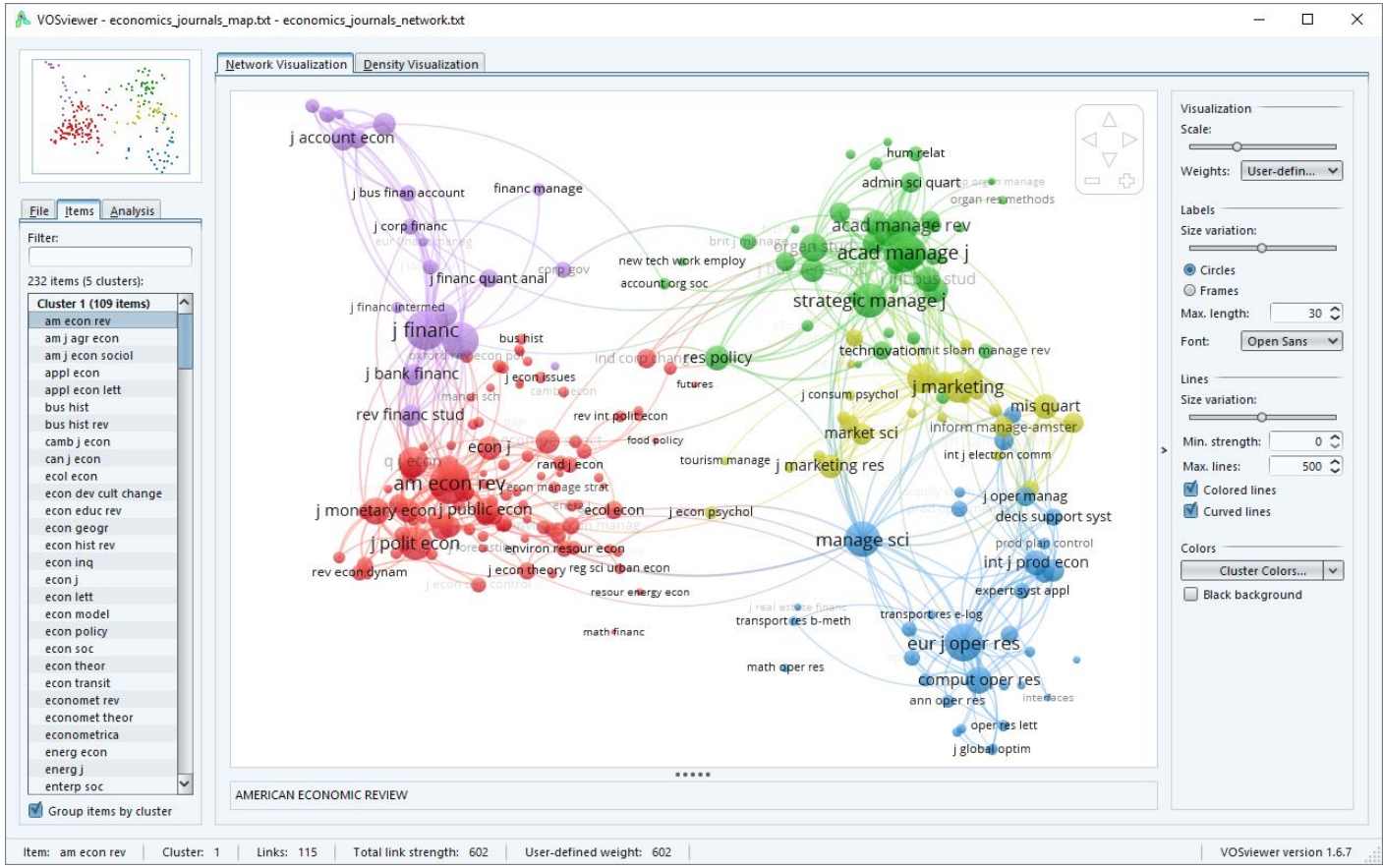


COER
Center for Open Education Research


VOSviewer
Visualizing scientific landscapes
Leiden University
CWTS
CWTS B.V.
Other CWTS sites
Home
Features
Getting Started
Download
Publications
Products
Course
Contact
Univ Michigan
Univ Calif - Berkeley
Univ Washington - Seattle
Univ Calif - Los Angeles
MIT
Caltech
McGill Univ
Johns Hopkins Univ
Princeton Univ
Univ Penn
Yale Univ
Harvard Univ
NYU
Univ Oxford
King's Coll London
Univ Coll London
Univ Copenhagen
Univ Helsinki
Lund Univ
Univ Cape Town
Univ Southern Denmark
Univ Montréal
Laval Univ
Univ Warsaw
Karlsruhe Inst Technol
Univ Ljubljana
Univ Münster
Univ Groningen
Tech Univ München
Utrecht Univ
ETH Zurich
Heidelberg Univ
VU Univ Amsterdam
Ecole Polytech Fédérale Lausan
Natl Autonomous Univ Mexico
Univ Zagreb
Ludwig-Maximilians-Univ Münche
Univ Bern
Erasmus Univ Rotterdam
Univ Zurich
Welcome to VOSviewer
VOSviewer is a software tool for constructing and visualizing bibliometric networks. These networks may for instance include journals, researchers, or individual publications, and they can be constructed based on citation, bibliographic coupling, co-citation, or co-authorship relations. VOSviewer also offers text mining functionality that can be used to construct and visualize co-occurrence networks of important terms extracted from a body of scientific literature.

VOSviewer

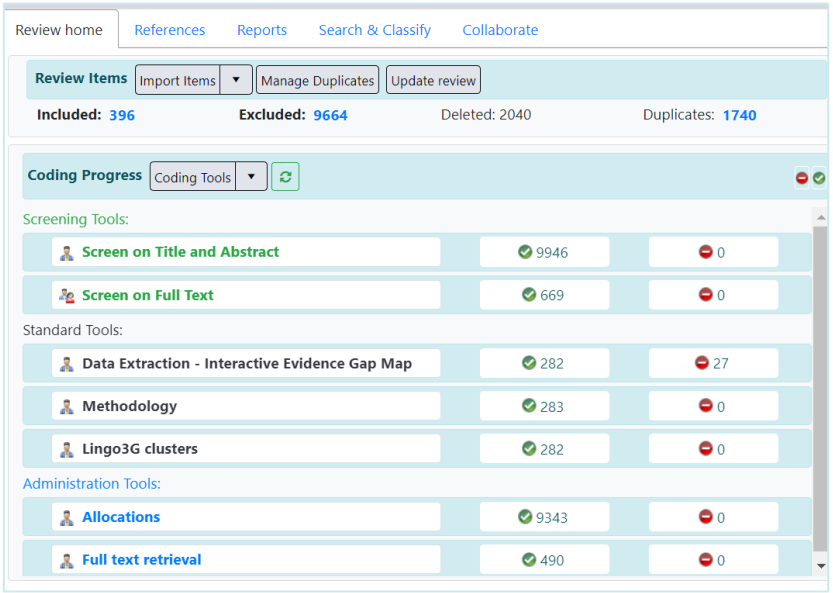
- State-of-art: network clustering
- NLP: co-occurrances
- Bibliometric networks
  - Co-authorship networks
  - Bibliographic coupling
- Open Source
- Visit: https://www.vosviewer.com/



EPPI-Reviewer

EPPI-Reviewer evidence synthesis software was created to support the methodological work conducted at the EPPI-Centre.

- Web-based - accessed from any device with an internet connection.
- Developed for all types of systematic review.
- Designed for flexibility.



EPPI-Reviewer helps by:

- keeping your review process explicit and replicable
- enabling you to work with many others in one review
- keeping your data in one place
- helping with large screening loads through priority screening
- enabling updates to your review, including through machine learning
- allowing the easy creation of interactive evidence gap maps

https://eppi.ioe.ac.uk/EPPIReviewer-Web/home

EPPI-Reviewer Gateway

https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=2914

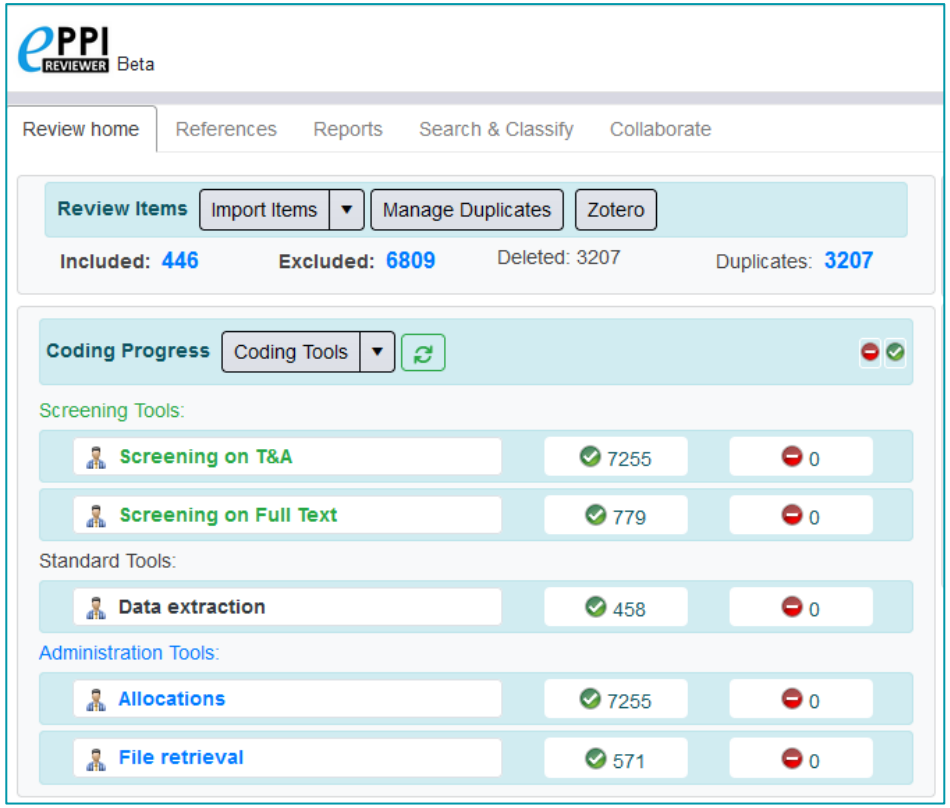
- Create a new account.
- Activate your account.
- Login using your EPPI-Reviewer username and password to manage your account and reviews.
  - When sharing reviews in particular.
- Forgotten password and username facility.

https://youtube.com/playlist?list=PL9xuE5D2RaCIEZbXObTKzZ7OaGMJp3Bjr

EPPI-Reviewer

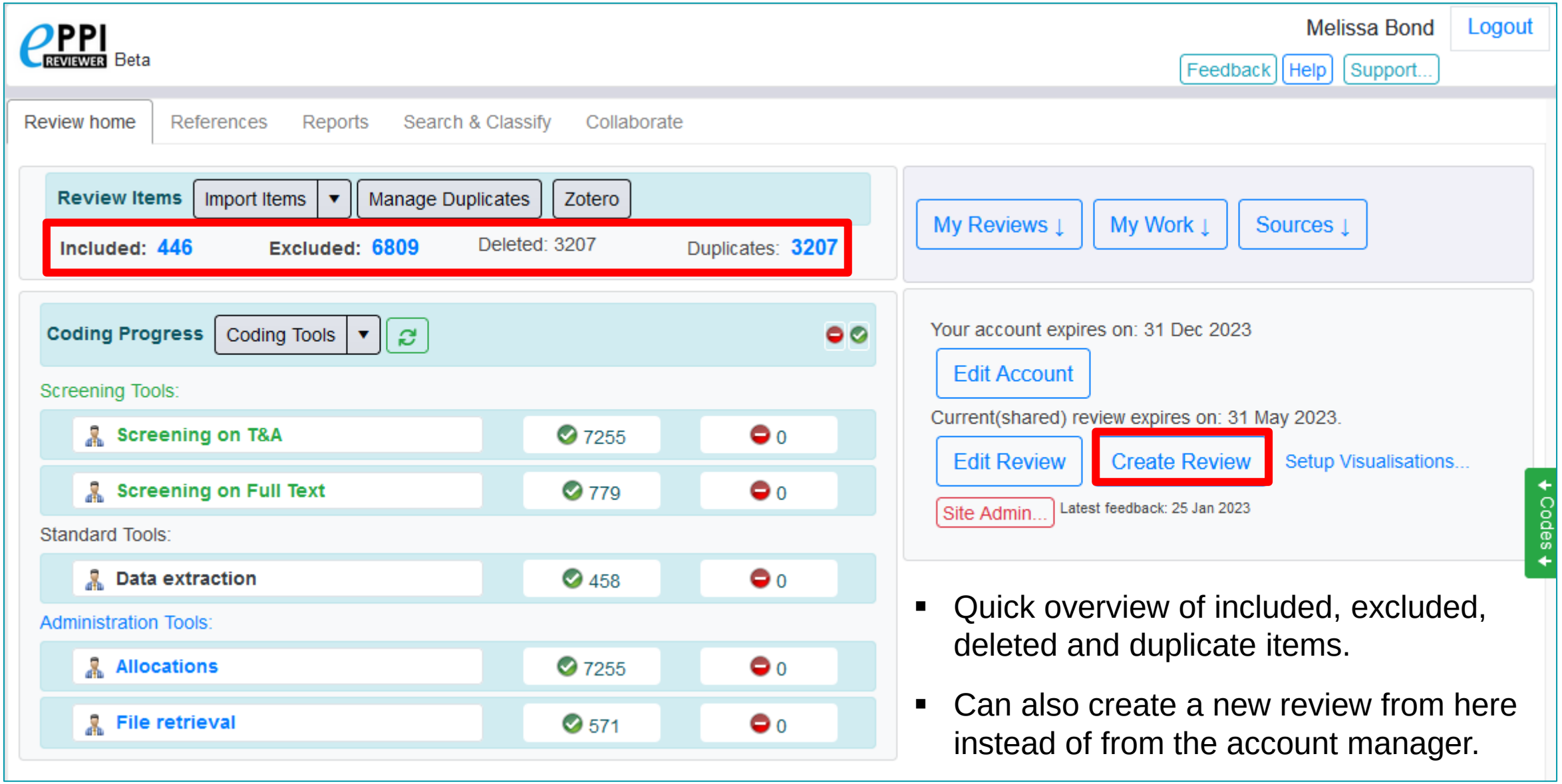
https://eppi.ioe.ac.uk/eppireviewer-web

- Works with modern browsers (Firefox, Safari, Chrome).
- Works on web-enabled devices, e.g. smartphones and tablets.
- Uses the same data as EPPI-Reviewer 4.



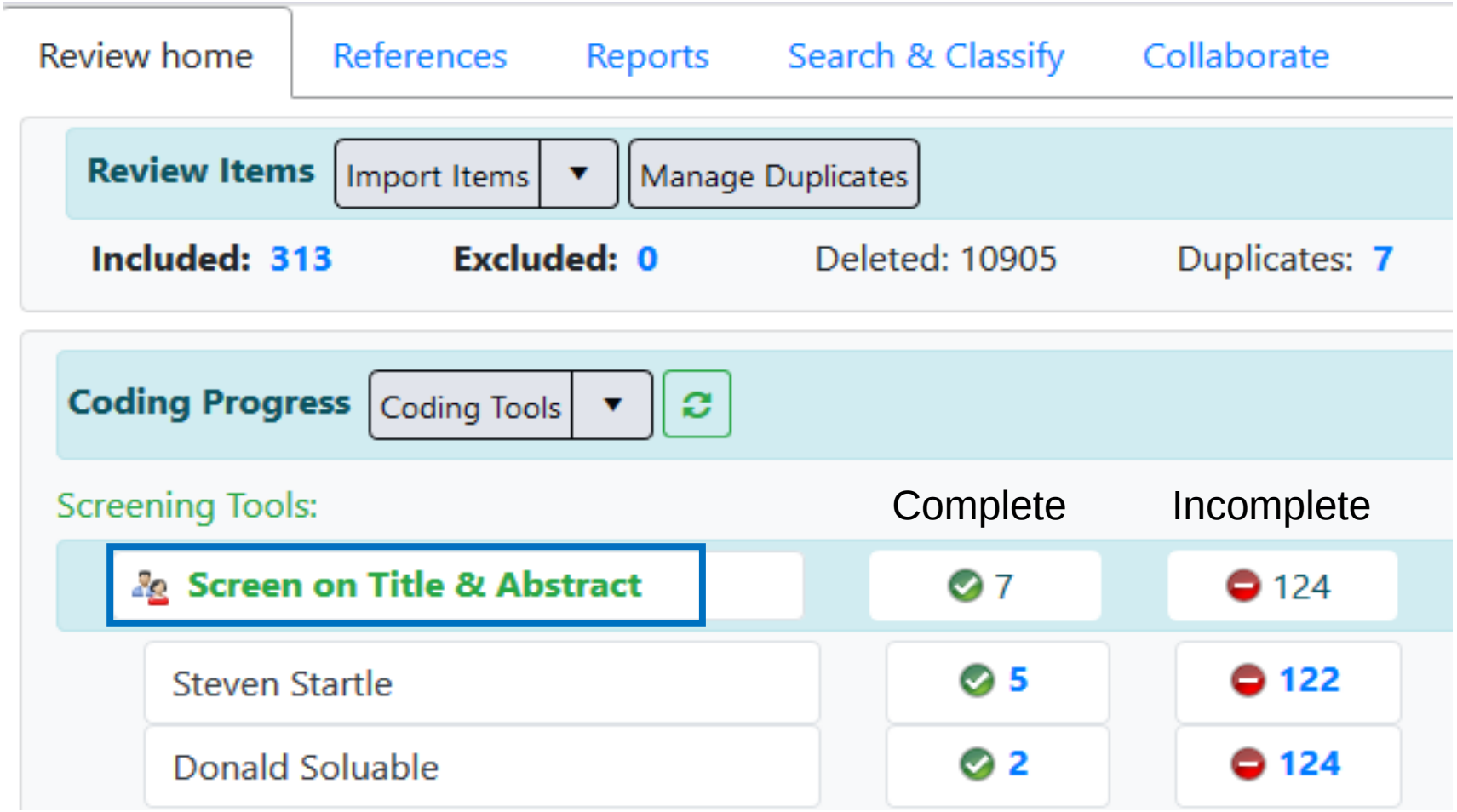
- Based on same tech as Google Docs and Gmail.
- PubMed and OpenAlex integrated.
- Machine learning incl. priority screening

EPPI-Reviewer Home Screen



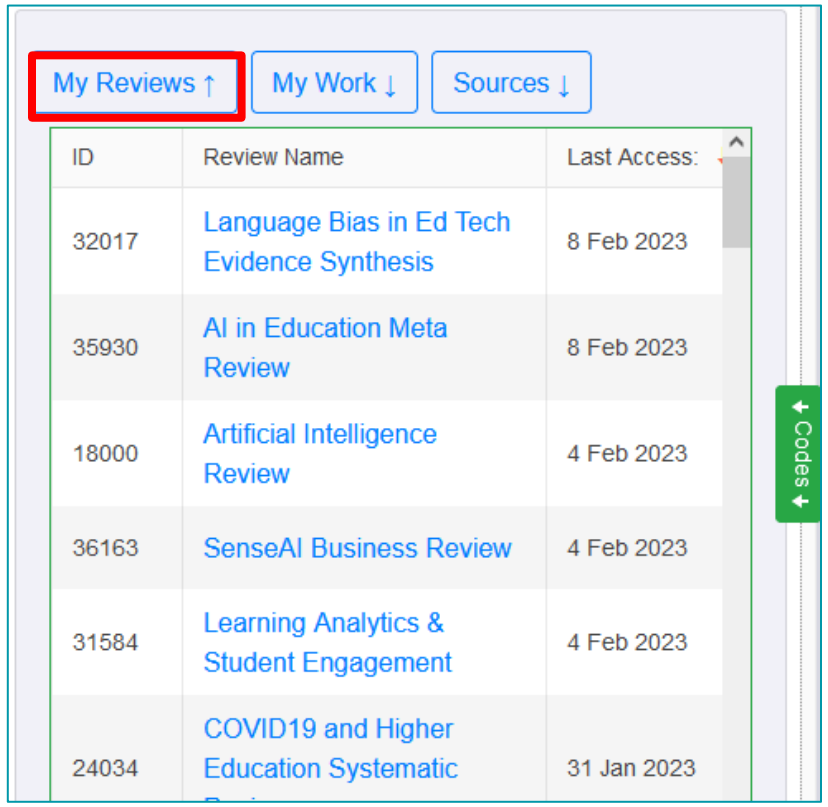
- Quick overview of included, excluded, deleted and duplicate items.
- Can also create a new review from here instead of from the account manager.

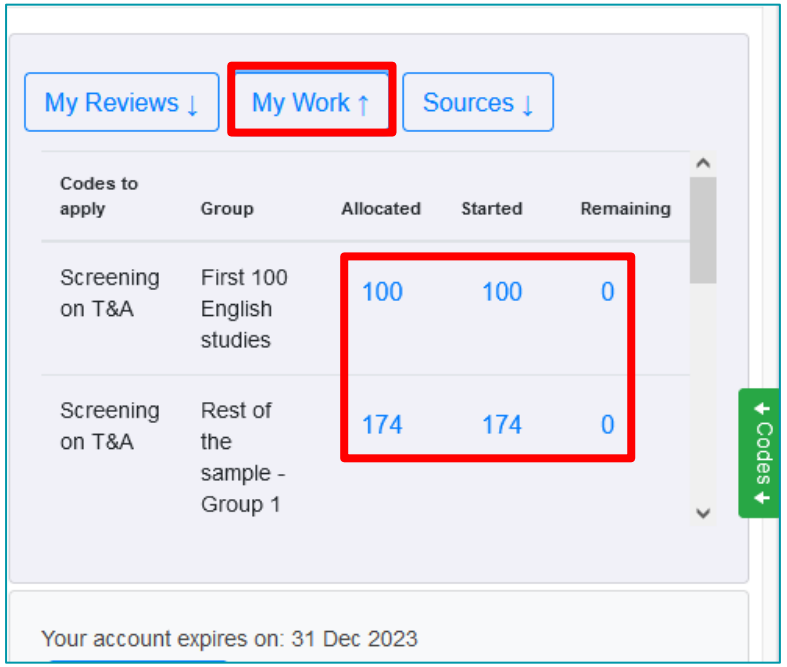
EPPI-Reviewer Web – Home Screen

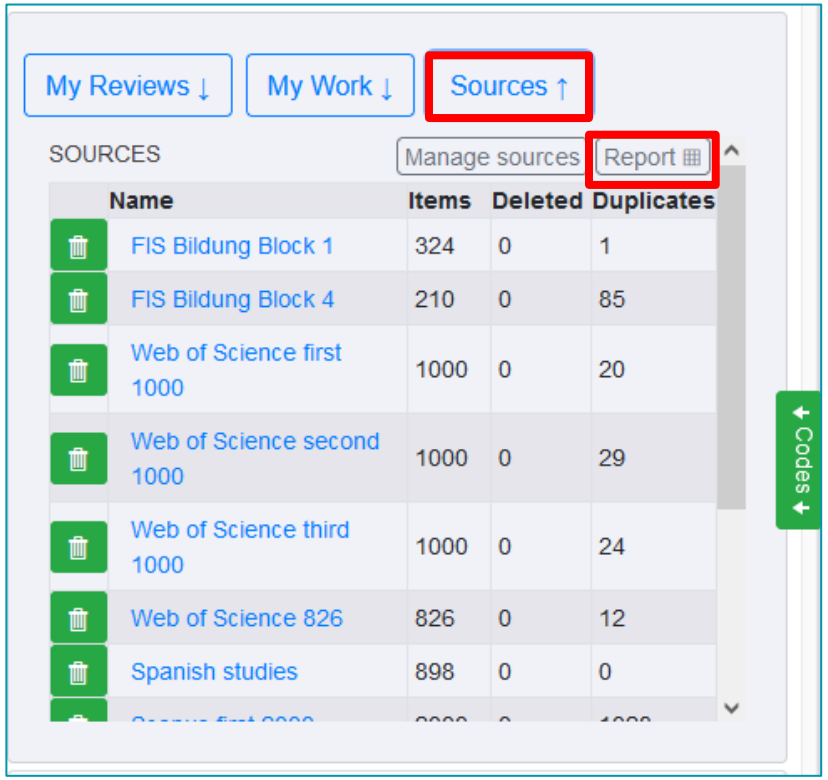


- Clicking on the name of a coding tool will show the coding progress.
- By clicking on a blue number, you will be taken to a list of those items in the References tab.

EPPI-Reviewer Home Screen







My Reviews

- Easily toggle in between reviews you have access to.

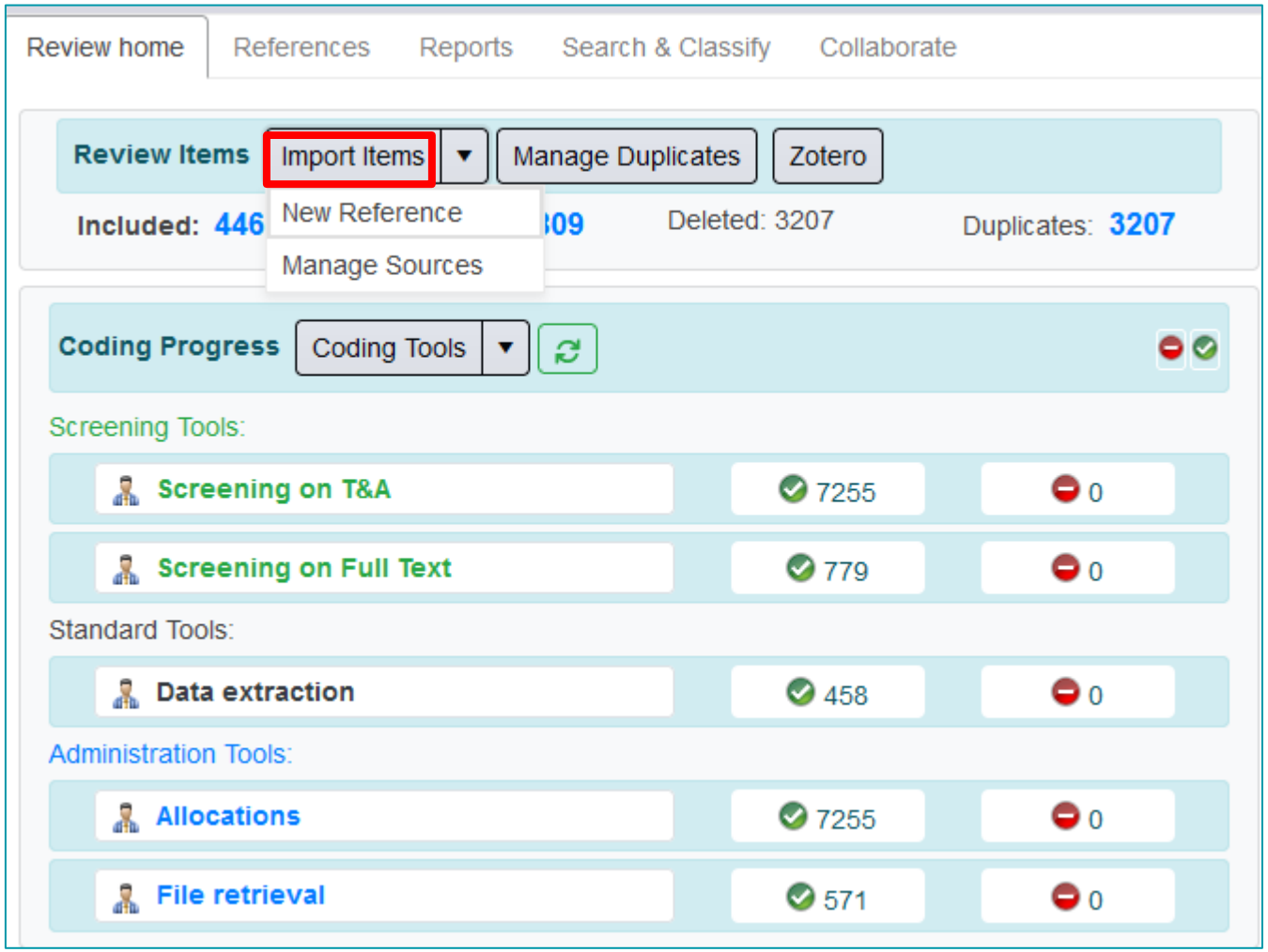
My Work

- Displays any coding assignments assigned to you.
- Click on a blue number to go to a list of those items.

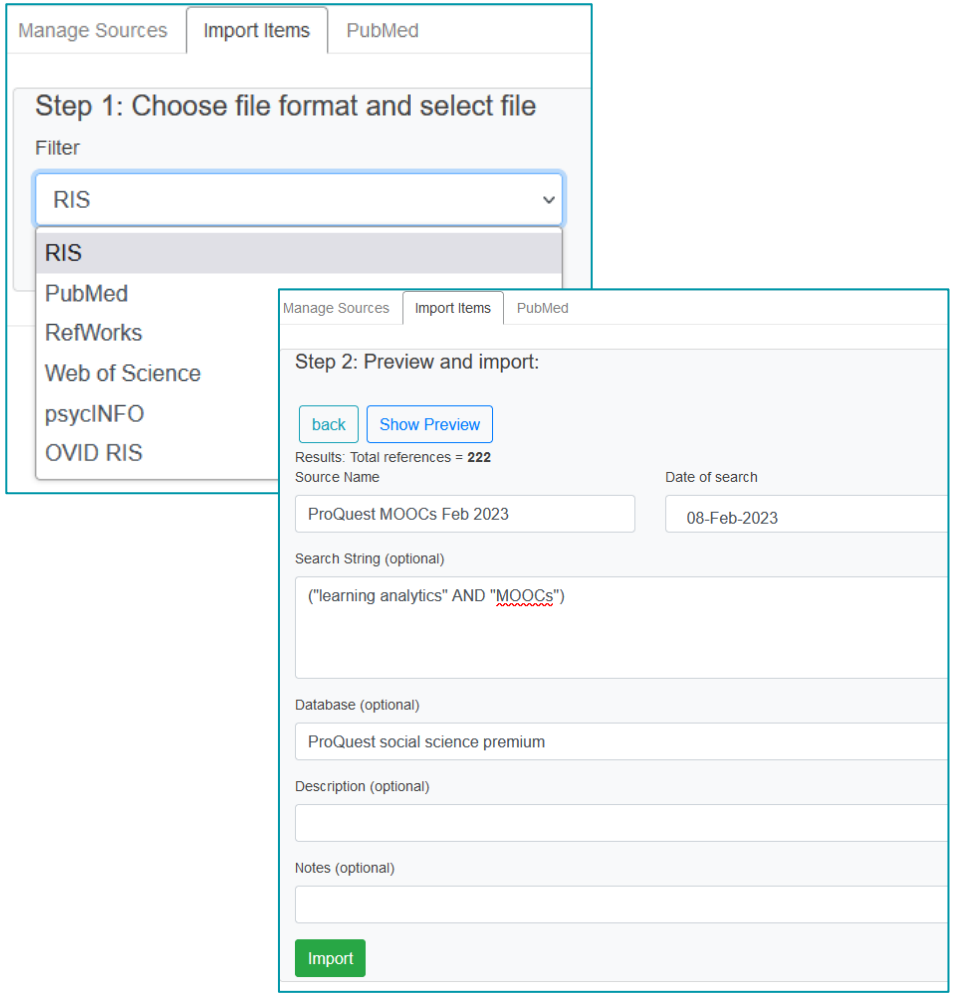
Sources

- Lists all imported files.
- Click on Report to produce an itemised record of search meta data.

Importing Items

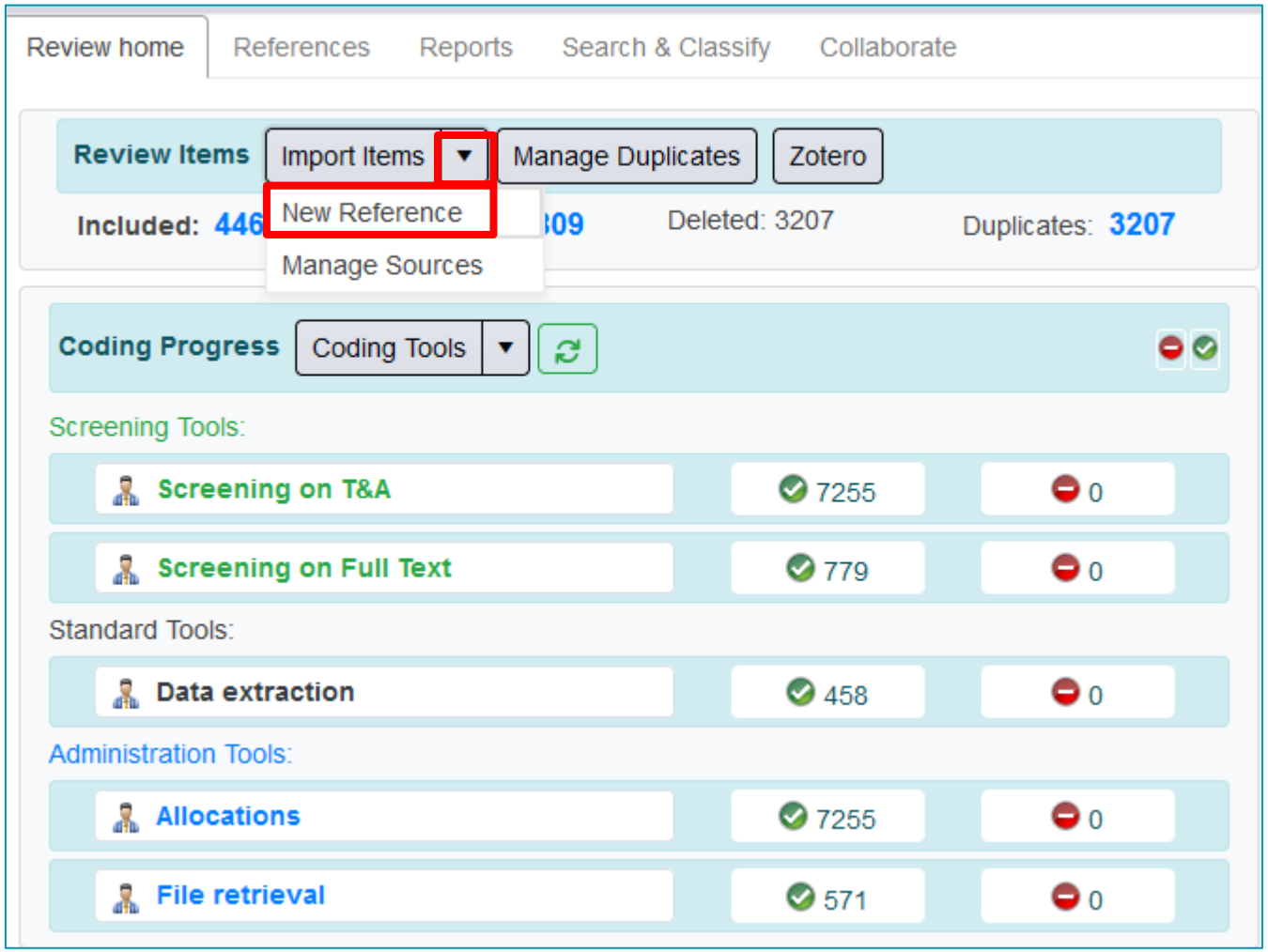


- Importing items is easy

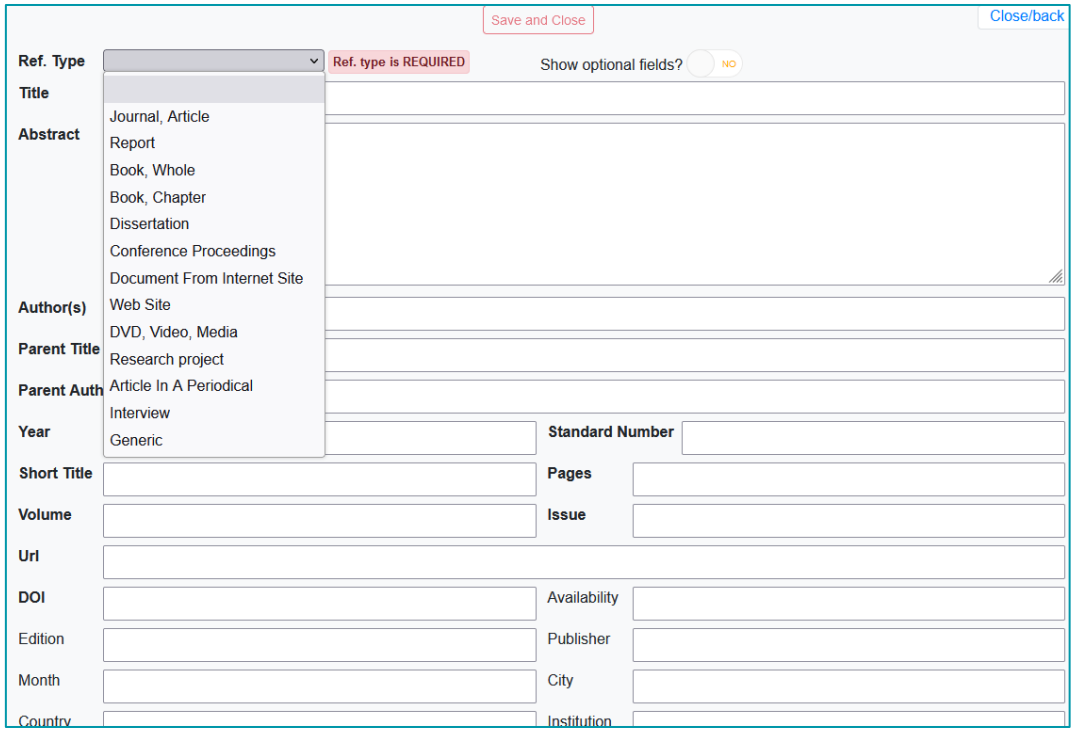


https://youtu.be/Emkuq5H_FB0

Importing Items



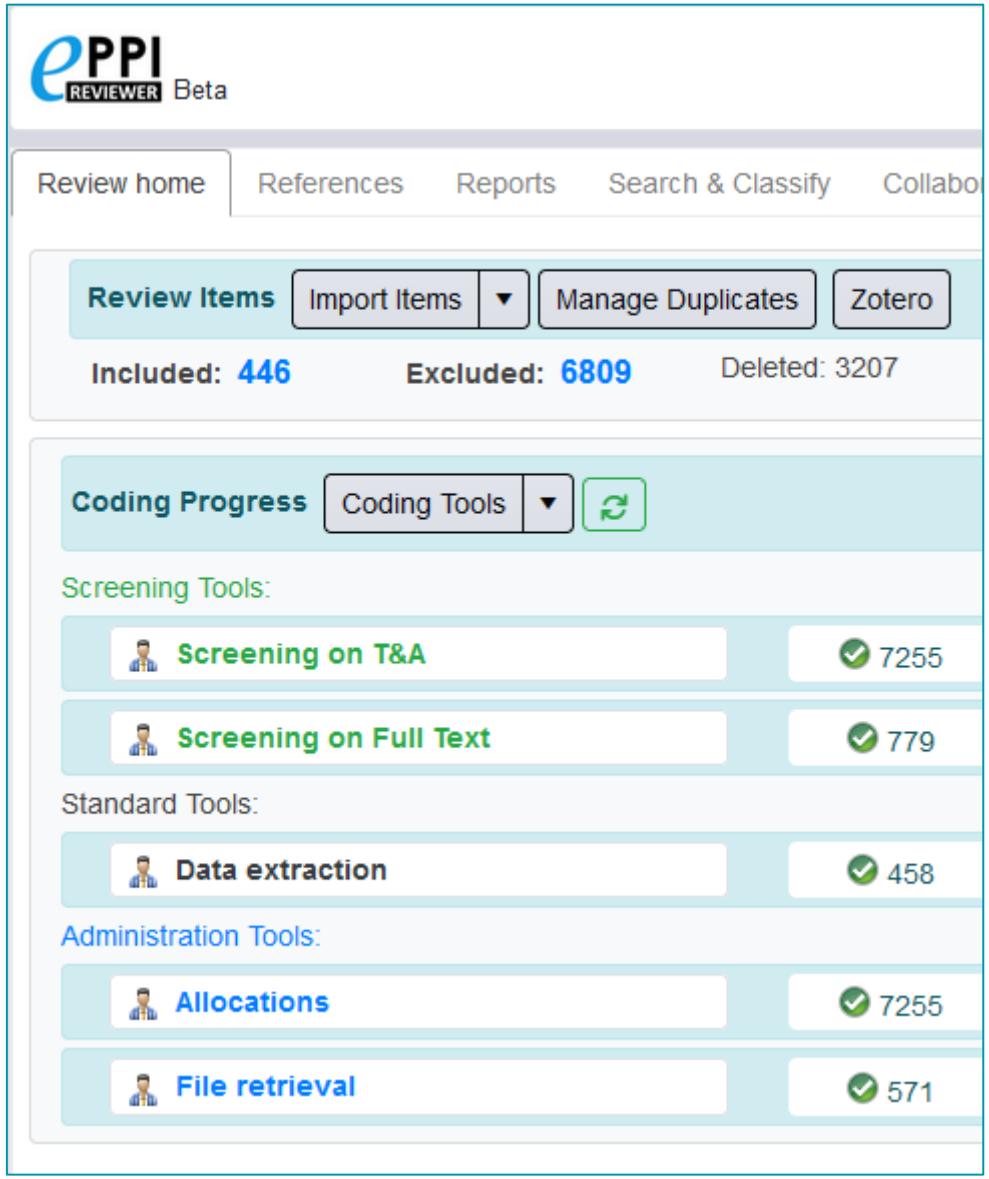
- Manually add items

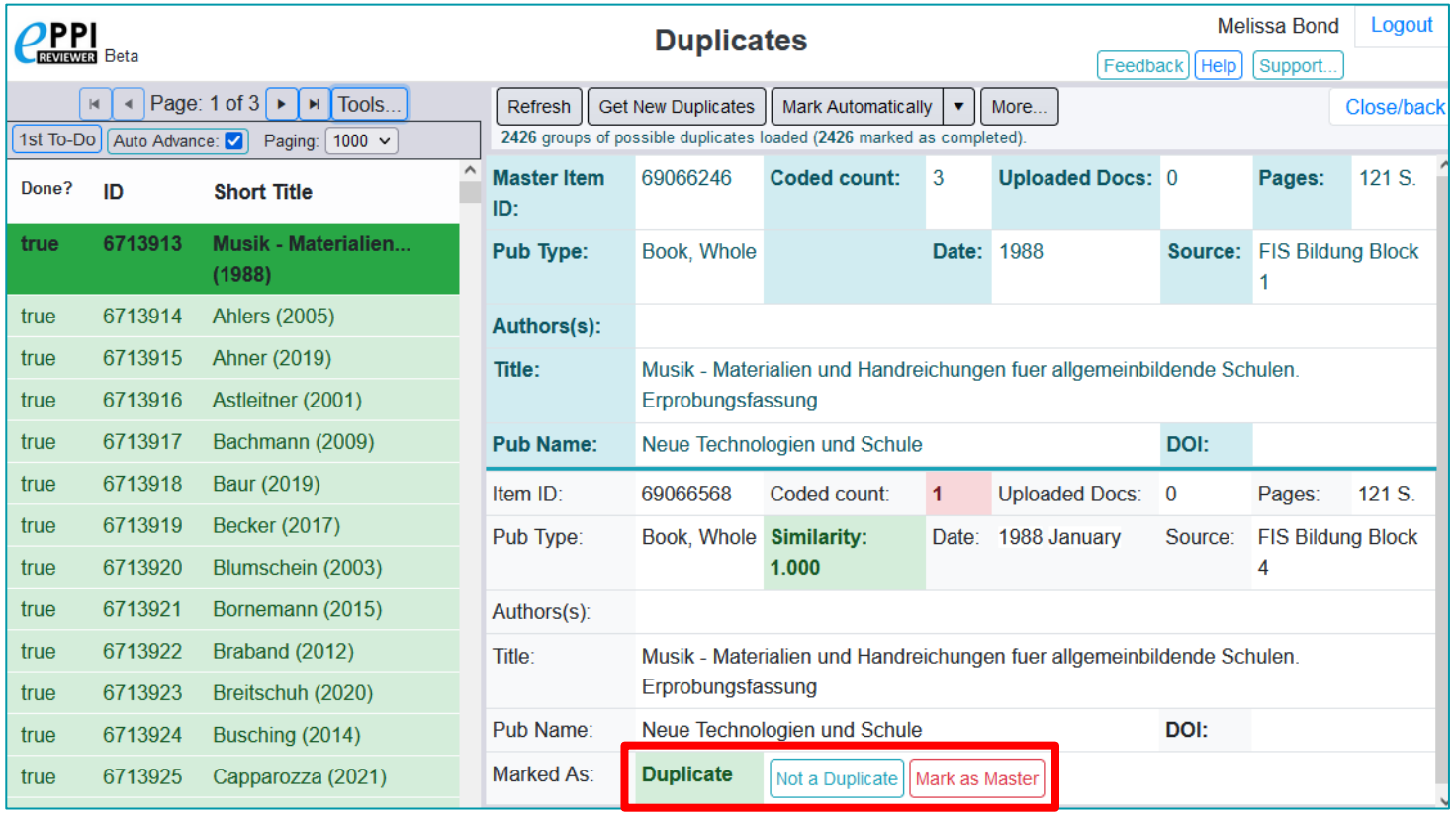


➢ *Make sure you choose the correct reference type*

https://youtu.be/Emkuq5H_FB0

Managing Duplicates





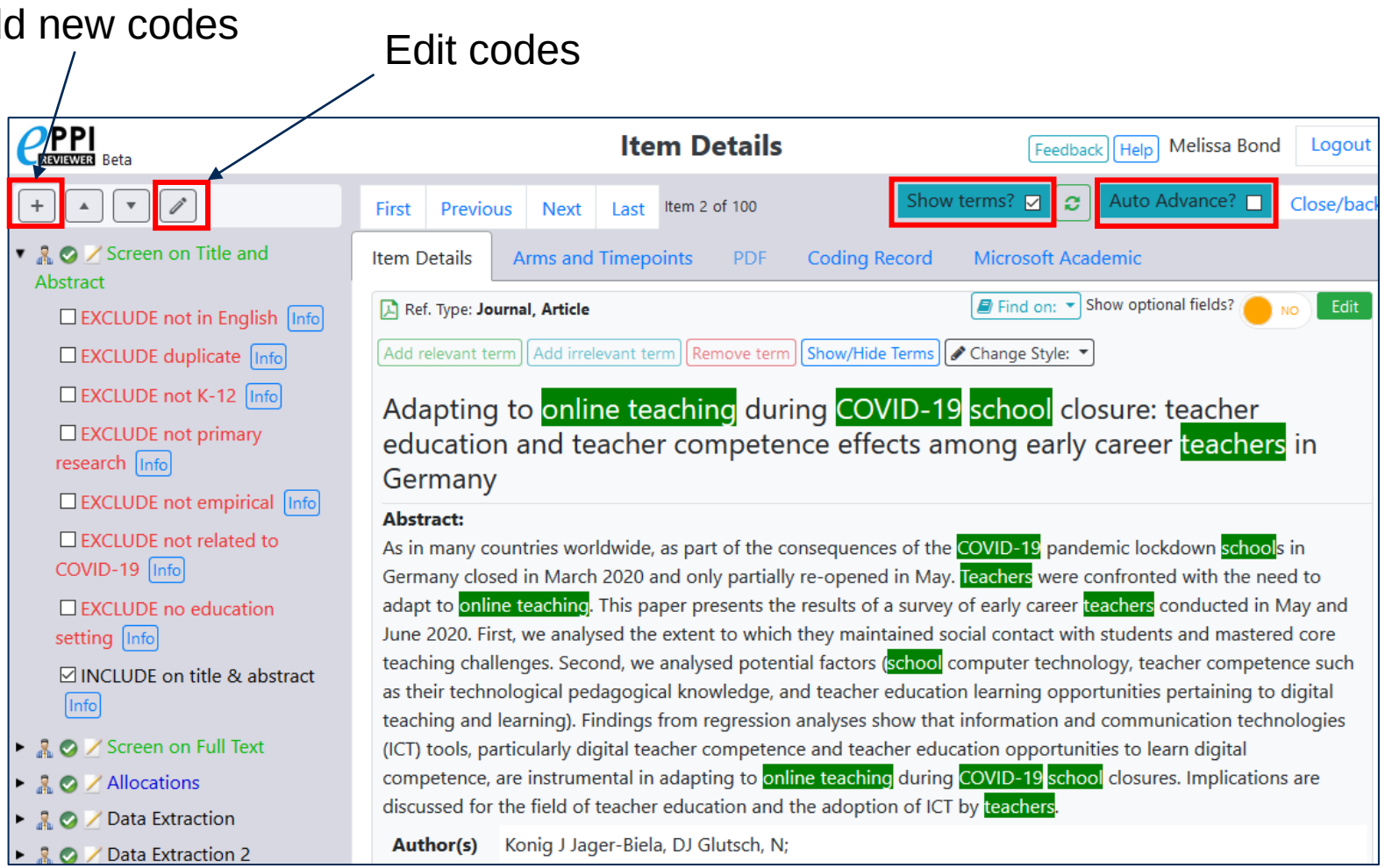
- Click **Get New Duplicates** to run the process.
- **Mark Automatically** will speed it up.
- **1st To-Do** takes you to the first possible duplicate in the list.
- Buttons to mark items as duplicate, not a duplicate or master.

https://youtu.be/DGcIOWX61xc

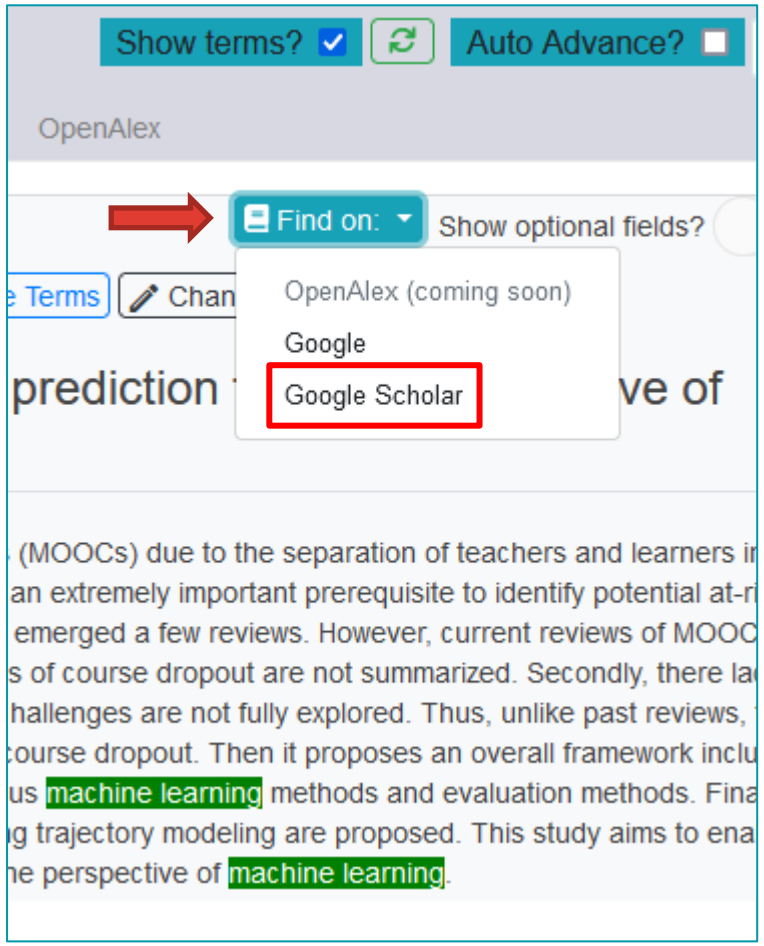
EPPI-Reviewer

Screening

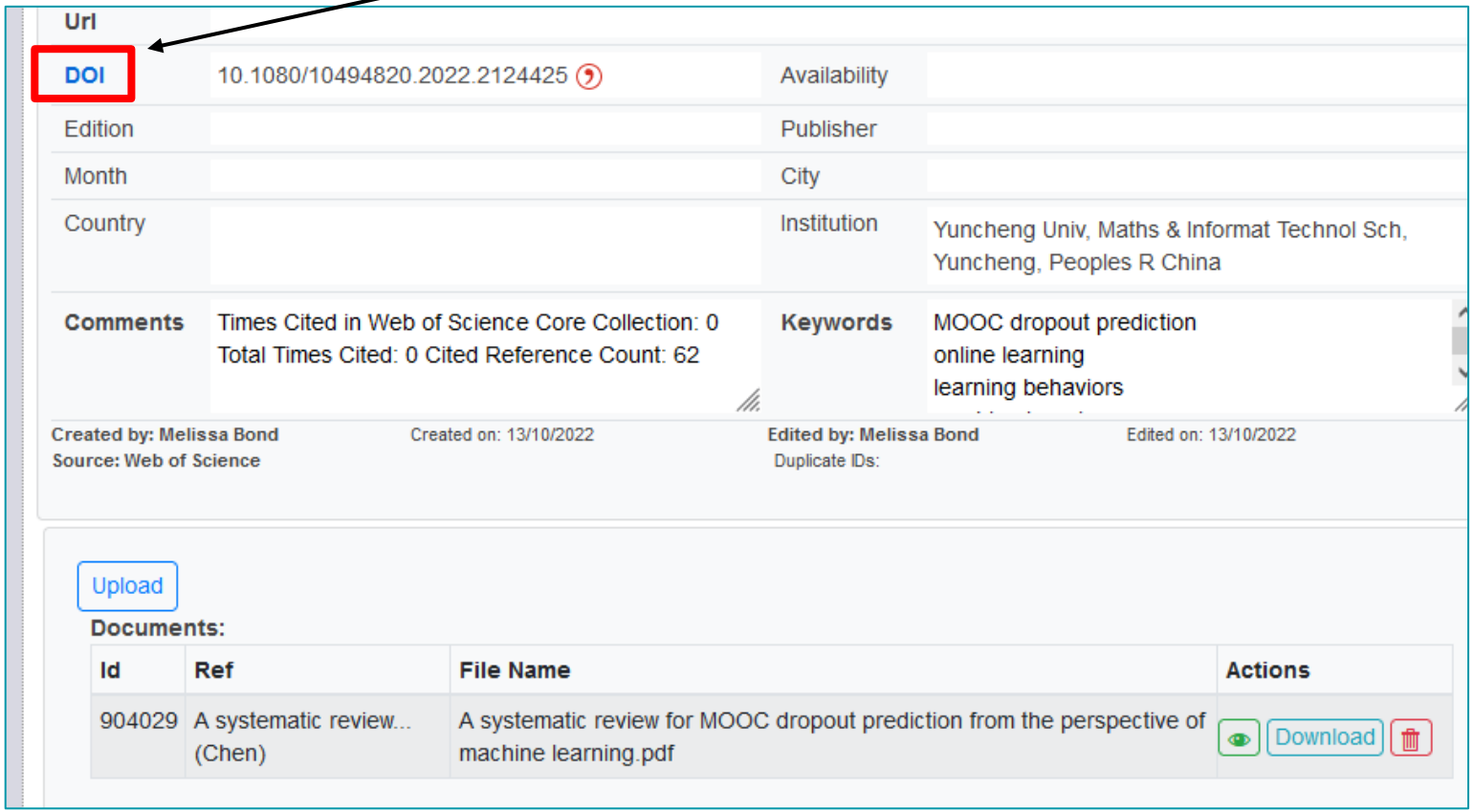
- Enable ***auto advance***
- ***Show terms*** function highlights key phrases
- Use touch device
- Easy to edit and add codes or extra information



Find PDFs

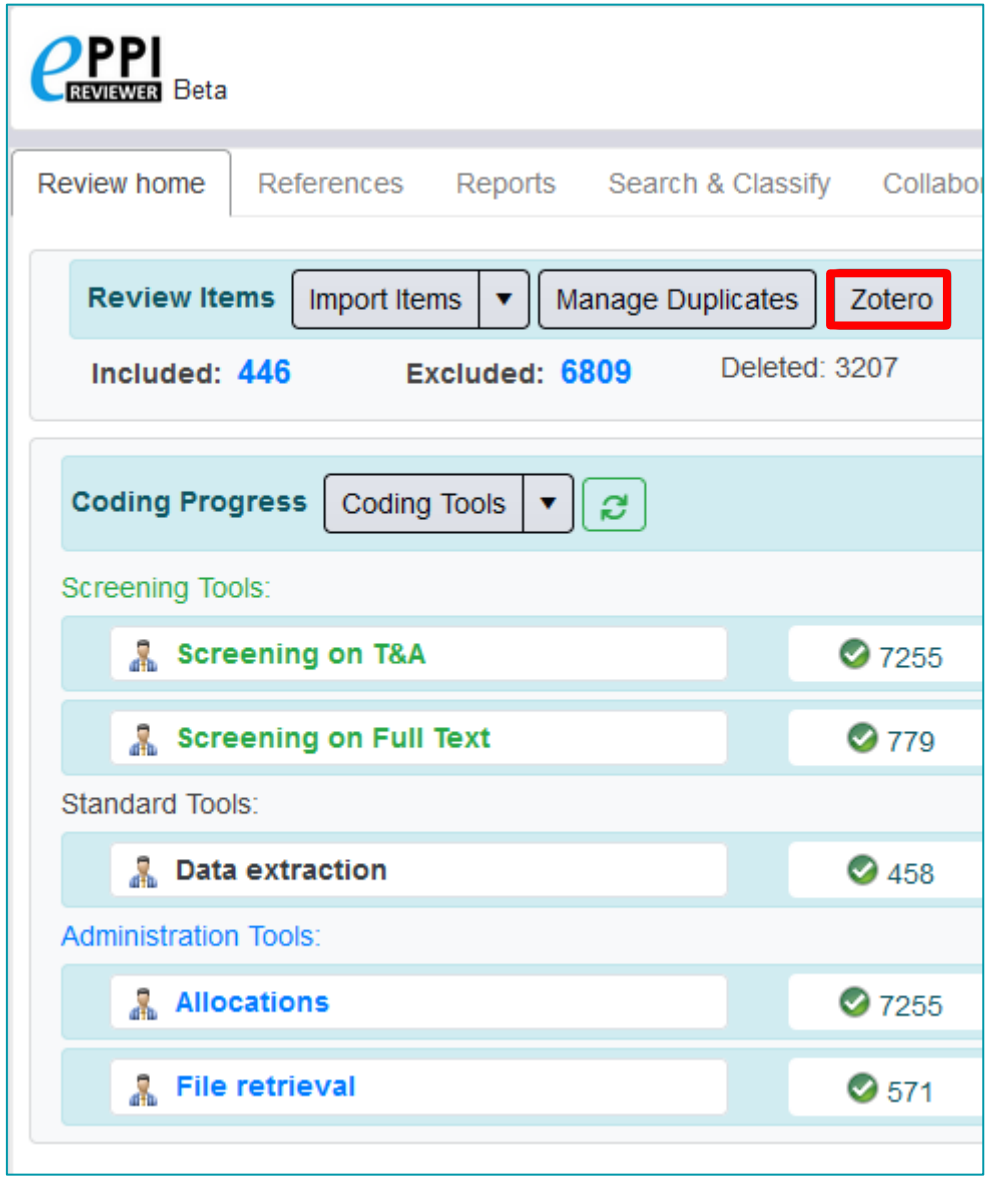


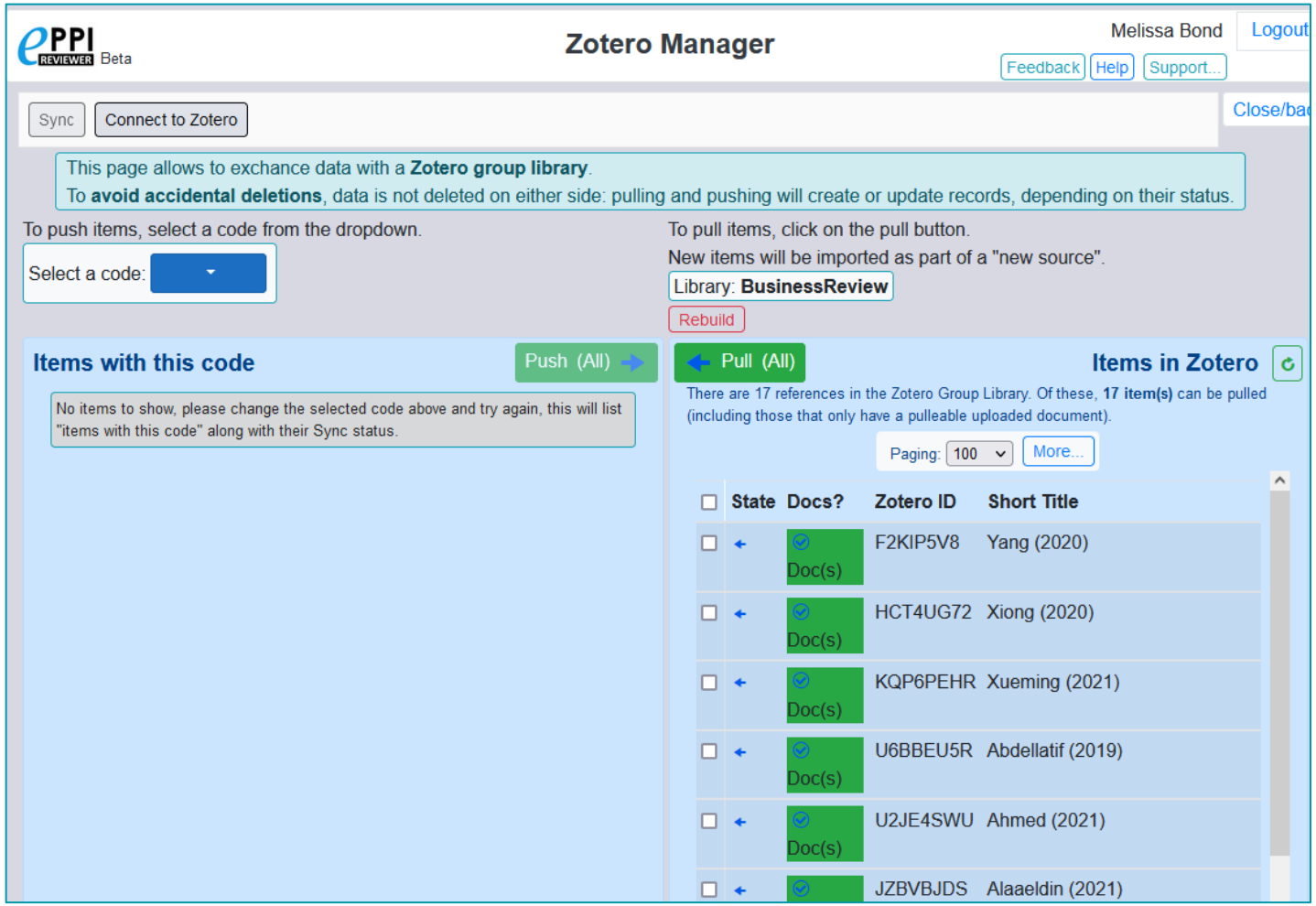
- Use Google or Google Scholar to locate PDFs, or click on the blue URL or DOI text.



- Scroll to the bottom of the item record and click on the blue Upload button.

Bulk import PDFs



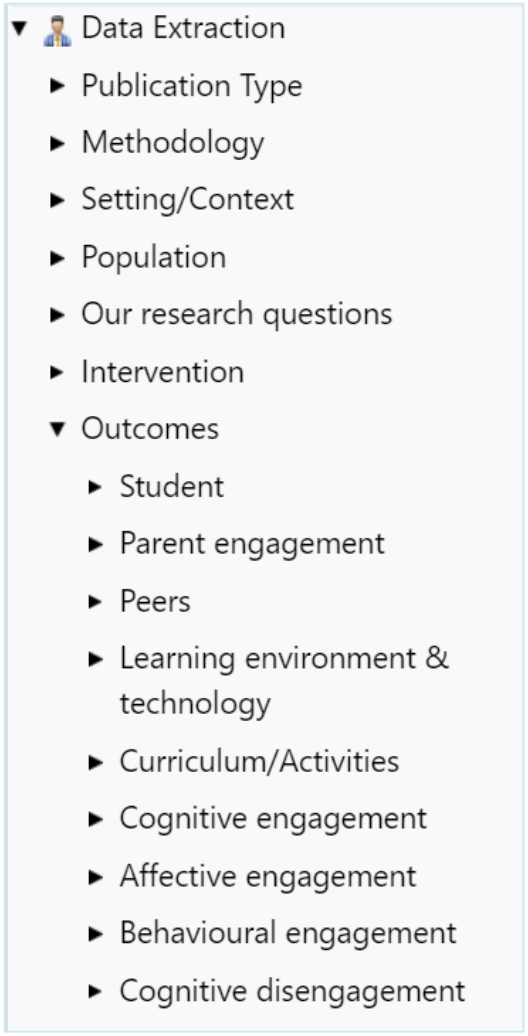


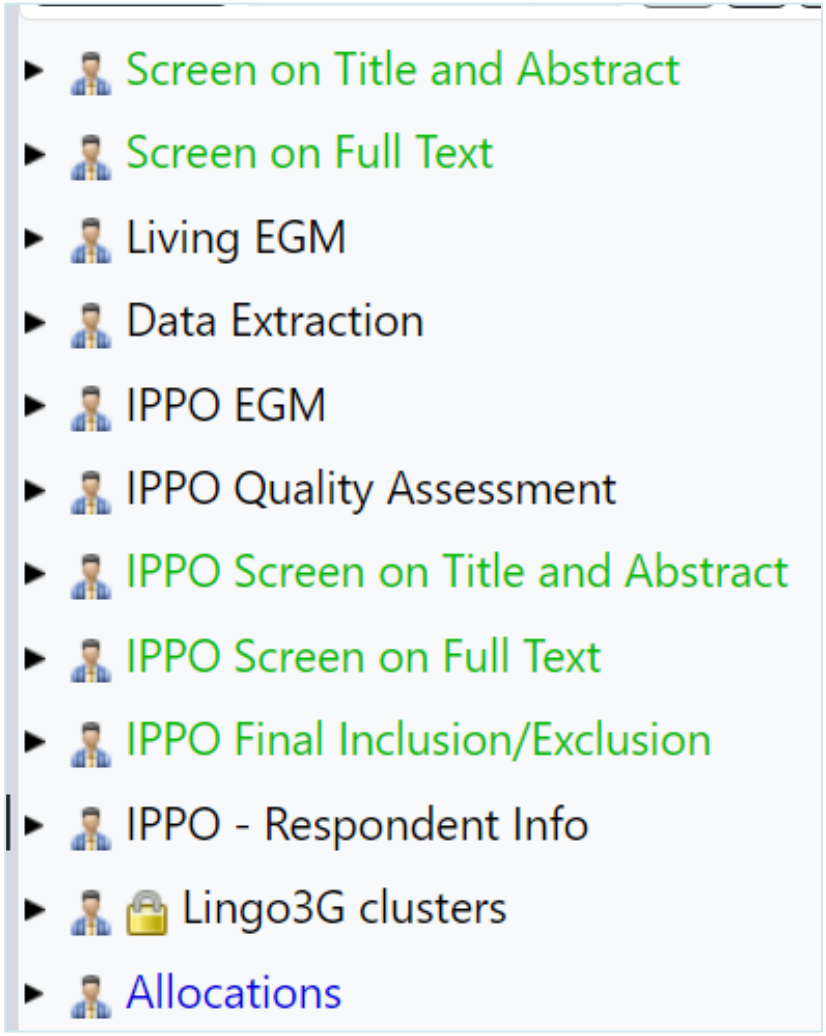
- Link to a Zotero Group Library and bulk import PDFs.
  - ➢ *Only free for up to 300MB*

https://youtu.be/nWG9i5spHyc

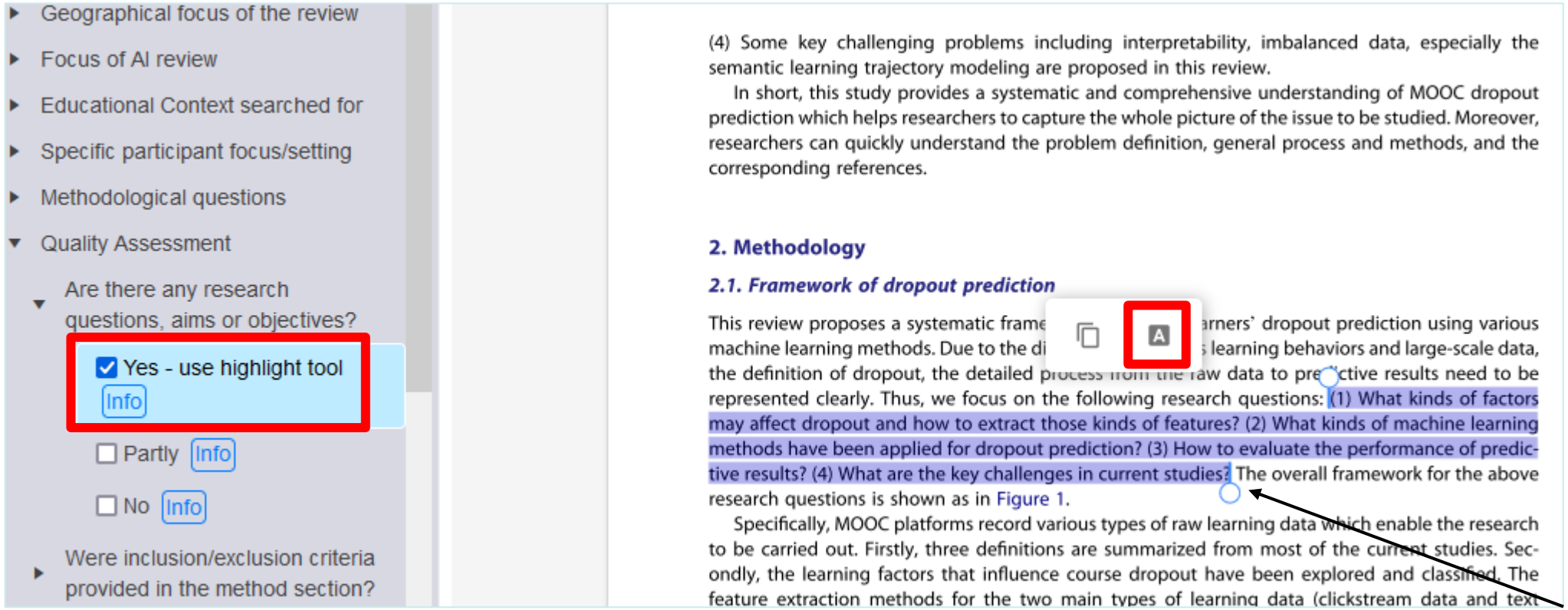
Data Extraction

- Complex coding tools supported
- Both quantitative and qualitative codes
- Coding tools allow for multi-stage reviews to occur within the one review
- Consider your coding tool first, if you're going to create EGMs





Line by line PDF coding



Assigned text from PDF

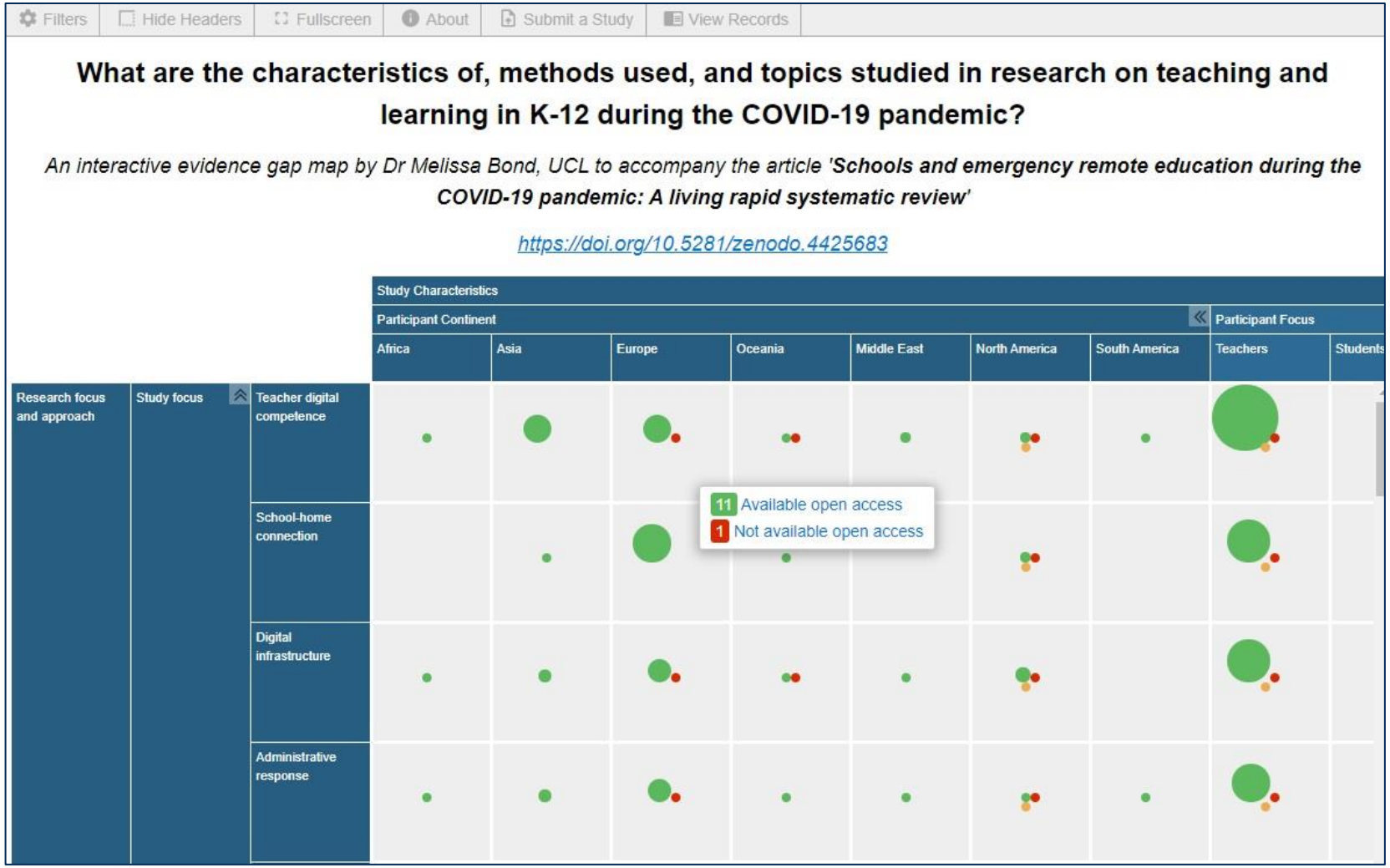
Coding report

- Quality Assessment
  - Are there any research questions, aims or objectives?
    - **Yes - use highlight tool**
      A systematic review for MOOC dropout prediction from the perspective of machine learning.pdf: Page 4: "(1) What kinds of factors may affect dropout and how to extract those kinds of features? (2) What kinds of machine learning methods have been applied for dropout prediction? (3) How to evaluate the performance of predic- tive results? (4) What are the key challenges in current studies?"
  - Were inclusion/exclusion criteria provided in the method section?
    - **Partly**
  - Are the publication years included defined?
    - **Yes**
      2012-2022

Text entered via Info box

Interactive evidence gap maps

- Created for each research question
- Freely available open access
- Filterable, searchable
- Can download references
- Direct links to studies
- Can assist synthesis



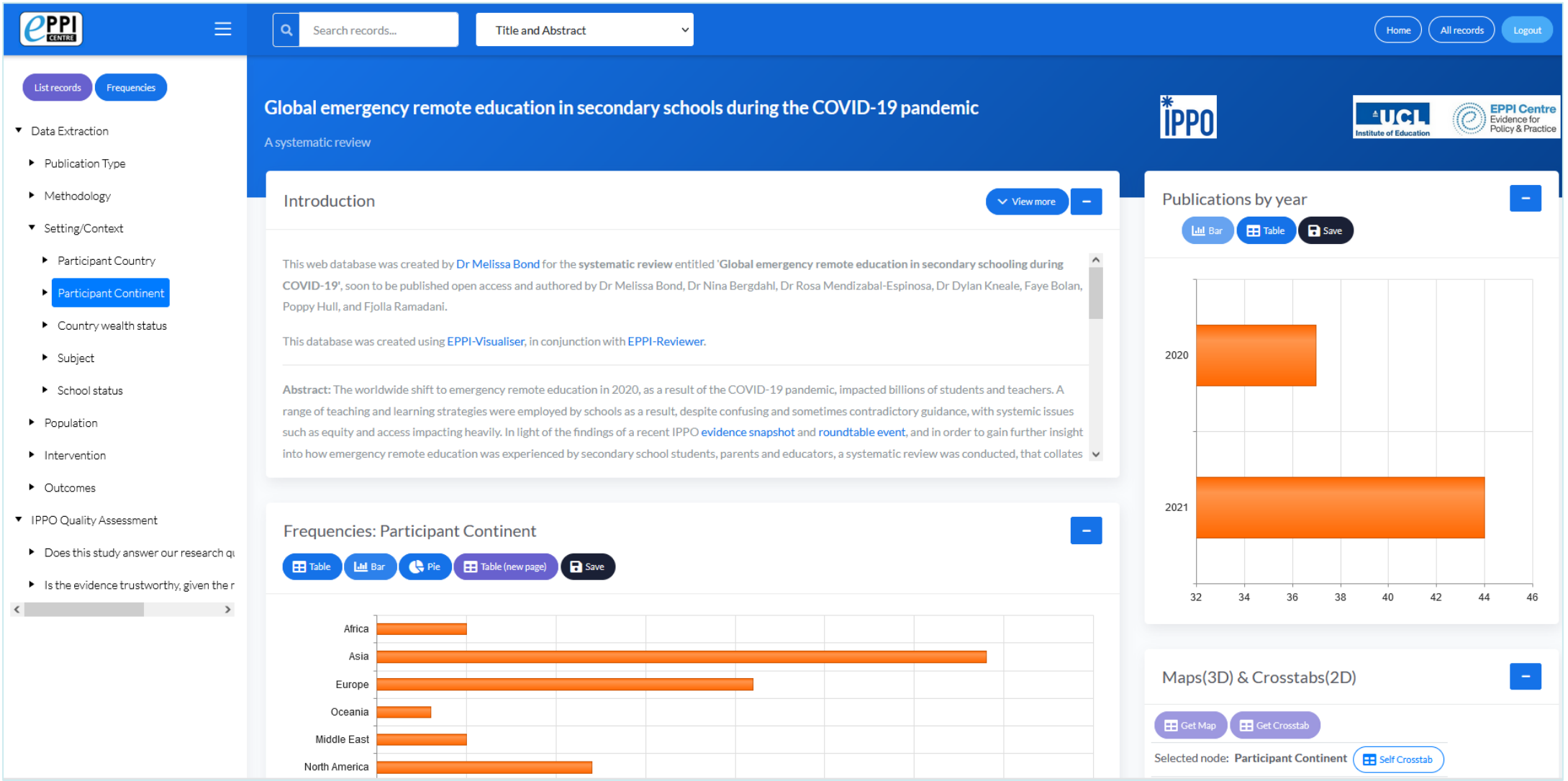
https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3794

https://youtu.be/nW353pA75io

EPPI-Visualiser

EPPI-Visualiser is a new web database tool, displaying the studies and coding conducted in your review.

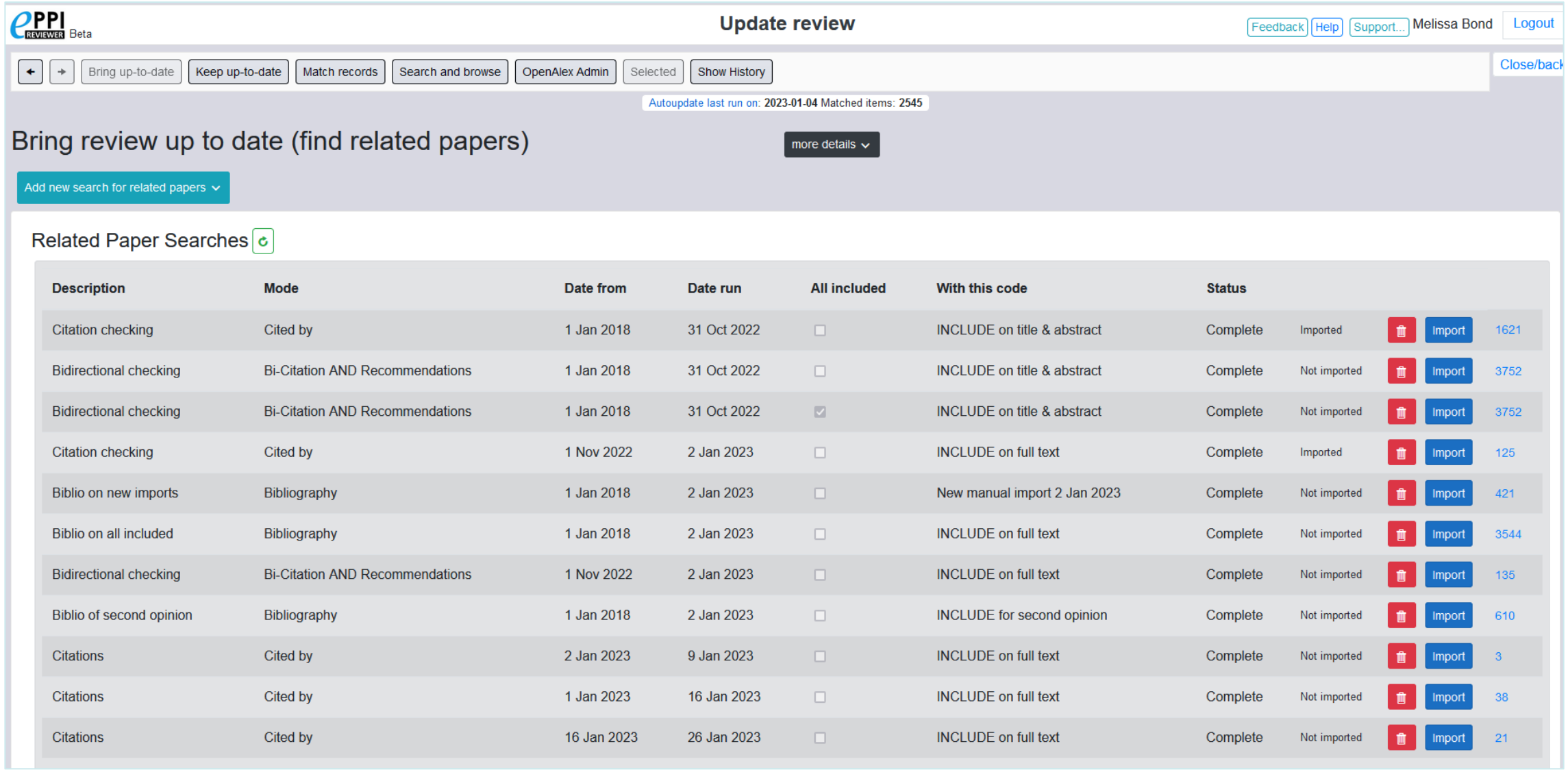
➢ Any changes made in your review are updated live in the database.



https://youtu.be/bhQuGpeB2Lo

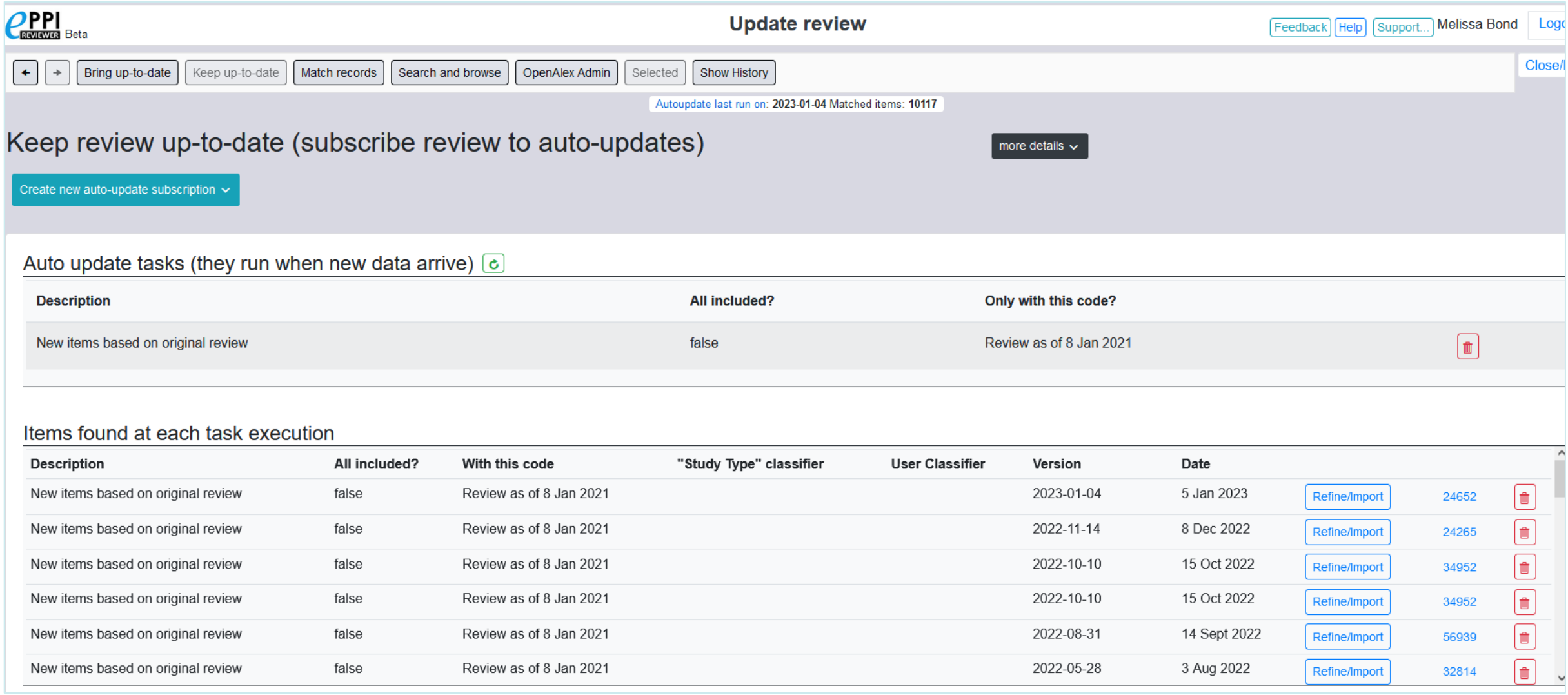
Source: https://eppi.ioe.ac.uk/eppi-vis/login/open?webdbid=23

OpenAlex to update or keep up-to-date



Description	Mode	Date from	Date run	All included	With this code	Status			
Citation checking	Cited by	1 Jan 2018	31 Oct 2022	☐	INCLUDE on title & abstract	Complete	Imported	Import	1621
Bidirectional checking	Bi-Citation AND Recommendations	1 Jan 2018	31 Oct 2022	☐	INCLUDE on title & abstract	Complete	Not imported	Import	3752
Bidirectional checking	Bi-Citation AND Recommendations	1 Jan 2018	31 Oct 2022	☑	INCLUDE on title & abstract	Complete	Not imported	Import	3752
Citation checking	Cited by	1 Nov 2022	2 Jan 2023	☐	INCLUDE on full text	Complete	Imported	Import	125
Biblio on new imports	Bibliography	1 Jan 2018	2 Jan 2023	☐	New manual import 2 Jan 2023	Complete	Not imported	Import	421
Biblio on all included	Bibliography	1 Jan 2018	2 Jan 2023	☐	INCLUDE on full text	Complete	Not imported	Import	3544
Bidirectional checking	Bi-Citation AND Recommendations	1 Nov 2022	2 Jan 2023	☐	INCLUDE on full text	Complete	Not imported	Import	135
Biblio of second opinion	Bibliography	1 Jan 2018	2 Jan 2023	☐	INCLUDE for second opinion	Complete	Not imported	Import	610
Citations	Cited by	2 Jan 2023	9 Jan 2023	☐	INCLUDE on full text	Complete	Not imported	Import	3
Citations	Cited by	1 Jan 2023	16 Jan 2023	☐	INCLUDE on full text	Complete	Not imported	Import	38
Citations	Cited by	16 Jan 2023	26 Jan 2023	☐	INCLUDE on full text	Complete	Not imported	Import	21

OpenAlex to update or keep up-to-date



Hands-on Activities

You can choose to just have a look around yourself, ask questions, or you can choose to complete a pre-prepared hands-on task:

- Hands-on practice task #1
- Hands-on practice task #2 – Education specific
- Setting up a shared review
- Setting up a data-extraction coding tool
- Setting up coding assignments

Folder link:
https://drive.google.com/drive/folders/1BiC8YwnwrmHi5IzIR4j7JyVMA9WkCnBl?usp=sharing

Further information

EPPI-Reviewer Account Manager – sign up to a free one month trial.

- Importing references into EPPI-Reviewer
- Managing duplicates in EPPI-Reviewer
- Editing codes and coding tools
- Creating reference groups and allocating coding assignments
- Understanding data entry modes, double coding and reconciliation
- Pushing items from EPPI-Reviewer to Zotero and importing bulk PDFs
- Line by line PDF coding
- Creating a comparison report
- Using the Reports tab
- Introduction to interactive evidence gap maps
- Creating an interactive EGM using EPPI-Mapper
- Introduction to EPPI-Visualiser

Contact Information

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Website: http://drmelissabond.weebly.com/

ResearchGate: https://www.researchgate.net/profile/Melissa-Bond-5

LinkedIn: https://www.linkedin.com/in/bondmelissa/

YouTube: https://www.youtube.com/user/EPPIReviewer4

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Bond, M., & Bedenlier, S. (2019). Facilitating student engagement through educational technology: Towards a conceptual framework. *Journal of Interactive Media in Education*, *2019*(1), 1–14. https://doi.org/10.5334/jime.528

Bond, M., Bedenlier, S., Marín, V.I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first online global semester. *International Journal of Educational Technology in Higher Education, 18*, 1-24. https://doi.org/10.1186/s41239-021-00282-x

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