

The state of capacity development evaluation in biodiversity conservation and natural resource management

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SUPPLEMENTARY MATERIAL 1 Additional detail of methods.

Additional Search Strategy Details

We compiled a number of relevant terms and descriptive words using Boolean nomenclatures on the root of words where several different endings applied. Below is our list of search terms, which include three search strings; we combined (i) capacity development search terms; (ii) outcome and evidence search terms; and (iii) conservation search terms to create a search “set”. We also used a search set with only the first two search strings to find high quality resources outside of the conservation field.

We used the Boolean operator ‘OR’ to separate search terms within a string and the operator ‘AND’ to separate the strings. As necessary, we adjusted the search sets to suit the different search engines and databases used, which often involved multiple search sets. Below is a list of the terms used in each search strings to create the comprehensive search sets.

Search strings

Our search string was broken into three separate search sets (specifically: capacity development terms, evaluation terms, and conservation terms. The following search strings were used in databases / search engines that would allow all these terms. In instances where this was not possible, we used truncated search strings pulling from each of the three sets. Before the search strategy was finalised, the full list of terms was made available for comments from the WCPA Capacity Development Group.

Set 1: Capacity Development Terms: "Capacity development" OR "capacity building" OR training OR "adult learning" OR "peer learning" OR "capacity strengthening" OR "professional development" OR mentoring OR "experiential learning" OR "distance learning" OR "learning communit*" OR "institutional development" OR "learning network" OR "transformative learning" OR "institutional strengthening" OR "collaborative learning"

Set 2: Evaluation Terms: evidence OR evaluat* OR assess* OR monitor* OR measur* OR empirical* OR quantitative OR qualitative OR counterfactuals OR "lessons learned" OR "best practices" OR outcome* OR output* OR metric OR indicator OR result OR success OR significance OR impact OR effect*

Set 3: Conservation Terms: "conservation sector" OR "biodiversity conservation" OR "ecosystem conservation" or "environmental conservation" or "habitat conservation" or "wildlife conservation" or "protected area*" or "natural resource management" or "resource stewardship" or "community based conservation"

For our search strategy, we also used snowballing (where the reference list in a relevant article is used to identify other relevant articles) and citation searching, which identifies later publications that cited a relevant article, to identify other publications relevant for the review (Livoreil et al., 2017; Collaboration for Environmental Evidence, 2018).

Additional Coding Details

Data extraction fields for case studies were developed through iterative discussions and trials across the author list as well as via external review by non-author specialists in evaluation and conservation. The final data extraction fields are as follows:

Overview of paper

- Sector (*conservation, natural resource management, public health, agriculture, education, economic development, governance, other*)
 - Describe other (*free text*)
- Geographic scale of the evaluated intervention (*local - one specific locality; national - multiple localities within a country; multinational region - localities in multiple countries in one region; global - localities in countries in multiple regions*)
- Continent involved (*Africa, Asia, Europe, North America, South America, Oceania, Global - multiple continents involved*)
- Causal model (e.g., a theory of change, results chain, or logical framework) - how clearly is it described in the paper (*Clearly stated/explicit, can be inferred, difficult to identify*)

Capacity Development Overview

- Where was a need identified for initiative? (*internal - individuals whose capacity is being built identified the need, external - need identified by external party, unclear - hard to tell from information provided*)
- Implementing organisation - what type of institution is responsible for implementation / organisation of the capacity development intervention (*higher education, government, non-profit organisation, private sector, local community, other*)
 - Describe other (*free text*)
- Who is the target of capacity development - in what context is the person's capacity being developed (*pre-professional, teacher, facilitator/trainer, employee, local community member, interest groups, multi-stakeholder working groups*)
- What is the method to build capacity (*formal education, informal education, training, mentoring, learning networks/communities of practice, other*)
 - Describe other (*free text*)

Capacity Development Evaluation

- Evaluation design - was there a control group? (*yes/no*)

- Evaluating organisation - what type of institution is performing the evaluation of the capacity development intervention (*higher education, government, non-profit organisation, private sector, other, indicate if differs from implementing organisation*)
 - Describe other (*free text*)
- Evaluation tool(s) (*one-off questionnaires/tests by mail/email/in person, pre-test/post-test, structure/unstructured/semi-structured interview, diaries/scrapbooks, focus group, observation, physical measurements, examining existing documents and data, graphic tools such as arts and concept mapping drawings, other*)
 - Describe other (*free text*)
- Level assessed (*Individual level (e.g. employees, pre-professionals, etc.) outcomes such as attitude, beliefs, knowledge and behaviour change; organisational level (e.g. outcomes related to companies, universities, etc.) outcomes such as company culture and policy; system level (e.g. government, infrastructure, etc.) outcomes such as national laws and regulation*).
- Who is the tool being used on to evaluate capacity (*pre-professional, teacher, facilitator/trainer, employee, local community member, interest groups, multi-stakeholder working groups, other, indicate if differs from target of capacity development*)
 - Describe other (*free text*)
- Time period evaluation tool was administered post intervention (*immediately after intervention, less than 1 year after intervention, 2 to 4 years after intervention, 5 to 9 years after intervention, 10 or more years after intervention, not enough data/unclear*)
- Frequency of evaluation (*once, twice, three or more times-can include periodic / regular evaluation, unclear*)
- Type of evaluation (*formative assessment, summative assessment*)

Analysis

- Quantitative (yes/no)
- Qualitative analysis (yes/no)
- Triangulation (yes/no)

Outputs and Outcomes

- Categories Assessed
 - *Enjoyment, satisfaction, or other reaction to the intervention*
 - *Learning/knowledge/awareness outcomes*
 - *Self-reported behavioural intentions or attitude change*
 - *Application of newly acquired behaviour or skills*
 - *Conservation outcomes (clearly reported empirical evidence, observations, or perceptions of improved desired state of biodiversity or reduced threats to biodiversity)*
 - *Non-conservation related outcomes, e.g. household income*
- Intervening variables' impact on intervention considered: individuals factors (yes/no), organisational factors (yes/no), any considered intervening variables (yes/no)
- Explicit systems approach aspects/perspective to evaluation (yes/no, for yes, paper uses a systems framing, approach, or perspective often in contrast to a results-based approach.

Systems approaches are marked by: complexity, adaptation, iteration, emphasis on generating feedback and learning as the intervention proceeds.

List of Coders*

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*Coders refining the codebook included experts in the field and doctoral students

Critical Appraisal Details

For literature deemed relevant as described by the inclusion/exclusion process, we applied a critical appraisal framework that assessed the following four principles of quality: conceptual framing; validity of study design; quality of data sources; and quality of analysis. For each principle, we provided a series of clarifying questions to help evaluators in assessing the principle of quality. The questions are not intended to be comprehensive and are not intended to suggest essential requirements – it is highly unlikely that all these indicators will be present, or even relevant, in any one study. They merely provided guidance for the critical appraisal process.

The guiding questions were as follows: **conceptual framing** (i.e. Does the study set up why the main question/intervention is important? Is the study question contextualised within a conceptual framework? Is the conceptual framework supported with background literature? Does the study summarise existing work/research/studies?); **validity of study design** (i.e. Does the paper describe the research process (study design, sampling, data collection, analysis, and reporting)? Does the paper provide a logical justification for why the chosen design and method are well suited to this research question/evaluation of intervention? Does the study employ triangulation of methods to evaluate the intervention? Are the methods used to assess the effectiveness of the intervention replicable? Is internal validity assessed? Is the sample size specified? Is the sample presented in the context of the overall study population?); **quality of data sources** (i.e. Does the study describe the process by which data is assessed for quality? Does the duration of the study

seem sufficient given the question and methods? Does the study present or link to the raw data being analysed so others can assess/analyse results?; and **quality of analysis** (i.e. Are the statistical analyses, if present, appropriate? Are there logical links between data, interpretation and conclusions – i.e. is there a logical route to conclusions? Does the author consider the study's limitations? Does the author consider possible alternative interpretations of the analysis? Are confounding factors considered? Are outliers or negative cases effectively considered?).

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Dataset for evidence map

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Dataset for framework synthesis thematic review

We used expert solicitation, backward citation searching of literature screened for inclusion in our coding, and forward citation searching of selected included literature and of background literature (Livoreil et al., 2017; Collaboration for Environmental Evidence, 2018) to compile the dataset for our thematic review, which could introduce possible bias as the resulting dataset was not generated through systematic searches or critical appraisal. Despite this possible limitation, we believe this external dataset is useful for contextualising our findings and illustrating areas

where the knowledge base on lessons learned and recommendations could be further expanded in conservation and other fields.

Collaboration for Environmental Evidence. 2018. Guidelines and Standards for Evidence synthesis in Environmental Management.

Livoreil, B., J. Glanville, N. R. Haddaway, H. Bayliss, A. Bethel, F. F. de Lachapelle, S. Robalino, S. Savilaakso, W. Zhou, and G. Petrokofsky. 2017. Systematic searching for environmental evidence using multiple tools and sources. *Environmental Evidence* **6**:1-14.

Expert solicitation sources include:

- Membership of IUCN World Commission on Protected Areas Capacity Development Initiative
- Villa de Lleyva Capacity Development Working Group
- INTRAC

Dataset

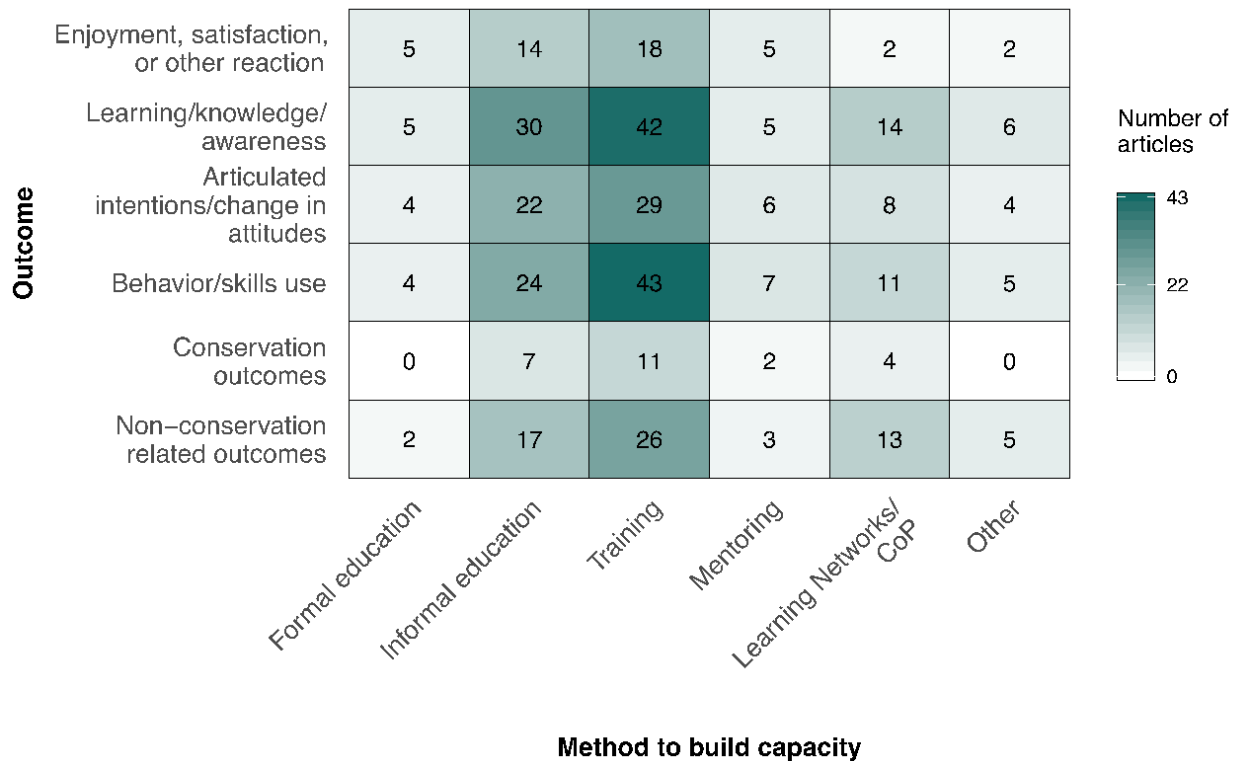
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SUPPLEMENTARY MATERIAL 2 Case study coding.

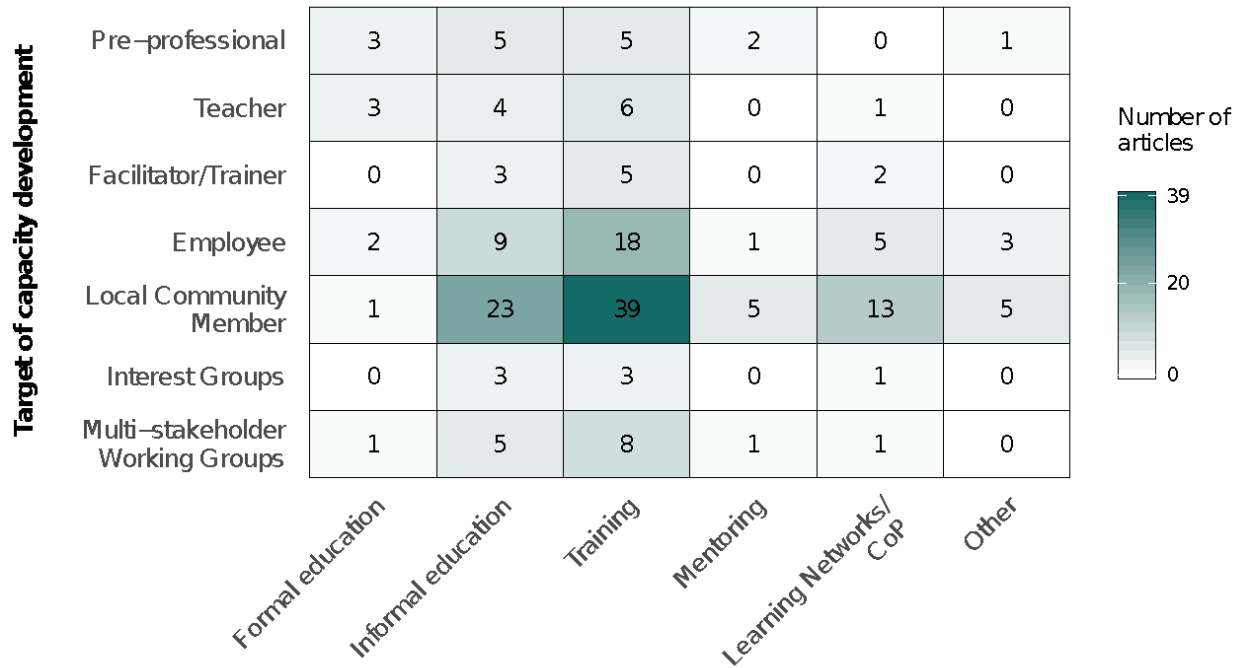
The CSV file of coding for the fields in the evidence map is available at doi.org/10.1017/S0030605321000570

SUPPLEMENTARY MATERIAL 3 Heat Maps of Key Variables

Visual heat maps of key coded variables from our evidence map.



Method to build capacity
 SUPPLEMENTARY FIG. 1 Method to build capacity vs. the outcomes assessed. The number in each cell represents how many articles used a particular method to build capacity and also measured a particular outcome category; the darker the shading the greater the number of articles. Note an article may be counted multiple times.



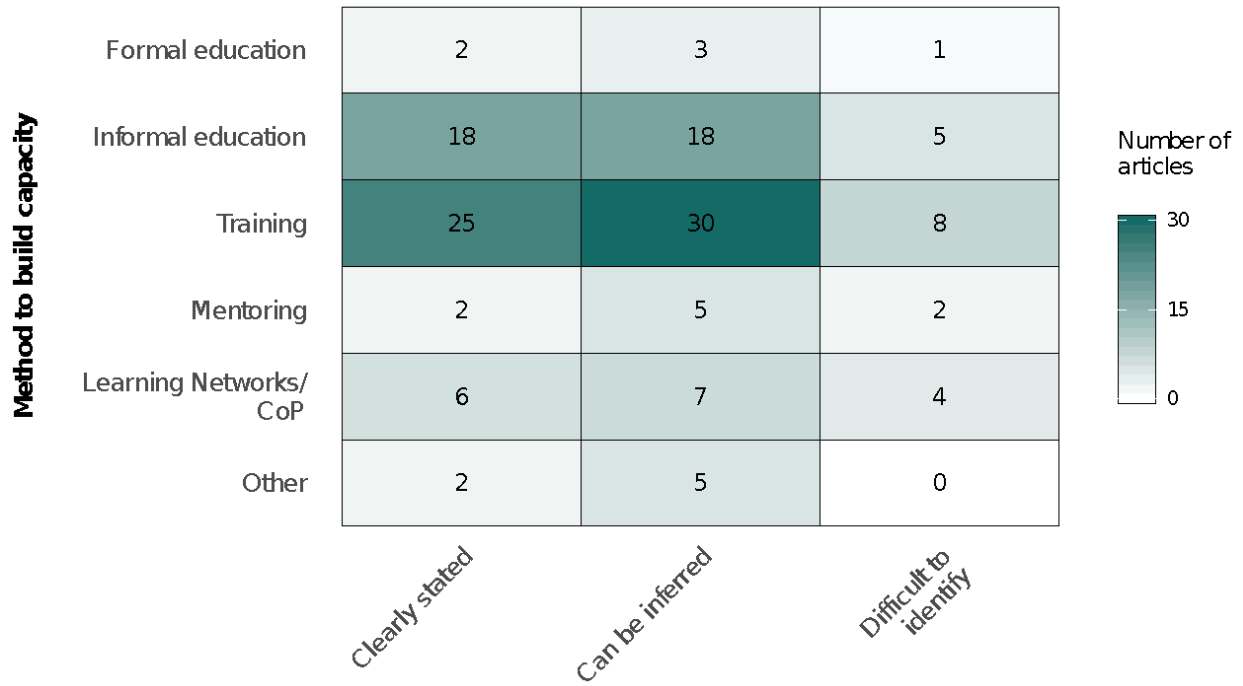
Method to build capacity

SUPPLEMENTARY FIG. 2 Method to build capacity vs. the Target of capacity development. The number in each cell represents how many articles used a particular method to build capacity and also targeted a particular group for the capacity development intervention; the darker the shading the greater the number of articles. Note an article may be counted multiple times.

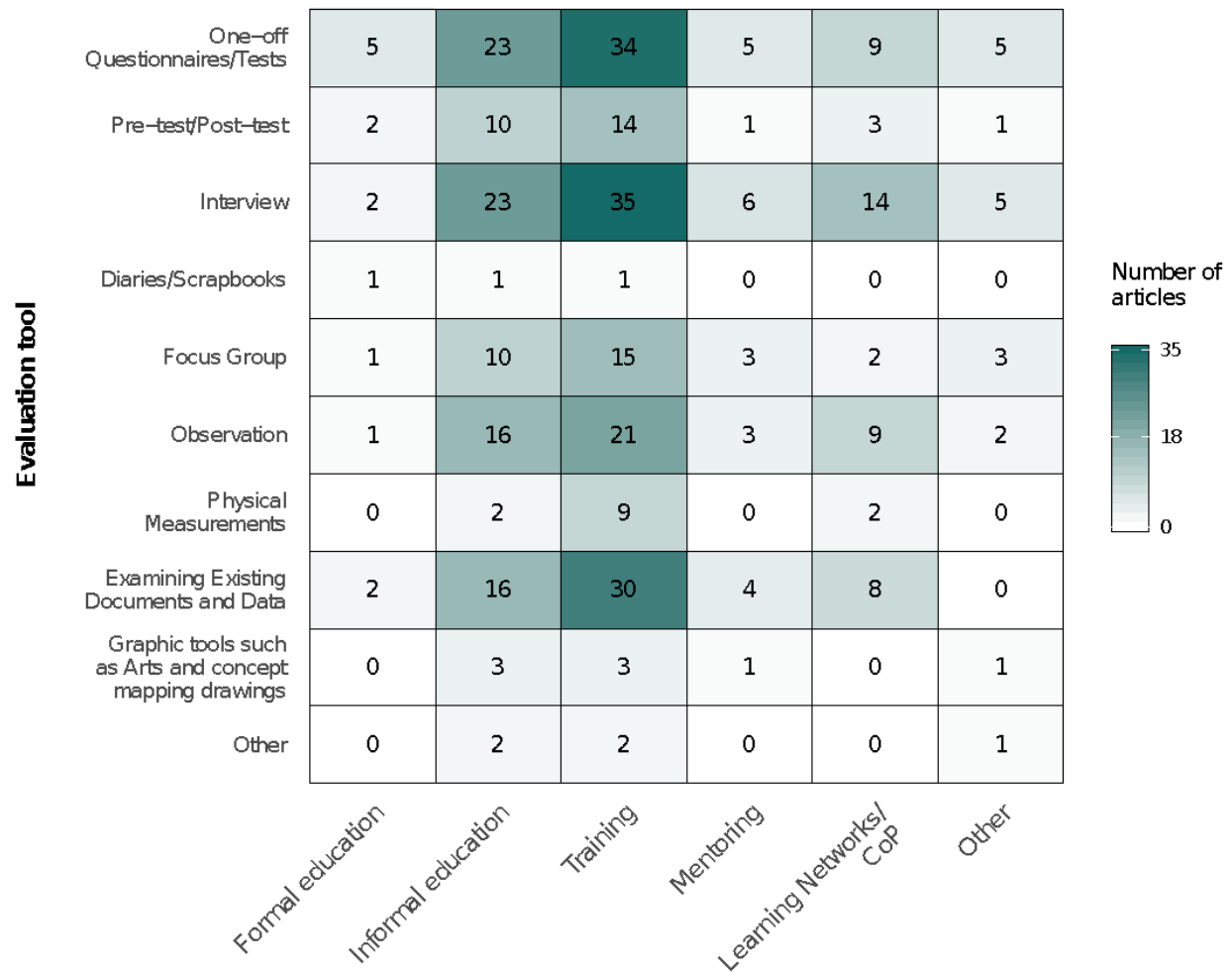


Identified need for project

SUPPLEMENTARY FIG. 3 Identified need for a project vs. the Geography of the project. The number in each cell represents the number of articles by where the need for the project was identified (external, internal, unclear) by geography; the darker the shading the greater the number of articles.

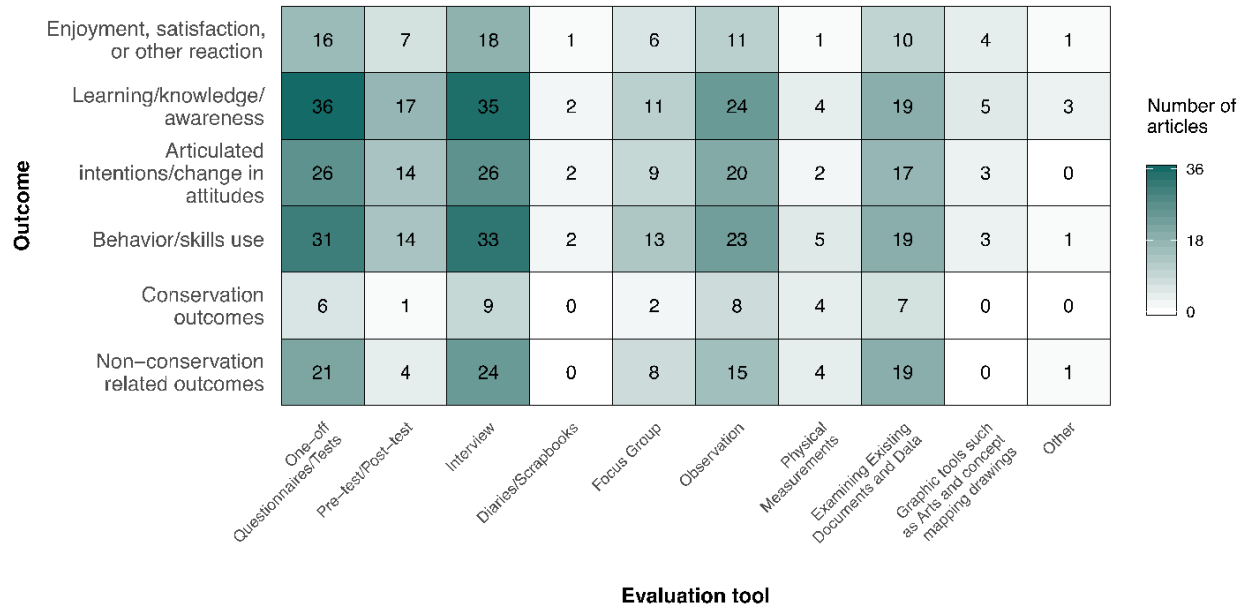


SUPPLEMENTARY FIG. 4 Presence of a causal model vs. the Method to build capacity. The number in each cell represents how many articles described a casual model in a particular way and also used a specific method to build capacity; the darker the shading the greater the number of articles. Note an article may be counted multiple times (while there was only one way of classifying an article’s causal model, it could be coded for multiple methods used to build capacity).

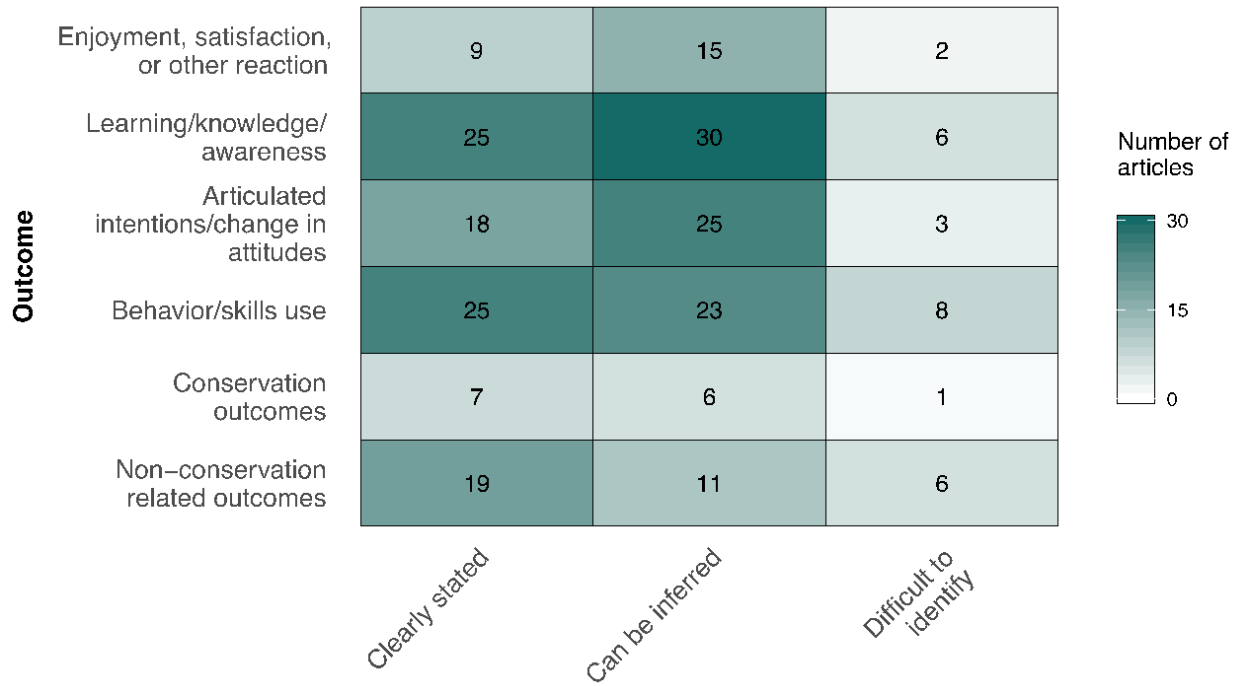


Method to build capacity

SUPPLEMENTARY FIG. 5 Method to build capacity vs. the Evaluation tool. The number in each cell represents how many articles used a particular method to build capacity and also used a particular tool to evaluate the capacity development intervention; the darker the shading the greater the number of articles. Note an article may be counted multiple times.

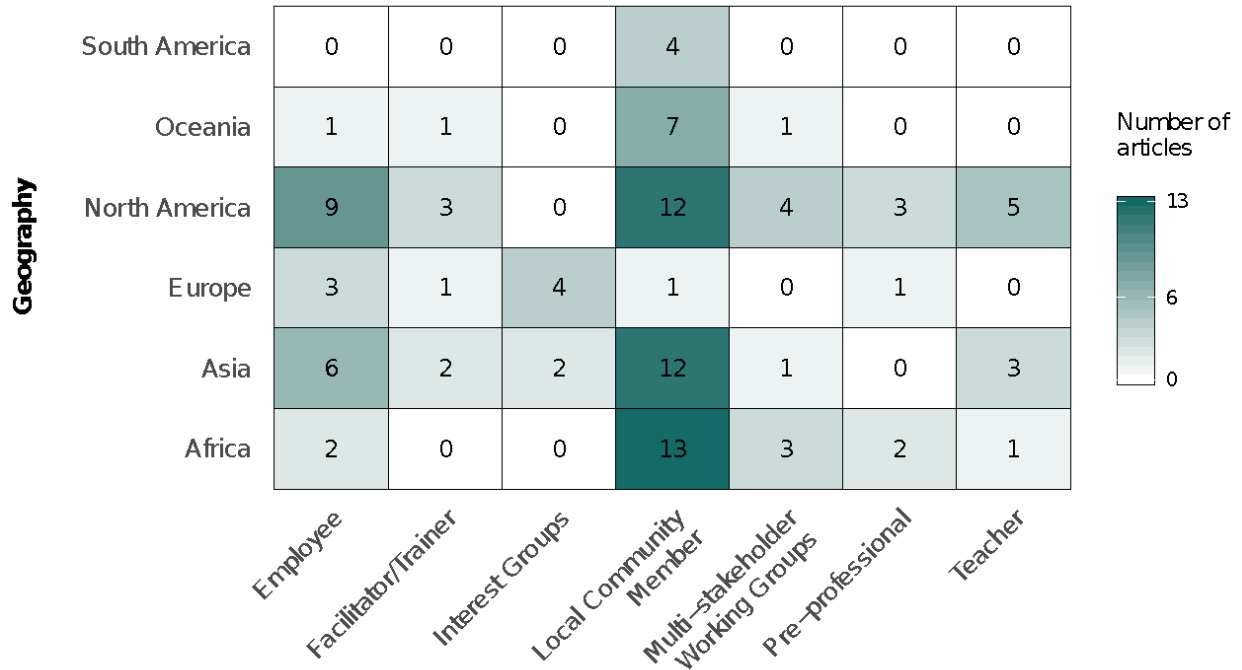


SUPPLEMENTARY FIG. 6 Evaluation tool vs. the outcomes assessed. The number in each cell represents how many articles used an evaluation tool and also measured a particular outcome category; the darker the shading the greater the number of articles. Note an article may be counted multiple times.



Causal model

SUPPLEMENTARY FIG. 7 Presence of a causal model vs. the outcomes assessed. The number in each cell represents how many articles described a causal model in a particular way and also evaluated a particular outcomes category; the darker the shading the greater the number of articles. Note an article may be counted multiple times (while there was only one way of classifying an article’s causal model, it could be coded for assessing multiple outcome categories).



Target of capacity development

SUPPLEMENTARY FIG. 8 Target of capacity development vs. Geography. The number in each cell represents how many articles targeted a particular group for capacity development by geography; the darker the shading the greater the number of articles. Note an article may be counted multiple times.