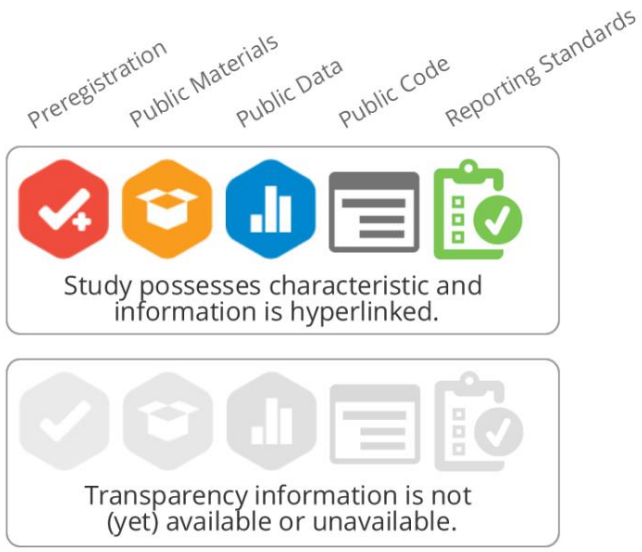
Curate Science Specs for Contract #1
(version 0.5.5.0; October 2018)

Contents

Curate Science Web Platform Main Features

Science requires transparency. Currently, no platform exists to ensure that published scientific findings comply with the relevant transparency standards. Curate Science aims to solve this problem. It is a web platform to allow the research community to *label, link, and organize* the transparency of published findings according to the relevant standards (different transparency standards apply to different kinds of empirical research). As an analogy, we offer *nutritional labels for scientific articles*, however, instead of nutritional information, we organize transparency information. The platform focuses on the 3 most fundamental aspects of transparency:

1. **Method/Data Transparency**



Article Types

Original or Replication Articles

(all 5 transparency categories); Example article:

Two replications of an investigation on empathy and utilitarian judgment across socioeconomic status. HTML PDF
Babcock, Li, Sinclair, Thomson, & Campbell (2017)
Scientific Data 10.1038/sdata.2016.129
Replications 2
low empathy utilitarian effect

Meta-Analyses

(4 transparency categories – study materials N/A); Example article:

A series of meta-analytic tests of the efficacy of long-term psychoanalytic psychotherapy Preprint
Woll & Schönbrodt (2018)
Under peer review
Reanalysis - Meta-analysis

Reanalyses – Reproducibility/Robustness

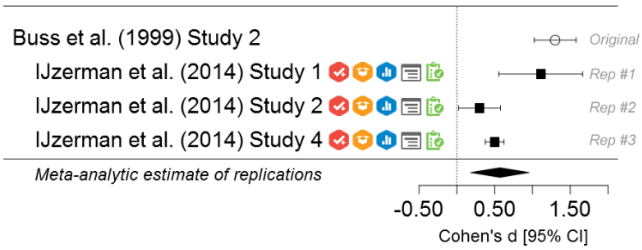
(3 transparency categories – materials & reporting standards N/A); Example article:

A reanalysis of mouse ENCODE comparative gene expression data
Gilad & Mizrahi-Man (2015)
F1000Research 10.12688/f1000research.6536.1
Reanalysis - Robustness

HTML PDF

2. **Effect Replicability Transparency**

Transparent new sample replications of published effects.



3. **Analytic Reproducibility/Robustness Transparency**

Transparent analytic reproducibility and robustness re-analyses.

Analytic Reproducibility:
A study's primary result is reproducible by repeating the *same* statistical analyses on the data.

Analytic Robustness:
A study's primary result is *robust* across *all justifiable (alternative)* statistical analyses and data processing choices.

Guiding Principles - Theoretical Framework

The theoretical framework that outlines the general principles that guide the design of the web platform (optional reading):

Link to PDF:

LeBel, E. P., McCarthy, R., Earp, B., Elson, M., & Vanpaemel, W. (2018). **A unified framework to quantify the credibility of scientific findings.** *Advances in Methods and Practices in Psychological Science*.

Abstract:

Societies invest in scientific studies to better understand the world and attempt to harness such improved understanding to address pressing societal problems. Published research, however, can be useful for theory or application only if it is credible. In science, a credible finding is one that has repeatedly survived risky falsification attempts. However, state-of-the-art meta-analytic approaches cannot determine the credibility of an effect because they do not account for the extent to which each included study has survived such attempted falsification. To overcome this problem, **we outline a unified framework for estimating the credibility of published research by examining four fundamental falsifiability-related dimensions: (a) transparency of the methods and data, (b) reproducibility of the results when the same data-processing and analytic decisions are reapplied, (c) robustness of the results to different data-processing and analytic decisions, and (d) replicability of the effect.** This framework includes a standardized workflow in which the degree to which a finding has survived scrutiny is quantified along these four facets of credibility. The framework is demonstrated by applying it to published replications in the psychology literature. Finally, we outline a Web implementation of the framework and conclude by encouraging the community of researchers to contribute to the development and crowdsourcing of this platform.

Website Development Roadmap

Contract #1 is the first of 3 contracts to be completed within the next 6-8 months. If we are satisfied with the work completed in Contract #1, the additional 2 contracts will be awarded to this same developer (preference will be given to a developer who is interested in, and available for, all 3 contracts).

The contract work is situated in the context of an upcoming 2-year full-time developer position (starting early 2019; pending approval) to further expand and improve the functionality and feature set of the web platform.

Contract #1 (3-4 weeks of frontend work)*:*

- Homepage UI enhancements (see Home Page Specs)
- Article page UI enhancements (see Article Page Specs)
- New/Edit Article page UI enhancements (see New/Edit Article Page Specs)
- Connect these pages to our DB via Django REST API
- Minor UX work to improve the layout and workflow for each page (homepage, article, & new/edit article pages)

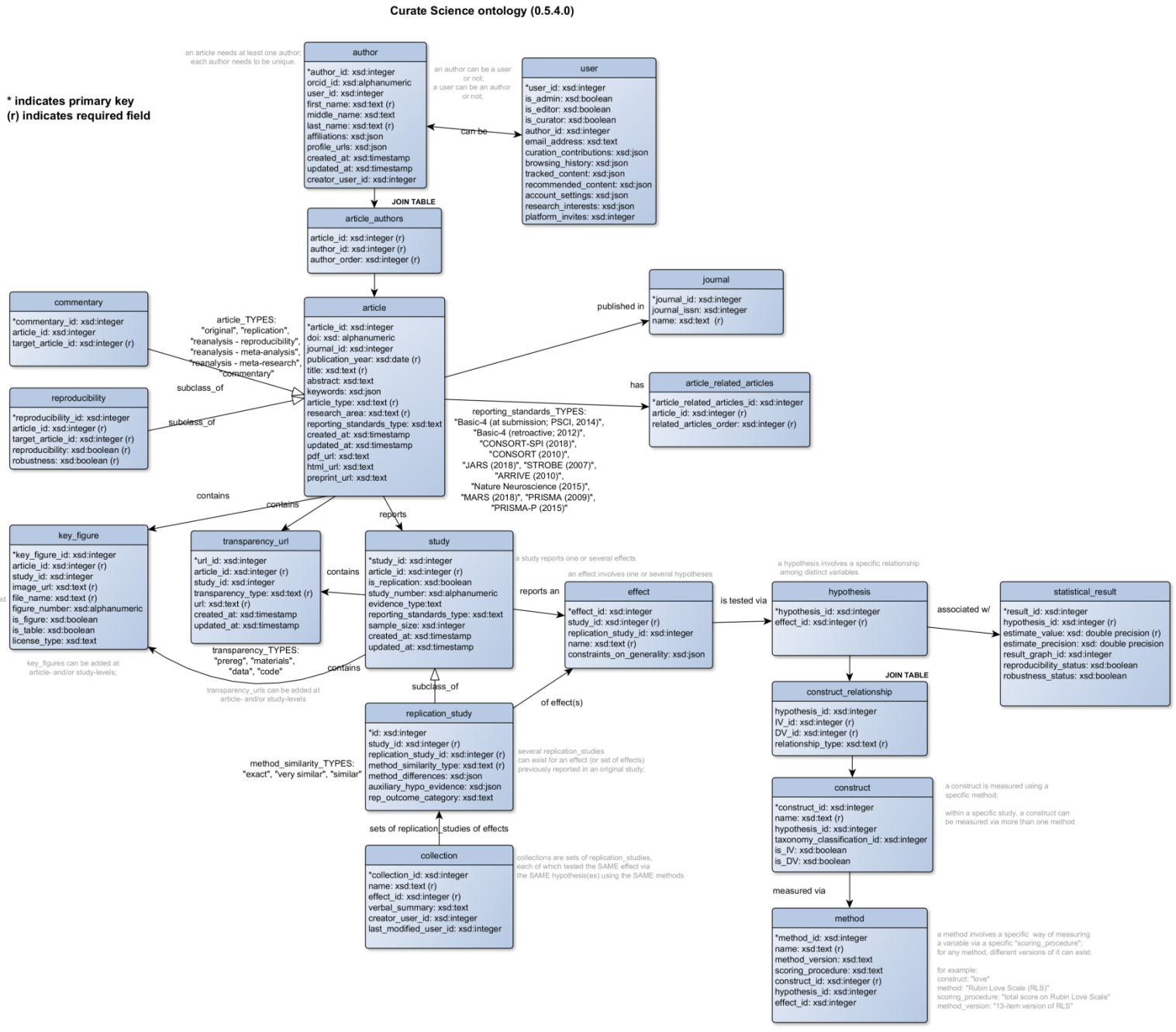
Contract #2 (3-4 weeks of frontend work)*:*

- Author page UI enhancements (see our working prototypes: http://curatescience.org/author-page.html and https://etiennelebel.com/)
- Collection page UI enhancements (see working prototypes: http://curatescience.org/collections/macbeth-effect.html and http://curatescience.org/collections/money-priming.html)
- User page UI enhancements (prototypes being designed/finalized)
- Enhancements of Contract #1 UIs/features

Contract # 3 (1-2 weeks of frontend work)*:*

- Improvements and additional bug fixes from Contract #1 and #2 UIs/features
- Implementation of new frontend UI features as requested by early Beta testers (testing to start upon completion of Contract #1 work).

Ontology/Entity-Relation Diagram



Tech Infrastructure

- Django/Python web application for back-end/server-side operations
- Django REST API for DB interactions (open/public API later)
- PostgreSQL 9.6 DB; PostgreSQL full text search (ElasticSearch later)
- Google Cloud server (Google App Engine)
- HTML, CSS, JavaScript, jQuery
- Github open source code base: https://github.com/ScienceCommons/curate_science (MIT license)
- TravisCI
- Mailchimp
- Frontend prototypes of main pages: https://github.com/eplebel/science-commons
    - Homepage: https://github.com/eplebel/science-commons/blob/master/index.html
    - Article page:
        - Sole-study article: https://github.com/eplebel/science-commons/blob/master/articles/cbkd(2018%2Cjrp)-for-developer.html
        - Multi-study article: https://github.com/eplebel/science-commons/blob/master/articles/bdc(2016%2Cjesp)-for-developer.html
    - New/Edit article page: https://github.com/eplebel/science-commons/blob/master/new-edit-article-page.html

General Requirements

General features:

- Code for fast and efficient user experience:
  - Minimize the number of clicks required from the user
  - Ensure that standard keyboard shortcut keys work (e.g., ESC closes popup/modal screens, TAB goes to the next logical field, etc.)
- Responsive web design and layouts for all pages (e.g., Bootstrap), though only **desktop** and **tablet** views. That said, homepage/search results pages *do* need to also be mobile friendly (though HTML prototype already mostly mobile-friendly).

Other website-wide requirements:

- Create SPRITE for all non-Font-Awesome icons (I had it implemented for low-resolution icons [see http://curatescience.org/assets/sprite-CSS.css and http://curatescience.org/logos/spritesheet.png], but I somehow couldn't get it working for the new hi-resolution icons)

General programming principles:

- Follow standard coding style guides (e.g., Google's HTML/CSS and JavaScript style guides), including generous commenting
- Code functions with generality/extensionality in mind, so that it is easier to extend the code in the future
- Code for scalability

General scientific publishing conventions:

- Convention for citing articles with different number of authors:

# of authors	Reference to study
Single-author	Smith (2018)
2 authors	Smith & Jones (2018)
3 (or more) authors	Smith et al. (2018)

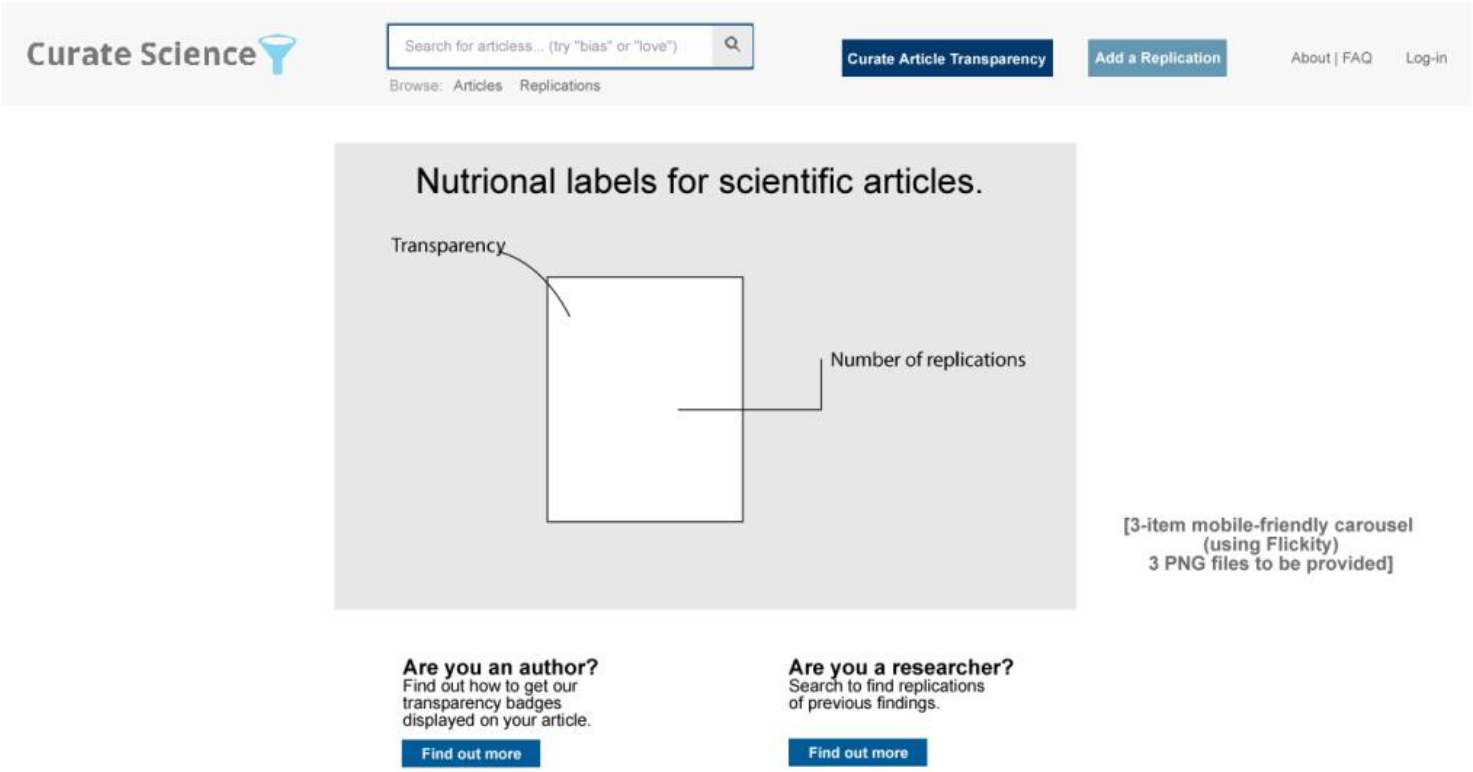
- Study numbering/Study numbers:
  - If an article reports only a single study (i.e., a "sole-study" article), that study is unnumbered and is simply referred to by referencing the authors and publication year of the article.
  - It is **only** when more than one study is reported in an article that studies become numbered. For example:

# of studies	Study number status	Reference to study
1	unnumbered	Smith & Jones (2018)
2 or more	numbered	Smith & Jones (2018) Study 1 Smith & Jones (2018) Study 2

  - Therefore, one would never use the term "Study 1" to refer to a study reported in a sole-study article.
    - This means there is a difference between a situation where an article reports a single study (which is unnumbered) *versus* a situation where only 1 study (out of a multi-study set) has been curated (which *would* be numbered). This matters for the different article page layouts, which will be explained in the article page Specs.
  - Also: In a multi-study article situation (and only in this situation), sometimes studies are numbered using letter suffixes (e.g., Study 2a and Study 2b; usually done when the studies are highly similar to each other). Consequently, the study number field is alphanumeric (rather than strictly integer).

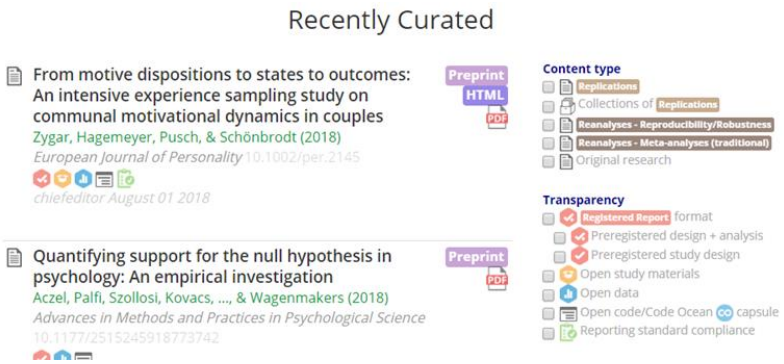
Home Page Specs

For non-logged-in users (public facing; homepage prototype, for navbar and content below carousel)**:**



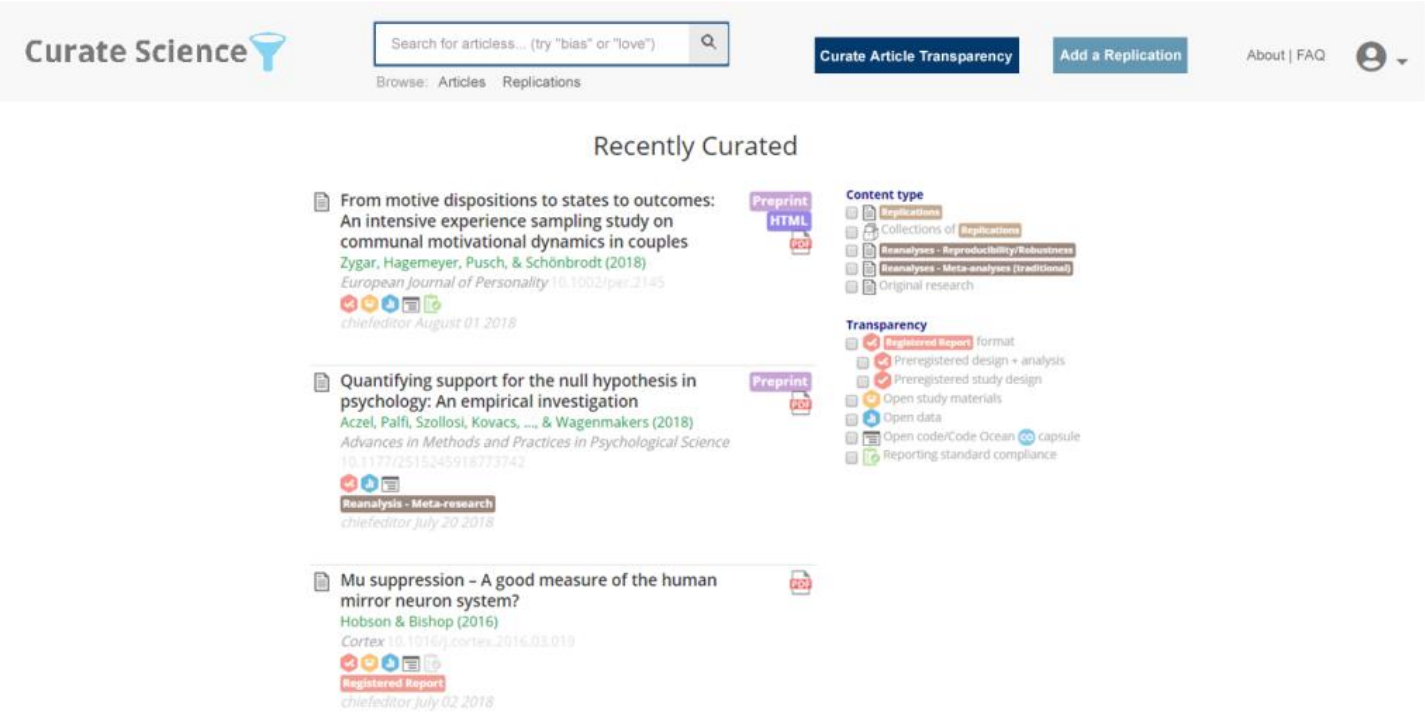
Actions:

- Searching something [i.e., entering text & pressing "ENTER"/clicking search icon) will bring user to the search results page for such keywords (list of articles with content type and transparency filters on the right; see below)
- "Articles" link will bring the user to the list of 25 most recently curated articles (positioned just below the main homepage carousel display), as follows (adaptable from homepage prototype):



- "Replications" link will bring user to Replications page: http://www.curatescience.org/replications.html
- Clicking "Curate Article Transparency" or "Add a Replication" buttons will display the login modal window.
- "About" link will bring user to About section of the homepage: http://www.curatescience.org/#about
- "FAQ" link will bring user to FAQ section of the homepage: http://www.curatescience.org/#FAQ
- "Log-in" will display login modal window (see Github repo login.html template)
- "Are you an author? Find out more" button will bring user to About section of homepage
- "Are you a researcher? Find out more" button will bring user to About section of homepage

For logged-in users:



Same as public facing (logged-in) homepage, except:

- "Curate Article Transparency" button will bring the user to the New-Edit-Article page, with the Article Type = "Original research" radio button selected (the standard default)
- "Add a Replication" button will bring the user to the New-Edit-Article page, with the Article Type = "Replication" radio button selected.
- Replace "Log-in" link with generic avatar icon (font-awesome) and downward caret for user actions (positioned on the right-most side of the navbar)
    - Only user actions (for now) will be "Logout", which will logout the user.

- As shown in the screenshot, main carousel section is replaced by list of 25 most recently curated articles.

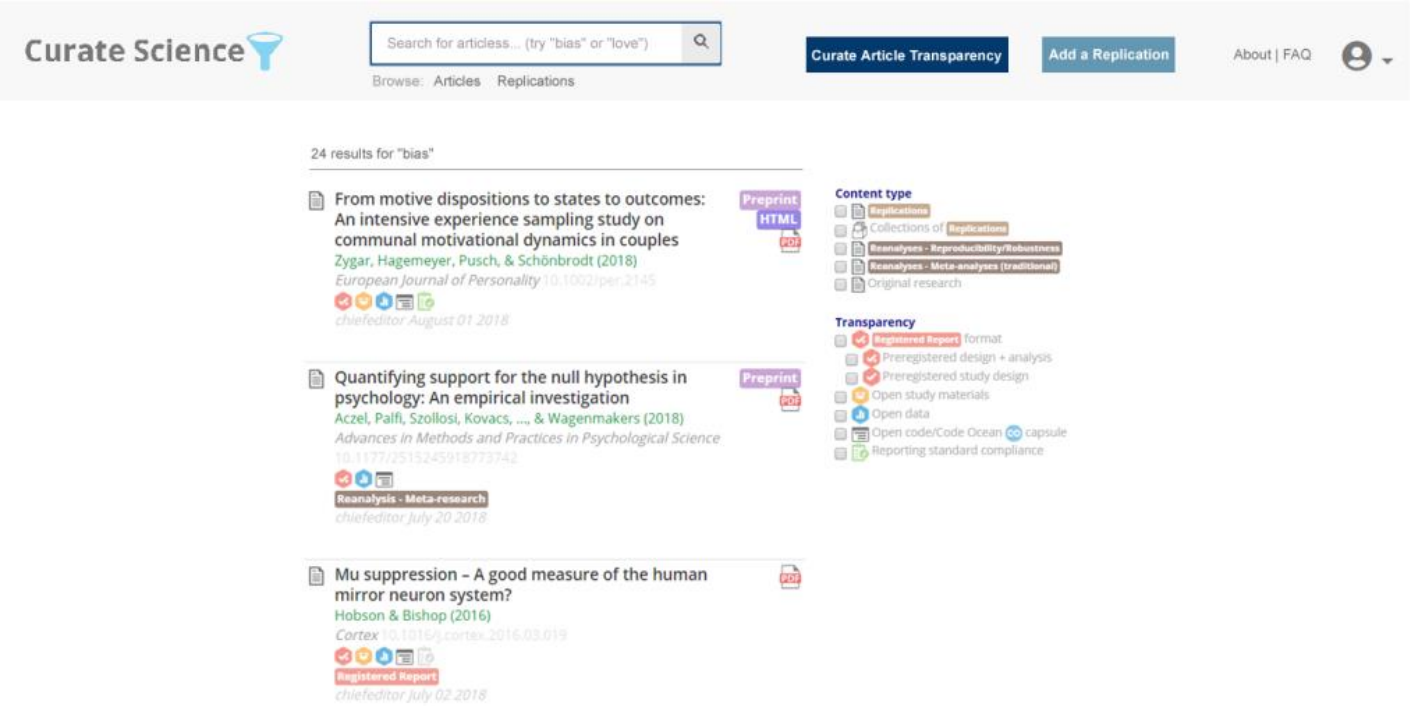
NOTE: For each article in the list, the article badge icons and article type labels must be displayed as they appear in the prototypes.

- Collections (e.g., "Ego depletion" replication collection) will not be displayed in the Browse or Search results pages for now (these will be re-added in Contract #2).

Login modal window (see Github repo login.html template):

- Displayed as it currently is, except:
    - Add a "Signup" link at the bottom-right.
        - Clicking on this link will display the following message: "Curate Science is currently in early Beta, hence it is only open to a small group of users. Please signup to receive our newsletter to be notified of the date of our public Beta launch (expected early 2019)."

Search results page:



Additional modifications to homepage/search results page:

- Add pagination to the "Browse" and "Search results" article list.
    - Display only the 25 most recently added/edited articles and have a "Show more" button to reveal the next 25 most recent articles (without reloading the page & without the 25 currently displayed articles moving).
- Link article titles to their respective article page.
- Add a research area dropdown box (immediately under "Content type", but above the "Replications" checkbox filter) as follows:

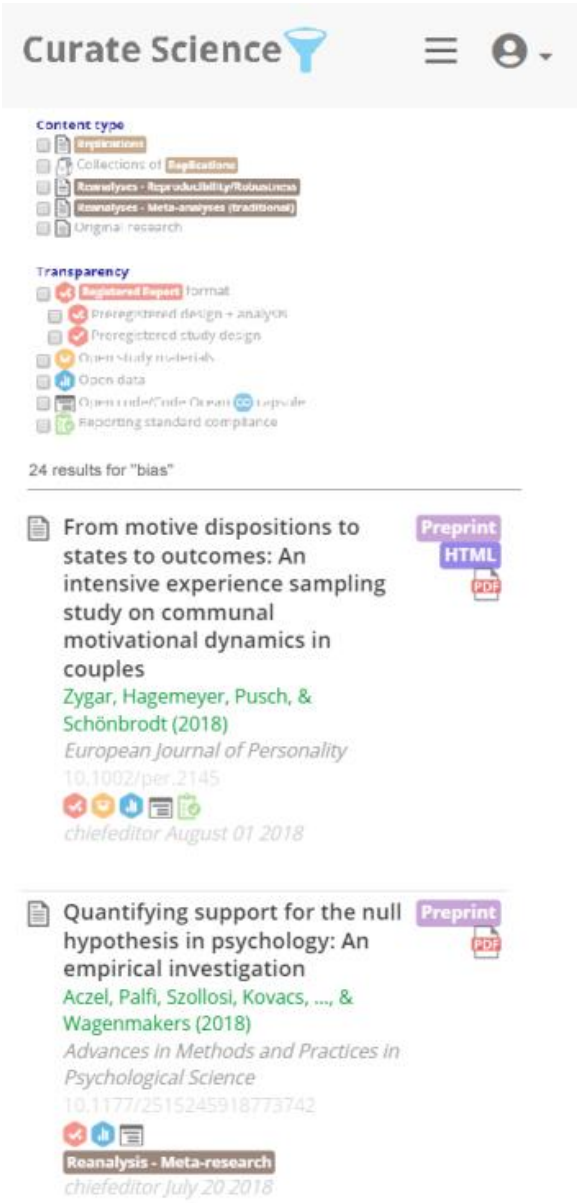
  Area: Social Sciences ▼

    - Dropdown list items:
        - "Social Sciences" (default)
        - "Medical/Life Sciences"
        - "All"
- "Collections of Replications" checkbox will be disabled (for now; this will be re-added in Contract #2)
- Filter checkboxes enhancements:
    - Clicking "Reanalyses – Reproducibility/Robustness" checkbox will clear and disable "Open study materials" and "Reporting standard compliance" filters (because these don't apply to this article type)
    - Clicking "Reanalyses – Meta-analyses (traditional)" checkbox will clear and disable "Open study materials" (because this transparency category doesn't apply to this article type).
    - Clicking "Replications" or "Original research" checkboxes will re-enable any disabled transparency checkboxes

- Badge popups on hover within article list: Display list of link(s) as is used on the article page (see http://curatescience.org/articles/bdc(2016,jesp)-for-developer.html)
- Commentaries popups on hover updated to how they look on the article page prototype (i.e., “Smith et al. (2018)” instead of our “Commentary 1” temporary solution; see http://curatescience.org/articles/cbkd(2018,jrp)-for-developer.html).

Mobile-friendly layout

- The “Recently Curated” list prototype (from homepage index.html prototype) is already mobile friendly (e.g., content & transparency filters are “pulled” above article list for mobile view). Hence, achieving mobile-friendliness for the homepage and search results page means making the navbar mobile-friendly:
    - Mobile view navbar will look like this:



    - As in desktop/tablet views, for non-logged-in users the avatar is replaced with the “Log-in” link.
    - No search textbox or icon within mobile navbar (for now; this will be re-added later)
    - Links to be included within the collapsible navbar menu, which hides itself after clicking a link:

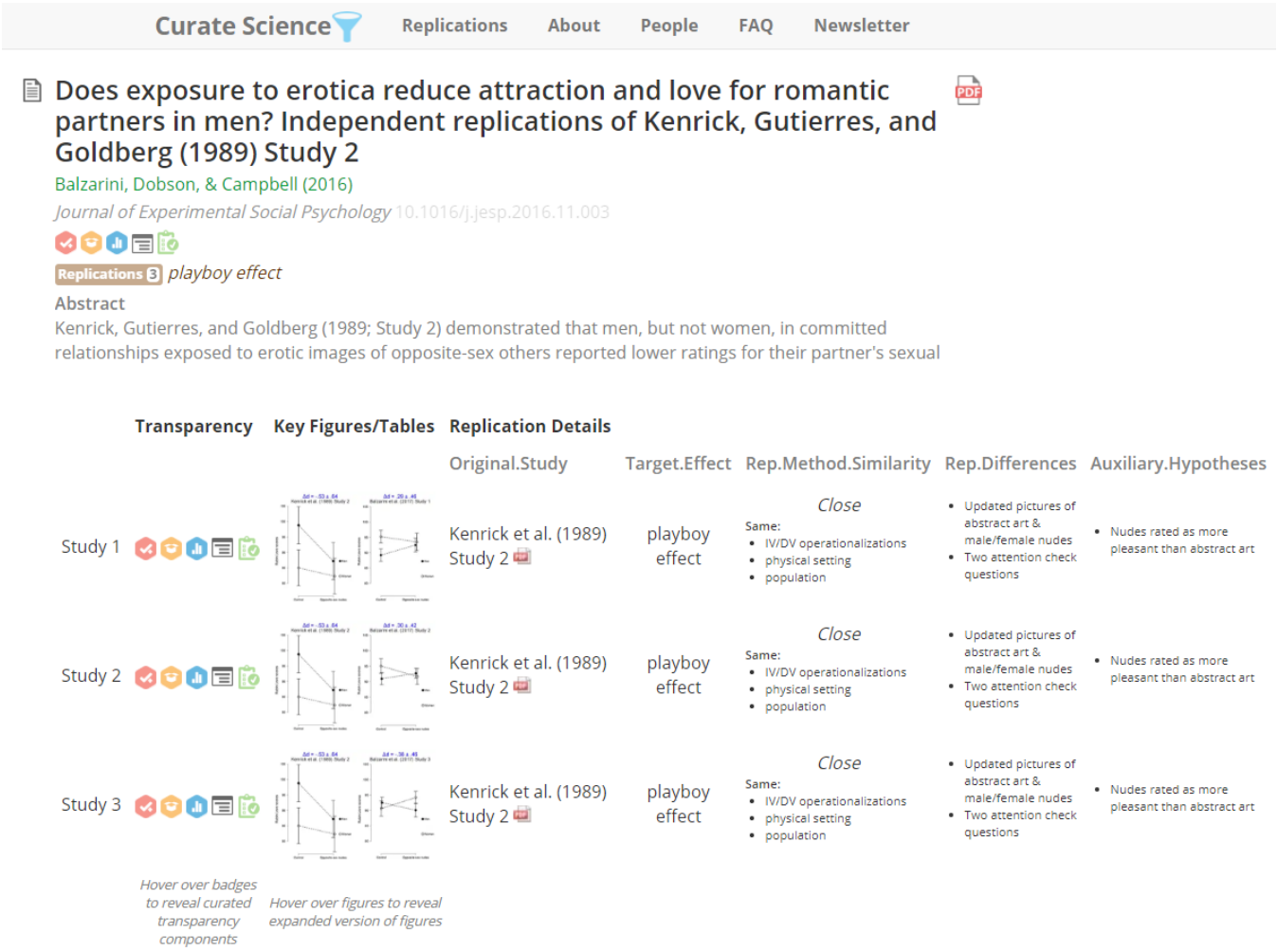
- Browse Articles
- Browse Replications
- About
- FAQ
- Curate Article Transparency
- Add a Replication

Article Page Specs

Different article types:

- Article reporting replications: http://curatescience.org/articles/cbkd(2018,jrp)-for-developer.html (file on Github repo)
    - "Sole-study" situation (see General Requirements section above, which outlines the important distinction between sole- vs. multi-study situations):

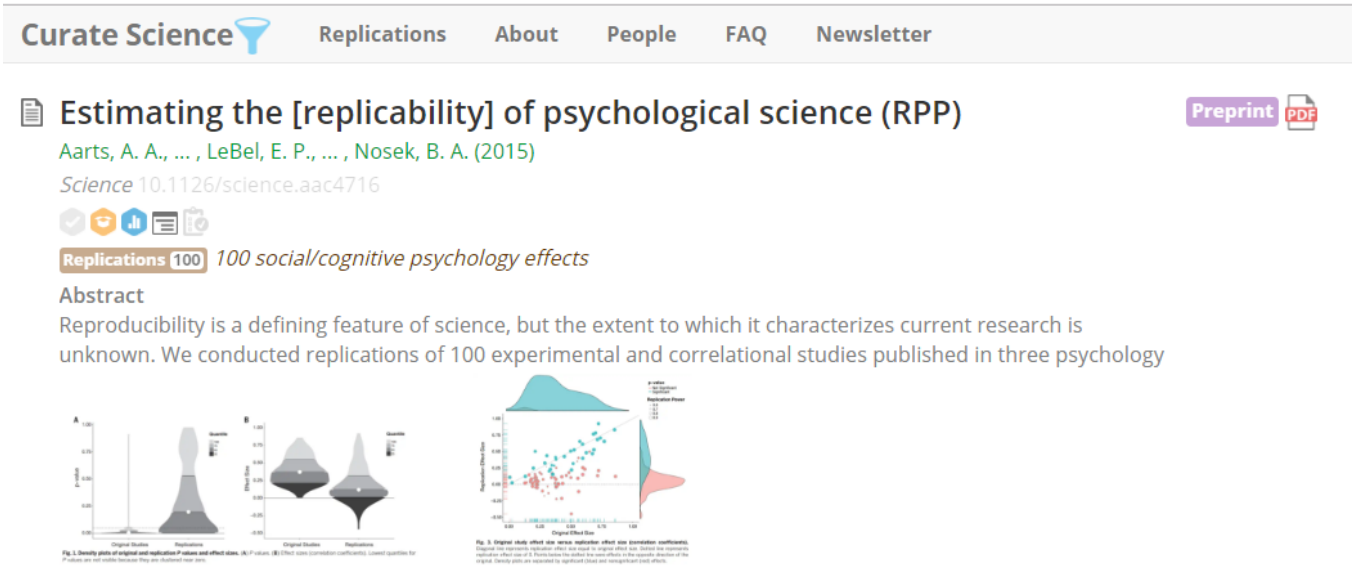
- Multi-study situation: Same general layout as sole-study situation (above), except each study is now on its own row and a new column is added (left-most and header-less column) to display each study's Study #:



- For "Original research" articles, same layout is used as above (for both sole-study and multi-study situations), except without the "Replication Details" columns.

In addition to the following article page modifications:

- Article-level (thumbnailed) key figures/tables underneath the abstract, which expand on hover (to the maximize size of the current window
  - Example (http://curatescience.org/articles/RPP.html [though in the current prototype, the expanded image doesn't properly expand to maximize size]):



- For logged-in users only, add an “Edit Article” link with pencil icon (font awesome icon: class="fas fa-pencil-alt" Edit Article) at the top-right of the page (to the right of PDF, preprint, and HTML labels).
    - Clicking on this will bring the user to the edit article page (http://curatescience.org/new-edit-article-page.html) to allow the editing of that particular article’s information (with that article’s information of course loaded automatically upon page load).
- The Abstract text should be hidden after the second-line of text (with ellipsis) and display a clickable “See more” link that reveals the remaining abstract text.
- Add 1000ms delay to activate the transparency badge popups on hover (the standard delay for the <a title> class apparently) to avoid “accidental” popup activations when user quickly hovers over badges to go somewhere else on the page.
    - For these badge popups on hover (article-level *and* study-level badges), use proper tooltip positioning (rather than my “display on hover ” hack).
- If no Key Figures/Tables are available, entirely hide that column (for both article and replication article types).

Later:

- No author information popup on hover (this will be added in Contract #2 work)
- Show embed-viewable content within study-level badge popups on hover (see the 2 Campbell et al. article page for prototypes of this functionality: http://www.curatescience.org/articles/cbkd(2018,jrp).html and http://www.curatescience.org/articles/bdc(2016,jesp).html)
- Add “Edit Related articles” functionality to “Related articles” section to add (and update/correct) links to related articles

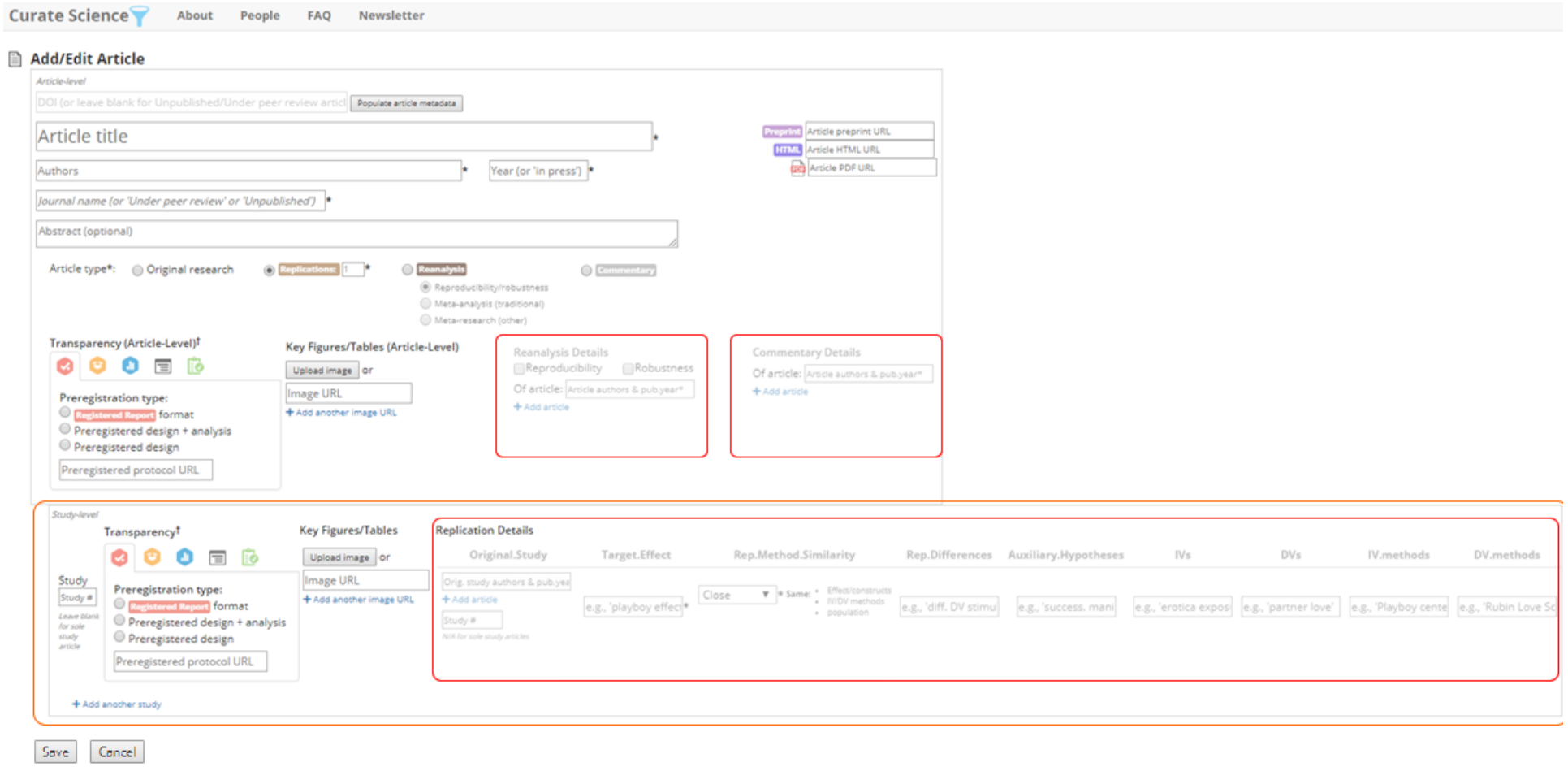
New-Edit Article Page Specs

According to current new-edit-article prototype page (see http://curatescience.org/new-edit-article-page.html ; file on Github repo)

Depending on the article type selected, the fields are different:

General Overview

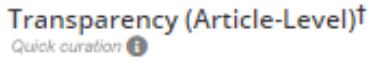
- "Replication" article type: "Reanalysis Details" and "Commentary Details" subsections no longer visible



- "Original research" article type: "Reanalysis Details", "Commentary Details", and "Replication Details" subsections no longer visible
- "Reanalysis" article type: "Commentary Details", "Replication Details", and *entire* "Study-level" subsections no longer visible (given that only article-level curation will initially be available for reanalysis article type).
- "Commentary" article type: "Reanalysis Details", "Replication Details", and *entire* "Study-level" subsections no longer visible (given that only article-level curation will initially be available for commentary articles).

Additional Details for Article-type Fields:

- If either "Original research" or "Replications" article type radio button is selected, add the following:
  - Below the "**Transparency (Article-Level)†**" heading within the article-level section, add the instruction text "Quick curation" (like the "Deep curation (recommended)" instruction text at the study-level):

    Hovering over the "information icon" (from font-awesome library) will display the following text: "Please curate transparency information at the article-level ('Quick curation') *or* at the study-level below ('Deep curation (recommended)'), but not at both levels."
- If "Reanalysis" is selected,
  - The "Reproducibility/robustness", "Meta-analysis (traditional)", and "Meta-research (other)" radio buttons become enabled, with the "Reproducibility/robustness" radio button selected by default.
  - If the "Reproducibility/robustness" radio button is selected,
    - The "Reanalysis Details" section becomes enabled and editable.
    - The "Open materials" and "Reporting standards" tabs within the "Transparency (article-level)" section become disabled/non-clickable (given that these two transparency categories don't apply in this scenario).
  - If the "Meta-analysis (traditional)", radio button is selected,
    - The "Reanalysis Details" section is no longer be visible
    - The "Open materials" tab within the "Transparency (article-level)" section becomes disabled/non-clickable (given that this category doesn't apply in this scenario).
  - If the "Meta-research (other)" radio button is selected,
    - The "Reanalysis Details" section is no longer be visible
    - The "Open materials" and "Reporting standards" tabs within the "Transparency (article-level)" section become disabled/non-clickable (given that these two transparency categories don't apply in this scenario).
- If the "Commentary" radio button is selected, the "Commentary Details" section becomes visible and editable.

Things to note:

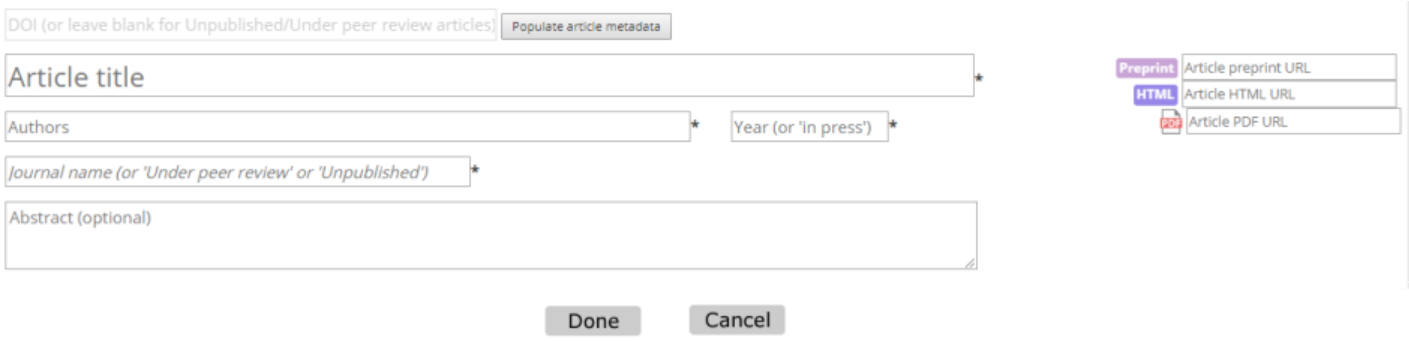
Article metadata section:

- An article's DOI must be unique (i.e., it should not already exist in our DB; what to do when a user inputs a non-unique DOI is explained below).
- Clicking "Populate article metadata" will retrieve all (available) article metadata via the CrossRef lookup service (as we had working in our first beta website; GitHub code; relevant GitHub issue).
  - For example, for DOI="10.1177/1948550612448196", the following call https://api.crossref.org/v1/works/http://dx.doi.org/10.1177/1948550612448196 returns that article's metadata as JSON (i.e., title [`"title"`], authors [`"author": "given" and "family"`], year

["published-print"], and journal name ["short-container-title"]; abstract info not available, which is typically the case). (CrossRef also offers a REST API for fancier lookups/interactions with article metadata of over 100 million articles, but this probably not needed.)
    - If a user attempts to import article metadata for an article that is already in our DB (i.e., a non-unique DOI), the following message should be displayed: "Article with that DOI already exists in the database. Browse to the article." With the word "article" hyperlinked to the relevant article page.
- For the "year" field, the input must be a valid year (YYYY) or "in press" (nothing else)
- For the "journal name" field, it should autocomplete (TypeAhead) based on pre-existing journal names in our DB
    - If no match is found, the journal name manually entered for an article is automatically added to our DB upon saving the article.
- The "authors" field will need to involve some kind of individual "TypeAhead pills" (or "taggable Charfield" autocompletes) for each author (similar to different email address pills within Gmail's to: field; (can adapt from our first beta website).
    - Each author must be verified to already be in the DB via autocomplete or else be added as a new author into our DB via the "Add Author" modal window (see below for details). This is the case whether the author field is manually inputted or populated via a CrossRef article metadata lookup.
    - When article metadata is populated via a CrossRef lookup, after all (available) fields are populated, the cursor will be focused within the first "author pill" with autocomplete automatically trying to match the 1st author to authors already in our DB.
        - If there's a match, the user then selects it (or clicks down-arrow + TAB), and then the cursor is moved to the second "author pill" with autocomplete automatically trying to match the 2nd author to authors already in the DB (and so on for any remaining authors).
        - If there's no match, the user then needs to click the "Add author" link/button to manually input the new author information via the "Add author" modal:

Article-level characteristics:

- Clicking "Add article" (within the sections: "Reanalysis Details", "Commentary Details", and "Original.Study (within Replication Details") will open a modal popup to add the article metadata via DOI or manually (the exact same functionality as is implemented at the top of the article page, but with the addition of "Done" and "Cancel" buttons (see mockup screenshot):



- For the "Open materials", "Open data", and "Open code" tabbed panels (at article-level and study-levels), clicking "Add another URL" will make another textbox appear so that the user can add additional links.
    - Once a 2nd textbox appears, the "Add another URL" link remains visible under that 2nd textbox in case a 3rd link needs to be added (and so on).
- For Key Figures/Tables (at article-level and study-levels), clicking "Upload image" will open a standard file browser window so that the user can select an image file from their local folders (only *.jpg, *.jpeg, *.png, and *.gif image file types accepted for now).

Study-level characteristics:

- As previously mentioned, following scientific publishing conventions, if an article reports only a single study (i.e., a "sole-study" article), that study is unnumbered and is simply referred to by referencing the authors and publication year of the article. It is only when more than one study is reported in an article that studies become numbered. For example:

# of studies	Study number status	Reference to study
1	unnumbered	Smith & Jones (2018)
2 or more	numbered	Smith & Jones (2018) Study 1 Smith & Jones (2018) Study 2

    - Therefore, one would never use the term "Study 1" to refer to a study reported in a sole-study article.
    - Also: In a multi-study article situation (and only in this situation), sometimes studies are numbered using letter suffixes (e.g., Study 2a and Study 2b; usually done when the studies are highly similar to each other). Consequently, the study number field is alphanumeric (rather than strictly integer).
- Clicking "Add another study" will allow users to add an additional study, involving exactly all of the same fields as already present within the "Study-level" section row. Once a 2nd study row appears, the "Add another study" link will still remain below the 2nd study row in case a user needs to add a 3rd study (and so on).
    - Autocomplete will also occur for each of the following Replication Details fields: "Target.Effects", "Rep.Differences", "Auxiliary.Hypotheses", "IVs", "DVs", "IV.Methods", and "DV.Methods". For example, for the "Target.effects" field, typing "play…" would suggest the effect "playboy effect").
    - For the last 6 fields, multiple entries can be made within each field when the user types a semi-colon ";" (exactly as implemented within Gmail's "To" field), which will add each entry as a list item (formatted exactly like the "Rep.Method.Similarity" field).
- When curation of transparency links is done at the study-level, transparency information at the article-level will be displayed as follows for single- vs. multi-study article situations:
    - *Single-study article situation:* In this case, it is simple: The study-level information is the same as the article-level information.
    - *Multi-study article situation*: In this case, transparency information is combined across studies in the most generous way possible. That is, transparency information for only 1 study is needed to "earn" a

badge for that category at the article-level. For example, if an article has only 1 of 3 studies with open materials link(s), an open materials badge would nonetheless be displayed at the article-level (indicating for which study the open materials are available).

- On hover, transparency information links are displayed basically the same as the sole-study article http://curatescience.org/articles/cbkd(2018,jrp)-for-developer.html page, but the information is displayed as a list, bulleted per study. Example: http://curatescience.org/articles/bdc(2016,jesp)-for-developer.html (file on Github repo). In this 3-study article paper, the study-level transparency information is combined at the article-level as follows:

Study-level badge popups	Article-Level "combined" badge popups
Study 1 Study 2 Study 3	Does exposure to erotica reduce attraction and partners in men? Independent replications of K Goldberg (1989) Study 2 Preregistration Study 3 Preregistered study protocol Public Materials Study 2 Materials link #1 Public Data Study 1 Data link #1 Study 2 Data link #1 Study 3 Data link #1 Reporting Standards Study 1 complies with the Basic 4 (retroactive) reporting standard. Study 2 complies with the Basic 4 (retroactive) reporting standard. Study 3 complies with the Basic 4 (retroactive) reporting standard.

Explanation of article-level "combined" badge popups for each category (as displayed in table):

- For preregistration, a badge appears displaying (on hover) that it is only Study 3 that was preregistered.
- For public materials, a badge appears displaying (on hover) that it is only Study 2 that has public materials.
- For public data, all studies have public data links, consequently this information is displayed (on hover) as a bulleted list for each study.
- For public code, none of the studies have public code links, so of course at the article-level this is also the case.
- Finally, for reporting standards, the badge displays (on hover) that each study complied with a specific reporting standard (distinct studies could comply with distinct reporting standards or have no reporting standards information available at all).

When user clicks Save:

- If a user attempts to save an article with a DOI that is already in our DB (i.e., a non-unique DOI), the following message should be displayed: "An article with that DOI already exists in the database. Browse to the article." With the word "article" hyperlinked to the relevant article page. (In the future, this will be done in better/fancier ways [e.g., as the user inputs a DOI or article title], but for now we will just do it this simpler way.)
- If a user attempts to save an article that has *no* transparency information at the article- or study-levels, the following error message should be displayed:
  *"To add an article to the Curate Science database, information for **at least one transparency badge** must be*

added at either the article-level or study-level (for study-level curation, information for at least one badge per study must be added)."

Default values:

- Year field: current year (but only select/display this once cursor is inside the textbox; any other time, the placeholder text "Year (or 'in press')" should be displayed, as in prototype).
- Article type: "Original research" radio button should be selected by default.
- As in prototype:
    - Reanalysis subtype: "Reproducibility/Robustness" radio button is selected by default
    - Research area: "Social Science" radio button is selected by default
    - Reporting standard dropdown: "Basic-4 (at submission); PSCI, 2014)" selected by default
    - All other fields should be blank or unselected by default.