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Novel Approaches to Acknowledge Research Contributions? "Writing" the Wrongs

September 11, 2020 | Article No. 19

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Insights

- Researchers participate in a wide range of scholarly activities beyond publishing their own findings, such as peer-review work and supervising trainees.
- There is growing recognition for acknowledging all research contributions to promote transparency and accountability – leading to development of several guidance documents and organizational systems.
- There remains a lack of consensus regarding the research activities that should be acknowledged, and individuals that should be acknowledged for completing them.
- Developing some universal recommendations for acknowledging research contributions is crucial for maintaining integrity and rewarding individuals for their work.
- Considering our **C.O.N.T.R.I.B.U.T.E** acronym can support a comprehensive evaluation of the true impact of a researcher's scholarly activities.

"Problems with authorship in publications persisted throughout history. A classical example is the dispute over William Shakespeare's poetry claimed to be authored by other more educated and noble person(s) close to the Elizabethan court, who, for some reasons, could not disclose their identity to the public (a prototype of ghostwriting). Whoever the author(s) of these literature masterpieces are, they left a huge imprint in history and enriched culture."

"The most harmful are the consequences of inappropriate authorship in current biomedicine, where publications facilitate evidence-based clinical decision making and have yet another role—to drive the author's academic growth and prestige amongst specialists"

Gasparyan et al 2013 (1)

Changing Landscape of Research Contributions

Historically speaking, publications have been the main currency for researchers to demonstrate their productivity and advance their career. In the last few decades, there have been some major shifts in the research enterprise – with diverse opportunities for research contributions which extend beyond publications. There are many activities that researchers engage in beyond publishing their own findings, such as peer-review work, serving on journal editorial boards, volunteering in scholarly or professional associations, planning conferences, supervising trainees, as well as participating in promotion, tenure, and hiring committees (2). Over time, the methodological and operational strategies used for these activities have evolved, with individuals with a wide range of skills increasingly involved in research. While the research enterprise has been rapidly evolving, there is still a lack of consensus and formal guidance regarding who should be acknowledged for different research contributions, and activities themselves that qualify for acknowledgment. Developing ethical and universal standards to reward individuals for their work through formal acknowledgement, while establishing their accountability to the work, is of paramount importance. Not only do these acknowledgements have important implications for future career prospects of those involved, but they are also crucial for preserving the moral fabric of the research community. A critical appraisal of the current landscape of acknowledging research contributions is pivotal for preventing malpractices, as well as promoting fair norms and practices in the future.

> "The best practice is for authorship criteria to be explicit among all collaborators. In addition, collaborators should be familiar with the conventions in a particular field to understand their rights and obligations. Group meetings provide an occasion to discuss ethical and policy issues in research."
>
> **-National Academy of Sciences (US), National Academy of Engineering (US), and Institute of Medicine (US) Committee on Science, Engineering, and Public Policy, 1995 (3)**

Current Standards for Authorship

The International Committee of Medical Journal Editors identified 4 key criteria that should be fulfilled for authorship (4):

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and
- Drafting the work or revising it critically for important intellectual content; and
- Final approval of the version to be published; and
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Yet, these criteria are not always met for every publication, whether it is due to poor oversight, unhealthy power dynamics, or choosing to adhere to the initial list of proposed authors even when the work is not delivered adequately by the end of a project. Over the years, some problematic authorship practices have been normalized, in some settings more than others, that raise some serious ethical concerns and ultimately question the integrity of the work itself. For example, honorary authorship is awarded to individuals even without substantial contributions to a publication (5). There are different forms of honorary authorship, including (5):

1. Gift authorship: This is given out of respect for an individual such as departmental heads or senior researchers.
2. Guest authorship: Including a well-known individual to increase the marketed quality of the paper.

There is also the issue of ghost authors – these are individuals who make substantial contributions to a publication but are not acknowledged as an author. An alarming 21% of articles published in major medical journals in 2008 showed evidence of honorary and ghost authorship (6).

> "I found myself wishing that there was a way for publishers to capture and display structured information about who contributed what to multi-authored works, instead of, or in addition to, the list of author names…it occurred to me that if it was possible to create a controlled vocabulary of contribution tags, then those tags could be included as additional metadata in association with the DOI and, ultimately, with an individual's ORCID."

Dr. Amy Brand

VP Academic & Research Relations and VP North America for Digital Science, co-founder of CRediT, 2014 (7)

Moving Beyond Authorship: Giving Credit where Credit is Due!

In order to foster responsibility and transparency in authorship, as well as to maintain integrity in publications, there are growing calls to establish universal standards for acknowledging research contributions. This is particularly important when a large group of authors contribute to a publication and the specific roles of individuals are not always clear. A variety of strategies have been proposed to improve acknowledgment of authors, including (5):

- Journals requiring public disclosure of the specific contributions of each author;
- Journals requiring a public guarantor for each publication, or an author who takes responsibility for the entire research project; and
- Establishing a database or the use of existing research community networks (such as ResearchGate) to track contributions.

Recently, CRediT (Contributor Roles Taxonomy) was introduced to take a systematic approach in acknowledging author contributions. The roles included in this taxonomy are not limited to traditional authorship and are meant to include all the work needed to produce scholarly publications (Exhibit 1) (8).

Exhibit 1: Roles Defined by CRediT to Improve Acknowledgement of Research Contributions (8)

Role	Description
Conceptualization	Ideas; formulation or evolution of overarching research goals and aims.
Data curation	Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later re-use.
Formal analysis	Application of statistical, mathematical, computational, or other formal techniques to analyse or synthesize study data.
Funding acquisition	Acquisition of the financial support for the project leading to this publication.
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.
Methodology	Development or design of methodology; creation of models.
Project administration	Management and coordination responsibility for the research activity planning and execution.
Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.
Validation	Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs.
Visualization	Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.
Writing - original draft	Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation).
Writing - review & editing	Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages.

CRediT has been refined by the Consortia Advancing Standards in Research Administration (CASRAI) and National Information Standards Organization (NISO) (9). It is also currently adopted by many publishers including the British Medical Journal, Elsevier, Oxford University Press, SAGE Publishing, and Springer (10). Incorporating a taxonomy such as this can help research teams take an objective and transparent approach to assess the true contributions of each of the authors for a publication, while limiting chances for any potential disagreements regarding authorship.

> "The outputs from scientific research are many and varied, including: research articles reporting new knowledge, data, reagents, and software; intellectual property; and highly trained young scientists. Funding agencies, institutions that employ scientists, and scientists themselves, all have a desire, and need, to assess the quality and impact of scientific outputs. It is thus imperative that scientific output is measured accurately and evaluated wisely."
>
> **San Francisco Declaration on Research Assessment (11)**

The Problem with Using "Citations" As a Key Measure of Success

There is now growing recognition that publication metrics should not be the sole criteria for evaluating researchers' scholarly contributions. Yet, metrics that focus largely on citations of journal articles are still the tools of choice for most organizations for evaluating researchers' productivity (2). However, a wide range of challenges have been identified with this approach, which revolve around capturing the true impact of an article through citations, such as (12):

- Groups of colleagues choosing to cite each other regularly;
- Citations can occur in footnotes and have nothing to do with a previous article's contribution to the current discussion;
- Cited article may not be central for developing the work in question:
    - This can occur when a citation is embedded in a larger group of citations to describe previous work on a general topic;
        - This can occur more commonly in some journals than others – journals that allow 10,000 words or more per article will have more "situating" citations than journals that require less than 5,000 words.

Recognizing the need for an alternative approach for capturing different forms of research contributions that can be a more realistic reflection of the impact of scholarly endeavors, the San Francisco Declaration on Research Assessment have proposed a series of recommendations for different stakeholders, including the following listed verbatim from their statement **(11)**:

General Recommendation	Do not use journal-based metrics, such as Journal Impact Factors, as a surrogate measure of the quality of individual research articles, to assess an individual scientist's contributions, or in hiring, promotion, or funding decisions.
For funding agencies	Be explicit about the criteria used in evaluating the scientific productivity of grant applicants and clearly highlight, especially for early-stage investigators, that the scientific content of a paper is much more important than publication metrics or the identity of the journal in which it was published. For the purposes of research assessment, consider the value and impact of all research outputs (including datasets and software) in addition to research publications, and consider a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice.
For institutions	Be explicit about the criteria used to reach hiring, tenure, and promotion decisions, clearly highlighting, especially for early-stage investigators, that the scientific content of a paper is much more important than publication metrics or the identity of the journal in which it was published. For the purposes of research assessment, consider the value and impact of all research outputs (including datasets and software) in addition to research publications, and consider a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice.

Despite the progressive nature of these recommendations, many funding agencies and institutions have yet to adopt them, demonstrating the challenges of changing long standing practices for acknowledging research contributions.

"To improve the practices of responsible authorship, it is important to understand the definition(s) of authorship, its impact on research productivity and roles of different stakeholders in the allocation of publication credit."

"Recently, PubMed – the largest bibliographical database in biomedicine made a new record in the number of authors on the byline of an indexed article: 2080 authors needed 165 lines on the PubMed site to spell out their surnames and initials. The paper was from high energy physics [1] and the number of authors probably did not surprise any physicist. It also probably did not surprise those involved in clinical trials, where the number of authors can also reach thousands [2]. But researchers in many areas of social sciences and humanities may expect to be sole authors, or perhaps discuss the senior authorship between a supervisor and a doctoral student [3]."

-Marušić et al 2011 (13)

Food for Thought: Re-Imagining Academic Credit

When considering scholarly research and publications, researchers should consider 3 actions:

1. Reflecting critically on every single step of conducting a research project and identifying every single individual who has contributed to the project by using an existing framework such as CRediT;

2. Developing a detailed contribution list for every single individual involved in the project;

3. Deciding as a group the relative extent and value of each individual's contribution to the whole project, whether the contribution warrants formal acknowledgement, and the order in which contributors will be listed in publications (14).

At a broader level, all of us can consider the **C.O.N.T.R.I.B.U.T.E** acronym, which serves as indicators of scholarship (Exhibit 2).

Exhibit 2: Indicators of a Researcher's Scholarly Contributions

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Recognizing the importance of taking a comprehensive approach to evaluate research contributions, below are two hypothetical profiles of two unique individuals. Imagine you are a reviewer in the candidate selection committee, which profile would you rank higher?

Candidate A	Candidate B
• Strong academic background (MSc) • Area of research is surgery • 35+ publications annually – first author in 5 publications. • 3 industry funded research projects • Used different iterations of the same methodology using the same dataset for majority of publications (most commonly systematic reviews • Limited collaborations outside institution • Teaching experience (5 years) • Presented scholarly work locally, nationally, and internationally many times • Mentorship experience- 10 undergraduate students, and surgical trainees annually • Participating in no thesis committees, or graduate level mentorship	• Strong academic background (PhD) • Area of research is rehabilitation • 10 publications annually – first author in 5 publications • 1 large, peer-reviewed grant from a National Research Agency. • 1 recent publication with Impact Factor> 50 (Lancet/NEJM) • Conducted primary research for each of the publications by collaborating with different local and international teams • Used diverse methodology in majority of the publications • Teaching experience (2 years) • Presented scholarly work locally and nationally • Extensive mentorship experience (6 years: Thesis supervisor for 4 students (3 MSc, 1 PhD)

If we focus on the traditional numbers game, Candidate A may initially seem most impressive. Yet, if we review backgrounds with a lens on quality of research pursuits, our views may change. Both Candidates are excellent; however, Candidate A, as productive as he/she is will inevitably hit a ceiling of scholarly advancement. Mentoring, high impact papers, peer-reviewed grants and high degree of collaboration are all important indicators of a broader scholarship.

We asked the OE community about the factor they consider to be most important for determining research activity. Majority of the respondents (74%) indicated that quality of the publication is the most important factor. Total amount of research grant money received was considered to be the least important factor (4%).

WHAT DO YOU FEEL IS THE MOST IMPORTANT FACTOR IN DETERMINING RESEARCH ACTIVITY?

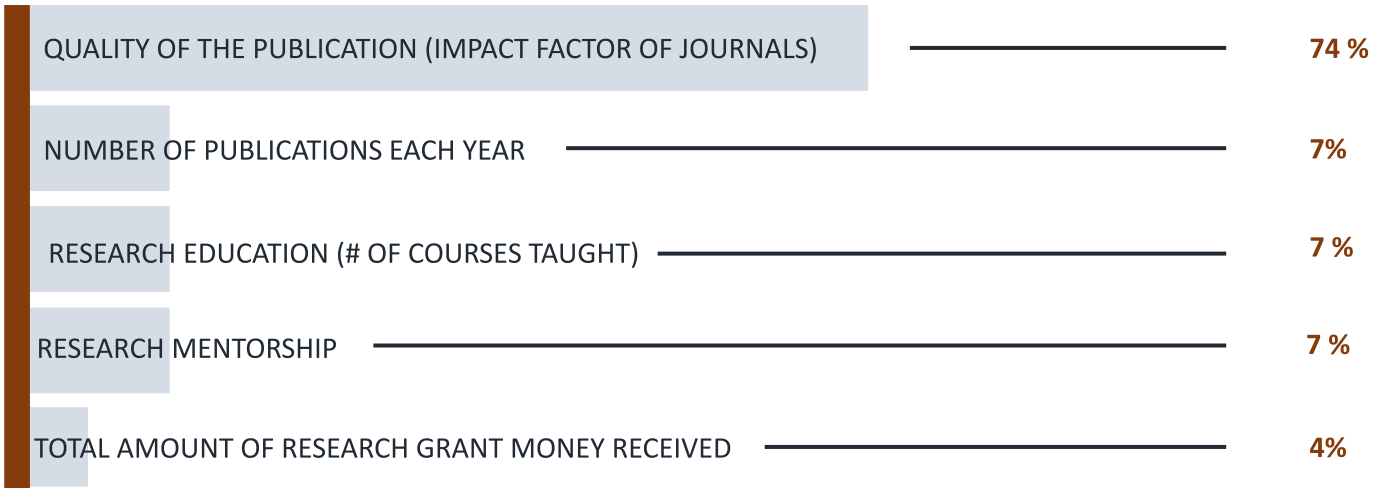

Exhibit 3 : Important factors in determining research activity.
OrthoEvidence Random Sampling 27 members

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