Office of the Director

MEMORANDUM

DATE: April 21, 2016

TO: National Science Board Committee on Audit and Oversight

VIA: Dr. France Córdova, Director

FROM: Dr. James Hamos, Senior Advisor and Dr. Jessica Rosenberg, AAAS Policy Fellow, Office of the Director

SUBJECT: Information item on Improvement in Titles and Abstracts as part of NSF Efforts towards Transparency and Accountability

Background

With the launch of a 2013 initiative on transparency and accountability, new policies were put in place that emphasize the need for each National Science Foundation (NSF) award title and abstract to clearly convey, to a broad audience, the nature of the funded activity and how it serves the national interest, as stated by the agency's mission. In May 2015, the National Science Board (NSB) passed resolution NSB-2015-19, *Resolution on NSF and the National Interest*, which acknowledged the Foundation's transparency and accountability initiative and requested a report regarding progress on these efforts in a year. Here we describe the progress on staff training and the resulting impact on the clarity of award titles and abstracts.

All stakeholders – including the public – have open access to information about every NSF award through online searches of the awards database. An online award search tool on nsf.gov is the way that the majority of people access this information (a much smaller fraction search the awards using research.gov) with more than 300,000 user visits to search results in 2015. A goal of the transparency and accountability initiative is to make what the public finds in these search results even easier to understand.

The data presented here, which represent changes after one year of implementation of these new policies, serve as a baseline for future efforts.

Changes in guidance and training given to Program Directors

In order to change titles and abstracts from being directed primarily at a scientific audience to also being understandable by the public, NSF staff members must be trained on the new expectations. They have multiple opportunities to receive such training through the directorates themselves and an elective internal professional development course, Merit Review Basics III. Key points raised during the training include: (1) abstracts and their titles are NSF documents so NSF staff should write them or revise documents submitted by principal investigators, as necessary; (2) the abstract must begin with a non-technical description of the award written for the layperson; and (3) the abstract should explain the importance of the project as a justification for the expenditure of federal funds.

All directorates provide guidance on titles and abstracts to staff. The most important place where the guidance is given is during the onboarding of new staff. As part of the onboarding process, new Program Directors hear about this issue from division and directorate leadership as well as from liaisons to NSF's Office of Legislative and Public Affairs. In addition, the need for titles and abstracts to be clear to the public is discussed in a variety of formats within the different directorates such as focused meetings on this topic, annual training on all aspects of merit review, and written documents describing the writing of titles and abstracts.

The NSF Academy provides high quality courses to address learning and development needs within the agency, including a four course Merit Review Basics series. The first two courses in the series are required for new Program Directors. Merit Review Basics III, where titles and abstracts are discussed, is an elective course. Approximately 50% of Program Directors freely elect to take the course.

Changes to titles to improve clarity

The frequency with which titles change between proposal submission and the time an award is made provides a window into the efforts made by Program Directors to clarify titles. We examined the fraction of all awards with significant (>10 characters) changes to titles from 2012 (before the new guidance) and 2015 (after the new guidance).

- Between 2012 and 2015, the fraction of award titles that were changed increased from 10% in 2012 to the more recent 24%.

- In addition, 88% of 2014 and 2015 titles for conference or workshop awards were changed to include the location and dates of the event in order to increase transparency.

While original and changed titles are considered to be understandable by the scientific community, we examined whether the changes in titles made them clearer for all potential audiences. For this study, we asked 20 individuals – including scientifically-trained fellows,

administrative staff, and professional staff at NSF – to read and evaluate >500 titles. Each title was read by at least 4 people and was declared likely to be clear to the public if a majority of readers found it to be clear. We found:

- Overall, 53% of award titles were considered clear.

- Of titles that had been changed, 68% were clear while only 43% were clear before the changes were made.

- For 91% of the award titles, at least one reader indicated that it was improved from submission – this suggests that while edits don't always fix titles, changes are directed at making the titles clearer.

- For titles that were not changed, only 47% were clear.

The data show that where titles are edited, clarity is improved. As the number of titles that are edited continues to increase with this effort, the overall clarity of titles should continue to rise.

Changes to abstracts to convey the nature of the science to the public

Improving how well award abstracts convey the nature of the science and its significance to the general public is an important part of the transparency and accountability effort. However, assessing the improvement in the abstracts for these purposes is difficult. To understand the changes that have been made, we analyzed both the readability of abstracts and their dominant word themes. Readability measures indicate the complexity of the abstract language (average sentence length and average number of syllables). Identifying word themes provides a look into the use of technical (and non-technical) terms in the abstracts. We found:

- Abstracts generally follow the new NSF guidance and begin with a paragraph, the "non-technical" component, which is an effort to describe the project to a lay audience.

- The "readability"[1] of the abstracts (see Table) indicate that the technical and non-technical parts of abstracts are both written using big words and complex sentence structures. The scores are much higher (written with greater language complexity) than they are for articles written by science writers for the general public.

- Word themes identified in the non-technical parts of abstracts include less technical jargon than those found in the technical parts of abstracts.

- Even in cases where highly technical terms remain in the non-technical abstract, effort is being made to explain these terms to the public.

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[1] Analysis has been done using the Flesch-Kincaid grade level formula:
grade level = 0.39x(average sentence length) + 11.8x(average syllables per word) – 15.59.

- The technical and non-technical parts of abstracts have only a small amount of overlap in their common word themes, indicating that different words are being used in each part of the abstract. This result is consistent with less technical jargon being used in the non-technical sections.

Comparison of Grade-level Reading Scores

Sources	NSF non-tech	NSF tech	NSF Press releases	*Science* news	*Nat. Geo.*	*NYT Science*
Median	18 ± 3	18 ± 3	14 ± 2	13 ± 2	11 ± 2	12 ± 1

Table: Comparison of grade-level Flesch-Kincaid readability scores, a measurement of the language complexity of the abstracts. The table shows the scores for the non-technical (NSF non-tech) and technical (NSF tech) parts of the NSF abstracts compared with scores for science articles written for the general public – NSF press releases, news articles from the journal Science, articles in National Geographic (Nat. Geo.), and articles from the Science section of the New York Times (NYT science).

The readability of abstracts has remained at an advanced level, even while the use of technical terms has decreased. Until now, the training has emphasized making the abstracts clear to the public by removing technical language. It is only with this analysis that it has become clear that the sentence structure and use of big words needs to be considered as well. More emphasis will be placed on language complexity moving forward.

Broader context for Transparency and Accountability

While the above analysis has focused on award titles and abstracts, NSF strives to make many of its processes accessible to the public. There is a broad array of topics that are easily available on the NSF website, although they are not currently packaged under a Transparency and Accountability umbrella. We plan to assemble all of this information under a single website in the coming few months. These other web sites include:

- Awards database search tools (http://nsf.gov/awardsearch and http://research.gov)
- Public access to results of NSF-funded research (http://www.nsf.gov/news/special_reports/public_access/index.jsp)
- Merit review process (http://www.nsf.gov/bfa/dias/policy/merit_review/)
- Merit review reports (https://www.nsf.gov/nsb/publications/pubmeritreview.jsp)
- Committee of visitors reports (http://www.nsf.gov/od/oia/activities/cov/covs.jsp)
- Performance and accountability reports (http://www.nsf.gov/about/history/annual-reports.jsp)

- Open government (http://www.nsf.gov/open/)
- Open data (http://www.nsf.gov/data/)

Summary

The renewed focus on transparency and accountability has had a clear impact on how the titles and abstracts of NSF awards are written. The changes are a recognition that these documents are an important way to communicate with the broader public and an effort is being made to make the science clear. The studies discussed in this memorandum will serve as a baseline against which continuing efforts on titles and abstracts can be measured.

A lot has been learned about the clarity of titles with these studies, but this is only the beginning. Improving the clarity of titles and abstracts will continue to require training adjusted to incorporate what has been learned. Over the next year, directorate-developed documents and training will be shared with managers to help spread the best practices across the Foundation. Discussions are also underway about how to optimize the Merit Review Basics courses. Readability will be added into existing training and other training techniques, such as an online module, are also being considered for this topic.

Transparency and accountability is a much bigger issue than how well a title and abstract conveys the science of an award and indicates how it fulfills the NSF mission. The NSF transparency and accountability efforts start with the ability for anyone to search for any award made by NSF using the awards database search tools, the results of which include much more information than just the titles and abstracts. The efforts extend to new guidance on making the scientific publications resulting from NSF-funded research accessible to all. In addition, descriptions of the NSF merit review process and its results are publically available and NSF has new policies on the accessibility of data. Currently there is no place on the NSF website that points to all of the information on NSF processes and awards. A centralized location that will connect all of this information will be created in coming months.