

REQUEST FOR APPROVAL under the Generic Clearance for NASA STEM Engagement Performance Measurement and Evaluation, OMB Control Number 2700-0159, expiration 06/30/2021

I. TITLE OF INFORMATION COLLECTION:

NASA Office of STEM Engagement Engineering Design Challenge Impact Surveys: Parent Survey

II. TYPE OF COLLECTION:

- Attitude/Behavior Scale
 - Baseline Survey
 - Cognitive Interview Protocol
 - Consent Form
 - Focus Group Protocol
 - Follow-up Survey
 - Instructions
 - Satisfaction Survey
 - Usability Protocol
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GENERAL OVERVIEW: NASA Science, Technology, Engineering, and Mathematics (STEM) Engagement is comprised of a broad and diverse set of programs, projects, activities and products developed and implemented by HQ functional Offices, Mission Directorates and Centers. NASA's Office of STEM Engagement (OSTEM) delivers participatory, experiential learning and STEM challenge activities for young Americans and educators to learn and succeed. NASA STEM Engagement seeks to:

- Create unique opportunities for students and the public to contribute to NASA's work in exploration and discovery.
- Build a diverse future STEM workforce by engaging students in authentic learning experiences with NASA people, content, and facilities.
- Strengthen public understanding by enabling powerful connections to NASA's mission and work.

To achieve these goals, NASA STEM Engagement strives to increase K-12 involvement in NASA projects, enhance higher education, support underrepresented communities, strengthen online education, and boost NASA's contribution to informal education. The intended outcome is a generation prepared to code, calculate, design, and discover its way to a new era of American innovation.

The parent survey for this information collection is specific to determining the importance parents place on STEM education and their encouragement and support of their child(ren)'s interest in Out-of-School Time (OST) STEM education activities.

III. INTRODUCTION AND PURPOSE: Engineering Design Challenge activities are based on best practices in motivation, engagement, and learning for students and educators in formal and informal settings (e.g., Farland-Smith, 2012; Gasiewski, Eagan, Garcia, Hurtado, & Change, 2012; Kim, et al., 2015; Leblebicioglu, Metin, Yardimci, & Cetin, 2011; Maltese & Tai, 2011). The parent survey includes items focused on parental level of education, parental support, parental perceptions of child(ren)s interest in STEM and importance of STEM. In a NASA engineering design challenge (EDC) activity, the focus is

a design task in which students must meet certain criteria through a series of steps that engineers follow to arrive at a solution to a problem. This engineering problem is within the context of NASA-unique content and subject matter experts.

Our interest is in determining the importance parents place on STEM education and their encouragement and support of their child(ren)'s interest in Out-of-School Time (OST) STEM education activities in order to understand why, how, and in what ways students are impacted in the short-, intermediate, and long-term by participation in STEM Challenge activities with an engineering design or scientific research process focus. Thus, the purpose for pilot testing is to develop valid instruments that reliably explain the ways in which participants' attitudes and behaviors are impacted by participation in these activities. Guided by the most current STEM education and measurement methodologies, it is the goal of this rigorous instrument development and testing procedure to provide information that becomes part of the iterative assessment and feedback process for the NASA STEM Engagement line of business.

Hence, the goals of this cycle of pilot testing are as follows:

- o Determine clarity, comprehensibility, and preliminary psychometric properties (e.g., validity, reliability) of these instruments. And, to explore individual item functioning, and to make any necessary adjustments in preparation for large-scale testing as the basis for more sophisticated statistical testing.
- o Determine an accurate response burden for these instruments.

I. RESEARCH DESIGN OVERVIEW: NASA STEM Engagement is using a quasi-experimental design. Responses will be used to validate these follow-up surveys for clarity, comprehensibility, and to determine psychometric properties with the respondent pool.

Following this pilot phase of testing, indeed NASA STEM Engagement has tentative research questions and hypotheses to test regarding the impact of STEM Challenge activities on all participants—students and teachers alike. Thus, this work is integral to the iterative assessment and feedback process for the STEM Engagement line of business.

NASA STEM Engagement is pilot testing a parent survey. Despite the absence of a control group, this design can still yield strong causal effects when effort is made to satisfy requirements of quasi-experimentation such as identifying and reducing the plausibility of alternative explanations for the intervention- as- treatment effect (Shadish, Cook, & Campbell, 2002), identifying conceivable threats to internal validity, and statistically probing likelihood of treatment-outcome covariation (Mark & Reichardt, 2009).

IV. TIMELINE: Pilot testing of surveys will take place approximately February 2020 through January 2021, coordinated with the implementation periods of the STEM Challenge activities.

V. SAMPLING STRATEGY: The universe of EDC student participants is 3600 or below, therefore the universe of EDC parent survey respondents (one parent survey per student) is also 3600 or below. NASA STEM Engagement will administer surveys for testing to the universe of EDC parent respondents (one parent survey per student).

Table 1. Calculation chart to determine statistically relevant number of respondents

Data	(N)	(A)	(Z)	(P) *Variability	Base	Response	(n) Number
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Collection Source	Population Estimate for FY16	Sampling Error +/- 5% (.05)	Confidence Level 95%/ Alpha 0.05	(based on consistency of intervention administration) 50%	Sample Size	Rate	of Respondents
EDC Parents respondents	3600	N/A	N/A	N/A	3600	N/A	3600
TOTAL							3600

VI. BURDEN HOURS: Burden calculation is based on a respondent pool of individuals as follows:

Data Collection Source	Number of Respondents	Frequency of Response	Total minutes per Response	Total Response Burden in Hours
EDC Parent Respondents	3600	1	10	600
TOTAL				600

*

VII. DATA CONFIDENTIALITY MEASURES: Any information collected under the purview of this clearance will be maintained in accordance with the Privacy Act of 1974, the e-Government Act of 2002, the Federal Records Act, and as applicable, the Freedom of Information Act in order to protect respondents' privacy and the confidentiality of the data collected.

VIII. PERSONALLY IDENTIFIABLE INFORMATION:

1. Is personally identifiable information (PII) collected? Yes No

- NOTE: The following questions support potential PII collection:

- Do you or someone in your immediate family work in a STEM-related field? If yes, please specific
- What is your age group?
- What is your highest level of science and math you studied beyond elementary school?
- In what state is your child's program located?

2. If yes, will any information that is collected be included in records that are subject to the Privacy Act of 1974? Yes No

3. If yes, has an up-to-date System of Records Notice (SORN) been published?
 Yes No

Published March 17, 2015, the Applicable System of Records Notice is NASA 10EDUA, NASA STEM Engagement Program Evaluation System - http://www.nasa.gov/privacy/nasa_sorn_10EDUA.html.

APPLICABLE RECORDS:

4. Applicable System of Records Notice: SORN: NASA 10EDUA, NASA STEM Engagement Program Evaluation System - http://www.nasa.gov/privacy/nasa_sorn_10EDUA.html

5. Completed surveys will be retained in accordance with NASA Records Retention Schedule 1,

Item 68D. Records will be destroyed or deleted when ten years old, or no longer needed, whichever is longer.

IX. PARTICIPANT SELECTION APPROACH:

1. Does NASA STEM Engagement have a respondent sampling plan? Yes No

If yes, please define the universe of potential respondents. If a sampling plan exists, please describe? The universe of EDC student participants is 3600 or below, therefore the universe of EDC parent survey respondents (one parent survey per student) is also 3600 or below. NASA STEM Engagement will administer surveys for testing to the universe of EDC parent respondents (one parent survey per student).

If no, how will NASA STEM Engagement identify the potential group of respondents and how will they be selected? Not applicable.

X. INSTRUMENT ADMINISTRATION STRATEGY

Describe the type of Consent: Active Passive

6. How will the information be collected:

- Web-based or other forms of Social Media (50%)
- Telephone
- In-person
- Mail
- Other (50%)

If multiple approaches are used for a single instrument, state the projected percent of responses per approach. The parent survey will be administered via the web and in-person on site. Because it is preferable that all parent surveys be administered during registration and or family events supporting the Engineering Design Challenge activity, hard copy surveys will be made available to collect survey responses in the event web access is temporarily unavailable. In the past, no more than 50% of respondents may be asked to complete hard copy surveys due to internet or computer difficulties.

7. Will interviewers or facilitators be used? Yes No

1. Will interviewers or facilitators be used? Yes No

Note: "Facilitators" refers to Educators who will read and explain student retrospective survey instructions.

XI. DOCUMENTS/INSTRUMENTS ACCOMPANYING THIS REQUEST:

- Consent form
- Instrument (attitude & behavior scales, and surveys)
- Protocol script (Specify type: Script)
- Instructions NOTE: Instructions are included in the instrument
- Other (Specify _____)

XII. GIFTS OR PAYMENT: Yes No If you answer yes to this question, please describe and provide a justification for amount.

XIII. ANNUAL FEDERAL COST: The estimated annual cost to the Federal government is \$1120. The cost is based on an annualized effort of 20 person-hours at the evaluator's rate of \$56/hour for development and administering the survey instrument, collecting and analyzing responses, and editing the survey instrument for ultimate approval through the methodological testing generic clearance with OMB Control Number 2700-0159, exp. exp. 06/30/2021.

XIV. CERTIFICATION STATEMENT:

I certify the following to be true:

1. The collection is voluntary.
2. The collection is low burden for respondents and low cost for the Federal Government.
3. The collection is non-controversial and does raise issues of concern to other federal agencies.
4. The results will be made available to other federal agencies upon request, while maintaining confidentiality of the respondents.
5. The collection is targeted to the solicitation of information from respondents who have experience with the program or may have experience with the program in the future.

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Bibliography

- Farland-Smith, D. (2012). Personal and Social Interactions Between Young Girls and Scientists: Examining Critical Aspects for Identity Construction. *Journal of Science Teacher Education*, 23(1), 1-18.
- Gasiewski, J. A., Eagan, M. K., Garcia, G. A., Hurtado, S., & Change, M. J. (2012). From gatekeeping to engagement: A multicontextual, mixed method study of student academic engagement in introductory STEM courses. *Research in Higher Education*, 53(2), 229-261.
- Goedhart, H., & Hoogstraten, J. (1992). The retrospective pretest and the role of pretest information in evaluative studies. *Psychological Reports*, 70(3), 699-704.
- Kim, C., Kim, D., Yuan, J., Hill, R. B., Doshi, P., & Thai, C. N. (2015). Robotics to promote elementary education pre-service teachers' STEM engagement, learning, and teaching. *Computers & Education*, 91, 14-31.
- Leblebicioglu, G., Metin, D., Yardimci, E., & Cetin, P. S. (2011). The Effect of Informal and Formal Interaction between Scientists and Children at a Science Camp on Their Images of Scientists. *Science Education International*, 22(3), 158-174.
- Maltese, A. V., & Tai, R. H. (2011). Pipeline persistence: Examining the association of educational experiences with earned degrees in STEM among US students. *Science Education*, 95(5), 877-907.
- Mark, M. M., & Reichardt, C. S. (2009). Quasi-experimentation. In L. Bickman, & D. J. Rog (Eds.), *The SAGE handbook of applied social research methods* (2nd ed., pp. 182-214). Thousand Oaks, CA: SAGE Publications, Inc.
- Norman, G. (2003). Hi! How are you? Response shift, implicit theories and differing epistemologies. *Quality of Life Research*, 12, 239-249.
- Pelfrey, Sr., W. V., & Pelfrey, Jr., W. V. (2009). Curriculum evaluation and revision in a nascent field: The utility of the retrospective pretest-posttest model in a Homeland Security program of study. *Evaluation Review*, 33(1), 54-82.
- Unfried, A. S., Feber, M. S., Stanhope, D. S., & Wiebe, E. S. (n.d.) (2015). The Development and Validation of a Measure of Student Attitudes Toward Science, Technology, Engineering, and Math (S-STEM). *Journal of Psychoeducational Assessment*, vol. 33, 7: pp. 622-639.
- Verhoeven, M., Arentze, T., Timmermans, H., & van der Waerden, P. (n.d.). Retrospective Surveys: Some Experiences in the Context of Measuring Lifecycle Events. Paper for the 87th Annual Meeting of the Transportation Research Board. Washington, DC., 2008.