NDSGC Evaluation Plan
October 2018 Revision

A. NASA Internships, Fellowships, and Scholarships (NIFS)

All students who receive funding of at least $2500 (all **NASA internship** recipients, all **fellowship recipients**, and some **scholarship recipients**) are **longitudinally tracked** through the National Space Grant Foundation. This annual survey is an assessment that can aid in determining program impact, as students continue in STEM studies or NASA-relevant careers. Students are surveyed about the impact of Space Grant programming on their academic and career paths, including data on current employment status.

Students who receive funding for NASA internships and research fellowships are also required to submit a final report detailing their research progress and their experiences upon completion of their projects (at the end of every semester for which they receive funding). These **final reports** are used in part to determine the effectiveness of supporting NASA internships and fellowships for student achievement of academic and career goals. An upward trend in the **number of student applications** received by the NDSGC for NASA internships and fellowships each semester is also an indicator of program success.

The NDSGC maintains **communication** with NASA internship and fellowship recipients throughout their award period. An element of this communication includes an **official check-in** between the NDSGC team and student award recipients regarding their research progress and overall experience. This **formative review** aids the NDSGC in determining impactful strategies to promote student learning and helps to identify effective mentors on these projects. This evaluation allows the NDSGC to improve the experience for both current and future students participating in these programs.

As the Community College and Tribal College **Fellowship Bridge Program** continues to evolve, the NDSGC implemented an **interview process** to identify areas for program improvements. This summative evaluation includes an interview following participation in the program, where students are asked about their overall experiences and suggestions for program improvements.

SMART Goals: The following goals align with FY19 – FY20 proposed funding levels. The NDSGC will partially and/or fully fund 6 NASA internships, 11 fellowships, 3 bridge fellowships, and 225 undergraduate scholarships. The NDSGC will provide a minimum of 51% of NIFS funding to female students in STEM annually.[1] Although available data does not include students who identify outside the gender binary, these gender identities are underrepresented in STEM fields as well. Therefore, the NDSGC will include these students in the goal of awarding 51% of NIFS to students who do not identify as male. The NDSGC will provide a minimum of 15.2% of NIFS funding annually to underrepresented minority students in STEM.[2] Each of these

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[1] https://nces.ed.gov/programs/digest/d17/tables/dt17_304.30.asp
[2] https://nces.ed.gov/programs/digest/d17/tables/dt17_306.60.asp?current=yes

percentages are in alignment with the 2016 enrollment in ND higher education institutions (most current data available).

These NIFS metrics and goals are highlighted in the third and sixth columns of the *Summary Table of SMART Objectives*.

For example, to assess our goal of awarding 15.2% of NIFS to underrepresented minority students:

$$Goal\ (15.2\%) = \frac{\#\ of\ NIFS\ Awarded\ to\ Underrepresented\ Minority\ Students}{Total\ \#\ of\ NIFS\ Awarded}$$

If we award 245 total NIFS, and 38 of these awards go to underrepresented minority students, we will meet our goal of awarding a minimum of 15.2% of NIFS to underrepresented minority students.

B. Higher Education

All higher education **student competition teams** (NASA Robotics Mining, NASA Student Launch, etc.) are required to submit a **final report** following their event, documenting team activities throughout the year, participant demographics, resulting publications, outreach activities, successes, and challenges. These competition teams must demonstrate continued successful performance and/or improved performance (seen by competition placement, special awards, impact of outreach activities, etc.) and on-time reporting to be eligible for funding the following year. These **performance trends** and an increase in the **number of student competition team applications** received by the NDSGC each year are both indicators of program success. In the fall of 2017, the NDSGC implemented a new online application process to accommodate the growing number of student competition team applications and to increase the competitiveness of funding support.

All **summer faculty fellowship (SFF)** recipients are required to submit a **final report** including details on the student population impacted, andragogy and overall teaching format utilized, metrics used to evaluate the course, inclusion of NASA content, and any research and publications resulting from course development.

STEM Ambassadors (college students who are paid hourly to conduct and participate in STEM outreach events across the state) are required to complete multiple forms of assessment. These students submit **data spreadsheets** to the NDSGC throughout the year regarding the impact of their activities including data on the number of K-12 students, teachers, and community members participating in their programming. When appropriate (such as K-12 classroom visits), STEM Ambassadors also distribute **participant evaluations** regarding their experiences and program impact. The K-12 student surveys inform the NDSGC of effective activities, improvements to be made to future lessons, and any further trainings necessary for STEM Ambassadors.

STEM Ambassadors also participate in formative and summative evaluations regarding *their* experiences in the program. Following their training at the start of their appointment, they

complete a **survey** that the NDSGC uses to improve programming and support for the STEM Ambassadors throughout the year. STEM Ambassadors also complete a **formative evaluation** after the first semester of participation for the NDSGC to identify further areas in need of improvement (such as an additional training to refresh STEM Ambassadors on effective teaching strategies). This formative evaluation drives content included at an **in-person meeting** held at the start of the spring semester each year, where STEM Ambassadors participate in supplemental training. A **summative evaluation** is given to STEM Ambassadors following one year of participation in the program to further examine areas in need of improvement. An upward trend in the **number of STEM Ambassador applications** received by the NDSGC each year is also an indicator of program success, especially as these applications continuously come from more affiliate colleges and non-research institutions, increasing the reach of NDSGC programming.

Students who receive funding for **travel grants** to present research at conferences are required to submit a **final report** detailing their experiences upon return from the conference. These final reports include any connections gained through networking as a result of conference participation and further achievement of academic and career goals. An upward trend in the **number of student applications** received by the NDSGC for travel grants each semester is also an indicator of program success.

SMART Goals: The following goals align with FY19 – FY20 proposed funding levels. The NDSGC will fund 5 NASA competition teams, with at least one team located at a non-research affiliate institution. The NDSGC will provide 4 summer faculty fellowships. The NDSGC will fund 8 *STEM Ambassadors*. The NDSGC will award 6 student travel grants, with at least one travel grant awarded to a student at a non-research affiliate institution.

These Higher Education (HE) metrics and goals are highlighted in the third and sixth columns of the *Summary Table of SMART Objectives*.

For example, to assess our goal of awarding funding to five NASA competition teams (with at least one team located at a non-research affiliate institution):

$$Goal\ (5) = \#\ of\ Competition\ Teams\ Awarded\ Funding$$

$$Sub\ Goal\ (1) = \#\ of\ Competition\ Teams\ Awarded\ Funding\ at\ non\ research\ institution$$

If we award funding to 5 total NASA competition teams with one of these awards going to a student team at a non-research affiliate institution, we will meet our goal.

C. Research Infrastructure

All students who receive funding of at least $2500 are **longitudinally tracked** through the National Space Grant Foundation. This metric includes all **Graduate Research Assistantship (GRA)** recipients. This annual survey is an assessment that can aid in determining program impact, as students continue in STEM studies or NASA-relevant careers. Students are surveyed about the impact of Space Grant programming on their academic and career paths, including data on current employment status.

Students who receive GRA funding are also required to submit a final report detailing their research progress and their experiences upon completion of their projects, at the end of each semester for which they receive funding. These **final reports** are used in part to determine the effectiveness of supporting GRAs for student achievement of academic and career goals. The NDSGC maintains **communication** with GRA recipients throughout their award period. An element of this communication includes an **official check-in** between the NDSGC team and GRA students regarding their research progress and overall experience. This **formative review** aids the NDSGC in determining impactful strategies to promote student learning and helps to identify effective mentors on these projects. This evaluation allows the NDSGC to improve the experience for both current and future graduate students.

Faculty Principal Investigators (PIs) who have received **Research Focus Area (RFA)** funding are required to submit a **final report** at the conclusion of their performance period. These reports must include research progress and results, discussion of accomplishment alignment with proposed outcomes, participant demographics (both faculty and students), resulting publications and conference presentations, outreach efforts, and plans for continued research development. The NDSGC uses these final reports to determine RFA program impact on student preparation for research and careers that support NASA's goals and the high-tech workforce development needs of North Dakota.

Any direct-funded students participating in RFA projects who receive funding of at least $2500, are **longitudinally tracked** through the National Space Grant Foundation. This annual survey is an assessment that can aid in determining program impact, as students continue in STEM studies or NASA-relevant careers. Students are surveyed about the impact of Space Grant programming on their academic and career paths, including data on current employment status.

Students who receive direct funding through participation in RFA projects are also required to submit a final report detailing their research progress and their experiences upon completion of their projects, at the end of each semester for which they receive funding. These **final reports** are used in part to determine the effectiveness of supporting RFA stipends for student achievement of academic and career goals.

Students involved in **Human Spaceflight Laboratory (HSFL)** research are required to submit a **final report** following the academic year, documenting activities throughout the year, participant demographics, resulting publications, outreach activities, successes, and challenges. Students working in the HSFL must demonstrate continued successful performance (indicated by number of simulation missions, innovative habitat, rover, and space suit development, improved mission strategies, strengthened NASA, institutional, and industry collaborations, publications or conference presentations, thesis research, impact of outreach activities, etc.) and on-time reporting to be eligible for funding the following year.

Student leads for **high altitude ballooning (HAB)** are required to submit a **final report** following the academic year, documenting team activities throughout the year, participant demographics, resulting publications, outreach activities, successes, and challenges. The HAB team submits **flight reports** to the NDSGC throughout the year and holds **regular meetings**

and launch debriefings to determine areas in need of improvement. The HAB team must demonstrate continued successful performance (indicated by number of launches, new payload development, improved launch, chase, and retrieval strategies, publications or conference presentations, thesis research, impact of outreach activities, etc.) and on-time reporting to be eligible for funding the following year.

SMART Goals: The following goals align with FY19 – FY20 proposed funding levels. The NDSGC will fund four ¼ time Graduate Research Assistantships (GRAs) in the fall semester and four ¼ time GRAs in the spring semester in the UND Space Studies Department (8 total GRAs). The NDSGC will encourage RFA involvement from affiliates at non-research institutions. The NDSGC will award at least one RFA to a non-research affiliate institution lead. The NDSGC will expand involvement in the HSFL and HAB programming to include interdisciplinary teams of student researchers, from both UND and affiliate colleges, with the goal of having at least one new ND affiliate institution committed to involvement.

These Research Infrastructure (RI) metrics and goals are highlighted in the third and sixth columns of the *Summary Table of SMART Objectives.*

For example, to assess our goal of awarding funding for two RFA projects (with at least one RFA project led by a PI located at a non-research affiliate institution):

$$Goal\ (2) = \#\ of\ RFA\ Projects\ Awarded$$

$$Sub\ Goal\ (1) = \#\ of\ RFA\ Projects\ Awarded\ with\ PI\ at\ non\ research\ institution$$

If we award funding for two total RFA projects with one of these awards going to a PI at a non-research affiliate institution, we will meet our goal.

D. Pre-college

The impact of educator workshops is assessed through **participant evaluations** and **future participation in NDSGC programs**. At **pre-service workshops**, the NDSGC distributes surveys to participants aimed at program improvement and evaluation of the achievement of workshop goals (e.g. increased confidence in teaching space sciences). The NDSGC reviews these evaluations in developing future iterations of the workshops.

The NDSGC completes more in-depth evaluations of **in-service workshops**. These **pre- and post- evaluations** include items on confidence in knowledge of space sciences and NASA missions, confidence in teaching space sciences, the building of networks with other ND STEM educators, knowledge on the availability of resources, and capabilities to conduct workshop activities with various groups of learners. The NDSGC regularly completes **Institutional Review Board (IRB) approved studies** at long-duration in-service educator workshops and utilizes these results in the development of subsequent professional development workshops. These results also aid the NDSGC in revising evaluations implemented in future programming.

All **pre-college student competition teams** (e.g. FIRST Robotics) are required to submit a **final report** following their event, documenting team activities throughout the year, participant demographics, outreach activities, successes, and challenges. These competition teams must demonstrate continued successful performance (seen by competition placement, special awards, improved team management strategies, impact of outreach activities, etc.) and on-time reporting to be eligible for funding the following year. An upward trend in the **number of student competition team applications** received by the NDSGC each year is also an indicator of program success. In the fall of 2017, the NDSGC implemented a new online application process to accommodate the growing number of student competition team applications and to increase the competitiveness of funding support.

All **Near-Space Balloon Competition (NSBC)** middle and high school teams are required to complete multiple forms of assessment. After submitting **proposals** at the start of the academic year, teams participate in **multiple design reviews** (NASA Project Life Cycle milestones, including video conference calls with college student mentors and the NDSGC team) to evaluate progress on their payloads and identify any guidance or resource needs for successful completion of the competition. At the competition, NSBC teams **present** their final payload design and research goals. Following the launch and retrieval, NSBC teams submit a **final report** documenting team activities throughout the competition, participant demographics, outreach activities, research goals, results, and analysis, and both successes and challenges. NSBC teams are evaluated at each stage of the competition by a panel of faculty and graduate student judges in STEM fields.

All NSBC participants (college student mentors, K-12 teachers, and students) complete an **online survey** following their participation in the competition. The NDSGC uses this survey to assess the program's impact on students' decisions to pursue STEM degrees and/or NASA-relevant careers as well as programmatic improvements for future iterations of the competition.

These competition teams must demonstrate continued successful performance (seen by competition placement, special awards, improvements made throughout multiple years of participation and/or one competition season etc.) and on-time reporting to be eligible for funding the following year. An upward trend in the **number of NSBC team applications** received by the NDSGC each year, and a **more comprehensive geographical representation of the state** by participating school, are both indicators of program success.

Any North Dakota middle or high school interested in participating in a **"mega-launch"** (a grade-wide high altitude balloon launch) must submit a **proposal** detailing their proposed STEM payloads, budget, timeline, and expected program impact on student participants. Selected schools will participate in similar activities to NSBC teams, such as: **multiple design reviews** (NASA Project Life Cycle milestones, including video conference calls with college student mentors and the NDSGC) to evaluate progress on their payloads and identify any guidance or resource needs for successful completion of the mega-launch. Prior to the launch, student teams **present** their final payload design and research goals. Following the launch and retrieval, student teams submit a **final report** documenting activities throughout the process, participant demographics, research goals, results, and analysis, successes, and challenges.

All mega-launch participants (K-12 teachers and students and college student mentors) complete an **online survey** following their participation in the program. The NDSGC uses this survey to assess the program's impact on students' decisions to pursue STEM degrees and/or NASA-relevant careers as well as programmatic improvements for future iterations of the program.

An upward trend in the **number of "mega-launch" applications** received by the NDSGC each year, and a **more comprehensive geographical representation of the state** by participating school, are both indicators of program success. In the fall of 2017, the NDSGC implemented a new online application process to accommodate the growing number of student competition team applications and to increase the competitiveness of funding support.

The NDSGC evaluates the effectiveness of its **space camps** in **summative surveys** given to participants (students in grades 3-8). The NDSGC uses this survey to assess the program's impact on students' decisions to pursue STEM degrees and/or NASA-relevant careers as well as programmatic improvements for future iterations of the competition.

K-12 Classroom visits are largely conducted by STEM Ambassadors. STEM Ambassadors (or other students, faculty, and staff conducting these visits) submit **data spreadsheets** to the NDSGC throughout the year regarding the impact of their activities such as the number of K-12 students and teachers participating in their programming. During classroom visits, STEM Ambassadors also distribute **participant evaluations** regarding their experiences and program impact. The K-12 student surveys inform the NDSGC of effective activities and any further trainings necessary for STEM Ambassadors.

SMART Goals: The following goals align with FY19 – FY20 proposed funding levels. The NDSGC will conduct pre-service workshops that impact a minimum of 200 education students from affiliate colleges. The NDSGC will support 20 educators to attend the annual in-service teacher workshop. The NDSGC will engage 400 participants in pre-college programming. The NDSGC will fully or partially fund participation of 3 teams in FIRST Robotics. The NDSGC will fund six teams' participation in NSBC with the goal of one of these teams coming from a rural or Tribal community. The NDSGC will support one mega-launch, with the goal of expanding to a school district in a rural or Tribal Community. The NDSGC will conduct a Space Camp for at least 15 students, with a focus on females in grades 3-8. The NDSGC will continue to conduct statewide classroom visits with the goal of visits to more school districts in rural or Tribal Communities.

These Pre-college (P-C) metrics and goals are highlighted in the third and sixth columns of the *Summary Table of SMART Objectives*.

For example, to assess our goal of awarding funding for six NSBC teams (with at least one team from a school in a rural or Tribal community):

$$Goal\ (6) = \#\ of\ NSBC\ Teams\ Funded$$

$$Sub\ Goal\ (1) = \#\ of\ NSBC\ teams\ from\ a\ rural\ or\ Tribal\ community$$

If we award funding for six total NSBC teams with one of these teams being from a rural or Tribal community, we will meet our goal.

E. Informal Education

Informal education events are largely conducted by STEM Ambassadors. STEM Ambassadors (or other students, faculty, and staff conducting these visits) submit **data spreadsheets** to the NDSGC throughout the year regarding the impact of their activities such as the number of K-12 students, teachers, and community members participating in their programming. When appropriate, STEM Ambassadors also distribute **participant evaluations** regarding their experiences to gauge program impact and make improvements for future iterations. These surveys inform the NDSGC of effective activities and any further trainings necessary for STEM Ambassadors. The **increasing number of requests** for UND **Aerospace Tours** and of **NDSGC participation in community events** is also used as an indicator of program success.

SMART Goals: The NDSGC will engage 1000 participants in informal education programming. The NDSGC will participate in an informal education event hosted by a Tribal College affiliate or held in a Tribal Community to encourage STEM and NASA involvement of American Indian students and their families and to encourage participation in subsequent years. The NDSGC will conduct an increased number of informal education events through the connections made with the ND STEM Network.

These Informal Education (IE) metrics and goals are highlighted in the third and sixth columns of the *Summary Table of SMART Objectives*.

For example, to assess our goal of reaching 1000 members of the public through informal education programming (with at least one event being held in a Tribal community):

$$Goal\ (1000) = \#\ of\ community\ members\ at\ IE\ events$$

$$Sub\ Goal\ (1) = \#\ of\ events\ held\ in\ a\ Tribal\ community$$

If we engage 1000 community members in informal education programming with one event being held in a Tribal community, we will meet our goal.

F. Summary of NDSGC Evaluation Plan

The NDSGC is committed to continue conducting meaningful assessments of the effectiveness of all programmatic elements. In addition to the aforementioned methods, **achievement of SMART goals informs decision-making each year.** Where the NDSGC succeeds in meeting SMART goals, existing methods are continued and expanded upon. Where the NDSGC falls short of attaining SMART goals, methods are re-examined and improvements are implemented. The NDSGC's *Summary Table of SMART Objectives* is presented in this section.

The NDSGC regularly utilizes **social media platforms** to encourage the participation of North Dakota students, teachers, faculty, and the general public, in all programmatic elements. The NDSGC has a robust presence on SnapChat, Instagram, YouTube, Facebook, and Twitter. The continued strategic use of these platforms (e.g. application of hashtags, tagging other users, events, groups, and locations, etc.) better reaches the next generation of students, who are actively engaged in this form of communication. Continued improvements in marketing strategies with social media has aided in the recruitment of students for various funding opportunities and participation in hands-on NASA activities. The NDSGC examines the **reach of posts via total** *retweets, views, shares, likes* **(and other reactions)** as well as **increased attendance at events and an increase in applications to NDSGC programming** as a result of social media use to determine the effectiveness of sharing information via these platforms.

Summary Table of SMART Objectives for FY19 – FY20
NIFS = NASA Internships, Scholarships and Fellowships. HE = Higher Education. RI = Research Infrastructure. P-C = Pre- college. IE = Informal Education, POP = Period of Performance.

Program	Verb	Metric	Population	Object	Goal	Timeframe
NIFS	Fund	NIFS awarded	College students	Females	51%	Annually
NIFS	Fund	NIFS awarded	College Students	Underrep minorities in STEM	15.2%	Annually
NIFS	Fund	# of NASA Internships	College Students	College Students	6	Annually
NIFS	Fund	# of Fellowships	College Students	College Students	11	Annually
NIFS	Fund	# of Bridge Fellowships	College Students	Tribal and Community College	3	Annually
NIFS	Fund	# of Scholarships	College Students	College students	225	Annually
HE	Involve	# Involved in NASA student competitions	Affiliate Institutions	≥ 1 team from non-research institutions	5	Annually
HE	Fund	# of SFF awarded	Affiliate Institution Faculty	Non-research Institutions Faculty	4	Annually
HE	Fund	# of travel grants	College students	≥ 1 from non-research affiliate institution	6	Annually
HE	Fund	# of STEM Ambassadors	College Students	STEM passionate college students	8	Annually
RI	Participate	# of college students in HAB	College students	≥ 1 group from non-research affiliate institution	2	POP
RI	Fund	# of GRAs funded	UND SpSt Graduate Students	UND SpSt Graduate Students	8	Annually
RI	Participate	# of RFAs funded	Affiliate Institutions	≥ 1 from non-research affiliate institution	2	POP
RI	Participate	# of HSFL activities funded	Non-research affiliate colleges	≥ 1 group from non-research affiliate institution	2	POP
P-C	Involve	# of ND pre-service teachers	ND pre-service teachers	Affiliate institution pre-service teachers	200	Annually
P-C	Involve	# of ND in-service teachers	ND in-service teachers	Rural and Tribal community teachers	20	Annually
P-C	Fund	# of FIRST Robotics Teams	High School students	Rural or Tribal community school	3	Annually
P-C	Participate	# of NSBC teams	Students grades 6-12	Rural or Tribal community schools	6	Annually
P-C	Participate	# of HAB "mega-launches"	8th grade classes	Rural or Tribal community school	1	POP
P-C	Participate	# of Space Camp attendees	Pre-college students	Female students (grades 3-8)	15	Annually
P-C	Participate	# of classroom visits	K-12 classrooms	Rural or Tribal community school	2	POP
IE	Participate	# of participants at outreach events	ND general public	Rural and Tribal communities	1000	Annually

Many secondary pre-college and informal education goals are achieved through primary programming initiatives (e.g. STEM Ambassador program).