

**2003 NASA Academy at the NASA Goddard
Space Flight Center**

Conceptual Education Template

Student Project Website

Alexander Soucek
Master of Space Studies Student,
International Space University

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Dear Participants of the 2003 NASA Academy,

The following paper shall help you to organize and develop your project related website for the NASA Academy 2003. To offer a useful website accessible from all over the world is not only an opportunity for any visitor / reader, but also for you. It is a way to market your ideas and efforts and it will be – *to speak in space terms* – a “secondary payload” (beside your actual project) you can “launch” to the public. It is also a tool connecting your scientific research with a public audience as well as students and teachers all over the place. This is why, despite the fact that your primary focus is the project itself, you should not forget about the power of a well-developed educational tutorial on the world-wide web...

Even if the following five pages may look confusing at a first glance, they give you the outline of what will later be **your individual NASA Academy website**. The three main headlines in Grey indicate the three levels we have developed:

- The **Intro Level** will more or less look similar (not identical) for each of you; it carries a bit of a “corporate identity” image, or say the “NASA Academy team feeling”.
- The **Main Level** will contain your detailed project description and should be enough for an average visitor to get both a good overview and some educational inputs.
- The **Scientific Level** will, according to your personal judgment, lead readers into the depths of science and provide additional graphics, material and links.

All texts you will find in Blue are examples taken from a student project of the 2002 NASA Academy, *Julie Arnold's Next Generation Space Telescope (NGST) Breadboard Optical Systems*. These texts are just for illustration.

Finally, don't forget that the actual website will look quite different. This paper is just the conceptual skeleton, nothing more. It shall help you, guide you and prepare you. Take time to read it carefully and start early enough thinking about your INDIVIDUAL WEBSITE. In a couple of months, Julie's text passages will be replaced by your own texts!

Good luck and have fun with this task.

LEVEL 1 (INTRODUCTION)

Title:

Does not need a clarification; but think of the fact that this is the first thing people will see when opening your website. It's also the reference for anyone speaking about your project.

NEXT GENERATION SPACE TELESCOPE (NGST) BREADBOARD OPTICAL SYSTEMS

Project Focus Area:

The PFA shall give one or two keywords capturing the scientific background of your project; it shall allow a visitor of the website to immediately identify the scientific context. Don't hesitate to indicate very broad areas – it's just for a first orientation.

OPTICS

Educational Key Points:

The EKP shall give an overview and / or suggest how teachers could use this project for educational purposes within their own institutions. The EKP can be both outlines of the main project phases / levels and ideas how project-related research for educational purposes could be performed / developed.

TESTING FOR OPTICAL HIGH-PRECISION INSTRUMENTS

DEVELOPMENT OF TEST METHODS

INTEGRATION OF OPTICAL TEST SENSORS

TEST METHODS USED AND EXPLAINED:

- PHASE RETRIEVAL METHOD
- SHACK-HARTMANN TEST

Background Story:

The aim of the background story, which will be displayed at Level 1 (Intro), is to capture the readers interest by a non-scientific (better: “not-so-scientific”), narrative description of the project background. Try to write down a short paragraph about the frame environment of your specific project; while doing so, try to think that you are narrating the introduction for a new IMAX movie or giving a TV interview to capture the fascination of the auditorium.

The Hubble Space Telescope (HST) has opened new windows to the universe. Its 2.4 meter diameter reflecting mirror and its perch above Earth's atmosphere allow it to create exceptionally sharp images. Originally launched in 1990, HST optics were repaired to their intended accuracy in 1993. Astronomers using HST continue to make numerous monumental scientific discoveries, including new estimates of the age and composition of our universe, previously unknown galaxies, evidence of massive black holes,

protoplanetary star systems and star forming regions, and a better understanding of physical processes in our universe. Despite these success stories, a “**New Generation Space Telescope**” (NGST) will soon take over and replace HST. One aspect of the NGST that is very different from previous observatories is its large, segmented primary mirror to be deployed in space. A crucial component for ensuring even more stunning successes after deployment is therefore the verification of optical performance on the ground. This project contributes to the design and implementation of testing methods for phasing the primary mirror and telescope – helping to obtain even better images of the wonders of our universe.

Student Information

Give one or two sentences describing yourself, mainly what you are currently doing or / and why you participated in the Academy program. You might want to have a link from this very brief personal introduction to your curriculum or personal homepages from here. Please provide a picture for this section.

Note: All additional personal information shall not appear on the introduction level (page), but will be accessible with links.



Hi, I'm **Julie Arnold**. I am an Aerospace Engineer (Sophomore level) studying at Massachusetts Institute of Technology (MIT). (...)

Link Bar

A link bar will lead the reader from the intro level to the main level (project description) and other related sites / levels. Try to think of four to six links you would like to include in your personal introduction page.

The Project	Teaching Tools	The NGST	Project Poster	Links
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Rating

Take into consideration that you will have to include a rating matrix in order to find out over time how useful your website was for teachers and students. NASA Academy will provide you with this matrix.

LEVEL 2 (MAIN PROJECT DESCRIPTION)

Abstract:

The Abstract shall give a compact overview over the entire project, including results, outcomes and future work / proposals. For this purpose, the Abstract should not be longer than 2 paragraphs. Try to write a representative statement which can be taken as such and shown to a scientist or teacher outside the website context.

Introduction:

*The Introduction is the first part where you actually go into depth on a semi-scientific basis. From now on, try to imagine standing in a university or college classroom and addressing students and teachers. The language shall be on a higher level than it was on the introduction page, but still you must not forget that your homepage is an **educational tool** and has to be helpful rather than inapprehensible.*

Step by step description of the project:

Try to keep the following pattern in mind when developing the main level of your project website:

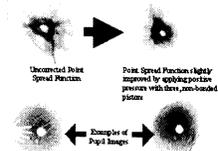
- ✓ **That was my basic question or goal (*Statement of problem*)**
- ✓ **That's how I prepared the project**
- ✓ **That was *step 1***
- ✓ **That was *step 2***
- ✓ **That was *step 3***
- ✓ **That's how I came to my conclusion or end result**
- ✓ **That is my *conclusion / end result***

*The process outlining shall be supported by pictures / graphs (see below). The reason for us to propose you this pattern is the experience that it supports the effectiveness of (science) education if you keep a consequential order (**develop a story board**). Contrary, it will help **you** to structure your project or any related presentation thereof.*

Graphical Back-up:

In order to make the website attractive for readers, and in order to support your scientific and educational level (!), try to include graphics / pictures. At this point you have to be careful: Do not overload your main page with graphics, but try to find a reasonable balance. The following points of interest may help you in choosing graphics:

- Avoid large images (download time)
- What graphics actually **help understanding** the text?
- If you were a high school teacher, what graphics (pictures, videos, etc.) would you be interested in?
- Teachers or students may wish to print or copy a graphic
- If your project consists of a step-by-step process, you might want to illustrate that by providing one image per step to visualize the progress
- **Simple** graphics (easy to make) often help more than complex ones
- Try to **support** teachers with your material, not confuse them



While choosing material for the main level, bear in mind that you have a third level as well to really go into science. Save complex graphs or long calculation sheets for the science level.

Links to the Science Level (Level 3):

*One of the most challenging problems of your website development is to find useful links in order to lead interested or more advanced readers into the real science. For this purpose, we developed the three-level-approach. It will be up to you to identify interesting **areas / problems / statements** you want to develop in more details. Once you have made up your mind, a minor, but nevertheless important step is to identify the best **keyword** or passage in the main level text for establishing the actual link.*

Links to pages outside the webpage should be avoided within the main level text (takes time to open a new window, distracts). You can provide such hyperlinks at the end (science level).

*And last but not least: **Do not overload your text with links. Stick to the point and think of useful links rather** than making the reader spend two hours going through your main text because he has to click on two links per sentence...!*

*You can describe phase retrieval as an image based wavefront sensing method which estimates **optical aberrations or “imperfections”** from conventional defocused point spread function images and pupil images.*

Concluding statement for main page:

Another aspect you might want to take into consideration is to explain in a last point why your project is important or useful:

- See, that’s what NASA (or you, the reader) can get from my project.
- This is the potential of my findings.
- That’s what people can do to continue.

LEVEL 3 (SCIENTIFIC LEVEL)

Purpose:

The Scientific Level will be the most sophisticated one. It gives both you an opportunity to show your scientific level and background and the interested reader an opportunity to deepen his / her knowledge.

Sub-chapters

The content of your third level will be determined by the amount and nature of the hyperlinks you applied in your main text. Every link will lead to a scientific sub-chapter you can arrange, organize and design as you want. But even at this stage try to stick to useful in-depth information:

- Try to educate teachers
- Try to instruct them on how to conduct experiments
- Include graphics and provide material
- Give hyperlinks to related websites
- Think of educational tools

You see that this can easily lead to loads of work. During the academy you will not have the time to develop endless numbers of sub-chapters. Try to keep these subchapters short, too, or refer the reader to related websites. A sub-chapter on Level 3 can even consist of just a full-length equation / calculation or a set of screenshots from a computer program you used.

Good luck!