



NATIONAL SOCIETY OF BLACK ENGINEERS

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STEM Community Training: Curriculum Design Workbook

VERSION 1.2

July 2011



Introduction

The purpose of this curriculum workbook is to assist TORCH volunteers and group leaders to develop their program content in an organized, outcomes based, and easily reportable fashion. The completed workbook can be submitted for each of your TORCH programs or events to your regional and national counterparts for easy tracking of NSBE programs and their success. Completing the workbook will guide you in designing more effective programs, assessment instruments, ultimately reaching the TORCH objectives.

TORCH Objectives

- To provide science, engineering, technology and mathematics **exposure** opportunities within black communities
- To stimulate **enthusiasm** about science, engineering, technology and mathematics within black communities
- To provide introductory **training** to members of the community in modern technology, software and technical knowledge
- **Promote the value** of science, engineering, technology and mathematics education at all levels
- Encourage greater black **participation** in science, engineering, technology and mathematics at all levels

TORCH Umbrella Categories

TORCH is an umbrella program of NSBE that encompasses outreach activities that impact non-NSBE members and NSBE members alike, especially pre-college youth in black community. Although increasing membership may be a result of these activities, TORCH programs seek to provide services ahead of promoting membership. TORCH programs are divided into the following branches:

- STEM Community Training
- Informal Engineering and Science Education
- A Walk for Education
- Technical Expertise Services
- Traditional Community Service Activities

Determining Your Audience

This is the most important and fundamental component of planning your TORCH programs and events. Answer the following questions inline to specify your audience.



Community Partners

This section will help you gather specific information regarding potential community partners. If your chapter has already selected a partner, still complete this exercise as opportunities and limitations of your program may still be identified in the process.

Our chapter has relationships with the following community organizations who service the members of our local community (Examples include Boys and Girls Club, afterschool program, public school or community center):

Specify the resources associated with each community partner option. Resources include meeting space, technology access, community relations professional, etc.

Current program offerings of the community partners:

Community partners service the following groups:

Pre-K – 2nd grade 3rd – 5th grades 6th-8th grades 9th-12th grades

Working adults Senior citizens Other (please specify)

Of the groups indicated, how many participants are currently served by programs:

Community partners' hours of availability (Include any limitations or space specific availability)

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

Sunday

Special considerations:

The community partners have indicated a need or desire for the following types of programs:



Identify the following of your selected community partner(s):

Strengths: What do they already do well? What attributes of the partner will help ensure success for a TORCH program?

Weaknesses: What programming deficiencies exist for the community partner? What are potential issues that are already clear in working with the partner?

Opportunities: What are the characteristics of this community partner that NSBE can assist in improving? Indicate any specific factors that the TORCH program can enhance?

Threats: What are major issues or limitations associated with the community partner?



TORCH Program Design

Some important information will need to be collected from your community partner or an evaluation of the participants that you will service. A few important items can be easily identified and that information used to design the program! If your chapter will complete more than one program in the year please fill out this section for each separate program.

Our TORCH program will service (circle demographics):

Pre-K – 2nd grade 3rd – 5th grades 6th-8th grades 9th-12th grades

Working adults Senior citizens Other (please specify)

What are the specific needs of this population that your TORCH program intends to meet? List as many as apply (Examples: computer literacy training, supplemental instruction, exposure to the engineering design process, GED preparation, access to mentors, etc.)

Our TORCH program fits in this **one** umbrella category (see the TORCH handbook for detailed descriptions):

STEM Community Training
Informal Engineering and Science Education
A Walk for Education
Technical Expertise Services
Traditional Community Service Activities



Developing an Objective Statement

The objective statement can seem rather simple and easy to develop, but it is very important to take the time to develop. Your objective statement should be high level; it should direct the overall theme and content of your program and clearly communicate that to anyone who reads it. It also answers who, what, where, when, and how. Own your objective statement – it's what you do to make a difference in the community!

Example objective statements:

“The ___ University NSBE TORCH program will provide computer literacy training opportunities to working adults in the city of ___ during the fall of 2010 through a partnership with ___ community agency and utilization of Microsoft office program suite.”

“The ___ NSBE Alumni Chapter TORCH program will provide engineering exposure experiences to middle school students in ___ city through company site visits, hands on engineering activities, and mentor matching for the 2010-2011 NSBE year.”

“The ___ chapters joint TORCH program for the spring of 2011 will provide supplemental instruction in science and math for ___ high school sophomores through seniors at the ___ university campus.”

Our TORCH program objective statement is:



Backward Curriculum Design

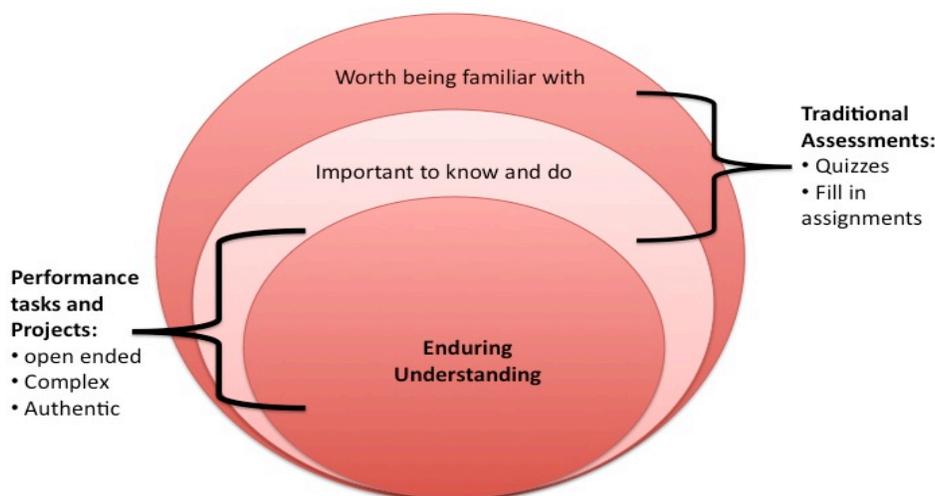
To develop a good curriculum, your team should use a backward design process, much like backward design in engineering. Use the following exercises to develop your curriculum with the end in mind. Also in designing the content, developing your evaluation tools at the same time will help ensure that your program is constantly evaluated and ensure success.

Establishing Curricular Priorities:

At the core of designing your curriculum is determining what your group desires your students to walk away with “enduring understanding” of. Enduring understanding in the context of TORCH could range from any of the following:

- What does a mechanical engineer do?
- Design of presentations in PowerPoint
- Safe navigation of the internet for personal and professional use
- Mathematics is not a scary subject!
- Value of technology in our day to day lives

It is also important to make sure that your enduring understanding ideas are not too ambitious. Selecting an enduring understanding topic of thermodynamics and calculus for a group of fourth graders may be a bit ambitious, however understanding heat and temperature and how to measure both may be more attainable.



Adapted from: *Understanding by Design* by Wiggins, G. P. and McTighe, J. (1998) Association for Supervision and Curriculum Development



Our TORCH Program seeks to reach the following “enduring understanding” objective:

Along with determining the enduring understanding objective, your team should identify the desired results. Your results should ideally link and support your objective statement as well. Below are examples of results based on the prior enduring understanding objectives:

- Participants will decide to major in mechanical engineering
- Participants can design professional PowerPoint presentations to present a variety of information
- Participants are comfortable using the internet and adequately protect themselves, finances, and privacy from internet based predators
- Participants overcome mathematics anxiety and are able to perform at grade level mathematics
- Participants are comfortable and able to use commonly found technology artifacts in their daily lives (computers, self check out scanners, online banking, basic computer operations etc.)

Our TORCH program’s desired results are:

After you determine what you want your students to gain enduring understanding of and the desired results, the next step is to decide how you will expect the students to demonstrate it. In your classes this is often done by a test, final project, or presentation. The same idea, but in a more creative fashion are what TORCH programs should do. Instead of giving your students a multiple choice examination, maybe a design project, presentation about themselves, or completing a competition will demonstrate their understanding. In some cases this can also be done through surveys, or other assessments given throughout or at the end of the program.

Determining the evidence you want your participants to demonstrate is key for producing artifacts to show others your program and what it does. This information can be used to advertise for future programs, submit in Institute for Chapter Development reports, maintain for documentation of the program and give your participants something tangible to say that they have learned something from your program. Evidence can be collected or produced at every session or at the end with a single item.



Based on the previous examples, here are some ideas of the types of evidence that a TORCH program could collect, but be creative!

- Participants design a small practical device with a basic engine
- Participants create a PowerPoint presentation about themselves using a required number of features
- Participants indicate increased confidence in using the internet properly and know how to identify fraudulent e-mails and websites
- Participants score well on a mathematics competition (Try Math-A-Lon) competition
- Participants demonstrate increased confidence in using everyday technology

Our TORCH program's evidence will be:

Planning TORCH Sessions

This is the part that we all tend to jump toward first, but is really the last item in good curriculum design (yet the most fun!). Early on decisions about when programs will take place should have been made and now with the set schedule we can again work backwards from the final meeting date and fill in the blanks. What do you want the final TORCH meeting to look like? Will it be participant presentations? A science fair? Or will your final meeting be a celebration of the TORCH session? Based on what your culminating activity will be fill in the last block of your TORCH Session Calendar. Using the TORCH Program Timeline document ensure that you plan for time for your group to complete program review, considering the end of the semester, or holiday seasons that may take your volunteers away. Using the example below as a guide, develop your final meeting date agenda.



Tentative Agenda for Final TORCH Meeting Date

Date:

Start Time:

End Time:

Ex.

- 8:30 AM - Volunteers arrive and set up
- 9:00 -9:25 AM - Participants arrive and breakfast
- 9:25 -9:30 AM - Settle in
- 9:30 – 9:35 AM - Introduction
- 9:35-10:30 AM - Participant presentations – 10 minutes each
- 10:30-10:40 AM - Icebreaker/ Brain Wake Up
- 10:40-11:00 AM - Motivational speaker
- 11:00AM-12:00 PM - Participant display tables/fair
- 12:00 PM - Dismiss

Our TORCH Program Final Meeting Date Agenda

Date:

Start Time:

End Time:

Begin and End Time	Details	Responsible Volunteer

Your proceeding events should also be well planned to ensure that your team reaches the objectives for each session. Ensure that each session objective links in some relevant way to your overall objectives. Take baby steps backward to fill in the following for each of your proceeding events using the TORCH Program Session Agenda Form.



Budget

How in the world can we afford this program?! We're sure this is running through your mind now that you've gone through planning the entire program. Rest assured, you can gain resources for your program, especially after completing the program design process. The National TORCH committee provides funding on a rolling basis to support chapter TORCH programs. By completing all the documentation requested in this form and the supporting documents, securing funding is as simple as attaching and clicking send. Use the TORCH Model Budget below to support your funding application. Ensure that you request as few consumables as possible. This includes "one-time" use items that do not directly support your program objective. Items such as meals, t-shirts, speaker honorariums, and other such items do not directly support the program. Items such as equipment, software, supplies, and even paper and pencils are appropriate expenses to list.

Beyond NSBE, your chapter could gain TORCH program funding from your college, local businesses, corporate partners and other sources in your local community by simply spelling out what your program will do. While TORCH is not meant to be a chapter fundraiser, it can easily sustain itself financially with just a little leg work on the part of the chapter TORCH committee. Use the National TORCH Funding Request form to organize your budget request to obtain funding from NSBE for your program.



Other Resources

Beyond this workbook there are several resources within NSBE and external that can be used to support your chapter's TORCH program. Use the following list of resources and others for creative TORCH programs and events. If you are based on a college campus, check with your campus or college of engineering outreach office as well for local support.

National TORCH Chairperson & National TORCH Committee Contacts
torch@nsbe.org

NSBE TORCH National Website
<http://www.nsbe.org/Programs/NSBE-Programs/T-O-R-C-H-.aspx>

National Science Digital Library
<http://nsdl.org/>

This collection of tried, research based engineering and science activities contains a variety of projects based on subject area and grade level. Once your objectives are established your team can use this search engine to collect project ideas that have been funded through National Science Foundation programs.

Engineering Go For It!
<http://www.egfi-k12.org/>

Engineering Go For It is a great resource for your TORCH program participants to learn about many of the engineering disciplines, get recent technology news, and learn how to prepare for careers in engineering. The "For Teachers" section provides in class project ideas that may also support your program.

LEGO Education
<http://www.legoeducation.us/store/>

The LEGO Education site is primarily a retail site to purchase LEGO's many education and robotics kits. There is also an activities page to share project ideas and find out what other things teachers and students are doing with their LEGO kits. Also, join the community! LEGO offers classroom scholarships that your program could be eligible for to get new equipment.

Junior Engineering Technical Society - TEAMS Competitions
<http://www.jets.org/teams/>

This national competition geared toward high school students challenges students to apply their mathematics and science skills to engineering problems. You could have your group join a competition or simply purchase the very inexpensive competition sets and have your own competition or plan an entire session on the competition themes.



PBS Zoom - Show Activities

<http://pbskids.org/zoom/activities/index.html>

This fun website offers students a variety of activities that can be done with simple at home supplies and apply engineering and science principles. The site also offers educational games, and resources for teachers and parents.

Teach Engineering: Resources for K-12

<http://www.teachengineering.com/>

The Teach Engineering site offers a range of simple short activities through entire subject areas of lesson plans in engineering principles. By selecting the appropriate grade level, and the time that is available for the activity your team can select a variety of projects that help teach engineering and science concepts. Also, a helpful tool is their link to state educational standards, as each of the projects on the site have actually been used in classrooms around the country. If your TORCH program needs additional evidence of effectiveness, try to select activities that relate to state educational standards.



Tips for Mentors

Being a TORCH mentor is a rewarding experience! It is also not one for the faint of heart or those who are not committed to positively impacting the community. You've taken the hardest steps in planning an effective TORCH program and implementing is where the fun comes in. Here are a few things to keep in mind as your team's volunteers begin to prepare and execute your TORCH program.

- There is a good chance that you are the only view into engineering for your program's participants
- Think of how you got into engineering or science, and try to use that to encourage your students
- It's not easy, but it is worth it!!
- Patience is key.
- Remember WHY you are doing it every time you go
- Servant leadership is the best leadership

"Service is the rent we pay to be living. It is the very purpose of life and not something you do in your spare time." - Marian Wright Edelman