Section 5 - EDUCATION

Education

Classes

While many projects in this handbook involve some aspect of space education, this section deals with formal classes. You can use this information when teaching classes yourself or to help teachers develop their own space education projects.

why?

There are many reasons why an NSS chapter or an individual member may decide to teach a class about space development:

1. To present these ideas in a serious, responsible manner to as wide a range of people as possible.
2. To publicize your group and improve its image.
3. To attract new members.
4. To make money.
5. To develop/improve teaching skills of the members.
6. To increase your own knowledge of the field.
7. To educate a special target group, such as teachers or leaders of Young Astronaut chapters or Scout groups.

NSS has a definite image problem with the general public. People have a need to fit things into categories. To the question "Who are these people?" the reply, "We teach such-and-such class" helps to define us to them in terms of a familiar, credible and worthy activity. Sitting at booths and handing out literature will actually reach MORE people, but to some this equates us with "fringe" groups.

Publicizing a chapter and its activities is another concern. If you teach a class that is part of a larger program, you may get free publicity in its publications. Anyone who reads them will at least know that space development is a topic being seriously discussed. (Of course, you will be very careful about how your class is described!)

These publications may also bring your chapter to the attention of the media, leading to useful interviews and articles. A course description and outline enclosed in correspondence will help establish the legitimacy of your group and your requests.

The course can turn a student's casual interest in space into a lasting one. Your graduates are a source of knowledgeable, enthusiastic and active members, maybe even a future chapter president! A class can be a way for a lone NSS member to build a strong nucleus for a group. The pleasure of finding others who share your interest in space can simply be too good to give up at the end of the course.

Those who teach will reap personal rewards in return for their considerable investment of time and effort. Teaching a subject is the best way to keep up with current developments. The organizational, teaching and speaking experience gained may be useful in career and other endeavors. Lastly, friendships formed are an especially pleasant dividend.

why not?

In all fairness, giving a course may not be right for your chapter now. Other projects may give a far larger return for your efforts. You may get only ten people in an adult education class, while a SpaceFair may attract a thousand. There are better ways to make money, and it is a rather slow way to build a group.

Read this section through and then decide whether a class fits your interests and needs at this time.

what kind?

You have a wide range of classes to choose from. To get started you may want to "hitch-hike" on an existing class as a guest lecturer. Your own class can be a full semester adult education class, an enrichment class for a school group or a single-session workshop.

captive audiences

If you have been disappointed by poor turnout at your chapter's public programs, it will be an extra pleasure to know that a guaranteed audience will be there for your presentation.

Always be aware that there is another kind of captive audience at school and other youth activities--the teachers, parents, Scout leaders and other adults. You may never have the chance to present our case to them again.

Often, one will come up to you afterward to say (with surprise) how much THEY learned! By catching their interest and teaching them something you have positively influenced a possible ally and helper. Keep a supply of newsletters, *Ad Astras* or information sheets with you to give them and add them to your contact file.

Preschool and Early Elementary

This can be rewarding if you like and are comfortable with this age group, but the returns are limited.

One instance where activities for young children can be VERY useful, however, is when you give simultaneous programs or workshops for more than one age group. Parents will be much more likely to bring an older child and/or participate themselves if there is a program for younger siblings.

Decide on a definite goal for the program, for example, learning the parts of the Space Shuttle. They can cut out a white orbiter and solid rocket boosters (SRBs) and orange external tank and paste them on blue paper. Then they could draw a launch tower or rocket exhaust. You could cut and paint large cardboard Shuttle components and have the kids walk through a launch and landing after you explained it with a model. Make up a simple song to a well-known children's tune. The same things can be done with a space station theme.

Elementary Space Education

[Editor's Note: In many ways the 3rd to 7th grades are the most receptive audiences. You can tackle some fairly abstract concepts like gravity vs. free-fall or pseudo-gravity and centrifugal force if you use demonstrations and relate these to their own experience. DOROTHY DIEHL, an NSS member who is a part-time teacher's aide, shared some of her experiences as a space educator in the May, 1983 L5 NEWS:]

In preparation for the visit of astronaut Gordon Fullerton's mother, the students at Dorothy's school filled out space science vocabulary worksheets and wrote down questions that they wanted to ask Mrs. Fullerton.

Bulletin boards were set up with a days/hours countdown for the then upcoming space shuttle mission #STS-5 launch and information about the mission, a 3 1/2 by 28-foot time line of U.S. space projects since Sputnik, NASA photos and reports, collections of NASA emblems and *Life Magazine* covers and space posters. Fourth grade students figured out a crossword puzzle whose clues were answered somewhere on the bulletin boards.

On the eve of the launch of STS-5, a group of eligible fifth graders gathered at Dorothy's home for a slide presentation. After settling down in their sleeping bags, they listened to a tape of the radio transmissions during STS-5. At 4:05 a.m. they awakened to the voice of High Harris at Mission Control over the telephone amplifier. They viewed the countdown and launch of STS-5 when the commercial networks finally decided to telecast it. (Cable Network News usually gives much better mission coverage.)

Dorothy offers this advice: Elementary space education is important because many people begin forming life-long interests when they are in grade school. They usually do not make specific career choices then, but it's a prime time for planting the ideas that initiate career formation.

Grade school children respond enthusiastically to space. Either they still retain the child's spirit of adventure and exploration or their organic molecules "remember" their origin in the stars and "recognize" their kinship to them. Whatever the reason, their enthusiasm will keep an adult space activist going indefinitely.

Projects rather than a regular space education class can be integrated with regular classes providing much learning motivation. For example, Dr. David Smith's 5th grade students in Lewiston, Idaho devised their own astronaut-qualifying test as part of a shuttle launch project in the spring of 1981. They required that students demonstrate outstanding citizenship, pass a math test, decipher a Morse code message, recite the order of the planets, label parts of the ear, read a map, and run 600 yards. (*INSTRUCTOR*, Nov., Dec. 1982, p.24.)

Other ways space education can be included are as follows:

1. Social Studies--News reports of current space events and how they affect geopolitics, economics, technology, etc. A futures unit would include space communities. History of U.S. and/or U.S.S.R. space programs.

2. Language Arts--Writing and mailing business letters to companies and institutions for space information. Allow only two or three students to write to the same address. Vocabulary study of space science terms.

3. Math--Reading and writing large numbers or numbers with exponents of astronomical distances. Calculating scale models for distance and size.

4. Science--Gravity and motion experiments. Names and order of the planets. Geological description of the planets. Voyager, Galileo, Pathfinder, Global Surveyor, Cassini, Mir spacecraft positions, velocity, direction, returned photographs and information. (Visit the NASA JPL website off of http://www.nasa.gov for latest positions. Star parties. Model rocket launches.

5. Art, Music, Literature--Design a space station or spacecraft or space habitat. Draw space-related pictures to music. Creative writing, poetry.

6. Health-Importance of exercise in microgravity. Nutrition in spaceflight. How space conditions affect the way food is processed for use in space.

Helpful procedures for doing space education are as follows:

1. Make contact with a teacher or administrator who thinks a space education project would be good. Some teachers are not interested in space or not very knowledgeable and may have a negative attitude. Be sensitive to these feelings, because you are selling support for space programs as well as teaching space education. Also remember that teachers are bombarded with requests and expectations, from controlling head lice to promoting physical fitness contests to providing classroom experiences in democratic government to saving baby seals AD INFINITUM. Have a

definite but general outline for your suggested project. Welcome suggestions. Always go through channels. Courtesy is a must.

2. If you are not an artist, photographer, or calligrapher, make sure you have friends who are and who are willing to volunteer to help you lay out displays, etc.

3. The more posters, slides, videocassettes, etc. of space subjects that you have in your file, the better. If you have to order any of these items for a project, plan on about three MONTHS lead time.

Here is a sample project I did for the Spacelab 1 mission:

1. Since I had posters and photographs on hand, I began planning about Nov. 1. I asked the principal's permission to use about 30 feet of the wall space in the hall for a bulletin board. I asked a helper to print the captions. I cut out 6" letters for the title myself because it was short.

2. We put up the items gradually beginning about T-minus-10 days. You get more mileage out of the students' span of attention that way.

3. The 4th grade teachers allowed me to do a 20-minute oral presentation about the mission. I ask the students a lot of "why" questions and get them to guess and/or figure out the answer. I partially accept "wild" guesses and try to "herd" them into the correct answer. Never put down a student's wild guess.

When doing a presentation, the following is also important:

A. **Use simple sentences with words of two syllables or less**. Do one basic concept per project. For Spacelab 1 we concentrated on how the orbiter flies in a straight line, but its flight path on a map is a wavy line. We also talked about the crew and their work, but the flight path was our main problem.

B. **Make it concrete**. We used a ribbon around a globe to represent the inclination of Columbia's orbit. On the wall behind the globe we had an enlarged map of the Pacific Rim showing the de-orbit glide path. (Original map was from the Spacelab Press Handbook.) To solve the straight line-wavy line problem we used an orange peel and some adhesive tape.

C. **Relate the concept to familiar experiences**. We compared the time it takes to drive four miles to a neighboring town. Then we thought about the orbiter going the same distance in less than a second.

D. **Be accurate in what you say and illustrate**. Accuracy in round numbers is all right. Remember that astronomical scale model diagrams do not fit in textbooks. You can't use the same scale for size and distance of the solar system unless your school has a hallway with three miles of wall space. Do not use popular fictional space characters and stories when teaching space science. I also avoid discussing UFOS, aliens, humanized robots, etc. Grade school students do not always distinguish clearly between fact and fantasy. Space science is so new it doesn't seem very factual.

E. **Be enthusiastic**. Tell them over and over that some day they will be working in space IF they do all their homework carefully while in school. We had the students watch the launch of Columbia and Spacelab on Nov. 28. They reported during the flight what they had seen on the evening news and what they had read in the newspaper about the mission. We had planned to watch the landing, but it was delayed past school dismissal. I

4. We involved the students by giving them an information hunt as a contest. To win they had to write down the missing information by studying the bulletin board and using map reading skills.

5. I evaluated their work and invited the reporter of the local paper to come for their award ceremony. The winners each received a 4" decal of the official Spacelab emblem and a Mars candy bar. The reporter took their photograph for the paper and wrote a news item about the contest.

6. I had the display photographed in detail for my file before dismantling it. If someone helps me a great deal, I send them a written appreciation. For Spacelab, this meant a thank you note to the NASA engineer at Vandenberg AFB for sending me a Spacelab Press Handbook and other materials. I also asked the teachers for recommendations for the next project.

High School

Space education can also be done at the secondary level. However, DOROTHY DIEHL points out three problems to keep in mind:

1. Class schedules are tight and curriculum objectives are comprehensive, leaving little time for a subject often considered an enrichment item.

2. Secondary students have so many personal, social and academic concerns, that a space activist is faced with considerable competition.

3. Due to mathematical probability, there will usually be at least one very bright student in most secondary groups who will be as technically competent as the space educator. This is not a problem as long as you are accurate down to your decimal points. Having a student point out discrepancies can reduce your credibility. Since living in space is not a commonplace reality, your credibility is very important.

However, there is still much that we can do with this age group. Most importantly, teens should be made welcome in your chapter. They can be very helpful with chapter projects. You will sometimes find a teen who even initiates projects and takes on leadership responsibilities.

A teen may come into your group when a parent joins or she may bring in the rest of her family when she becomes active. After all, most teens need transportation to chapter activities; you may be able to get the driver to stay too!

Not only should you welcome these young people as potential workers, but remember that they may start a new chapter when they go to college or move for a job. Lastly, they add variety and a different point of view to your membership.

There are some school-based opportunities for space education. You can develop an assembly program similar to those given by NASA's education specialists. Perhaps there are science clubs or enrichment programs already in existence. You may want to start a space science club or a space Explorer post, especially if you are a teen or the parent of one. See Section 4 - PROJECTS, for information about Exploring.

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Teaching Space With History

by Dr. Lawrence C. Wolken

[Editor's Note: This article appeared in the December, 1979 issue of "The Colonist," the newsletter of the L5 Society of Texas. While some references are outdated, the general idea of applying history to space is intriguing.]

The success of shows like "Star Trek" and "Star Wars" is ample evidence of the public's interest in space. This interest-needs to be focused into a grass-roots support of space activities.

One way to accomplish this is through our schools. To date, most efforts in this area have concentrated on science courses. Unfortunately, such programs reach a relatively small portion of the student body. By bringing space into the American History classroom we could reach virtually every student in the nation. But how can this be accomplished?

In our schools today, a great deal of time is spent studying the period of exploration and colonization of the New World. If one looks closely, many parallels exist between this period of history and today's exploration and colonization of space. The early explorers were financed by government funds. Colonization of the New World was begun by private companies hoping to make a profit. Today, many companies have purchased cargo space in the first flights of the Space Shuttle. They hope today's research and development will lead to profitable products and techniques in the future. Early explorers and colonists searched for riches such as spices, gold and silver. Will the search for cheap energy lead the way to colonization of space? These are just a few of the more obvious similarities between the past and the present.

Many teachers are finding the space/history approach attractive for several reasons. For one thing, the student's interest in space is transferred to the study of history. It also helps the student realize that a knowledge of the past can be helpful in solving some of the problems we face today. After all, don't we study history so we won't keep making the same mistakes? Will we treat our space colonies the same way England treated its colonies? How should space colonies be governed? Should they be privately owned? Will we treat extraterrestrials the same way we treated the American Indian? What will happen if they are more powerful than we are? These questions can be covered using a wide variety of techniques which differ greatly from the usual lecture format. This teaching method, then, gives the history teacher a unique opportunity to make the course lively and exciting for students.

If we sincerely want to develop a greater public understanding of space and its potential benefits, the history classrooms of the nation offer a golden opportunity. This will not yield immediate results, but its effects will be widespread and long-lasting. Today's students will be tomorrow's voters and will help shape the nation's goals. Perhaps the most important decision they will face is whether mankind will venture into space or remain bound to the Earth's surface.

Adult Education

Much of the information in the following section is also relevant to courses for other age groups.

groundwork

If you or your chapter decide to give a class, whether it is a single session workshop or a full-semester course, you MUST allow enough lead time to produce a superior product. If you frantically write each lesson at the last minute, it will show, and the project could end up being an embarrassment to you and your chapter.

where?

There are probably several adult education programs in your area. Collect their brochures and compare their administrative structure, course offerings, fees, etc. If there are no existing continuing education programs in your area, you may have to set up a class yourself in a library or community center. You will then have to take care of publicity, audiovisual equipment and fee collection yourself.

how?

Most program directors are happy to get suggestions for new courses, but you must come prepared with a detailed outline of course content and tell him how many sessions you plan, who will teach it and why you think it will attract students. He will have helpful suggestions, but he will not put the course together for you.

He will want to know why you are qualified to teach this subject. Be confident, if you carefully research the material you plan to teach, you will probably be the "expert" in your area.

Once he has expressed interest in your course and you have discussed its structure, you will want to check on pay (if any), schedules, deadlines for brochure information (usually 2 or 3 months in advance) and the availability of A-V equipment, blackboards and reproduction of supplementary material.

content

You may want to give students an overview of the entire field of space development or concentrate on one aspect, e.g. space stations or teaching space.

Remember that the course must give the students more information about and understanding of the topic(s) than they can get from buying a paperback or two or by attending your chapter's meetings. Ideally, they will learn so much that they will want to become an active NSS member to keep up with developments.

Historical background material helps students to understand present developments, but don't start with the history of rocketry, etc. until you have given an exciting view of the potential of space development. Otherwise, you may lose their interest with a bunch of seemingly unrelated space projects. Continually remind them of each topic's place in the ongoing adventure of humanity's movement into space.

The "whys" or politics of space are never as easy to pin down as are names and dates, but they put life and meaning into the facts. It is useful to compare accounts written at the time of an event with those from a later date. Try not to exclusively push our own view of history or current politics, but let the students see that a situation may be considerably more complex than it first appears.

titles and descriptions

Your course will be one of many in the brochure. The title must catch their attention and the short description convince them that it will be interesting and useful enough to spend time and money on. Of course, don't let your enthusiasm cause you to misrepresent the course or promise more than you can deliver.

Look at old brochures to get hints for titles and a format for the description. "Space Shuttle and Beyond," "Space--The New Frontier," "Our Once and Future Space Station," "Teaching Space" and similar titles can be used.

teachers

If more than one member will be teaching your course, you may choose one to be the course coordinator who is responsible for the many administrative details: liaison with the education director, brochure material, scheduling of classes and instructors, obtaining supplemental material and A-V equipment and attending all sessions. Rotate this position among your experienced teachers each time you give the course so that each learns the important details of running it and shares the work and responsibility.

In order to make this a true group project, involve other members, especially graduates of the course. You can ask someone to teach a specific topic; they may pick one or suggest a new subject or approach that they would like to develop.

money

Some programs pay quite well, but others do not pay at all. If the latter is true, make sure that they provide A-V equipment and reproduction of handouts, or giving your "free" course may be quite an expense.

The stipend may be donated to your chapter, divided among the teachers or split between the chapter and the coordinator with the other teachers donating their services. Whatever system you use, make sure it is clearly understood and agreed upon by all participants before the course begins.

If the chapter gets money from the course, you may want to designate that it be used for educational materials of direct use in future courses, such as slides, videotapes or subscriptions.

publicity

As with any chapter activity, you can not have too much publicity! Don't depend on the program's publicity. Push your course in your newsletter, at your public meetings, mall exhibits, etc. Distribute posters to libraries, schools and other public places. Try to schedule a radio interview show two or three weeks before registration and work a solid plug for your course into the conversation.

students

Encourage active participation by your students from the start. Schedule time for questions and discussion. This will tell you what they want from the course and what their levels of knowledge are. It also allows a feeling of fellowship to develop. Learn and call them by their first names to promote this.

You may want to plan a specific question related to the session's topics as a lead-off to the discussion period. Take care, however, that you maintain enough control. Even the most interesting discussion during a break should not prevent the prompt continuation of the class.

questionnaires

Students can participate from the first session by filling out a "student background questionnaire" while you are busy with attendance or registering late-comers. Choose questions with short answers that will show how much your students already know and what they expect from your course.

Another questionnaire should be filled out at the end of your last session. It gives your students the feeling that they are contributing to a joint endeavor--and indeed they are! Ask them to be brutally frank and tell you if they hated something, what should be included or excluded, or if your presentation needs polishing. This response is the best way to improve your product.

media

Videotapes and slide programs provide a welcome change from straight lecturing. Videos can, however, be a problem if they are not available locally and do not arrive on time.

Slides are a relatively inexpensive and versatile way to bring life to your topics. You can informally speak over a series or use a pre-taped program as a voice-saver. The time it takes to prepare these is well spent, as they can be used for future classes, meetings and talks to outside groups.

Since video technology is becoming cheaper and more versatile than film, more and more schools and other institutions are not replacing worn out film projectors with new ones. As they become less available, you will probably want to concentrate on videotapes instead of investing in expensive, easily damaged films. Video combines the benefits of high quality and action of film with the lower cost and custom design of slide programs.

Add variety to lecturing by using the blackboard, charts and an overhead projector. Bring in a stack of posters, photos or books for appropriate sessions and schedule time to informally look through and discuss them. Give the students a chance to review newsletters from a variety of pro-space groups when discussing space activism.

As always, take special care when ordering A-V equipment. It is disastrous to find that the projector, screen, video player or tape recorder is not available when you need it.

supplemental material

While students love to get real NASA literature, a more reasonable approach is to request literature for your chapter library that can also be used to photocopy class handouts. Odd shaped items and materials from more than one source can be cut-and-pasted from a high-quality photocopy onto a standard size page. You can not use copyrighted material unless you have permission and list the source.

Different handouts serve a variety of purposes. The most important one is an outline of the course to be given out at the start of the first class. It is vital that the students realize that these are not isolated subjects, but related to the movement of humanity into space. They will also be less likely to skip a class if they know what topics they will miss.

Handouts are ideal for material that you want to cover, but is too time consuming, difficult, dull, or of interest to only some of your students. Follow hand-out chronologies in history sessions instead of writing long lists of dates and names on the blackboard.

A bibliography is frequently requested by students. You should update it frequently and can include local library call numbers. Also give out your group's newsletter and membership information.

Be sure to invest in high quality photocopies for your masters.

organizational meeting

The first time you give your course, if you have more than one teacher, schedule an organizational meeting as early as possible. Schedule a second meeting about a month before the session. Everyone who wants to teach should attend. Go through the course topics and decide who will teach what, and when films, videos and slide programs will be used. Then rearrange the course outline, if required by teachers' schedules, and group their subjects together as much as possible.

Take session-by-session notes of the length of each segment, which handouts will be used, audio-visual equipment needed, etc. Even if your teaching style is very informal, you need a detailed schedule to

keep you organized and in control. It is absolutely necessary when more than one person teaches during a single session!

After the meeting, the coordinator can type up a course outline and a sheet for each session. A set is given to each teacher with specific sections, handouts and other responsibilities underlined in red. Leave space at the bottom where changes can be written. A copy is returned to the coordinator. The more complicated your class, the more you need to get things down on paper.

registration

Students may be enrolled by mail or during a registration session. You may not be sure until the first class if your course "fills". Most programs will cancel a course if too few students register to cover costs. You could decide to accept a decreased stipend to gain experience. You may gain more students from other courses that did not fill, or students may bring in friends when they find out how great your course is going to be!

If your course is cancelled, you can teach the first session. since You are all there, or have an informal discussion. Perhaps you can interest them in your chapter and NSS ideas. Let them know when you plan to offer the course again. If there is no first session, ask for the list of students who registered and send them information about NSS and your chapter.

giving it again

Each time you give your course, tighten it up: include new topics and material, compress and refine the old, and omit material where necessary. If you had trouble filling your course even though it was well-publicized, consider restructuring it, making it shorter or setting up several one-session, mini-courses. Maybe you just need a better title and description, even more publicity or to join a different program.

advanced courses

After you have given your course a few times, there might be a group of students who are interested in an advanced course. You could explore one or more topics in greater detail or at a technical level, guide individual study or have the students apply the concepts from your introductory course.

A small group could construct a timeline for the development of space, deciding in what order events will take place and which countries and institutions they think will participate. Several timelines could be developed using premises chosen by the group or supplied by you, then compared and evaluated. They could decide which period or activity interests them, design a space facility for it and discuss the implications of its existence. Choices include near- and far-future, residential, industrial, commercial or military, small or large, single or multinational, in Earth orbit or elsewhere.

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