let's talk science

Partnership Program

Volunteer Handbook

Partnership Program Volunteer Handbook

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SECTION ONE: OPERATIONS

How the Program Works

1 Introduction

The Partnership Program is appropriately named: the original idea was to foster a partnership-style relationship between a teacher and graduate student which, if successfully implemented, would enhance the Science[1] education of the students. Ideally the synergy between the partners would generate exciting activities for the students, giving them not only an increased awareness of Science, but access to positive scientific role models.

Over the years, the concept of the "partnership" has evolved beyond the simple "one volunteer-one teacher" model. Volunteers at Partnership Program sites also have the opportunity to judge Science fairs, participate in career panels, take part in events and any number of other activities. The essential goals of bringing Science to children and young adults in an energetic and novel way hasn't changed, but the method of doing that is limited only by the imaginations of the people involved.

This manual is designed as a training handbook for those volunteers who will be participating in the "traditional" partnership concept, so this first section is focused on that kind of volunteering. However, the second section, focusing on basic teaching skills, can be useful to anyone who is interested in developing their ability to communicate Science to a broader audience. Further information on taking advantage of the other opportunities the Partnership Program presents to graduate students can be found on our website: http://www.letstalkScience.uwo.ca.

2 Your Role as a Volunteer

The Partnership Program is intended to be teacher-driven. Remember that the teacher has a much better grasp of the students' level of understanding, background knowledge and curriculum goals. Your role is to support and enhance the teacher's in terms of bringing Science to the students.

Each partnership is unique, and is shaped by the personalities and experiences of the people involved. This highlights the overriding importance of the dynamic between you and the teacher. It's vital that the lines of communication stay open in any relationship, and this one is no different. If you have a clear sense of each others' roles, whatever the dynamic of your relationship identifies them as being, then your partnership will be a success.

[1] Our "Science" includes the life and physical Sciences, technology, engineering and mathematics.

2.1 Your Commitment

Time is an important consideration for graduate students, but beyond that, any volunteer is by definition giving freely of themselves. We appreciate any level of commitment from you, and any time you may have to give.

Having established that, it should also be said that any relationship of the nature we're attempting to cultivate between a teacher and a volunteer will require some time commitment in order to be successful. Previous experience tells us that monthly contact is just about the minimum amount required to make the relationship grow. The frequency of your activities may be different from that (more or less often), but you should at least speak to or e-mail your teacher partner once a month. Establishing a routine date of contact is a useful tool for making sure neither of you loses touch.

We would also prefer that a partnership last at least a complete school year. This will provide some continuity to all the parties involved, especially the students.

2.2 Volunteer Responsibilities

Your responsibilities include, but are not limited to:

- Making the initial contact with your teacher partner.
- Doing one activity per month, or at least two per semester.
- Filling in activity reports after your visits in a timely manner.
- Maintaining communication with your teacher partner.
- Having **fun!**

3. Coordinator Responsibilities

The Partnership Program coordinator at your host university facilitates the volunteers' efforts. They can provide volunteers with activity hints, some supplies, guidelines and training, but they cannot do the activities for the volunteers. A strong and active volunteer base is an absolute necessity for a successful program.

The coordinator is the person to whom all volunteer questions should be addressed. If there's something a volunteer is not sure of, they are strongly encouraged to ask. Better to be safe than sorry, especially when we're dealing with children. Issues such as taking photos of children, exposing children to potentially hazardous chemicals, materials or equipment and other potential liability problems should certainly be discussed with the teacher partners and the coordinator prior to an activity that involves any or all of these things.

Other than liability issues, the coordinators are also responsible for reporting to the Let's Talk Science National Office, maintaining communication with the National Office, setting up partnerships, managing the money at each site, recruiting new volunteers and teachers, and generally "running" the program. This (incomplete) list of responsibilities can grow and shrink or be delegated to other members of the coordination team, depending upon the governance model of the site.

Getting and Working With Your Teacher Partner

4 What **you** have to do:

4.1 Make the Initial Contact with the Teacher

This meeting will set the stage for the rest of the partnership, so its importance shouldn't be under-emphasized. During this meeting you will establish the boundaries and roles played by each of you in the coming year. Many of the questions you may have about the class, and the questions the teacher may have about your experience and background, should be answered here. **It is vital that this meeting take place as soon as possible after you're assigned a teacher partner**.

Come to this meeting prepared to answer questions like "Why are you interested in working with kids?" and "How much do you know about [*blank*]?". It's also fair of the teacher to respond to your questions about their background scientific knowledge. Another important consideration is the students' interests. Depending upon the time of year and the age of the class, the teacher may have already identified some distinct subject areas that seem to appeal to the students and are required in their curriculum. This can serve as a useful guide when you're thinking about the kinds of activities you can do with this group.

You should also establish the nature of the partnership in terms of time commitment. Are you going to be doing an activity every other week, or once a month? It is very important that this be clear to the teacher from the start, so they won't be expecting more than you're capable of giving.

You should also give your teacher partner a copy of the Teacher Handbook during this first meeting, if the coordinator has not already done so. Their handbook contains some of the same information as yours, and will hopefully give them a good understanding of the program, and their responsibilities towards it. If your teacher has any questions about the handbook, you can either try to answer them to the best of your abilities, or refer them to the coordinator.

4.2 Maintain Communication

The importance of maintaining communication can't be stressed enough, and it's at the initial meeting that the nature of the communication will be established. Teachers are often difficult to reach, but many use e-mail, which is probably the most common method of communication among graduate students. Teachers historically have been reached by phone or fax, so it's important to clarify at this meeting which method they prefer.

Remember that the demands on a teacher's time are different from the demands on yours. They tend to operate between 8:00 and 3:30 on weekdays, and are unavailable by phone for all but some very narrow windows of time during the day. (Lunch time is often a good time to reach them by phone, but even then they may be occupied.) Generally speaking, your schedule has much more flexibility than that of a teacher. Therefore it is largely your responsibility to reach the teacher, not the other way around, simply due to practical considerations.

One way around many of these difficulties is to exchange home phone numbers. Many teachers are comfortable giving out their number, but some are not. If you'd like them to get in touch with you outside school hours, make sure you provide them with your lab number and, if you're comfortable with the idea, your home number, too.

4.3 Be Prepared

Before you go into the classroom to do any activity you should go over it with your teacher partner. This clears up several things, not the least of which is the appropriateness of the activity in terms of the age and experience of the class, the availability of resources, and the length of time allotted to your activity. Teachers, as you would expect, have a much better sense of how to structure a lesson and how to keep the students engaged: listen to their advice, but make your contribution in terms of your knowledge and enthusiasm for Science.

Some coordinators may be able to provide you with materials for more complex demonstrations or activities, depending upon the resources available to them. Run your ideas past them before you act on them; they can also be of help.

Here are some useful questions that you can ask your teacher partner as you're planning an activity:

1. What would you like me to cover in my visit?
2. (If your presentation is going to be messy…) Is there a place I could be messy in your classroom?

Before your visit, it's useful to do the following:

1. Ask the teacher to fax you directions to the school.
2. If you have a made a lesson plan (see point three of Section 2), send a copy to the teacher for suggestions.
3. Arrange a time and place to meet in the school.
4. Discuss how to respond to any special needs in the classroom.
5. Advise on the audio-visual equipment you need. (Overhead projector, slide projector)
6. Suggest a way the teacher can prepare the students for your visit.
7. **Call the day before your visit to confirm**.

4.4 Complete and Submit the Activity Report

Activity reports are an essential component of the program. Without them, we at the National Office have no way of recognizing the efforts of the volunteers and celebrating your success, nor do we have any way of reporting to our supporters. In particular, it's useful for the National Office to have numbers of students reached. This way we can compile statistics to demonstrate our reach and success to both our current supporters and potential new supporters.

Please complete an activity report as soon as possible after completing the activity, while it's still fresh in your mind. Your coordinator should be able to provide a template of the required form; if you don't already have one, ask for one soon. The form asks for some basic information, such as your name, the name of the teacher, the name of the school, the name of the activity and the number of students involved. It also should include a section for your personal observations on the event. Your evaluation of your own performance and the response of the class, including the teacher, is a very useful way for you to chart your progress as a teacher of Science. Be honest, but don't be bashful!

The teacher is also asked to evaluate your performance, and their feedback, from the perspective of a professional educator, can be invaluable to you as you seek to improve your teaching skills.

5. Teacher Responsibilities

Teachers are in charge of the classroom; you are their guests. This basic fact figures largely into the relationship that develops between the two. The relationship is a partnership in the truest sense of the word; both parties are responsible for making it work.

The teacher should not simply hand over the class, but should play an active role in presenting the material to the students. It should never be forgotten that the teacher has the best sense of the students' abilities. The teacher can play the role of a useful guide to the level of the activity, responding intuitively to the needs of the class.

The teacher partner is also responsible for maintaining order and discipline in the class. You should always look to the teacher for guidance in this area, and be especially careful not to step out of bounds. **For liability reasons, the teacher must always remain in the classroom with you.**

Teachers are also important coordinators of the logistics of the activity: when should you arrive? How should the desks be arranged? When should an activity be finished? All of these questions should be answered by the teacher before the activity takes place.

Teachers should, like you, always fill out the correct evaluation forms after an activity. Their responses are very valuable to us, as they tell us how well we're doing from the perspective of an educator. They can also give us the perspective of the students, another crucial player in the Partnership Program dynamic.

Finally, the teacher partner should give you an opportunity to learn. They should give you room to experiment with your teaching style, within reason, and make your own mistakes. One of the goals of the program is to allow you to develop your teaching skills, and the advice and guidance of the teacher can play a pivotal role in that process.

6. Partnering with HomeSchooled Students

There is an increasing trend, especially in Ontario, BC and Alberta, towards parents removing their children from public schools and educating them at home. This is referred to as "homeschooling", and it's something anyone working with the educational system should be aware of.

6.1 Why Homeschool?

The reasons parents have for homeschooling might be many-fold, including reasons of a religious nature, disaffection with the public educational system or simply personal preference. Whatever the reason, these children deserve to have the access to resources such as the Partnership Program. In fact, you may prefer the smaller, more intimate setting of homeschooled children to a large classroom.

6.2 Special Considerations When Dealing With Homeschoolers

If you are conducting a Science activity with children who are homeschooled, it's very important to discuss what you're going to say with the parent beforehand. These parents may have religious objections to such concepts as evolution to which you should be sensitive and respectful. (If you are uncomfortable with the parent's religious beliefs, perhaps you should consider declining the invitation to be partnered with them.)

You should also respect the fact that instead of being in a school, you're in someone's home, and should take extra care when performing activities that involve noise or mess. Once more, speaking with the parent beforehand is always a good policy.

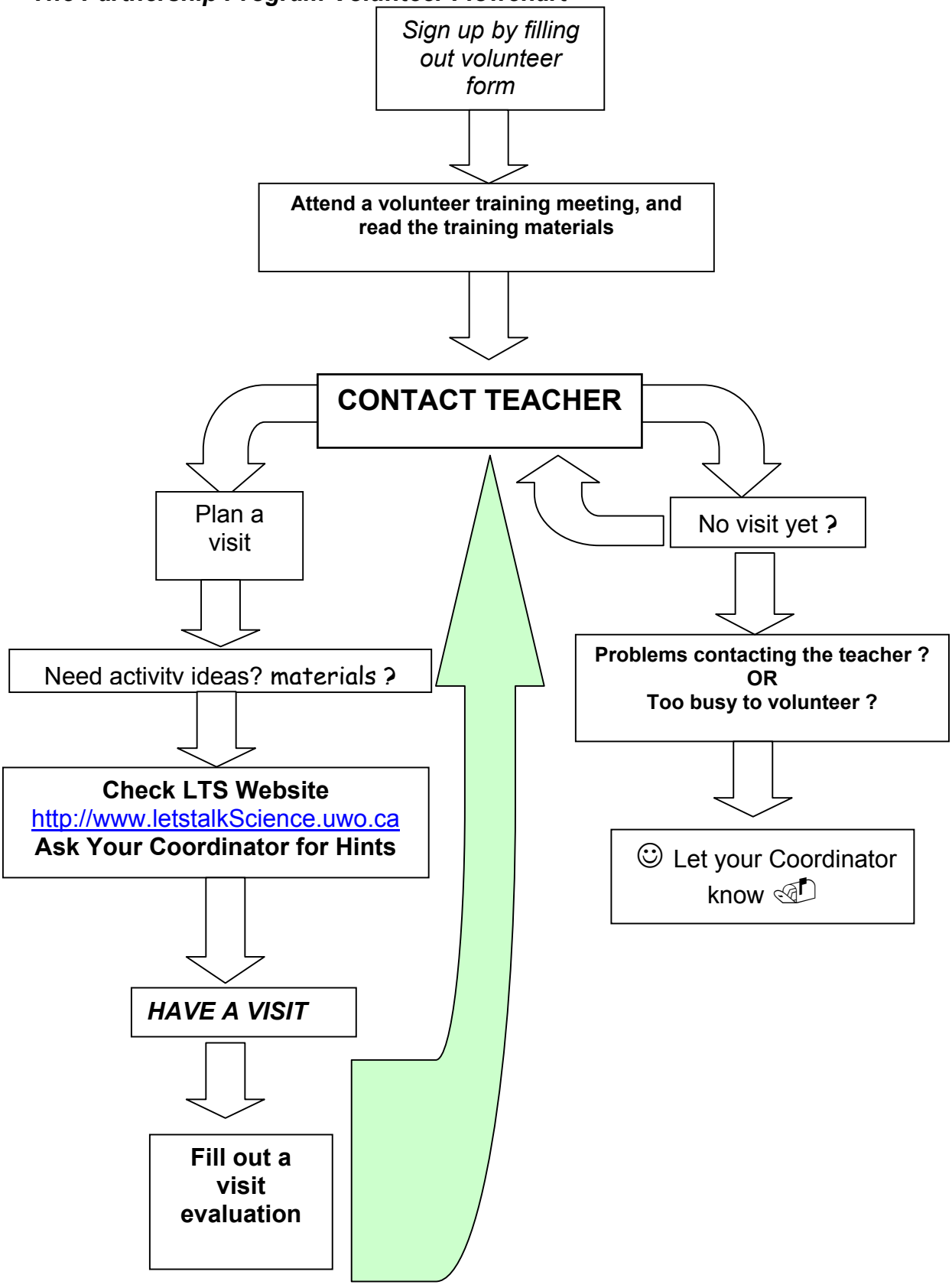
As always, a volunteer is never to be left alone with a child. The parent or guardian should always be present.

6.3 Final Notes About Homeschooled Children

Homeschooled children offer many unique challenges, but can also offer many unique rewards. Homeschooled children have much greater curriculum flexibility than those in public schools, so you may be able to cover a wider range of topics. The opportunities for "field trips" are also greater than for children in public school, as the children are generally not bound to a rigid schedule, and parents can plan a "field day" at your convenience.

If putting Science into the hands of every child is our goal, partnering with homeschooled children offers you a wonderful chance to reach out directly to your community.

The Partnership Program Volunteer Flowchart



SECTION TWO: A GUIDE TO TEACHING SCIENCE

1. Why Teach Science?

We live surrounded by the products of Science and technology. We wake up to the sound of digital clocks, we check e-mail on high-speed computers during the day and we fall asleep by the incandescent glow of the television. All three would have been considered miracles fifty years ago, and are commonplace today.

Think of how much technology has developed since people who are now in their mid-twenties were born. The world of the mid-seventies was a world without fax machines, without bank machines, without video games, without compact discs. The children of today will grow up never knowing a world without the internet.

The point is, we live in a world where Science is important to our lives, and in the future it will become even more important. Moreover, the big issues of today, the ones which arouse the most debate and controversy, are Science-related. Need convincing? Try this list of topics on for size: genetically modified foods, environmental protection, the spread of communications technology, human cloning.

If we are to have anything approaching an informed opinion on these or other topics, we need a basic level of scientific literacy. But this literacy is not only lacking, there are forces in society which run counter to its development. For every piece of valid scientific information available to members of the general public, there is at least one misleading fallacy. (That ratio is often much smaller.) The ability to distinguish between information and misinformation, particularly as it pertains to Science-related issues, is developed by increasing Science literacy.

It is not the goal of Let's Talk Science to make everyone into a scientist, but to provide people with an understanding of Science and a sense of its importance to their lives. Following from this, "scientific literacy" may be defined as the minimal level of understanding of Science and technology needed to function as citizens and consumers in our society. This demands:

- a basic vocabulary of scientific and technical terms and concepts; after all, if terms such as "atom" or "molecule" are not understood, more complex concepts will be impossible to comprehend
- an understanding of how Science is done (the scientific process)
- an appreciation/understanding of the impact of Science and technology on our lives

Even if we take no position on the above-mentioned public interest issues, we still live in a world dominated by the products of Science, and we'll continue to do so. Scientific literacy has become not simply useful, but essential.

And what other skills does learning Science develop? At the core of the scientific process are some crucial skills:

- The ability to digest a large quantity of information and isolate the valid facts.
- The ability to think critically and solve problems logically.
- The ability to work in a team.
- A realization that there are always multiple answers to a single question, and that each can be supported to a greater or lesser degree by data.

These are not esoteric and meaningless skills. They are, in fact, vital life and employability skills, valued in any field. They are the qualities our youth must have in order to remain globally competitive and lead productive lives.

1.1 "Stop the Stereotype"

What image of a scientist is the most prevalent? What does this image imply?

Children, when asked to draw a picture of a scientist, will by and large come up with an old, demented-looking man in a lab coat surrounded by bubbling solutions. There are several things wrong with this image, not the least of which is the fact that the scientist is almost invariably a man. Even though great strides have been made in the past two decades, women are still under-represented in research Science.

Another, more dangerous stereotype is that scientists are portrayed as single-minded, unidimensional, anti-social and unethical. This, more than any other stereotype, is the one most responsible for generating the popular fear of Science and technology. Who would trust the world's most influential technologies to such a group?

At Let's Talk Science, we are committed to changing this image by bridging the gap between real-life scientists and their communities to foster a more realistic image of research Science: to "Stop the Stereotype".

Some Basic Teaching Skills

2. Learning Theory

2.1 Fact vs. Fiction

2.1.1 How Kids Don't Learn

…the inclined plane of little vessels then and there arranged in order, ready to have imperial gallons of facts poured into them until they were full to the brim.
- Charles Dickens, *Hard Times*

That's the image Charles Dickens painted of children in a 19th-century classroom. It seems foolish and ill-conceived to modern eyes, but many aspects of this stereotype unconsciously resonate today. In her brief "Cognitive Science: *Challenging Schools to Design Effective Learning*", author Sue Berryman lists five false assumptions instructors make about learners. We can all catch ourselves making at least one of these assumptions at some point:

- Learners can be predicted to transfer learning from one situation to another.
- Learners are passive receivers of wisdom – "vessels" into which knowledge is poured.
- Learning automatically happens when the learner is exposed to stimuli and correct responses.
- Learners are blank slates.
- Skills and knowledge can be acquired independent of experience.

This last point is especially important for our purposes. Science is taught, especially at the university level, in a way which obviously makes many, if not most of those false assumptions. Since this is the most of us have been taught Science, it tends to be the way we teach Science. When you're thinking about your activities, try to catch yourself before you fall into any of those traps.

2.1.2 How Kids Learn

It's impossible to say exactly how we learn, but a valid and logical current learning theory is called **constructivism**. This theory combats many of the myths and false assumptions surrounding learning, and if integrated into teaching practice creates an inclusive and stimulating environment in which successful learning has a better chance of taking place. In other words, it makes sense in principle and works in practice.

Constructivist theory makes the following assumptions:

- People learn by actively constructing their own understanding through reflection on their experiences.
- Experiences are unique and relate to the social and cultural environment of the participant.
- Learning is affected by the context in which an idea is taught as well as the learner's beliefs and attitudes.
- What we already know will influence what we can know.

Essentially, constructivism promotes learner-centered learning. It also promotes the importance of experiential learning; the idea that learning is inexorably tied to experience and context. It's not sufficient to *hear* about something, says constructivism, or even to *see* someone else do it. Effective learning only takes place when the learners do it for themselves, placing in the context of what they already know.

Effective learning also requires that the learner feel the information is relevant to their lives. While some enjoy abstraction, the overwhelming majority of people need to be convinced that what they're being taught has a place in their world.

Constructivist theory is supported and disseminated by Let's Talk Science because it fits very neatly into our vision of Science and its place in society. If children don't think that Science is relevant to them or get no chance to experience the process, they will not understand it, and may grow to fear those who do.

2.2 Hands On is Best

Following from what we know about constructivism, the best way of learning Science is to do it. That's why Let's Talk Science promotes hands-on activities as the best teaching method.

By learning in an interactive "hands-on" way, children construct their own understanding of the principles being taught, and are active participants in their own learning. Moreover, by working in small groups they learn about collaboration, communication and teamwork, all essential and valuable skills in any modern workplace.

On a more basic level, hands-on activities are **fun**! They get the children out of their seats, up and doing something instead of sitting and listening to a teacher. Their minds are engaged, their skills are being put to practical use and they are getting an impression of Science as a participatory activity, full of life and colour. Aside from enhancing their learning experience, hands-on activities "stop the stereotype".

This is the ideal learning environment, which you should always strive to create.

2.3 The Eight Intelligences

… I'm not a smart man, but I know what love is.
-Forrest Gump

The question for Forrest, and for the rest of us, is not "How smart are you?", but "How are you smart?" People often refer to someone who is "too clever by half". Forrest was someone, as one critic wrote, who was "too clever by just enough".

The concept of intelligence has come a long way from the days when IQ tests involving playing with blocks determined your academic potential. Well-known Harvard psychologist Howard Gardener proposed the concept of "multiple intelligences" to describe the human mind's learning process in a new and more holistic way. Others have proposed similar approaches, sometimes called "learning styles", and prepared "inventories" of the various ways in which we prefer to learn. (Even older methods of mind construction such as the Enneagram are not based in Science, but they do hit many of the same points.)

The thrust of all these intelligence theories is remarkably constructivist: learners are complex entities with unique abilities and preferences for the way in which they assimilate and learn. Gardener breaks these complexities into eight intelligences, others divide the learning styles in a more hierarchical fashion. The point which should never be lost in this discussion is that we all have multiple aspects of every "intelligence" or "learning style". Also, this theory implies that the best activities will appeal to as many intelligences or learning styles as possible in order to effectively reach the majority of the learners.

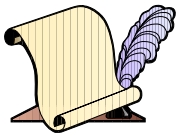
Gardener's eight intelligences are as follows:

1. Linguistic – People who excel at language and prefer to learn through words.
2. Musical – People to whom sound is the most meaningful way of communicating.
3. Logical-Mathematical – People who excel at abstract reasoning.
4. Visual-Spatial – Those to whom visual imagery, both its appreciation and creation, holds the most meaning.
5. Bodily-Kinesthetic – Athletic or otherwise physical people who tend to use their bodies to solve problems.
6. Interpersonal – People who are unusually sensitive to their social milieu and respond to the emotions of others.
7. Intrapersonal – Contemplative types who enjoy and excel at self-directed analysis.

8. Naturalist – Those who make lists, distinctions, and naturally place things into categories.

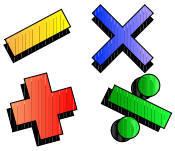
When you're confronted with a class of learners, you will be confronting all of these intelligences. Think about your activities in this light; are they appealing to one intelligence, or many? Try to design your activities such that there's "something for everyone".

• Theory of Multiple Intelligences



Linguistic Intelligence
- allow individuals to communicate and make sense of their world through language
- e.g., writers, poets

Spatial Intelligence
- is the ability to perceive visual or spatial information, to recreate visual images from memory
- e.g., artists, navigators



Logical-Mathematical Intelligence
- enables individuals to use and appreciate abstract relationships
- e.g., scientists, problem solvers

Interpersonal Intelligence
- helps individuals make distinctions about the feelings of others and their intentions, to react to the moods of people around them
- e.g., great leaders

Musical Intelligence
- allows people to create, communicate and understand meanings made out of sound
- e.g., musicians

Intrapersonal Intelligence
- helps individuals to build accurate mental models of themselves and to draw on these models to make decisions about their lives. It is an understanding of one's own strengths and weaknesses

Bodily-Kinesthetic Intelligence
- allow individuals to use all or parts of their body to create products or solve problems
- e.g., athletes, dancers, surgeons

Naturalist Intelligence
- is the ability to distinguish among, classify and use features of the environment that are natural or created

3. Planning a Lesson

Effective lesson planning not only enhances the lesson for the students, it can make things a lot easier on you by allowing you to work the bugs out of your lesson before you're in front of the kids. (Who can be a pretty unforgiving audience!)

There are many different models of lesson plans which are used by teachers, and we only present one of them here. Feel free to rely on this model to whatever extent is useful to you.

This is sometimes referred to as the "BOPPPS" model, with "BOPPPS" being an acronym for the following lesson elements:

Bridge
Objective
Pre-test
Participatory Lesson
Post-test
Summary

A lesson containing all these elements has a better chance of being successful, even if they are not rigidly demarcated.

1. **Bridge** – This is the "hook" that will make your class interested in what you're about to say or do. It's essential that the bridge contain something relevant to the lives of the students. It often takes the form of a question such as "Have you ever wondered about..?", but it could also be "Has anyone seen the movie *Jurassic Park*?"
2. **Objective** – The roadmap for the rest of the activity. There's no pressing need to break things down explicitly every time, but you should give your learners some sense of where the lesson is headed.
3. **Pre-test** – Assessing what your learners already is know is vital, and often forgotten. Asking a few questions, or brainstorming right at the beginning, can help you shape the rest of the activity to be the best it can be for the students.
4. **Participatory Lesson** – Participatory learning is an essential part of the Let's Talk Science philosophy of teaching, and we've outlined it elsewhere ("Hands-on is best").
5. **Post-test** – Try to pull together the elements of your lesson at the end. Ask your students what they've learned; are they the things you wanted to teach? It's a great way of getting instant feedback.
6. **Summary** – A few closing remarks or rough overview of the program works well to leave a good impression in the minds of the students.

You want them to be excited about Science, so leave on a positive note!

Don't worry about being too explicit about your lesson stages, or if you leave something out. Spending some time organizing your lesson a few days before the activity according to this model will pay off in spades later. And, as with anything else, have the courage to be imperfect, and realize that you'll get better with practice!

4. Working with Your Teacher Partner

It can't be emphasized enough that the classroom is the domain of the teacher, and that the volunteer is a guest. This arrangement implies both your responsibility, and theirs.

During a visit, your teacher partner should:

- Stay in the room with you at all times
- Maintain class discipline
- Help with students with special needs
- Keep track of time
- Introduce and thank you
- Help with the logistics of your activity

The one situation which should never arise is the one in which the teacher simply "hands over" the class to you for the duration of your visit. Make it clear to your teacher partner from the outset that this isn't acceptable, and if you find it happening, let them know. The teacher is legally responsible for the class.

5. The Audience

Before any presentation, it is important to know the audience. In the school system, each grade has specific characteristics that sets it apart from all the others. If you really want to get your message across, you need to know a little about the students you will be visiting.

Although all students are individuals, the following list will give you a summary of traits you can expect from each grade group.

5.1 Young Children K-3

Young children do not learn by mere instruction nor can they be expected to recite facts. When children participate in a variety of hands-on activities they find it easier to learn. If the activities are carefully selected and appropriate to their

age, children will enjoy Science and will be motivated to continue exploring on their own.

In "Experiences in Science for Young Children", Ronald Newman emphasizes the importance of experiential learning in early childhood. Adolescents are able to learn by hearing and reading because they have experience with their environment. These experiences have become part of their cognitive thought process. On the other hand, young children have yet to acquire this type of knowledge. They must first be able to touch, taste, smell, hear and see things before they can understand them. Children at this age level like dramatization, puppets and toys. Talking to the teacher will make it easier to find appropriate activities for this level.

5.2 Grades 4-7

The key to making successful Science presentations to these grades is hands-on activities. Actually touching and working with materials is very important. Because most elementary school-age children haven't developed complex abstract thinking skills, they need to have a concrete example of something in order to understand it. Hands-on activities provide that kind of experience. For example, it is better to start with airplane construction activities before introducing an explanation of flight. This may not sound ‘logical' to an adult. But the result of this sequence is that each child will know something about planes and flight, by direct experience, and so will have a better understanding of the explanations that come later. Furthermore, such participatory activities are particularly effective ways of concentrating the attention of young people.

Educational research has shown that children learn Science better if they participate in searching out and building ideas for themselves and finding their own answers to questions. When using an object for demonstration, you could ask questions about the object instead of immediately telling them what it is. This way, the children may figure out on their own what it is and what its purpose is. They remember those discovered answers far better than things they are merely told or read.

5.3 Grades 8-9

Research has shown that this age is extremely important for creating a positive attitude toward Science that will carry on in a student's life. Your personal rapport with the students is of utmost importance.

It is best, when dealing with students in this age group, to get them involved in the presentation as soon as possible. They are easily bored and often appear critical. Again, hands-on activities are very effective. This age group has a longer attention span than the elementary group, and can handle more advanced

concepts. However, it is still necessary to explain these concepts in simple terms.

If you are using a hands-on activity to show an engineering or Science principle, try to have the students come up with their own answers before telling them the correct response. This technique will not only keep the students more engaged in the presentation, but it will also show them the scientific method in action. Don't be too concerned if you initially get little response from the students. At this age they are trying to be cool.

5.4 Grades 9-12

At this level, students have developed more complex thinking skills. However, some students will be high achievers (take notes, ask questions) and others will be low achievers (appear apathetic). If you want to give a single topic presentation, try to present something hands-on.

A lecture-type presentation is acceptable if the topic is of great interest to the students. Use as many resources during the presentation as you can (eg. slides, charts, pictures, models, etc.). Even here, it is advisable to keep the presentation simple. Use language that the students can understand and avoid technical terms as much as possible, and when their use is unavoidable, define them well.

Students at this level are generally interested in hearing presentations about careers in Science. Thus, even single topic presentations should include a section on careers in engineering, Science and technology. Try to have your career section be as broad as possible rather than focus on only your area. Finally, make sure you allow at least one quarter of the time available for questions.

Diversity Sensitivity

These hints are intended only as guidelines for your approach to Science education. You can take from them what you feel is valuable. The section is included essentially because we feel it is important for you to be aware of the common pitfalls encountered by everyone working in the classroom environment in Canada, particularly in urban areas.

6.1 Gender Sensitive Teaching

It is important to be aware that we should not treat boys differently than we treat girls. Before going into the classroom, take some time to think about gender-sensitive teaching.

Be aware of the following**:**

- Calling on boys more than girls.
- Asking boys more higher-order thinking questions.
- Giving boys more extensive feedback.
- Providing less opportunity for girls to speak or take leadership roles.

What you can do:

- Present Science as something everyone can do.
- Ensure girls have the opportunity to lead.
- Use gender-neutral language.
- Refer to things relevant to both boys and girls – but be careful not to perpetuate gender stereotypes.
- Talk about men and women in Science.
- Focus on problem-solving.

6.2 ESL Considerations

You may find yourself in a classroom with a large population of students for whom English is a second language. When you talk to the teacher, find out his/her suggestions for working with the ESL students.

- Attempt to give everyone equal opportunity to ask, and respond to, questions.
- Describe one concept in many different ways with simple language.
- Allow ESL students time to finish their own sentences.
- Consider what stereotypes you may have before going into the classroom so that you could avoid acting on them.
- Be sensitive to the fact that children from some cultures are quiet around adults.
- Confirm that the student understands you.
- Speak slower, not louder.
- Use pictorial representations where possible

6.3 Disabilities

Increasingly, there are programs that integrate students with special needs into the classroom. Check with the teacher to find out if there are any children with mental or physical disabilities and ask the teacher how you might prepare yourself and alter your presentation.

6.4 Poverty

Avoid using food in experiments, particularly in schools in poorer areas. Some children come to school without having eaten. The destruction of food in experiments may seem extremely wasteful.

Peanut allergies are also something that should be discussed prior to any activity using peanuts or their derivatives (peanut butter, etc.). Another common allergy is one to latex, so be sure to discuss with the teacher any use of latex gloves before performing activities which require them.

6.5 Non-traditional Families

Refer to the "adult at home" rather than a mother and/or father. Some children are raised by single parents, same sex parents, grandparents, aunts, uncles, foster parents or other guardians.

6.6 General Hints

With issues such as these, the temptation is to be over-vigilant, which is ultimately not useful to creating a safe and inclusive learning environment. There is a fine line between being aware of the differences among the students you encounter and emphasizing them. Learning to deal with these sorts of things only comes with practice. *Have the courage to be imperfect*.

7. Summary and Conclusion

There are so many opportunities afforded to a volunteer by the Partnership Program, and if you take advantage of even a small number of them, your experience will be a good one. Working with children can be rewarding, but it can also be frustrating, as is anything worth doing. Your personal motivation for participating in this program might be to gain experience with children, learn more about education theory, practice teaching or simply to present a realistic face on the scientific community.

Whatever the reason, Let's Talk Science values your involvement. There are many ways to make a difference in this society, and participating in this program is one of the best.

APPENDIX A: FAQ

These are the most common questions asked of coordinators by volunteers.

1. How do I do an activity?

This is a common question, and relates directly to teaching skills. The training session should answer some of this question, or at least give them some skills which can be developed. However, here are some quick hints:

- Keep it moving! Have lots of breaks and lots of opportunity for the students to get up and DO something.
- Make it relevant. Make references to things which the children may encounter in their own lives. Try to tie that into your presentation.
- Time things appropriately. Don't try to squeeze too much into a short time. Remember that children have short attention spans.
- Use **active participation** to engage the students' enthusiasm. Have them DO something whenever possible instead of simply telling or showing them something.

2. How do I design an activity? – Ten Easy Steps

1. Narrow down your topic (i.e. magnets)
   - Get ideas from your teacher-partner, the students, your research area, your interests….
2. Look in several resource books or on the internet for activity ideas
3. Decide on two or three ideas
4. Test activities
5. Decide on one that works well (fun, hands-on, age-appropriate, inexpensive, easy to duplicate….)
6. Modify as necessary (copyright issues, [2] materials required, delivery situation – number of children, size of space…)
7. Test out on someone else (children, friends, family)
8. Write-up activity (What you need – materials list, What to do – steps for completing activity, What's happening – the basic Science behind the activity)
9. Gather supplies for appropriate amount of students (always bring extra just in case!)
10. Deliver activity!

[2] It's important to reference any source material you use in the design of the activity, including websites, textbooks or even other Let's Talk Science materials. Please ask the National Coordinator for assistance in this if you have any questions.

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