

Kerala State Council for Science, Technology & Environment
Workshop on Research Methodology, Writing Practices & Language Skills for Women
Scientists
15th & 16th December 2011

English Language Skills for Scientists

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Introduction

A course offered in an institution of higher learning in the Far East is entitled 'English For Scientists'. The duration of the course is two years. The sessions for the course is planned in such a way that opportunities are provided to students to perform and practice those skills essential to communicate their research findings. This then indirectly suggests that to master the skills, a longer time span is essential. So at the most what is feasible in a Workshop is to make an attempt to sensitize the participants to the skills they need to master.

Why are language skills important?

Today, we have a highly competitive global scenario. To succeed we need to communicate competently. And we communicate essentially through language.

Why are language skills essential for scientists?

Scientists may be called upon to communicate in many different situations. They may have to prepare reports, compose articles, write proposals, design a poster using the right words or even upload information on web pages. They may have to attend conferences, meetings or deliver lectures. The audience for them can be specific technical audience or a general technical audience. At times scientists may have to communicate to the lay man- a non technical audience. The language skills required to communicate ideas and information in each of the above situation requires a language skill that is suitable for that purpose. Failure to possess the required skill, can result in miscommunication or ineffective communication.

What is special about English?

English is used as an official or semi-official language in over 60 countries. It is dominant in all the six continents. It's the main language of books, newspapers international business, academic conferences, science, technology, medicine and advertising. Of all the information in the world's electronic retrieval systems, 80% is stored in English. Hence the English language has a special place.

Difference between Science and Art

The Oxford Advanced Learner's Dictionary gives simple definitions: "Science is the *knowledge* obtained by *observation* and testing of *facts*. It is the pursuit of such knowledge." " Art is something in which *imagination* and *personal taste* are more important than exact measurement and calculation. Literature is a good example and it can be contrasted with science."

Literary writing allows one to be creative and is usually fictional. But technical writings is based on facts and usually attempts to explain things.

What is the difference in function?

English is usually classified under the Arts. It is seen as a *skill* which includes: Listening, Speaking, Reading and Writing. The prime function of Science is providing *knowledge*.

English as a skill and its implication

A skill, we know, is the ability coming from one's knowledge, practice, aptitude etc. to do something well. It also means, the competent excellence in performance, experience or dexterity. But then, a skill requires practice for perfection. This means, if one wishes to master English and its four skills, one requires plenty of practice.

On critical thinking and language use

Critical thinking is a type of thinking that attempts to arrive at a judgment only after honestly evaluating alternatives with respect to available evidence and arguments. The editor of a book entitled **Education, Culture and Critical Thinking**, Brown, points out that many graduates are characterized as lacking the abilities to read, write and think with a minimum level of clarity, coherence and critical/ analytical exactitude. Brown also records the impressions of educational researchers: It is found that a significant part of the problem is a pedagogical diet excessively rich in memorization and devoid of autonomous critical thought. As a supplement to what Brown has stated, it is worth recalling the views of language teaching experts: To them, an ability to think critically is essential for students of Science when they try to communicate.

On the four language skills

Listening

It is said that speaking demands knowledge and listening demands wisdom. Listening serves a transactional function: of passing concrete information. Maintaining social contact is an interpersonal function of listening.

In face to face to face communication, it is important to maintain direct eye contact. One shouldn't interrupt the speaker and should use body language and signals which show that one is listening.

Tips to become an effective listener:

- Be motivated and prepared to listen.
- Resist distractions –learn to concentrate.
- Keep an open mind to be more receptive.
- Focus on content and not the style of delivery.
- Listen for ideas – central themes and not facts.

Speaking Skill

Spoken language is a medium of interaction. It involves many complex abilities including listening, comprehension, clarification and production. While speaking which is a cognitive skill, one has to match body language, tone, vocabulary and so forth. It is an important skill to practice and acquire.

It should be noted that speaking can vary with context. For instance, speaking to an individual is quite different from speaking to a group or the public.

Tips to communicate effectively

- Choose the right style.
- Organize your content clearly.
- Practice speaking in different contexts.
- Maintain the flow of communication initially and later move on to perfection and accuracy.

Reading

Reading is today regarded as a basic skill required for language learning. One's professional competence is now found to be directly linked to one's ability to read productively.

Reading can vary with purpose. You may read to get information (eg; newspaper); read for pleasure (eg: a short story); read critically to identify the validity of information provided (eg: a scientific report).

While reading a scientific article critically, you will be attempting to answer the following questions:

- Is there bias?
- Is there ambiguity?
- Are there any omissions ?
- How current is the material?
- How well referenced is the work?
- Is it possible to distinguish fact and opinion?
- Does the argument put forward make sense?
- Are the views consistent with the evidence provided?

Tips to improve reading skill

- Read a variety of text-types.
- Concentrate on text for meaning.
- Practice reading with set time limits.
- Develop ability to quickly recognize words.

Writing

Writing is the representation of language in a textual medium through the use of a set of signs or symbols (known as a writing system). Writing varies with purpose. For instance writing a Diary or a Story will not have the same objective as writing of a scientific article. The purpose of writing a scientific article will invariably be to inform or persuade. Hence, while beginning to write a scientific article it would be better to ask a few questions yourself :

1. Who are the people going to read it?
2. What do they know ?
3. Why will they be reading it?
4. How will they be reading it?

We can split the writing process into stages: This includes 1. Getting the mood to write. 2. Writing the first draft 3. Revising continuously 4. The final draft. The best guidance for writing is to read good scientific articles and attempt to imitate the style.

Tips to improve your writing skill

- Use a good dictionary
- Use a grammar or style book
- Regularly use a Thesaurus
- Practice, practice, practice and practice.

Summing up

A mastery of the four language skills should go with a sound knowledge of grammar and a good repertoire of vocabulary which is essential to communicate effectively. Given the recent development in Information and Communication Technology, a familiarity with the varied techniques of integrating language skills with digital technology is extremely essential for scientists.

This is to say that, changing times require a changing pedagogy. Let me conclude by quoting S.G. Gowardhan who wrote at the turn of this century:

...In the new millennium, English language has been made fashionable, commercialized and computerized. It is going to change in consonance with the requirement of a developing science...Communication of ideas in various ways has become inevitable along with the needs of science...

-The Hindu 25 July 2000

Author's note: Select material from **The Craft of Scientific Writing**, 3rd edition (Springer-Verlag, 1996) was made use of for preparing this write-up.

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Worksheet

Correct/add necessary Punctuation marks:

1. With the lid off the reactor core was exposed, allowing radioactive isotopes to escape.
2. As airplane designs change the anti-ice systems also have to change.
3. If the airplane waits too long to take off the de-ice fluid can dissipate.
4. To provide spill protection all tanks were to include catchment basins and automatic shutoff devices or overflow alarms or ball float valves.
5. Discharges of these hazardous substances occur through spills when loading vehicles, spills and over-spills when filling the tanks, leaks from supply pipes and pipe joints, rust holes and cracks in the seams of the tanks themselves.

Correct the word order (Syntax)

6. Most people are diagnosed with phenylketonuria at birth.
7. Reductions up to 80% in heat and mass transfer coefficients were measured due to outgassing.
8. The Lunar Module was only designed to hold two astronauts and to have a life time of forty-five hours.

Correct the error related to meaning (Semantics)

9. The objective of this endeavor is to develop a commercialization strategy for solar energy systems by analyzing factors impeding early commercial projects (i.e., SOLAR ONE) and by identifying the potential actions that can facilitate the viability of the projects.
10. Enormous mining companies are both continuing operations at old gold mines, such as the case of the Homestake Mine in Lead, South Dakota, which has operated continuously since 1877 and is continuing to increase its operations [Hinds and Trautman, 1983], and opening new gold mines, often in very disturbing locations, such as the proposed, and for now, postponed. New World Mine, whose proposed location was about 2.5 miles from the border of Yellowstone National Park, near Cooke City, Montana.

[Questions from *The Craft of Scientific Writing*, 3rd edition (Springer-Verlag, 1996)]

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[All the questions given below are from *The Craft of Scientific Writing*, 3rd edition (Springer-Verlag, 1996)]

Correct/add necessary Punctuation marks:

1. With the lid off the reactor core was exposed, allowing radioactive isotopes to escape.

Ans. *missing comma after the adverb "off,"*

2. As airplane designs change the anti-ice systems also have to change.

Ans. *missing comma after the verb "change,"*

3. If the airplane waits too long to take off the de-ice fluid can dissipate.

Ans. *missing comma after the adverb "long,"*

4. To provide spill protection all tanks were to include catchment basins and automatic shutoff devices or overflow alarms or ball float valves.

Ans. *Ambiguity from missing punctuation*

Possible revision: To provide spill protection, all tanks were to include catchment basins and one of the following: automatic shutoff devices, overflow alarms, or ball float valves.

5. Discharges of these hazardous substances occur through spills when loading vehicles, spills and over-spills when filling the tanks, leaks from supply pipes and pipe joints, rust holes and cracks in the seams of the tanks themselves.

Ans. *Ambiguity from missing punctuation*

Possible revision: Discharges of these hazardous substances occur through the following: (1) spills when loading vehicles, (2) spills and over-spills when filling the tanks, (3) leaks from supply pipes, and (4) pipe joints, rust holes, and cracks in the seams of the tanks themselves.

Correct the word order (Syntax)

6. Most people are diagnosed with phenylketonuria at birth.

Ans. *Possible revision:* Most people with phenylketonuria are diagnosed at birth.

7. Reductions up to 80% in heat and mass transfer coefficients were measured due to outgassing.

Ans. Reductions up to 80% in heat and mass transfer coefficients were measured due to outgassing. (*improper syntax with the prepositional phrase "due to outgassing,"*)

Solution: Rearrange sentence and move the misplaced phrase next to the noun "reductions"

8. The Lunar Module was only designed to hold two astronauts and to have a life time of forty-five hours.

Ans. The Lunar Module was only designed to hold two astronauts and to have a life time of forty-five hours. (*improper syntax with the adverb "only,"*

Solution : Move "only" immediately after the verb "hold" and immediately after the words "life time of")

Correct the error in meaning (semantics)

9. : The objective of this endeavor is to develop a commercialization strategy for solar energy systems by analyzing factors impeding early commercial projects (i.e., SOLAR ONE) and by identifying the potential actions that can facilitate the viability of the projects.

Ans: *Needlessly complex words*

Possible revision: This study will consider why current solar energy systems, such as Solar One, have not reached the commercial stage and will find out what steps we can take to make these systems commercial.

10. Enormous mining companies are both continuing operations at old gold mines, such as the case of the Homestake Mine in Lead, South Dakota, which has operated continuously since 1877 and is continuing to increase its operations [Hinds and Trautman, 1983], and opening new gold mines, often in very disturbing locations, such as the proposed, and for now, postponed. New World Mine, whose proposed location was about 2.5 miles from the border of Yellowstone National Park, near Cooke City, Montana.

Ans. *Needlessly complex sentence*

Possible revision: Enormous mining companies are both continuing operations at old gold mines and proposing the opening of new gold mines. An example of a mine continuing its operations is the Homestake Mine in Lead, South Dakota. This mine has operated continuously since 1877 and is increasing its operations [Hinds and Trautman, 1983]. An example of a proposed new gold mine is the New World Mine, whose proposed location is about 2.5 miles from the border of Yellowstone National Park, near Cooke City, Montana. Like other proposed gold mines, the New World Mine has been postponed because it is in an environmentally sensitive region.