Teacher's guide on basic environmental health

Prepared by Merri Weinger

Protection of the Human Environment
World Health Organization
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The Teacher’s Guide was developed to assist teachers in developing interactive, problem-oriented curricula on environmental health themes covered in the text.

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Merri Weinger
Education Specialist
Introduction

Purpose of the Teacher’s Guide

This Teacher’s Guide forms part of current efforts by its sponsors (WHO, UNEP, CRE-COPERNICUS, UNESCO) to strengthen environmental health capacity and promote actions that eliminate, prevent or minimize hazards. The quality of our environment and the health effects resulting from environmental factors are of increasing concern in both developed and developing countries. The extent of these health effects is often unknown and the technology to prevent and control environmental hazards needs further development. A variety of well-trained professional groups is needed to identify and effectively address current and future problems related to environment and health.

The Basic Environmental Health text and this Teacher’s Guide are designed to facilitate and promote environmental health teaching in both university settings and in-service training courses for government agency staff, industry professionals and managers, and interested people in non-governmental organizations (NGOs) or community groups. Specific target groups in universities include students in medicine, nursing, other health professions, engineering, environmental science and management, and others needing a basic introduction to environmental health (including students in geography, urban planning, social work and environmental law). In fact, environmental health education is desirable for most professions.

How the guide is structured

The guide is designed to be used in conjunction with the Basic Environmental Health text. It includes an orientation to the recommended teaching approach and the rationale for its use, a description of selected teaching methods, guidelines for organizing a course or workshop, and sample learning activities for many of the topics presented in the text. These learning activities are based on the methods described in the guide. The description of the methods should assist teachers in adapting the exercises to meet the needs of their students.

How to use the guide

The guide can be used to develop programmes on environmental health in a variety of teaching situations and educational settings. For example, teachers can:
- develop a full semester course;
- incorporate curricula on environmental health into existing courses;
- design a short course or workshop based on sections of the book;
- produce a lunch-time or weekend seminar series.

Teaching exercises should be used to adjust the complexity of the course to the needs of individual students or the whole class. In interdisciplinary classes, for example, the teacher may require more in-depth research from students in areas of their own expertise. This allows for each student to achieve a
maximum learning experience while contributing to the group. It also simulates real situations in which professionals in different disciplines are expected to understand each other while depending on each other to solve complex problems in the field.

To make teaching exercises more relevant, teachers are encouraged to adapt them to reflect national or local experience or to use local stories, investigations and issues to develop new case studies.

Teaching approach

Participatory education

There are various ways of imparting knowledge, developing skills and attitudes, and using the educational environment to promote the social actions necessary for solving environmental health problems. This section describes a participatory approach to education and training which has been successfully applied in environmental health.

Participatory education is an approach to learning that:

— is interactive;
— is based on real-life experiences;
— incorporates dialogue between and among teachers and students;
— critically analyses the organizational and systemic causes of problems.

The goals of participatory education are not only to increase knowledge and skills but also to provide the basis for problem-solving activities after the teaching sessions have ended. Its principles follow the basic tenets of adult education theory on how to promote participation and active learning.

• Adults retain information best when they are actively involved in problem-solving exercises and hands-on learning. They remember 20% of what they hear, 40% of what they hear and see and 80% of what they hear, see and do. Education is, therefore, less effective when people passively receive information, as in a lecture or through a didactic slide presentation. Doing refers to activities such as abstracting information, making a critical appraisal or applying knowledge.

• Education is most effective when it recognizes the context in which it takes place. This should include an analysis of obstacles to applying what has been learned. For example, many of the environmental health fields rely on the collection and analysis of data on environmental impact. Yet in many countries these data are limited and difficult to obtain. A good training programme would acknowledge such data gaps, explore the reasons for their existence, identify strategies for ameliorating the problem and propose mechanisms for working with this constraint in the meantime.

The use of participatory methods should include activities that help students develop critical thinking, practice problem-solving and decision-making, and gain the confidence to take effective actions in the field. Of course, educators who have adopted this approach also recognize that participation in classroom
settings alone does not necessarily result in increased student activity or improved environmental health status after training. Participatory education is best seen as one of the key components of a comprehensive prevention strategy that combines effective training with legislation, improved infrastructure and planning, and enlightened policies and procedures.

Objections to using participatory methods in the academic environment include the claim that it requires too much time, that teachers are more comfortable presenting information than developing an interactive activity, and that the students themselves may appear reluctant. Yet participatory exercises can be integrated into sessions as short as one hour and, with practice, become easy to use. Since adults learn in different ways, the use of differing learning approaches is likely to be more effective than using a single approach that may work for some but not for others. Teaching is most successful if the students have the opportunity to engage in multiple-learning modalities: to listen, look at visual aids, ask questions, simulate situations, take part in role-play, read, write, practice with equipment and discuss critical issues.

In addition to incorporating a variety of teaching methods, the instructor should try to set up a physical environment that is conducive to active participation. This means arranging participants in a circle or finding some other way to allow maximum interaction. It means using movable chairs so that the larger group can break into small groups as needed. In large lecture halls, this may be difficult; however, students can still be asked to get into pairs or subgroups of 3-5 students.

Organizing a course or workshop

Curriculum development

This section provides guidelines for developing the following basic elements of a course curriculum:

1. Goals and objectives.
2. Required background.
3. Subject matter/methods.
4. Selected teaching methods.
5. Audiovisual materials.
6. Reading list, resources.
7. Timetabling.
9. Follow-up.

1. Goals and objectives

Setting goals and objectives is an important first step in conducting any teaching session. Learning goals are the outcomes one hopes to achieve. A learning goal for a course in basic environmental health might be to increase
awareness about the health effects of environmental and occupational factors. After setting goals, the next step is to break broad goal statements down into specific objectives or concrete accomplishments to be attained. Each of the chapters in the text is preceded by a list of learning objectives. For example, following a session on "Air pollution", "participants will be able to describe the major sources of air pollution".

While most educational programmes outline three major types of learning objective (knowledge, skills and attitudes) this programme, with its emphasis on the practical application of environmental health knowledge, also includes the development of social action skills. The four types of educational objectives are described below.

- **Knowledge:** The information or knowledge that participants will acquire during the educational programme.
- **Skills:** The skills or competencies that participants will develop (e.g. skills related to course content as well as "life skills", such as information retrieval, problem-solving and communication skills).
- **Attitudes:** The attitudes or beliefs that participants will explore. These may affect participants' ability to put what is learned into practice.
- **Social action:** Collective (rather than individual) actions directed towards social change. This might entail formulating public policy, implementing monitoring and surveillance programmes, organizing professional associations and promoting community education.

Examples of the four types of objectives are given below:

At the end of the workshop (e.g. on environmental health for public health professionals), participants will be able to:

- **Knowledge:** List the adverse health effects of chemical, physical and biological risk factors.
- **Skills:** Demonstrate the use of EPI INFO, a computer programme for epidemiological data analysis.
- **Attitudes:** Appreciate the need to utilize scientific data on environmental health to make public health decisions.
- **Social action:** Establish a network of environmental health professionals.

These educational objectives, expressed in terms of student competencies, will become an effective tool for managing, monitoring and evaluating the course.

2. Required background

The background knowledge required for a student to benefit from the course or workshop should be stated in a list of prerequisites. If particular background in basic sciences, epidemiology or environmental health is required, this should be stated explicitly. These prerequisites may be waived if the individual concerned is particularly eager to participate in the course and shows adequate aptitude. Additionally, some background reading may be required prior to
acceptance onto the course. A pretest may be used to establish the student's baseline level of knowledge.

3. Subject matter/teaching methods

The curriculum should provide details on what is to be taught and how it will be taught. It is important to select the appropriate methods for the chosen objectives and content areas. The teaching methods chart (see Annex 3) provides a summary of different methods and the objectives that each might fulfil. For example, lectures or information videos primarily fulfil knowledge objectives. Worksheet questionnaires or brainstorming exercises can fulfil knowledge or attitude objectives. Other more comprehensive methods, such as problem-based exercises and role-plays may be aimed at social action objectives, but they may also contain new information and present opportunities to explore attitudes. Behavioural objectives are best achieved by hands-on practice.

Sample exercises are provided for a course on "Basic environmental health" or on single topics from the text and others can be developed by using the following section on teaching methods. A curriculum which incorporates a variety of different teaching methods will be most effective and engaging for students.

4. Selected teaching methods

This section describes several teaching methods and provides suggestions for implementing them.

4.1 Small group exercises

The purpose of the small group is to maximize participation and allow people to use their own experiences and available resources to answer questions or solve the problems presented. Small groups can also be used to generate interest in a new topic, to discover new information and to reinforce information learned in a training session. An additional benefit is that small groups provide practice in working as part of a team. Given that environmental health problems generally require input from professionals from a variety of disciplines, the ability to communicate and work effectively in a group is essential. Several applications of small group exercises are discussed below.

4.1.1 Problem-based exercises

In problem-based exercises, students are presented with a realistic situation or case study which incorporates the problem but does not provide solutions. The method requires students to consider a problem as they would have to do in real life, to use both facts and judgement to analyse its causes, and to propose strategies to resolve it. Enough information should be provided to outline the basic problems or issues to be dealt with, but not every detail about a situation needs to be specified. People should be encouraged to improvise the details,
calling on their own experience to make them realistic. Depth of coverage depends on the students’ background.

The problem or case can be offered as an example of the relevance of prior learning or as an exercise for applying information that has already been learned. For example, WHO has prepared a series of sample problems for the Global Environmental Epidemiology Network (GEENET) that can be used to teach epidemiology to environmental health professionals (Document WHO/EHG/98.1). One of these sample problems concerns an outbreak of acute illness in West Africa that is found to be due to contamination of flour with parathion, an insecticide. Students are given information about the epidemic, in the order in which incidents occurred, and are asked at each stage to interpret the data and suggest what steps should be taken next to identify the cause of the illness. Problems can often be solved by more than one approach and may result in more than one correct solution or outcome.

In some academic institutions, problem-based learning (PBL) is not simply a teaching method but the foundation for all curriculum development. In contrast to more conventional education in which subject matter is transmitted by the teacher in the form of specific disciplines (e.g. toxicology, epidemiology, biostatistics), students in a PBL curriculum learn information and develop skills by investigating and resolving problems, in small groups or individually. In contrast to the epidemiology exercise described above, problems are presented in a less structured and more open-ended way that requires students to draw from a variety of disciplines to resolve them. In the course of problem-solving, students decide themselves what information is needed, and how and where to obtain it. The teacher serves more as a facilitator or moderator. Education becomes problem-based rather than discipline-based.

In an example from Australia, students in an environmental health course were presented with a scenario of a hypothetical town, Multirad, where citizens are concerned about their potential exposure to radon. The students’ task over a 10-day period was to determine what risk to health existed due to radiation in the town and to decide on a course of action. Students had access to two tutors (an epidemiologist and a radiation physicist), a personal computer with bibliographic databases, and information on indoor radon. The radiation laboratory in the State Department of Health was another resource.

Whether problem-based exercises are the primary entry point for learning or simply incorporated into a varied curriculum, they are an effective approach for teaching subject matter and also encourage the development of valuable life skills such as critical thinking, problem-solving and decision-making.

4.1.2 Conducting small group exercises

A problem-based or other small group exercise must be not only well designed but also well administered. To ensure active participation, groups should consist of between 4-6 people. Varying group composition during the course will encourage wider sharing of experience. Specific tasks or questions should be defined to guide the small group’s work and an agreed time allotted to perform the task. Sample questions might include:
— What are the problems in the situation?
— What are the underlying causes of these problems?
— Is additional information required to fully assess the situation? If so, please describe.
— Where or to whom would you go for (more) information?
— How do you propose to resolve the problem? Who should be involved?
— What would you recommend to prevent such problems from occurring in the future?

Participants should be instructed to select a chairperson to facilitate the discussion and a recorder who will take notes and report back to the plenary session. The teacher's role is to move among the groups to check on their progress, intervening only when necessary.

The report-back session, which should be the final stage of a small group exercise, is a time to explore what participants learned during the exercise. Rather than simply summarize what each group covered, which may be somewhat tedious, the report-back session can be used to pursue a deeper analysis and to challenge students to defend their strategy or conclusions.

4.2 Role-play

In a role-play, the situation or problem is acted out rather than just described and analysed. Role-plays are especially effective for exploring attitudes and developing interpersonal communication skills. They are also an effective means of discovering relevant information which is unlikely to emerge in more formal circumstances. Role-plays may be conducted with the entire group, followed by discussion in large or small groups. Role descriptions, either verbal or written, are given to the students playing the various roles. Players should be instructed to express their point of view, although the role-play should end without resolution. The role-play simply poses a problem. Interpretations and conclusions will emerge from the ensuing discussion. For example, WHO has incorporated a role-play into the training programme it developed for environmental control professionals in the Global Environmental Technology Network (GETNET). The role-play encourages discussion of the importance of community involvement in pollution control and prevention by staging a meeting between health agency representatives and community residents who are concerned about the health risk from an environmental exposure. Those who play the agency representatives practice their risk communication skills, while those who play residents demonstrate their understanding of community concerns. Following the role-play, the instructor leads a discussion in which students identify the problem, its causes and the different opinions expressed, culminating in potential strategies for improving communication with the community about environmental health.
4.3 Discussion starters (triggers)

This method serves to pose problems for discussion and analysis leading to action about the issues. Discussion starters are a concrete physical representation of the problem in any form: a written dialogue, a role-play, a case study, a slide, a short video. In any format, discussion starters should have the following characteristics. They should:

— represent a situation which is familiar and easily recognized by the group;
— pose one single problem so that discussion can explore the theme in depth;
— provide no solutions or answers, so that action strategies can emerge from discussion in the group;
— tackle a problem that is not overwhelming, allowing people to come up with small actions for change.

The discussion after presentation of the trigger follows a five-step questioning process which enables the participant to identify a problem, its root causes and an action plan. To lead the discussion, the instructor uses the acronym SHOWeD (see box).

Action steps emerge directly from the dialogue among participants.

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<tr>
<td><strong>See:</strong> What do you see here? What are the issues?</td>
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<tr>
<td><strong>Happening:</strong> What seems to be happening here? What is each person saying? How do they feel?</td>
</tr>
<tr>
<td><strong>Our:</strong> Does this situation seem familiar? Is it the same as our situation or different from it?</td>
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<tr>
<td><strong>Why:</strong> What are the causes of this problem?</td>
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<td><strong>Do:</strong> What can we do about the problem?</td>
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4.4 Lectures

Lectures are used to convey a basic body of information. To be most effective, lectures should be brief and should be combined with participatory exercises that enable the students to work with and apply the information that has been presented. Some educators believe that 20 minutes is the longest period during which people can assimilate information presented in a lecture format.

A few pointers to keep in mind are itemized below:

- Begin with a summary of what the lecture will cover and why it has practical relevance for the specific audience, and conclude with a similar summary.
- Make the lecture relevant by using examples that are familiar to the participants e.g. current events, or situations relevant to the local context.

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1 Adapted from: Wallerstein N and Weinger M. Health and safety education for worker empowerment. A merian Journal of Industrial Medicine, 22(5):619-625, 1992
Make the lecture interesting by using good visual aids.

Increase active participation by inviting questions from the students and by posing questions which require the students to apply the information that is presented to their own situations.

Conclude with a brief summary of key issues.

The main guideline for lecturing is to keep the presentation short to allow time for skill-building and analytic exercises. Three tools for enhancing participation during a lecture are worksheet questionnaires, brainstorming and buzz groups.

— The worksheet questionnaire can introduce a lecture in a participatory format or serve as a catalyst for group discussion. For a lecture, the instructor would write a series of questions on the lecture’s main points. Participants would be instructed to complete the questionnaire at the beginning of the session by themselves, in pairs or small groups. If they are completely unfamiliar with the topic, they should be encouraged to guess the answers. The instructor then reviews the questionnaire, soliciting a show of hands as each potential response is read. Participants with different responses are encouraged to justify their response, which will often lead to a lively discussion. The instructor then presents the correct information and elaborates further as necessary. Participants are generally interested in learning the correct answer and will listen more attentively than if they were hearing a lecture without the worksheet.

— Brainstorming is an exercise in which students in the large group are asked to come up with as many ideas as possible on a given issue. For example, the instructor could brainstorm potential measures to prevent a specific environmental health problem. The brainstorming should be limited to 3-5 minutes. The instructor writes each idea on the flip chart or overhead transparency as it is called out. No comments are allowed on any suggestion during brainstorming. After the ideas have been listed, the instructor works with the group to evaluate and prioritize the list.

— The instructor may break the group into pairs (buzz groups) for a short period to come up with ideas on a particular issue. After these brief conversations, it is easier to return to the plenary and start a discussion on some of the ideas generated in the groups. For example, in a seminar on "Women, health and environment", the instructor could start the session with a question such as, “Can you think of any occupational or environmental hazards which have specific implications for women?” or a statement like “Take five minutes to share your own experiences of exposure to environmental hazards”. After a brief buzz group on the question, the instructor solicits some of the ideas that were generated, lists them on a flip chart and uses them to help frame the ensuing discussion.
4.5 Discussion

A discussion, which can be either incorporated into a lecture or conducted as a separate learning activity, gives participants the opportunity to present and consider the various sides of an issue. Once a discussion has been initiated using the techniques outlined above, it must be maintained. The following tips will help you to do so:

- Ask questions that encourage participants to draw on their experience to make or illustrate points. Call on people if necessary to keep things going.
- If students direct questions to you, redirect them to the group. Ask if others have ideas that could address the situation.
- Try to involve everyone in the discussion. If one person dominates, try shifting the discussion to another student by saying something like, "Thank you for the information. Maybe someone else would like to add something." If necessary, stop the discussion and tell the group that you will call on only those who have not yet spoken.
- If the discussion loses focus, try to summarize the points that have been made on the flip chart or break into buzz groups to summarize where the discussion stands.

4.6 Planning deck

The planning deck is an activity which involves participants in identifying and ordering the components of a task or procedure to be learned. Environmental health procedures might be steps in conducting a risk assessment or designing an epidemiological study. Participants are divided into small groups and given the task of identifying the steps in a given procedure and reaching consensus on the order of the steps. The first small group to complete the task reports and explains the procedure to the larger group. Groups with different responses can justify their positions, followed by discussion of the desired order and confirmation of the content of the procedure.

4.7 Prioritizing/planning

An effective tool for prioritizing problems is a type of brainstorming using pieces of paper instead of verbal feedback. For example, participants can be asked to rank environmental health problems in their country. In this activity, the instructor asks a question, such as, "What is the most significant environmental health problem in your country?"

Each participant writes one problem in large print on a standard sized piece of paper, using a marker. The instructor then asks for a volunteer to share his/her problem and pass the piece of paper to the front of the room where it is posted up for all to see. Following this, the instructor calls for problems with a similar theme, posting each piece of paper under the previous one to create a vertical column. A new column is created for each new theme. All sheets are posted in the column, even if they repeat the problem. Proceeding in this manner, a visual representation of the most pressing problems is created, with
the longest list usually reflecting the problem of greatest concern. Following
the identification phase, the instructor can initiate a discussion of each
problem, barriers to resolving it and positive action steps that can be taken.

For construction of a quick plan of action, the same process can be used by
asking a question such as, “What is one step environmental health
professionals can take to increase the visibility of environmental health on the
national agenda?” The steps generated by the group can then be evaluated and
prioritized.

4.8 Student presentations

Students can be requested to prepare, either individually or in small groups, a
presentation for the class. The report might include a description of an
environmentally-linked health issue, a summary of studies already implemented
concerning this problem, recommendations for additional studies and/or
proposed interventions.

After each student’s brief presentation on the case and proposal for follow-up,
time should be allotted for questions and discussion.

4.9 Learning activities outside the classroom

4.9.1 Independent study

A variety of independent projects can assist the student in developing
investigation and research skills, as well as an inquisitive approach to learning
and field work. For example, as part of a module on air pollution, students may
be asked to identify the sources of air pollution in their city, current strategies
in use to address the problem and responsible agencies. Students can also
become involved in intensive study of a particular theme or problem over a
period of weeks or months. Student tasks may include research, bibliographic
searches, and consultation or interviews with specialists. As individuals or part
of a group, students take responsibility for investigating a particular aspect of
the theme and presenting it to the rest of the group in a series of classroom
sessions.

4.9.2 Field visits

Structured field visits can provide students with an opportunity to apply skills
and concepts learned in the classroom in a community setting. In order to
focus the students' attention on local environmental/occupational problems,
field visits to local factories, polluted areas or other sites of interest could be
organized. The class should be divided into subgroups of 5-6 persons. Each
subgroup should be given observation questions or tasks to accomplish. A
checklist may be a useful tool to guide and systematize student investigation.
Sample questions or tasks might be some of the following:

- At the sites observed, what are the common exposures that may cause
  health effects?
Identify potential methods for exposure measurement (in this case, technical students could practice using sampling equipment).

Consider potential measures for health effects.

Consider problems in designing a research or programmatic intervention.

Discuss prevention and control strategies.

At the end of the field visit, the whole group should be brought together to discuss subgroup observations, findings, recommendations and conclusions.

Field visits also offer an excellent opportunity to develop skills and practice in report writing. Following the visit, students can be asked to prepare a detailed report which addresses the questions posed above, utilizing a format provided by the instructor.

4.9.3 Community-based projects

Community-based projects can be a useful way of involving students in the practice of environmental health. Projects are particularly appropriate for advanced students who have the maturity and experience necessary for conducting independent work (under supervision). Another advantage of projects is that students must work cooperatively as a team. However, projects are also demanding in terms of staff time and require active collaboration from people and agencies outside the teaching institution. Ideally, projects should be based on a real problem, as identified by a client in the community. Hospitals, community clinics and Ministries of Health are common sites for student projects. Projects should not be ambitious as the time available is often limited and the skills of the students are still developing.

4.10 Distance learning

Distance learning has proved particularly useful for continuing education in situations where students are not able to attend classes for reasons such as distance, lack of time or lack of finances. In distance learning, knowledge is gained through individual study of learning materials that have been prepared specially for this purpose. Materials may include written texts, problem-solving exercises, self-administered examinations, audio tapes, video recordings and computer software. Performance is measured by periodic examination and meetings with representatives of the sponsoring institution. Individual study may be combined with group meetings of students, phone conferences and discussion groups using the Internet. A credential, degree or diploma is awarded upon successful completion of targeted objectives.

The advantages of distance learning include cost-effectiveness and increased student control over the pace, place, time and process of learning.

4.11 Computer-assisted learning

While computers are almost always part of distance learning, computer-assisted learning has also been integrated into the classroom setting in environmental
health teaching. For example, there are computer programmes, such as EPI-INFO, a software for epidemiological analysis, which can be learned and utilized in the context of problem-solving exercises in the classroom and become an ongoing resource for the student. WHO has prepared a teaching module for GEENET based on EPI-INFO applications.

5. Audiovisual materials

Audiovisual aids, such as blackboard, flipchart, overhead transparencies, slides, videotapes and films are effective for communicating new knowledge and increasing student interest and understanding. Here are some tips for using three common audiovisual aids: transparencies, slides and flip charts.

5.1 The overhead projector (OHP) and transparencies

- In preparing transparencies, do not overload them. Use the "seven by seven" rule; no more than seven lines of type, no more than seven words per line.
- Include a title on each transparency.
- Design transparencies so that they can be clearly seen by persons sitting in the back row.
- Before starting a presentation, be sure the OHP (or slide projector) has been properly placed in front of the classroom and accurately focused on the projection screen.
- Organize transparencies in advance and test them before starting to avoid being embarrassed by texts that are too small or inverted.
- Avoid blocking the screen. Talk to the audience, not to the visual aids. Keep shoulder orientation to the audience at all times.
- Using a pointer, point at the screen, not at the overhead projector when referring to items on the transparency. Standing at the projector will often block someone's view of the screen. Hold the pointer in the hand closest to the screen.
- Avoid reading the words on the transparency verbatim. Instead, use the transparency as a point of focus or summary of key points for the audience.
- Turn off the OHP (or slide projector) when it is not being used to prolong the life of the bulb and to avoid distraction.
- Be prepared with extra bulbs and an extension cord for both the overhead and slide projectors.
- Have an alternative to the OHP (or slides) in case of equipment or power failure. Flip charts are less expensive and may be more accessible.
- If possible, distribute photocopies of transparencies to students. This will enable them to focus on the discussion rather than on copying the text.
- Transparencies can also be used as an alternative to the flip chart to record student input during brainstorming and discussion.
5.2 Slides

- Be sure to preview slides. For packaged slide shows and videos, draft discussion questions and give participants specific viewing tasks to help maintain their attention.
- Use slides as discussion starters to generate problem analysis or to provide information. Rather than lecture, ask group members to comment on what they see or to identify good or bad points in the picture.
- Do not plan to show slides continually for more than 20 minutes.

5.3 Flip charts (or blackboards)

- Stand to one side of the easel when writing so the audience can read what is being written.
- Face the audience, rather than the easel, when speaking. Avoid writing and speaking at the same time.
- Utilize the flip chart to record ideas that are generated by the group. Sheets can be posted on the wall and used as an ongoing reference. Flip charts can also be prepared in advance to accompany a presentation.
- Having a visual outline of key topics or points on the flip chart helps students to listen effectively.

6. Reading list, resources

The Basic Environmental Health text can be supplemented with readily available and internationally authoritative resources (such as WHO publications) which can be listed in the curriculum documentation.

7. Timetabling

The course timetable should be included in the curriculum. There are several potential formats for teaching environmental health. For example, the book can be used to form the basis of a full semester course (e.g. 14 weeks) or its equivalent which is offered in one three-hour block per week. Other options include incorporating a topic or module within an existing course or a series of lunch-time seminars. Alternatively, a workshop based on sections of the book can be offered for a few days, or for one or two weeks, based on the target audience and objectives.

A continuing education course could also be extended over time, with sessions held once or twice a week. In such cases, a problem-solving approach to learning is helpful since the students have time between sessions to put their new knowledge and skills to the test in real work situations.

8. Evaluation

Evaluation is a continuous process which should occur throughout the course (formative evaluation) and at its conclusion (summative evaluation) to both
examine the student's progress as well as the learning process. Formative evaluation promotes student learning by optimizing the learning experience, while summative evaluation facilitates decisions about learner performance and progress in a course and the assignment of academic grades.

Evaluation is very important for several reasons. It allows the instructor to:

— receive feedback, identify problems and make appropriate mid-course adjustments;
— monitor student performance and assess whether learning objectives are met;
— improve her/his performance in future educational sessions.

Evaluation allows the student to:

— evaluate the course content as well as the instructor's presentation skills, techniques used, facilities and course organization;
— assess and improve her/his own performance.

**Formative evaluation** can be accomplished using informal feedback from students at the end of each session, with more in-depth assessments half-way through the course and at its completion. Mid-course evaluation can also include assignments, tests (which incorporate a problem-solving approach) and observation of skills in the classroom (presentations, demonstrations, role-plays, etc.). Since the purpose of formative evaluation is to improve the learning experience, feedback should address the following issues: learning objectives (are they being met?); course content (level of interest, relevance and difficulty); effectiveness of teaching methods and aids; student participation; level of enthusiasm and motivation generated. It is important to emphasize that formative evaluation does not necessarily correlate with an individual's knowledge about the course material and academic performance.

**Summative evaluation** often includes similar tools. Final judgements about student progress should be made on the basis of multiple assessments obtained on different occasions using a variety of methods. Students should be informed in advance of the evaluation methods which will be used and should be active participants in the process. Frequently used methods to evaluate student performance include written examinations with multiple choice questions and essay questions, projects or special assignments and oral examinations. Resources for developing evaluation approaches are available in several handbooks (see references).

Evaluation of the course and the teachers by the students is as important as examination of the students. Anonymous questionnaires are often employed for end-of-course assessments. Time should be allowed for this during the class. Students should be asked for both positive and negative feedback and for constructive suggestions as to how the course might be improved. Teachers should remember that it is impossible to meet the needs of all students; students' comments may even be contradictory.
9. Follow-up

Monitoring the long-term impact of educational programmes is often the most difficult evaluation to undertake well. In addition to cognitive and behavioural objectives, "education for action" also measures to what extent students were able to put their learning into practice. To encourage ongoing application of learning, students can be encouraged to develop an "action plan" before the end of the course or workshop in which they outline concrete steps which they plan to carry out in the 6-12 months following the course. Follow-up activities might include: networking with local health professionals and policy-makers; involvement in ongoing activities by local groups and organizations in areas related to environment and development; participation in legislative initiatives; and pursuit of further health, social and environmental studies. Methods that have been used successfully to evaluate long-term educational impact include questionnaires or interviews six months or one year after the course has taken place, observation of skills/practice, facilitated group discussions, and examination of records (e.g. college acceptance rates, performance on standardized tests).

Teaching facilities, equipment, materials

1. Facilities

For both courses and workshops, it is preferable to have a classroom large enough to seat all participants, preferably with a seating plan that allows face-to-face discussion. If possible, seat small groups of participants around tables facing the front of the room (horseshoe formation). There should preferably be two or three smaller rooms for group work.

2. Equipment and materials

The following equipment and materials are useful when organizing a course.

- Table-top name cards at seats and participant name-tags help in facilitating introductions during workshops. A list of participants' names, addresses and affiliations should also be distributed at the start of the programme.

- To prepare material during the course or workshop for distribution to participants, a typewriter (or word-processor) and copying machine are required.

- An overhead projector and/or flip chart (or blackboard) are essential to demonstrate key concepts and results of group work. With the help of a flip chart, earlier points can be referred to again if necessary since they are not erased, and important sheets can be detached and put up on the wall for easy reference. Thirty coloured markers are required for certain group activities (see action planning) as well as masking tape to post large sheets of paper on the wall.

- A 35mm slide projector, slide tray and extension cord are needed.
To demonstrate computer software and give participants a chance to practice, it is useful to have at least one IBM-compatible microcomputer as well as equipment to show the computer screens to the whole group. A CD-ROM reader for the microcomputer is also helpful for demonstration of modern environmental hazard information systems.

Preparation for teaching the course or workshop

The following steps should be taken when preparing to teach the workshop:

- **Know your audience.** As far as possible, determine who will be attending the course by collecting information such as job descriptions, educational background and experience, current level of understanding or skill in the topic to be studied, training needs and interests, problems and special concerns. This information will be useful in tailoring the course to the particular group’s needs as well as assessing whether there are potential obstacles to achieving the learning objectives. For example, the group may face certain problems that will affect how much they can apply what will be taught. Potential obstacles may be lack of materials or resources (computers, access to data, calculators) or institutional constraints (lack of support from supervisors, training issues are not a priority).

  Strategies for assessing audience needs include:
  - administer a pre-course questionnaire, survey or test (see sample, Annex 1);
  - conduct pre-course interviews with selected participants;
  - organize a focused group discussion among selected participants;
  - observe workers on the job (for continuing education of professionals);
  - administer a pre-course assignment, both to learn about participants' skills and to obtain case material for the course;
  - review written documents, such as academic records, test scores, recommendations, etc.

- **Adapt the course or training programme.** Based on what you know about the participants, make any necessary changes in the programme to meet their particular needs. Identify local examples of environmental problems and potential interventions. If feasible, prepare slides or videos of these examples. Problem-solving exercises can be revised to reflect current events and real issues that participants will face.

- **Select the trainers (for workshops).** Two instructors makes it easier to teach, more interesting for the participants, and allows for better supervision of small groups.

- **Make facility arrangements.** Make arrangements for food and refreshments when appropriate.

- **Prepare resource materials and equipment.** Prepare course handouts, collect resource books to be used in the classroom, as well as any sample equipment and audiovisual materials.
Send information to participants in advance. Ensure that students receive the Basic Environmental Health text or other materials that must be read in advance of a workshop. It is also useful to request written case studies from participants which illustrate success stories in environmental health management and/or unresolved challenges.

Arrange for a field visit. Identify a site where participants can observe environmental and occupational health hazards as well as effective prevention and control measures.