An Environmental Scan of
Best Practices in Public Health
Undergraduate Medical Education

REPORT 5:
Strengths, Weaknesses and Applicability of
Teaching Methods
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1. LECTURES

**Strengths:** Lectures are efficient ways of delivering information. Good lectures can introduce new material or synthesize concepts students have through text-, web-, or field-based activities.

**Weaknesses:** Lectures are not as effective as small group sessions when it comes to stimulating thinking, inspiring interest in a subject, teaching behavioural skills, or changing attitudes. Most often, lectures will only address part of the learning cycle and appeal most to students who are primarily auditory learners or have an assimilating learning style, while others may disengage from the presentation of the material. Students will need other opportunities to apply and reflect on the content for deep learning⁴ to occur.

**Applications:** Most educators agree that lectures are necessary, but that they should be limited in number and well delivered. It is important to give students opportunities to apply and reflect on lecture material during course time. Buzz groups can be incorporated into lectures in order to promote more active learning (see below).

**Figure 1:** Kolb's learning cycle and model of learning styles

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⁴“Deep learning” requires higher order cognitive skills such as analysis and synthesis, compared with “surface learning” that consists primarily of comprehension and reproducing knowledge.
2. SMALL GROUP LEARNING

**Background:** Traditionally small groups consist of 8-12 participants. Small groups can take on a variety of different tasks, including problem solving, role play, discussion, brainstorming, debate, workshops and presentations. Generally students prefer small group learning to other instructional methods.

**Strengths:** The main advantages of small group learning are that it encourages active learning and develops communication and teamwork skills. Among the educational objectives that can be best achieved through the use of small group teaching methods are the development of higher-level intellectual skills such as reasoning and problem-solving, the development of attitudes and the acquisition of interpersonal skills such as listening, speaking, arguing, and group leadership. Small groups encourage deeper level of learning compared with lectures, as students are encouraged to discuss and interpret meaning.

**Weaknesses:** Small group teaching can be resource intensive.

2.1 PBL/ CASE-BASED LEARNING/TUTORIAL/CASE STUDY/CASE SCENARIO

**Background:** The definition of PBL is not always clear. One common definition is “problem first learning via work in small groups and independent study”. Harden describes a continuum of PBL from problem-oriented learning, involving a lecture with practical examples, to PBL itself, where from the study of a problem students develop principles and rules and generalize their applicability to a variety of situations (see table). Davies points out that PBL usually requires an element of self-directed learning (see below) on behalf of the learner. In the writer’s experience, people will use the term PBL to refer to all of the teaching methods listed in the title of this section.

**Strengths:** PBL is said to develop problem solving skills and an integrated body of knowledge. It is a student-centered approach to learning, in which students determine what and how they learn. Case studies help learners identify problems and solutions, compare options and decide how to handle a real situation. A recent review by Koh *et al* of physician competencies following medical education through a PBL curriculum in several countries including Canada, found a

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*b In active learning, students are much more engaged in their own learning while educators take a more guiding role. Active learning techniques include buzz groups, case studies, role play, group projects and seminars. This approach is thought to promote processing of skills/knowledge to a much deeper level than passive learning, in which material to be learned is often transmitted to students by teachers.*
positive effect on social and cognitive competencies, particularly teamwork skills, appreciation of social and emotional aspects of health care, appreciation of legal and ethical aspects of health care, appropriate attitudes toward personal health and wellbeing, coping with uncertainty, use of computers and information technology, and understanding of evidence based medicine. Although there was strong evidence that PBL graduates rated themselves as in possession of less medical knowledge than if they had been in a traditional curriculum, there was no observed evidence found to support this.

**Weaknesses:** In Koh’s review, PBL was not found to have a positive effect on technical, managerial or teaching skills, including patient education, prescribing and procedural skills. This may be expected, given that these skills are more effectively learned through practice. When using cases, problems that may arise include lack of learner motivation, unequal participation of learners and inadequate accommodation of various learning styles. Effective cases must be well developed and well administered, needing significant administrative and faculty commitment. Difficulties may also arise in the evaluation of student participation and teaching effectiveness.

**Applicability:** The use of cases and case examples is already widespread in public health teaching and can help make public health principles real. It has been shown that learners learn best when given the opportunity to integrate their education and experience with opportunities to apply what they have learned. Cases should be made as relevant as possible to students, either emphasizing the role of the clinician or clearly elucidating the practice of public health physicians. In the writer's experience of public health teaching, cases are more often used rather than problem based learning per se. Koh’s review could be used to make a case for integrating PH principles into the traditional medical curriculum, which is often based on a PBL format, as PBL appears to be an effective format for teaching many of the concepts often covered in PH courses, including appreciation of social and emotional aspects of health care, appreciation of legal and ethical aspects of health care, and understanding of evidence based medicine. The fact that Koh found little evidence for competency in preventive health care and health promotion following graduation from a traditional PBL curriculum may be related to the fact that integration is not widespread.
2.2 DISCUSSION/DEBATE

**Background:** There are several types of discussion tasks including: *guided discussion*, in which the facilitator poses a discussion question to the group and learners offer responses or questions to each other’s contributions as a means of broadening the discussion’s scope; *inquiry-based discussion*, in which learners are guided through a series of questions to discover some relationship or principle; *exploratory discussion*, in which learners examine their personal opinions, suppositions or assumptions and then visualize alternatives to these assumptions; and *debate* in which students argue opposing sides of a controversial topic.

**Strengths:** With thoughtful and well-designed discussion tasks, learners can practice critical inquiry and reflection, developing their individual thinking, considering alternatives and negotiating meaning with other discussants to arrive at a shared understanding of the issues at hand.

**Weaknesses:** For maximum effectiveness, students need to come prepared for discussions and these need to be well facilitated.

**Applicability:** The opportunity for discussion is one of the main strengths of small groups. Use of discussion can introduce students to basic PH principles as well as influencing their attitudes. The most effective discussion leaders would have a thorough knowledge of the topic and good facilitation skills.

° Readings are often used effectively as a basis for all of the above discussion tasks.
### Terminology

<table>
<thead>
<tr>
<th></th>
<th>Terminology</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Rul → Eg</td>
<td>Problem-assisted learning.</td>
<td>Information provided with the opportunity to apply it to practical examples. Lecture followed by practical or clinical experience. Book with problems or experiences included.</td>
</tr>
<tr>
<td>4.</td>
<td>Eg</td>
<td>Problem-solving learning.</td>
<td>Problem-solving related to specific examples. Case discussions and some activities in practical classes.</td>
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<tr>
<td>5.</td>
<td>Rul → Eg → Rul</td>
<td>Problem-focused learning.</td>
<td>Information is provided followed by a problem. The principles of the subject are then learned. Introductory or foundation courses or lecture. Information in study guide.</td>
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<tr>
<td>6.</td>
<td>Rul → Eg → Rul</td>
<td>Problem-based mixed approach</td>
<td>A combination of problem-based and information-based learning. Students have the option of an information orientated or problem-based approach.</td>
</tr>
<tr>
<td>7.</td>
<td>Eg → Rul</td>
<td>Problem-initiated learning.</td>
<td>The problem is used as a trigger at the beginning of learning. Patient management problems are used to interest the student in a topic.</td>
</tr>
<tr>
<td>8.</td>
<td>Eg → Rul</td>
<td>Problem-centred learning.</td>
<td>A study of the problem introduces the student to the principles and rules specific to the problem. A text provides a series of problems followed by the information necessary to tackle the problems.</td>
</tr>
<tr>
<td>9.</td>
<td>Eg → Rul</td>
<td>Problem-centred discovery learning.</td>
<td>Following the presentation of the problem students have the opportunity to derive the principles and rules. Students derive the principles from the literature or from work undertaken.</td>
</tr>
<tr>
<td>10.</td>
<td>Eg → Rul</td>
<td>Problem-based learning.</td>
<td>The development of the principles includes the generalisation stage of learning. The investigation of patients with thyrotoxicosis is extended to a more general understanding of thyroid function tests.</td>
</tr>
<tr>
<td>11.</td>
<td>Eg → Rul</td>
<td>Task-based learning.</td>
<td>The problem is the real world. A set of tasks undertaken by a healthcare professional are the basis for the ‘problem’ presented to the student.</td>
</tr>
</tbody>
</table>

**Figure 1.** Problem-based learning: a continuum.

Harden RM et al. The continuum of problem based learning. Medical teacher 1998. 20(4); 317-322

Note: In the diagram above “Rul” refers to description of rules or theory; “Eg” refers to providing examples.
3. E-LEARNING/WEB-BASED MEDICAL EDUCATION/COMPUTER-ASSISTED INSTRUCTION

**Background:** Computer technologies, including the Internet, can support a wide range of learning activities from dissemination of lectures and materials, access to live or recorded presentations, real-time discussions, self-instruction modules and virtual patient simulations. Most teaching methods, including lectures, small group discussion and exercises can be translated into an electronic format. Generally, all computer-based methods must follow the same educational principles as traditionally-based educational methods in order to maximize effectiveness. Some instructional methods are unique to computer technology, including virtual patient simulation, interactive models or games and the use of multimedia.

**Strengths:** Assuming that a computer-based learning intervention is well designed, it can have a number of advantages, including distance-independence, flexible scheduling, the creation of reusable learning materials that are easily shared and updated, the ability to individualize instruction through adaptive instruction technologies and automated record keeping for assessment purposes.

**Weaknesses:** There are concerns that computer-based learning can detract from building team-based working skills, that on-line facilitators are not able to respond as quickly or adequately to student needs and that instructional design may often be compromised in order to use educational technology for technology’s sake.

**Applicability:** Reviews of the literature have generally concluded that computer-based education is not superior to traditional methods and its effectiveness depends on the quality of the educational program’s design rather than the computer-based tools being used. This being said, the move to increased education being offered on-line has been described as “inevitable”. Exciting opportunities for public health education exist using instructional methods unique to computer technology, such as interactive models or games that allow students to apply public health principles and experience public health practice in real life simulations. Computer technology can also assist in sharing materials and improving student access to public health information.
4. SELF-INSTRUCTION MODULES/EXERCISES

**Background:** Self-instruction can include reading, workbooks, videos or computer-based modules, designed to teach a particular concept or skill through an individual's independent completion of a series of readings, tasks or exercises. Increasingly self-instruction is being delivered using computer technology, which allows for multimedia presentation and some adaptation of the educational experience to the individual learner.

**Strengths:** Self-instruction is an efficient and flexible way to increase cognitive knowledge. Students are able to progress through self-instruction modules at their own pace and at their own convenience. Many students find the multimedia interaction of computerized self-instruction modules attractive. Studies have found that computerized self-instruction modules are equally effective when compared with conventional teaching in terms of knowledge gain and retention.

**Weaknesses:** Self-instruction is less effective than other methods for teaching skills and attitudes. Specific self-instruction modules may vary widely in design and educational effectiveness and those included in a curriculum should be chosen with care.

**Applicability:** Self-instruction can be an effective way to teach basic public health knowledge. Discussion and application of this knowledge in small group exercises could allow students to further integrate their learning.
Background: Experiential learning is the keystone in adult education. Most theorists agree that having experiences and reflecting on these experiences is the way in which most learning is generated. In the undergraduate medical education context, experiences can be classified in two categories: observational experiences, such as site visits and community placements, and active experiences, such as rotations and electives. Schon describes three levels of professional practicum experiences, including "technical training", in which students learn facts and rules and apply them non-problematically, "thinking like a...", in which students learn the forms of inquiry by which competent practitioners reason their way, and "reflection–in–action" in which students are able to construct and test new categories of understanding, strategies of action and ways of framing problems.

Strengths: Site visits and community placements can allow students to observe different aspects of public health and help them to contextualize their theoretical learning. This can help engage students actively and will appeal most to kinesthetic learners and the accommodating learning style. Rotations and electives in public health can help students develop skills, apply their knowledge, and actively experiment with PH concepts.

Weaknesses: Available experiences may differ widely in quality and content. Regardless, the experience students may get from a site visit, community placement or rotation addresses only one part of the learning cycle. Educational opportunities must also exist for students to reflect on their experience and experiment with or alter their behaviour for deep learning to occur.

Applicability: The more opportunity students have to experience and reflect on public health, the deeper their learning will be. It is unrealistic to expect more then "technical training" to occur at an undergraduate medical education level. Administrative and public health human resource issues must be considered in order to plan good experiential learning opportunities.

d Reflection-in-action occurs when one changes behaviour during an event in order to adjust to unexpected occurrences. It differs from reflection-on-action, which occurs after the fact.
6. PERSONAL REFLECTION

Background: Reflection is one of the most important adult educational tools available. Many theorists have argued that without reflection, knowledge translation and thus genuine “deep” learning cannot occur. Individual reflection tools include: learning journals, learning portfolios, pre-course needs assessments, post-course commitment to change statements and time-out periods or reflective moments built into course time. Small group or team-based reflection can include: cases based on participants past experiences, team debriefing, critical incident analysis and practice review or audit.

Strengths: Reflection allows students to take inventory of their current knowledge skills and attitudes, to integrate concepts from various experiences, to transform current ideas and experiences into new knowledge and actions and to complete the experiential learning cycle.

Weaknesses: For some individuals, reflection is an uncomfortable process that is actively resisted. Ideally, reflection should be built into course time to allow for guidance by facilitators and to help overcome resistance.

Applicability: All curricula should allow time for students to reflect on their public health experiences and on how these experiences relate to their medical training. Easily incorporated reflection methods include some journaling after small group discussions, the opportunity for debrief or reflective discussions and reflective course assignments.
7. SELF-DIRECTED LEARNING

**Background:** In self-directed learning students have primary responsibility for planning, implementing, and evaluating their effort. It is an adult learning technique that assumes that the learner knows best what their educational needs are. The facilitators role in self-directed learning is to support learners in identifying their needs and goals for the program, to contribute to clarifying the learners' directions and objectives and to provide timely feedback. Within the context of self-directed learning, adults can seek out and participate in a variety of teaching methods. Self-directed learning is not the same as self-instruction (above).

**Strengths:** Self-directed learning can be highly motivating, especially if the learner is focusing on problems of the immediate present, a potential positive outcome is anticipated and obtained and they are not threatened by taking responsibility for their own learning.

**Weaknesses:** The process of clarifying learning needs can require extensive facilitation, especially if the adult learner is feeling threatened, dissatisfied or anxious, or if their learning needs are ambiguous.

**Applications:** Self-directed learning projects can give students the opportunity to explore areas of specific interest to them that otherwise may not be covered in the curriculum.
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