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Goals and objectives of many state and local environmental education programs have included developing students with knowledge, skills, positive attitudes and motivation to take action, to prevent and to resolve environmental problems. This digest describes variables involved in developing responsible environmental behavior and some teaching approaches and materials that have been effective in achieving this goal.

WHAT DO WE KNOW?

Individual who exhibit responsible environmt behavior on a broad range of problem

(1) Knowledge of relevant environmental concepts;

(2) Knowledge of environmental problems and issues;

(3) Concern for the quality of the environment;

(4) Knowledge of action strategies that may be used for resolving an issue;

(5) Belief that their action can make a difference.

(6) Commitment to take action; and

(7) Experience in action based activities.

Data indicate that a good knowledge of environmental concepts is not sufficient; knowledge of environmental issues, issue skill analysis, and attitudes and values related to taking action are also necessary for the individual to take action and to act responsibly.

Some states, such as Wisconsin (Engelson, 1985), have developed state curriculum guides that recognize the need to provide for these variables in school programs, beginning early in the school program and continuing the emphasis throughout the school program. The Wisconsin program supports a hierarchical approach and that (1) concepts, attitudes and skills develop over time, (2) effective programs involve both cognitive and affective emphases, (3) effective programs require issue analysis, and (4) experiences should be provided that help the individual develop the feeling that their efforts and actions can make a difference with real issues and problems.

Environmental curriculum developers have been working to develop and test materials to help students to exhibit more responsible environmental behavior. Three sets of materials that have been found to have a significant impact on student learning and behavior are summarized in this digest. Other materials are available through the National Diffusion Network and listed in the ERIC database.

WHAT ARE SOME ENVIRONMENTAL EDUCATION APPROACHES THAT MAKE A DIFFERENCE IN DEVELOPING RESPONSIBLE ENVIRONMENTAL BEHAVIOR? CONSERVATION FOR CHILDREN

Conservation for Children (NDN, 1988) is a program for use in grades 1-6 designed to increase (1) conservation awareness, (2) understanding of basic scientific environmental, and conservation concepts, and (3) conservation action. The program includes a variety of basic skill activities in the areas of language arts, mathematics, social studies and science with conservation concepts and conservation action.

The infusion approach used in the program provides a conservation emphasis throughout the curriculum. The program also provides a continuing emphasis on conservation concepts and behaviors over time by providing materials for six year

Materials can be used to replace or to supplement current materials so relatively little additional class time is needed. Six grade-level curriculum guides and one all-level guide (activities, resources) are available. Data indicate most pupils who use the materials on a regular basis learn over 80 percent of the concepts and implement conservation practices at home.

INVESTIGATING AND EVALUATING ENVIRONMENTAL ISSUES AND ACTIONS: SKILL DEVELOPMENT MODULES

Hungerford and his associates have analyzed research on variables related to the development and demonstration of environmentally responsible behavior and have designed and tested a set of instructional materials based on this research (Hungerford, 1985). The materials stress a hierarchical-approach involving four levels of activities (Hungerford p28-29 in Disinger, 1987).

1. Ecological Concepts: This goal level attempts to provide the learner with the ecological knowledge that will permit him/her to make ecologically sound decisions with respect to environmental issues. This knowledge would include (but not be limited to) such concepts as individuals and populations, interaction, limiting factors, biogeochemical cycling, abiotic influences, homeostasis, succession, etc.

2. Conceptual Awareness: This goal level attempts to develop a conceptual awareness (i.e., knowledge) of how individual and collective behaviors influence the relationship between quality of life and the quality of the environment, as well as how human behaviors result in issues which must be resolved through investigation, evaluation, decision-making, and citizenship action.

3. Issue Investigation and Evaluation: This goal level attempts to develop the knowledge and skills needed to permit learners to investigate environmental issues and evaluate alternative solutions for remediating these issues. It also provides opportunities for students to actually investigate and evaluate issues.

4. Environmental Action Skills: Training and Application: This goal level attempts to develop those skills needed for learners to take positive environmental action for the purpose of resolving or helping resolve environmentally-related issues.It also involves the development of action plans by the students and provides them with the opportunity to implement those plans if they desire.

Research data indicates that behavior change usually will not occur if students are exposed only to Goals 1 and 2. The data also indicates that behavior will change if students are thoroughly exposed to Goals 3 and 4 in addition to 1 and 2. The quality of the students environmental actions also tends to improve when they have used issue analysis and investigation.

The materials Hungerford and his associates have developed include six modules: (1) Environmental Problem Solving; (2) Issue Investigation (Basics); (3) How to Gather Information; (4) Interpreting Data; (5) Investigation of Issues; and (6) Environmental Action Strategies. (Hungerford, 1988).

Studies report that effective use of the modules has usually required about 18 weeks of instruction and activities, but alternative approaches have been suggested in the literature. The modules have been tested primarily at the middle school and junior high school level, but could probably be adapted to grade levels

as low as four and certainly could be used with older students in secondary schools and postsecondary institutions.

DECISIONS FOR TODAY AND TOMORROW: ISSUES IN SCIENCE-TECHNOLOGY-SOCIETY

These materials by Iozzi and Others (1987) were developed to supplement secondary school programs in the areas of science and social studies. The materials stress developing a knowledge base, problem solving, critical thinking, and thoughtful action.

The materials include a student guide with 12 chapters related to science-technology-society and the environment. There are two teacher guides that provide background material for the teachers, lesson plans, handouts, and worksheets. The guides provide suggestions on effective teaching approaches and activities to use.

SUMMARY

Research has identified several variables that are important in developing students who exhibit responsible environmental behavior. Programs and materials that include experiences with issue analysis, issue investigation, and working on real environmental issues and problems have been more successful than those that have not included these experiences. Programs that have included an emphasis on environmental knowledge and problems over several months to several years have also been more successful than brief activities. School staff and non- formal program developers concerned with effective environmental education programs should consider including such experiences in their programs.

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Para Guru Beradu Kreasi Pembelajaran

BAGAIMANA caranya menjelaskan sifat-sifat udara di depan murid SD? Tentu saja guru tidak hanya cukup dengan berceramah di depan kelas. Dibutuhkan kreativitas guru untuk memberi pemahaman akan konsep materi ini dengan mempergunakan sejumlah alat bantu.

TANPA perlu berbelit-belit, Arsyad mampu menjelaskan konsep udara kepada murid-muridnya yang duduk SDN 2 Tente, Kabupaten Bima, Nusa Tenggara Barat.

Hebatnya lagi, dengan alat yang murah meriah, murid-muridnya di wilayah kepulauan itu bisa menikmati materi pelajaran secara santai.

Para murid bahkan merasa seakan-akan tidak sedang berada di dalam kelas. Benda-benda yang dipakai untuk memeragakan sifat-sifat udara sangat akrab di memori mereka sebagai barang mainan di luar sekolah dan akrab dengan kehidupan sehari-hari.

Ada juga kartu Shinchan, kartu F4 Meteor Garden, Kartu Batman, dan semacamnya. Ada pula kartu bekas voucher isi ulang pulsa telepon seluler maupun topi. Kartu-kartu tadi dipergunakan untuk memahami dua konsep sekaligus, yakni tekanan udara pada bidang datar dan titik berat benda.

SATU per satu muridnya dipanggil ke depan kelas untuk melakukan percobaan. Sang murid diminta meletakkan topi di lantai dalam posisi menengadah. Murid berdiri di dekat topi sambil memegang setumpuk kartu. Kartu dipegang dari ujung pinggir secara vertikal (dari atas ke bawah).

Dari ketinggian sekitar dua meter, selembar demi selembar kartu dijatuhkan secara lurus menuju topi yang menganga di lantai. Sampai 10 murid yang maju melakukan hal itu, tak satu pun yang berhasil memasukkan kartu ke dalam topi. Arah jatuhnya kartu selalu meleset ke samping topi.

Setelah murid-muridnya penasaran, barulah pria kelahiran Bima 7 Juli 1966 itu membongkar "misteri" kartu.

"Secermat apa pun, kamu tak akan pernah berhasil menjatuhkan kartu itu tegak lurus apalagi jatuh tepat ke dalam topi," ujar Arsyad memancing rasa ingin tahu muridnya.

Dia menjelaskan, titik berat kartu tepat berada di tengahnya. Makanya, kartu mudah berputar dan oleng ketika dijatuhkan. Miring sedikit saja, sudah cukup untuk menimbulkan gaya tahan udara yang lebih besar terhadap sisi yang menghadap ke bawah. Udara menahan kartu lebih kuat dan mendorongnya ke samping.

Lalu, bagaimana caranya menjatuhkan kartu agar arahnya bisa lurus masuk ke topi? "Gampang! Coba pegang kartu secara mendatar atau horizontal, lalu jatuhkan," Arsyad memberi instruksi.

Alhasil, kartu jatuh pelan dan masuk ke topi. Penjelasannya, bagian kartu yang lebar akan membuat kartu jatuh tegak lurus.

Pada kesempatan lain, Arsyad mengajak para muridnya bermain-main lagi untuk mengetahui pemuaian udara akibat pembakaran. Lagi-lagi, benda yang dibutuhkan sangat akrab dengan lingkungan sekitar. Ada gelas, korek api, piring, dan uang logam.

Namun, kiatnya tidak berhenti sampai di situ. Arsyad pun memberi catatan sebagai hikmah yang dapat dipetik dari permainan tersebut.

"Jangan menyimpan botol plastik berisi udara yang tertutup rapat di lemari es atau kotak pendingin lainnya. Nanti botol itu remuk. Kaleng bekas semprotan jangan dibuang ke api. Nanti meledak!"

METODE pembelajaran itu dituangkan Arsyad dalam bentuk karya tulis ilmiah berjudul Efektivitas Learning By Game dalam Pembelajaran Konsep Sifat-sifat Udara di SD. Dalam Lomba Kreativitas Guru (LKG) 2003 yang diadakan Lembaga Ilmu Pengetahuan

Indonesia (LIPI), karya tulis tersebut keluar sebagai juara pertama untuk kategori guru SD.

Dalam pemaparan di depan tim juri di Gedung LIPI, Jakarta, Selasa (19/8), Arsyad menyisihkan dua finalis lainnya. Dua finalis yang dimaksud adalah Sudirman (SDN 1 Watampone, Sulsel) dan Rabia Habib Mukolang (SDN Oetama Kupang, NTT).

Seperti biasanya, LIPI menggelar LKG serangkai dengan Lomba Karya Ilmiah Remaja (LKIR). LKG dibagi lima kategori. Kategori pertama, guru SD, yang dimenangkan Arsyad. Kategori kedua, bidang Ilmu Pengetahuan Sosial dan Kemanusiaan (IPSK) tingkat SLTP, dimenangi oleh Rizal Napitupulu (SLTP Kuala Kencana YP Jayawijaya, Papua).

Kategori ketiga, bidang Matematika, Ilmu Pengetahuan Alam dan Teknologi (Mipatek), dijuarai Ketut Kamir Astika (SLTPN Busungbiu, Buleleng, Bali).

Kategori keempat, bidang IPSK tingkat SMU/Kejuruan, dimenangi Erni Dewi Kurniawati (SMUN 1 Sambas, Kalbar).

Kategori kelima, bidang Mipatek tingkat SMU/Kejuruan dijuarai Ade Wijaya (SMU Kristen 7 Penabur, Jaktim).

Para guru tersebut kini telah berkumpul kembali bersama keluarga dan anak muridnya setelah mempertahankan karyanya di depan tim juri yang dipimpin Prof Dr Robert Napitupulu.

MISI yang diusung LIPI sangat relevan dengan santer-santernya istilah pembelajaran kontekstual. Pada semua jenjang pendidikan, metode tersebut kini terus digalakkan.

Untuk ilmu eksakta, upaya itu dibutuhkan demi menjawab tudingan bahwa rendahnya daya serap peserta didik akan materi pengajaran lantaran minimnya alat peraga yang akrab dalam kehidupan sehari-hari.

Sementara untuk ilmu sosial dan kemanusiaan, upaya itu mutlak karena istilah dan wacana yang dikembangkan sering kali tidak sinkron dengan suasana kebatinan masyarakat sekitarnya.

Pada pelajaran ilmu eksakta di tingkat SLTP misalnya, karya Ketut Kamir Astika menunjukkan karya yang sarat kontekstualitas dan aktualitas.

Sama seperti Arsyad, pria kelahiran Bali 31 Desember 1959 itu mampu menawarkan solusi alternatif di tengah minimnya anggaran sekolah untuk pengadaan bahan hingga alat peraga.

Baik untuk pelajaran fisika maupun biologi, semua alat peraga yang dirakit Astika adalah barang-barang bekas yang mudah didapatkan di lingkungan masyarakat.

Untuk menentukan arah arus listrik dan kutub magnet pada solenoida, Astika hanya menyarankan bahan berupa paku 7 sentimeter dua buah, kawat berisolasi lima meter, dan sebuah batu baterai. Caranya, kedua paku dililiti kawat kemudian dihubungkan ke baterai sebagai sumber tegangan.

Dia juga menawarkan alat peraga berupa bel sistem elektromagnetik dari kaleng bekas. Bahannya, baut 7 sentimeter, kaleng bekas, paku, sakelar, kawat email. Juga diperlukan

kayu 20 cm x 5 cm, 10 cm x 5 cm, dan 14 cm x 2 cm masing-masing satu potong, ditambah sebatang paku ulir.

BAGAIMANA dengan ilmu sosial yang sulit diperagakan dengan benda-benda sekitar kita?

Eni Dewi Kurniawati memberikan solusinya. Melalui pelajaran bahasa Indonesia, Eni mampu menumbuhkan kesadaran pluralisme pada siswa SMU Negeri 1 Sambas. Isu yang diangkat adalah konflik etnik yang menelan ribuan nyawa di Sambas beberapa tahun terakhir.

Dengan metode diskusi dan tugas-tugas mengarang, Eni bisa mengukur perubahan sikap siswanya terhadap konflik etnik. Dalam debat dan tulisannya, terbaca bahwa sikap siswa SMUN 1 Sambas pun mengecam tragedi kemanusiaan yang menambah daftar panjang pelanggaran HAM di negeri ini.

Perempuan kelahiran Tambelan, Riau, 16 Desember 1964 itu membuktikan bahwa tanpa arahan kurikulum pun, sebetulnya guru bisa merancang pembentukan sikap positif para siswa terhadap bidang-bidang sosial. Setiap jenis pelajaran bisa dijembatani menuju realitas sekitar kita.

Intinya, pembelajaran yang efektif sangat tergantung pada kreativitas dan inovasi guru. Kalau LIPI saja mampu mengadakan LKG setiap tahun, sungguh naif jika Depdiknas tidak mentradisikan hal semacam itu. (Nasrullah Nara)