Environmental Education Compendium for Integrated Waste Management and Used Oil

A Cooperative Presentation by:

The California Integrated Waste Management Board
and California Department of Education

2000
Second edition

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The following individuals made significant contributions in the writing and development of this document:

Jennifer Rigby, Project Consultant
The Acorn Group

Amber Robinson-Burmester, Project Manager
California Integrated Waste Management Board

Gary Smith, Curriculum and Compendium Project Coordinator
Anaheim Union High School District

Bill Andrews, Education Programs Consultant
California Department of Education

Layout and design:

Jennifer Rigby
The Acorn Group

Amber Robinson-Burmester
California Integrated Waste Management Board

Cover art:

California Department of Education, Bureau of Publications

The following individuals reviewed and evaluated the curriculum materials presented in this document:

Martin Byhower, Chadwick School, Palos Verdes Peninsula
Carol Conway, McKinley Elementary School, Corona
Margaret Fauchier, Grange Middle School, Fairfield
Anne Harris, Jefferson Elementary School, Cloverdale
Beverly Hayes, Lincoln Acres and Olivewood Elementary Schools, National City
Al Janulaw, Creekside Middle School, Rohnert Park
Sharon Janulaw, Marguerite Hahn Elementary School, Rohnert Park
Wayne Johnson, Pescadero High School, Pescadero
Maria Laxo, Chabot Observatory and Science Center, Oakland
Lori Mann, Environmental Education Consultant, San Francisco
Pam Martin, Lincoln High School, Stockton
Dave Massey, Chet Harritt School, San Diego
Lynda Mooney, Las Palmas Elementary School, National City
Muthena Naseri, Moorpark College, Moorpark
Sam Patalano, Landmark Middle School, Moreno Valley
Doug Perry, Morada Middle School, Stockton
Tina Porter, Cambrian School District, San Jose
Laura Powell, Chabot Observatory and Science Center, Oakland
Jolene Redvale, San Bernardino County Museum, Redlands
Nona Reimer, Malcom Elementary School, Laguna Niguel
Julie Schardt, Cleveland Elementary School, Stockton
Cyndee Smith, North Tamarind Elementary School, Fontana
Mark Sorensen, Resource Consultant, Upland
Bonnie Styles, National School District, National City

The following individuals served as compendium advisors:

Bill Andrews, California Department of Education
Tricia Broddrick, California Integrated Waste Management Board
Liz Citrino, Integrated Waste Manager, Humboldt County
Olga Clymire, Lake County Office of Education
Jessica Craven, City of Oxnard Soild Waste Program
Joe Fulton, Evergreen Oil
Curry Hyde, Davis Street Education Center
Phil Lafountaine, K-12 Regional Alliance
Don Peri, California Integrated Waste Management Board
Tina Porter, Cambrian School District
Jennifer Rigby, The Acorn Group
Amber Robinson-Burmester, California Integrated Waste Management Board
Brenda Saldana, California Integrated Waste Management Board
Gary Smith, Anaheim Union High School District
Judy Wheately, Water Education Foundation
Shirley Willd-Wagner, California Integrated Waste Management Board
Becky Williams, California Integrated Waste Management Board

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To the Educator

Dear Educator,

It is our pleasure to present the second edition of the *Environmental Education Compendium for Integrated Waste Management and Used Oil*, a cooperative project by the California Waste Management Board and California Department of Education. This second edition is the result of a new nationwide search for environmental education curricula published in the 1990's.

We recognize that educators face an enormous challenge in integrating environmental education into the classroom. While a great deal of material exists within the field of environmental education, some may not be readily accessible or may fail to meet the high standards established by the California education frameworks and content standards.

According to current educational theory, students make conceptual change only when they actively construct their own knowledge. This active learning takes place when students are engaged in research, discussion, exploration, and application. Students develop the skills to analyze diverse perspectives, apply their own knowledge, and develop strategies for responsible action. In the context of integrated waste management and used oil, it is hoped that students will become informed citizens who, as consumers, will make wise decisions regarding the consumption of natural resources, reduction in waste, and recycling and reuse of materials. You, as an educator, play a vital role in this process by including the study of integrated waste and used oil issues in your classroom activities.

This compendium is one in a series providing information on quality environmental education instructional materials. We are confident this *Environmental Education Compendium for Integrated Waste Management and Used Oil* provides you with educationally sound resources to instruct and empower your students as they examine waste-related issues from a variety of perspectives.

We offer this compendium to you and to the students of California.

Sincerely,

Bill Andrews
Education Programs Consultant
California Department of Education

Ralph E. Chandler
Executive Director
California Integrated Waste Management Board

Table of Contents

About This Compendium.....i-ii

Significant Findings.....iii-iv

Field Guide to the Reviews.....v

Integrated Waste Management Curricula.....1-176

Materials for Grades K - 3

Closing the Loop.....2-3
Rethinking Recycling.....4-5
Action for a Cleaner Tomorrow.....6-7
Think Earth.....8-9
Pathways to a Sustainable Future.....10-11
A-Way with Waste.....12-13
Environmental Protection Native American Lands.....14-15
NatureScope: Pollution Problems and Solutions.....16-17
Ecology in Action.....18-19
The No-Waste Anthology.....20-21
Let's Reduce and Recycle.....22-23
Garbage Reincarnation.....24-25
Waste in Place.....26-27
Trash Today, Treasure Tomorrow.....28-29
Living Lightly in the City.....30-31
Activities Guide to Solid Waste and Recycling.....32-33
Counting On People.....34-35

Materials for Grades 4 - 6

Closing the Loop.....36-37
A Child's Place in the Environment: Unit 6.....38-39
Windows on Waste.....40-41
A Child's Place in the Environment: Unit 5.....42-43
Pathways to a Sustainable Future.....44-45
Environmental Protection Native American Lands.....46-47
Understanding Garbage and Our Environment.....48-49
Trash Conflicts.....50-51
An Ounce of Prevention.....52-53
Action for a Cleaner Tomorrow.....54-55
A-Way with Waste.....56-57
What a Waste!.....58-59
Re-Source Your Trash.....60-61
Waste in Place.....62-63
The No-Waste Anthology.....64-65
Counting on People.....66-67
NatureScope: Pollution Problems and Solutions.....68-69
BFI Mobius Curriculum.....70-71
Think Earth.....72-73
Garbage Reincarnation.....74-75
Activities Guide to Solid Waste and Recycling.....76-77
Living Lightly in the City.....78-79
Rethinking Recycling.....80-81
Let's Reduce and Recycle.....82-83
Air to Earth Teacher's Resource Kit.....84-85
Revise, Recycle, Recover.....86-87
Planet Patrol.....88-89
Reduce, Reuse, Recycle, A Waste Activity Kit 90-91

Materials for Grades 7 - 9

San Diego, A World in Harmony.....92-93
Exploring Environmental Issues: Municipal Solid Waste.....94-95
Environmental Protection Native American Lands.....96-97
Trash Conflicts.....98-99
Environmental Action: Waste Reduction.....100-101
Understanding Garbage and Our Environment.....102-103
Pathways to a Sustainable Future.....104-105
People and the Planet: Lessons for a Sustainable Future.....106-107
Action for a Cleaner Tomorrow.....108-109
Solid Waste: Is There a Solution?.....110-111
A-Way with Waste.....112-113

Table of Contents

An Ounce of Prevention.....114-115
Resource Cycles.....116-117
The No-Waste Anthology.....118-119
The Waste Hierarchy: Where Is “Away”?.....120-121
Let’s Reduce and Recycle.....122-123
Revise, Recycle, Recover.....124-125
Living Lightly on the Planet.....126-127
Generation Earth.....128-129
Rethinking Recycling.....130-131
Operation Separation.....132-133
Alabama PALS.....134-135
Economics and the Environment Eco-Detectives.....136-137
Activities Guide to Solid Waste and Recycling.....138-139
Litter Prevention and Recycling.....140-141

Materials for Grades 10 - 12

Pathways to a Sustainable Future.....142-143
Action for a Cleaner Tomorrow.....144-145
Exploring Environmental Issues: Municipal Solid Waste.....146-147
San Diego, A World in Harmony.....148-149
Earth Matters: Studies for Our Global Future 150-151
Environmental Protection Native American Lands.....152-153
Waste: A Hidden Resource.....154-155
Cycles for Science.....156-157
Environmental Action: Waste Reduction.....158-159
A-Way with Waste.....160-161
Rethinking Recycling.....162-163
The Waste Hierarchy: Where Is “Away”?.....164-165
Cycling Back to Nature with Biodegradable Polymers.....166-167
Generation Earth.....168-169
The No-Waste Anthology.....170-171
Revise, Recycle, Recover.....172-173
Let’s Reduce and Recycle.....174-175
Economics and the Environment Eco-Detectives.....176-177

Used Oil Curricula for Grades 4 - 12

Every Drop Counts (4-6).....180-181
Action for a Cleaner Tomorrow (7-9).....182-183
Used Oil Recycling, A Complete Curriculum (7-9).....184-185
Put Used Oil in Its Place (7-9).....186-187
Student/Teacher Guide to Recycling Used Oil (7-9).....188-189
Earth Resources - A Case Study: Oil (10-12).....190-191
Oil’s Well That Ends Well (10-12) 192-193
Action for a Cleaner Tomorrow (10-12).....194-195
Used Oil Recycling, A Complete Curriculum (10 -12).....196-197
Put Used Oil in its Place (10 -12) 198-199
Student /Teacher Guide to Recycling Used Oil (10-12) 200-201

Appendices

Overview and Unifying Concepts.....202-203
Conceptual Matrices.....204-205
Correlations to Frameworks and Standards.....206-207
Integrated Waste Management / Used Oil Evaluation Tools.....208-211
Supplemental Materials.....212-218
Software.....219
Internet Addresses.....220-224

About This Compendium

INTRODUCTION

This compendium is an easy-to-use guide to environmental education materials focusing on integrated waste management and used oil. Interdisciplinary by nature, environmental education is appropriate in any subject area, and many educators often integrate environmental concepts into their lesson plans. Finding suitable materials, however, can be a time-consuming and complicated task. This compendium helps streamline the selection process by identifying and reviewing exemplary curricula that are appropriate for classroom use.

CONTENT OF CURRICULA

An extensive national search was conducted to locate teaching materials that focus on integrated waste management and used oil issues. Through this process, numerous areas of study were identified. For integrated waste management, these include the impact of waste on natural and built environments; source and waste reduction; recycling, reusing, composting, and vermicomposting; the role of consumers in the consumption of natural resources and generation of waste; the need for conservation; and the impact of solid waste and pollution. For used oil, these issues include the role of consumers in the consumption of petroleum products; the finite, non-renewable nature of petroleum products; the impact of improper disposal of motor oil; and the recycling, re-refinement or re-processing, and reuse of motor oil.

In California alone, several new publications have emerged in the past five years. Mandated by legal requirement with the passing of the California Integrated Waste Management Act (Assembly Bill 939) and faced with the problematic reality of landfill closures, many government agencies have looked toward education as a vehicle to raise the public's awareness of the need to reduce waste. A new waste management hierarchy has been established, with source reduction, or waste prevention, as the first priority, recycling and composting as the second, and landfilling and transformation as the third, and last option.

For a majority of the curricula reviewed, lesson plans are organized around the concept of a waste hierarchy. The need for reducing, reusing, and recycling is examined within the context of conserving natural resources and diverting materials away from landfills. Through readings, discussions, and activities, students' awareness of solid waste is enhanced by knowledge of environmental implications. In many cases, this knowledge, in turn, is applied to school and community action projects. Conducting a classroom or campus solid waste audit, initiating a schoolwide recycling or cafeteria composting project, or launching a "buy recycled" campaign project are examples of the types of project-based learning proposed in recently published curricula.

A second area of study focused on used oil, chosen due to its applicability to discussions on recycling. Viewed as both a hazardous waste and valuable resource to recycle, used motor oil is emerging as a critical environmental issue – particularly relevant to secondary level students who are learning to drive and maintain automobiles. Recycling is the only environmentally safe and legal method to dispose of used oil; its improper disposal, including dumping it into storm drains or pouring it on the ground, can result in contamination of drinking water, fouling of sewage treatment processes, and long-term health effects in freshwater and marine organisms. In spite of the environmental implications and legal mandates, used oil continues to be improperly disposed. In a recent study by the American Petroleum Institute, eighty-two percent of the states reporting indicated that lack of public education is a major reason why "do-it-yourselfers"(those who change their own oil) do not participate in used oil collection/recycling programs. Through an exhaustive search for used oil education materials, however, only seven curricula were identified, three of which were developed in California.

About This Compendium

> I recognize the right and duty of this generation to develop and use our natural resources, but I do not recognize the right to waste them, or to rob by wasteful use, the generations that come after us.
>
> - Theodore Roosevelt, 1900

EVALUATIONS

On the following pages, both descriptive and evaluative information on each curriculum are presented. Evaluation scores are based on statistical means derived from these data. Two sample pages are featured from each curriculum. Due to the length of some lessons, only a portion of the sample lesson may be provided. Each evaluation includes a description of the curriculum, ordering information, a "report card," discipline emphasis, and brief comments from evaluators. Exact quotes from the reviewers are given quotation marks. General comments are not given quotation marks.

REVIEWERS

The curricula were evaluated by two teams of educators from throughout California. One team represented southern California; the other northern California. These educators were chosen on the basis of their extensive environmental education experience and expertise, as well as background in the topic area, state education frameworks, and standards. This distinguished group of evaluators has provided an important service to everyone associated with curriculum development and instruction related to environmental education.

MATERIALS

The curriculum materials were evaluated with the use of an evaluation tool developed by the California Department of Education in collaboration with other state agencies. The goal of this evaluation was to identify those curricula that align with California education frameworks and standards and present accurate and comprehensive issues related to the topics of integrated waste management and used oil.

Curricula were evaluated for appropriateness at four grade-group levels: K-3, 4-6, 7-9, and 10-12. Each piece was evaluated by a team of educators with teaching experience at the target grade-group level. Multi-level curricula were evaluated at each grade level that they encompassed, resulting in some curricula being evaluated at four grade-group levels.

Each curriculum described in this compendium received an overall grade of B- or above. These materials are highlighted in the main part of this document. Supplemental materials not deemed curricular in design are listed in the appendices, along with other resources.

For ease of use, the main body of the compendium has been divided into the four grade-group sections. Curricula are arranged within each section by rating; those with the highest ratings are listed first. Some curricula appear in more than one grade-group section. Because of the small number of used oil curricula, they are arranged in only one section, with the highest ratings per grade-group appearing first.

APPENDICES

Included in the appendices are a description of the Curriculum and and Compendium Project coordinated by the Office of Environmental Education within the California Department of Education; the Unifying Concepts for Environmental Education; the Conceptual Matrices for Integrated Waste Management and Used Oil; correlations of the Conceptual Matrices to seven California education frameworks, four California education content standards, and the California Education Code; the evaluation tool; and listings of supplemental materials, software, and internet addresses for on-line information about environmental education, integrated waste management and used oil.

Significant Findings

FUNDING

This project was funded by the California Integrated Waste Management Board and California Department of Education's Environmental Education Grant Program.

CONCLUSIONS

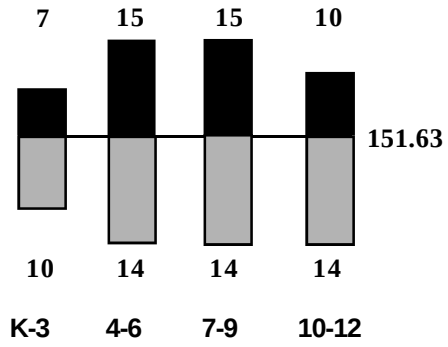
While this compendium was developed to reveal the strengths and weaknesses in existing curricula, it was also intended to serve as a guide for future curriculum development. The project identified several outstanding curricula; however, even some of these materials could benefit from further refinement, particularly in terms of ease of use in the classroom.

Three conclusions have been drawn from the review process: (1) in a manner similar to most of the other five compendia, the greatest number of curricula exists for the 4-6 and 7-9 grade-group levels, and the smallest number of curricula are found at the K-3 grade-group level; (2) recently-published curricula provide more opportunity for direct student involvement in waste audits, community outreach efforts, and recycling/composting programs at home and on campus; and (3) due to the structure of the evaluation tool, curricula covering a wide range of environmental topics may not have scored as high on specific content as those focusing exclusively on integrated waste management or used oil issues. This is not meant to imply that such curricula are inadequate, but only that they may not cover the specific subject matter of this compendium thoroughly.

It should also be noted that the topic of hazardous waste was not explored in this new compendium. Consequently, materials with a predominant emphasis on hazardous waste, household hazardous waste, and toxics have not been reviewed for inclusion in this document.

Lastly, this compendium is intended as a tool for educators interested in exploring with students waste management issues including that of used oil. Such an effort would promote acknowledgement of our consumption of natural resources, an understanding of strategies and reasons to reduce waste and recycle materials, and stewardship for the conservation of resources and protection of the environment.

One purpose of this review was to identify strengths and to reveal areas needing improvement in existing material to provide direction for the development of future curricula in the topic area. After a preliminary screening, one hundred twenty-nine pieces were submitted for formal evaluation, and of these, ninety-nine scored high enough for inclusion in this compendium. Findings are summarized below.



Each evaluated curriculum earned an overall score based on the evaluation tool included on pages 208-211. The number of points possible was 250. This graph displays the number of materials, by grade level, scoring above or below the average score of 151.63.

DEVELOPMENT

Twenty-one percent of the curricula was developed by private organizations and academic institutions; fifty-eight percent by county, state, or federal government agencies; and seven percent by county or state education offices. Several curricula are the outcome of academic alliances between universities and government agencies, resulting in publications that are pedagogically sound and backed by accurate and current topical information. The majority indicated classroom field-testing prior to publication and release of the material.

CONTENT

Many primary level (grades K-3) curricula examined individual components of waste management: the problem of litter, the value of recycling or vermicomposting, or accumulation of waste in the immediate environment of home or classroom. Used oil curricula are non-existent for this audience, and student action projects are limited.

Significant Findings

At the upper elementary level (grades 4-6), curricula tend to focus on the broader environmental consequences of waste generation and disposal. More involved community action projects appear, and in-depth analyses of economic, societal, technological, and health-related waste issues begin to challenge students to critical thought. Used oil curricula are still limited.

Intermediate and secondary level curricula provide further opportunity for multidisciplinary analyses of waste issues. Project-based learning is integrated in more recent curricula, allowing students to assume responsibility for their learning and their work in the resolution of "real-life" waste problems in the community. Because of relevance to driver's education and automotive shop classes, the majority of used oil curricula are geared toward this age level.

A problem can occur, however, when a curriculum merges activities for grades 7-12 together. The cognitive abilities seen at the middle school level do not match those at the secondary level, and the result is often a disconnection between the realities of a classroom and the expectations of a lesson plan.

Another significant trend seen in the current compendium pertains to internet access. The appendices of numerous curricula reviewed for this study feature website addresses to encourage use of the internet for communication and retrieval of relevent information concerning integrated waste management.

GRADE LEVEL COVERAGE

Seventeen percent of the curricula examined were directed at grades K-3; twenty-nine percent at grades 4-6; twenty-nine percent at grades 7-9; and twenty-four percent at grades 10-12. The greatest percentages of high-scoring curricula (above the mean score of 151.63) were found at both the 4-6 and 7-9 grade levels. Conversely, the lowest percentages of high-scoring material were found at both the K-3 and 10-12 grade levels, a finding similar to that in the original *Compendium for Integrated Waste Management.* It should be noted that in each grade-group level, forty-eight to fifty-eight percent of the curricula scored below the mean.

PEDAGOGY

The majority of curricula presented developmentally appropriate activities and thought-provoking discussion material. The reconstruction of mini landfills, creation of compost jars and worm bins, and daily monitoring and sorting of classroom waste are some of the engaging lessons found within the material.

Older curricula tend to rely on completion of paper and pencil worksheets and fill-in-the-blank tests as assessment. Newer curricula tend to make use of authentic assessment tools such as entries in student journals, workbooks, and action plans for student projects. They also offer more opportunities for students to apply skills in real-life situations.

TEACHER USABILITY

Concern was repeatedly expressed regarding ease of classroom use of the curricula. Awkward binding, lack of reference to duration of activity, extensiveness of preparation effort, and cost of supplemental materials are perceived as potential barriers to use of the material.

MULTILINGUAL/MULTICULTURAL MATERIALS

Very few curricula feature sections that have been translated into Spanish. Some materials offer multicultural perspectives on environmental ethics, including the perceived value of land and the cost (aesthetic and otherwise) of its degradation through waste disposal and littering. Other materials explore the global implications of natural resource consumption and waste generation, comparing consumptive patterns between industrialized and developing nations.

VISUAL PRESENTATION

The majority of the curricula feature acceptable formats and graphic design. Commerically published material are often accompanied by posters and other visual aids, depicting the life cycle of a product or process of recycling. Binding, however, becomes an issue when document size is excessive or when papers lack binding altogether.

Field Guide to the Reviews

Each curriculum received an overall grade, as noted in the Report Card depicted below. This grade corresponds to the number of icons appearing above: 5 icons represent A+; 4 1/2 icons, A; 4 icons, A-; 3 1/2 icons, B+; 3 icons, B; and 2 1/2 icons, B-.

Publisher
Address
Phone Number

Cost, Date, Page Count

Description of material

REPORT CARD

Overall Grade

General Content

Presentation

Pedagogy

Teacher Usability

Integrated Waste

DISCIPLINE	EMPHASIS 0	1	2	3
Science				
History/Social Science				
Health				
Mathematics				
Visual/Performing Arts				
Language Arts				
Industrial/Vocational Ed.				
Foreign Language				

COMMENTS

These comments reflect the evaluators' written responses on the narrative portion of the evaluation tool (see pages 208-211) and are categorized by topic. If there are no comments on a particular topic, the heading will not appear in the comments section. Comments that are direct quotes appear in quotation marks; others summarize the evaluators' notes and have been edited for clarity.

The facing page contains two sample pages from the curriculum. Many lessons are more than two pages in length. Sample pages, therefore, may not include an entire lesson.

Evaluators were asked to indicate the degree of emphasis placed on each discipline. Results are reflected on this scale. Zero (0) indicates no emphasis, one (1) indicates some emphasis, two (2) indicates more emphasis, and three (3) indicates major emphasis.