Every student who takes science needs to have experiences similar to those of scientists. Students should identify problems, create and implement solutions, bring projects to completion, and communicate the results.

As an Adventist science teacher, I also believe it is essential for students to experience the “joy of service.” For them to become responsible members of society, they must not only be exposed to adults involved in these meaningful and demanding tasks, but must also participate in such activities themselves. Therefore, it is vital to connect science instruction to everyday life.

Students at Walker Memorial Junior Academy (WMJA) in Avon Park, Florida, learn, through service, to gain a personal sense of purpose. By forming community partnerships, students can experience meaningful rewards and a sense of achievement through personal effort.

By extending the classroom into the community and providing hands-on cooperative problem-solving, I seek to bring students face to face with social and environmental issues and to create opportunities for them to become stewards of creation.

The outdoor classroom has become more than trips to the woods, fields, or stream. During field studies, learning occurs in the context of reality rather than being mediated by textbooks or videos. The outdoor classroom thus connects students with the affairs of their community.

To provide students with relevant work, an environmental monitoring project has been developed within the sophomore biology program at WMJA, where two teachers help with the project. Gordon Davis teaches grades 7 to 10, science, and physical education, and provides general guidance; and Stephen Roche, math and computer teacher for grades 7 to 10, serves as technology consultant. Partnerships have been formed with the University of Florida, Global Learning and Observations to Benefit the Environment (GLOBE), and the Highlands County Lakes Association. Eagle Eye Incorporated (EEI), a student-directed water-quality monitoring project, provides a community service and improves the environment.

By Gordon Davis
Jessica Current uses a Secchi disk to calculate the water clarity of Lake Lillian, while Larrie Parreno collects water samples that Lakewatch will test for nitrate, phosphate, and chlorophyll “a.”
The outdoor classroom has become more than trips to the woods, fields, or stream.

The Organization
The project is patterned after a corporate structure. Three officers—president, vice-president, and secretary—are elected at the beginning of the school year. These officers organize and direct the monthly meetings. EEI has four divisions: data retrieval, data control, lake restoration, and public relations, which are subdivided into departments. Division leaders provide leadership and management for the four divisions and their individual departments. All students, including the officers and leaders, are assigned to specific departments, where they conduct the activities of that department.

The job descriptions of each division and its departments are as follows:

**Data Retrieval** has three departments: Lakewatch, Chemical Tests, and Benthic Macroinvertebrates. *Lakewatch* collects water samples once a month from Lake Lillian and Eagle Pond for both nitrate and phosphate analysis, and determines chlorophyll “a” content. It also calculates water clarity and depth, and conducts a site survey. These procedures are conducted under the direction and cooperation of the Florida Lakewatch Program at the University of Florida. *Chemical Tests* collects and analyzes monthly water samples, providing a monthly water-quality index. Nine tests are performed: temperature, dissolved oxygen, five-day biological oxygen demand, pH, fecal coliform, total solids, total nitrates and phosphates, and turbidity. This department works in cooperation with GLOBE and reports monthly hydrology data to the GLOBE Internet server. The *Benthic Macroinvertebrate* department collects monthly bottom samples to determine the kinds of invertebrates found on the lake bottom. Using statistical analysis indices of sequential comparison, taxa richness, and diversity, this department also provides a monthly water-quality index.

**Lake Restoration** has two departments: Lake Management and Environmental History. Using information from Data Retrieval, *Lake Management* first identifies problems, then designs and implements solutions. For example, the students discovered storm water runoff. The members of Eagle Eye Inc. offered a partial solution by stenciling storm drains with this message: “Dumping here pollutes our lakes.” Testing also revealed dumping of trash around the lake’s watershed. Students designed a plan for collecting trash around the lake, bringing it back to school, and then sorting, weighing, and recycling it. The *Environmental History* department compiles a historical descrip-

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**Water Quality Index**

**Date:** 8/28/98  **Time:** 10:30

**Data Gatherer(s):** Margie Dunn & Michael Baker

**Test Location:** Lake Lillian  **Weather Conditions:** Sunny

<table>
<thead>
<tr>
<th>Test</th>
<th>Results</th>
<th>% Saturation</th>
<th>Q-Value</th>
<th>Weighting Factor</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissolved Oxygen</td>
<td>110%</td>
<td>Colonies/100mL</td>
<td>96</td>
<td>0.17</td>
<td>16.32</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>0</td>
<td>units</td>
<td>98</td>
<td>0.16</td>
<td>15.68</td>
</tr>
<tr>
<td>pH</td>
<td>67</td>
<td>mg/l</td>
<td>75</td>
<td>0.11</td>
<td>8.25</td>
</tr>
<tr>
<td>BOD</td>
<td>7</td>
<td>mg/l</td>
<td>48</td>
<td>0.11</td>
<td>5.28</td>
</tr>
<tr>
<td>Temperature</td>
<td>31</td>
<td>oC</td>
<td>10</td>
<td>0.1</td>
<td>1</td>
</tr>
<tr>
<td>Total Phosphate</td>
<td>7.2</td>
<td>mg/l</td>
<td>100</td>
<td>0.1</td>
<td>10</td>
</tr>
<tr>
<td>Nitrates</td>
<td>7.2</td>
<td>mg/l</td>
<td>100</td>
<td>0.1</td>
<td>10</td>
</tr>
<tr>
<td>Turbidity</td>
<td>3'8&quot;</td>
<td>NTU/feet</td>
<td>28</td>
<td>0.08</td>
<td>2.24</td>
</tr>
<tr>
<td>Total Solids</td>
<td>0.1</td>
<td>mg/l</td>
<td>78</td>
<td>0.07</td>
<td>5.46</td>
</tr>
</tbody>
</table>

**Water Quality Index Ranges**

- 90-100: Excellent
- 70-90: Good
- 50-70: Medium
- 25-50: Bad
- 0-25: Very Bad

**Overall Water Quality Index:** 74.23

**Water Quality:** Good
tion of the lakes from geological, social, and economical perspectives.

Data Control oversees the input of information into the appropriate spreadsheets and databases. This division supplies EEI with charts and tables for both monthly and year-end reports. It also ensures the safe storage of the data collected.

Public Relations has two departments, Promotions and Networking. Promotions manages several large projects such as a monthly newsletter, press releases, multimedia presentations, and grant writing. Networking coordinates all communications between EEI and its constituency, using various forms of communication such as the World Wide Web, E-mail, faxes, and the postal service.

The Schedule
The logistics of this project could not be managed without the aid and cooperation of the entire WMJA staff. The last Friday of every month, known as Expedition Day, the 10th-grade biology class is released from its normal schedule. Gordon Davis and Stephen Roche are also relieved of their regular classes.

In the morning, each grade has a block schedule so students can engage in projects that would not fit within a traditional schedule. The biology class is trans-
By extending the classroom into the community and providing hands-on cooperative problem-solving, I seek to bring students face to face with social and environmental issues and to create opportunities for them to become stewards of creation.

formed into Eagle Eye Incorporated. The day starts with a corporate meeting, directed by the three corporate officers. Each student reports orally to the corporation about the previous month’s accomplishments and discusses short-term goals. Upcoming events are also discussed. After the meeting, the students are dismissed to go about their individual responsibilities within EEI.

Integration
Because of the project’s applied math and science emphasis, students have learned a great deal about these areas. It came as a surprise, however, that writing was so central to the success of this project—both in terms of amount and quality. From the obvious (a newsletter) to the more obscure areas (like explaining the correlating of data points in different charts), writing has been foundational to almost all aspects of the project. Everyone in EEI has to do some writing—of a type that is relevant to real life. For EEI to form necessary partnerships, letters to business, civic, government, and educational leaders must be done well. Communication through an extensive Web site allows the world to appraise the quality of the students’ creative effort.

The need for artistic expertise also emerged. Corporate logos were needed for letterheads, business cards, envelopes, and the newsletter. The creative and artistic talents of several students were needed to develop a unique Web site design. Promotional displays featuring many aspects of EEI require a variety of artistic skills.

Oral presentations combine the skills of writing, artistic expression, and communication. Each student has the opportunity to share his or her experiences with fellow students and the community. In addition to the monthly meetings, the students also speak publicly about the work of EEI. They make formal and informal presentations at large conferences like the Florida Educational Technology Conference in Orlando, as well as to smaller local groups like the homeowners’ association, local public schools, and to the many guests who visit our campus on Expedition Day.

Technology plays an ever-increasing role in the implementation and success of Eagle Eye Inc. Each aspect of the project requires some form of technology literacy. Software applications like Microsoft Word, Access, Excel, and PowerPoint make it possible for students to create and develop spreadsheets, databases, and multimedia presentations, and to write and design the many communication forms needed. Microsoft FrontPage gives the students the opportunity to design and manage a World Wide Web presence. Other computer applications give the students experience with scientific probe-ware and video editing. There are always technology problems to fix, and students, under the direction of Stephen Roche, solve those problems.

Conclusion
Eagle Eye Inc. allows students to initiate their own learning, participate in productive questioning, and probe for information they can use in real life rather than just to fill in the blanks on a test. These students have a voice in their society and form a vital part of their community.
EEI helps students understand the importance of science literacy, which goes beyond vocabulary, concepts, or procedural methods. It encourages a wholistic understanding of science, as they observe, infer, analyze, and predict outcomes. It enables them to be problem-solvers, and to find solutions for family, career, and community dilemmas. As they are trained in Christian service, our students learn to become leaders. To accomplish this goal, we must teach them to conceive ideas, not just mirror other people’s thoughts, so they can successfully guide the future of the church and community.

A Christian school requires teachers with a vision, passion, and commitment who enjoy a challenge. It must prepare its students for the world out there and for eternity. Outdoor education makes an important contribution to this goal.

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**LAKEWATCH Lake Lillian**

<table>
<thead>
<tr>
<th>Lake name/County:</th>
<th>Sampler:</th>
<th>Phone:</th>
<th>Month/day/year:</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lillian/Highlands</td>
<td>Gordon Davis</td>
<td>(941) 453-3131</td>
<td>9/29/98</td>
<td>3:43pm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vanishing Point</th>
<th>Sun Code #</th>
<th>Sun Code Codes</th>
<th>Water Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station 1: 8'2&quot; ft.</td>
<td>1</td>
<td>1= full sun</td>
<td></td>
</tr>
<tr>
<td>Station 2: 10'2&quot; ft.</td>
<td>1</td>
<td>2= haze over sun</td>
<td></td>
</tr>
<tr>
<td>Station 3: 9&quot; ft.</td>
<td>1</td>
<td>3= thin cloud cover</td>
<td></td>
</tr>
</tbody>
</table>

Wind from?: sse

Wave height: 1 Inches

Wind strength: weak

Wind speed: none mph

Pollen on lake: little

Activity in your waters: none

Strong winds: none

Herbicides in lake: none

Heavy boat traffic: none

Large flocks of birds: none

Rainfall from: 8/28/98 to: 9/29/98 184.15mm

Lake level changes: none

Anything else?: none

Unusual weather: n/a

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**REFERENCES**

4. GLOBE is a worldwide network of scientists working together with students and teachers from more than 6,000 schools in 70 countries to study and understand the global environment.
5. GLOBE includes scientific instruments such as a pH meter that collects data while connected to a computer. The computer’s software allows for collecting, storing, graphing, printing, and analyzing the data.