

Summary of Exploring Life Materials Review Instrument Responses

**Alec M. Bodzin, Primary Investigator
Betsy Price, Westminster College**

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The Exploring Life Material Review Instrument (Appendix 1) was formulated by the evaluation team and primarily based on the AIBS/Packard review instrument (Morse and the AIBS Review Team) and instructional support items from the AAAS Project 2061 biology textbook evaluation (AAAS, 2000). The AIBS/Packard review instrument was constructed based on the *National Science Education Standards* (National Research Council, 1996) and synthesized the Review of Instructional Materials for Middle School Science (NSF, 1997), Benchmarks for Science Literacy, Project 2061 (AAAS, 1993; Roseman, Kesidou and Stern, 1997), and the Spokane, Washington School District 7-12 Materials Evaluation form (Stowell, 1997). The Exploring Life Material Review Instrument is divided into two main areas: Other Content Standards (OCS) and Pedagogy and Other Considerations (POC).

The Exploring Life materials were reviewed by twenty teams of 2-3 classroom biology teachers in Summer 2001 at the NECC and Lehigh 2001 evaluation workshops, and by two teams of 2-3 teachers at the NABT evaluation workshop in November 2001. It was noted that significant modifications had been made to the Exploring Life Web-based materials during the time between the summer workshops and NABT. Each biology teacher team completed the review instrument during the evaluation workshop. The scale of the review was based on scores of 0.5 increments to 5, with the descriptive terms, 0- Not addressed, 1 - Poor, 2 - Inadequate, 3 – Adequate / Somewhat Addressed, 4- Excellent, 5 – Exemplary / Well Addressed as responding to the *National Science Education Standards* recorded within the review instrument. Each team came to a unanimous consensus for each of their criteria ratings and listed the overall strengths and weaknesses for each criteria.

The results of the Exploring Life Materials Review Instrument from the workshops are displayed in Table 1. Scores in the section below are reported using the Summer 2001 scores.

Table 1. Results of the Exploring Life Materials Review Instrument. [Rating scale: Exemplary /Well Addressed (5), Excellent (4), Adequate/Somewhat Addressed (3) Inadequate (2), Poor (1), Not addressed (0)]

Criteria for evaluating the quality of instructional support		Summer 2001 (n=20 groups)		November 2001 (n=2 groups)	
		Mean	sd	Mean	sd
OCS-1	Science as Inquiry	4.03	0.64	4.00	0.00
OCS-2	Science and Technology	3.25	1.38	3.50	2.12
OCS-3	Science in Personal and Social Perspective	3.68	0.85	4.00	1.41
OCS-4	History and Nature of Science	3.20	1.08	3.00	0.00
POC-1	Active Learning	4.23	0.57	5.00	0.00
POC-2	Depth of Understanding	3.53	1.07	4.00	0.00
POC-3	Assessment	3.53	0.90	3.50	0.71
POC-4	Presentation and Format for Teachers	3.83	1.15	2.50	3.54
POC-5	Presentation and Format for Students	4.16	0.97	5.00	0.00
POC-6	Implementation and System Support	3.32	1.12	1.50	2.12
POC-7	Equity Issues	3.97	0.84	3.50	0.71

CONTENT STANDARDS

OCS-1 Science as Inquiry

Rating: Excellent (4.03)

General comments

The material does a good job of providing opportunities for students to do scientific inquiry and understand scientific inquiry.

Activities on the Website provide learners with opportunities to: identify questions and concepts about objects, organisms and events in the environment that guide investigations; design and conduct scientific investigations; use technology and mathematics to improve investigations and communications; formulate scientific explanations using evidence; and communicate a scientific argument.

Recommendations

Recommendations for this criteria will be forthcoming after the Web-based inquiry for learning science (WBI) data has been analyzed.

Specific participant responses to note: Strengths

- Students are given the opportunity to develop their own investigations and compare and contrast expected outcomes. Given real life examples such as tracking Monarch butterflies and Greenhouse Effect.
- Better than most other labs. We like the pre-lab questions to focus the student and the design an experiment sections. Extension questions also provide= for inquiry.
- Chapter 7.2-Cellular Respiration in Fastplants—provides the opportunity to devise own experiment and defend their findings.
- Web-based lab procedures with animation are student directed, so they are easily adapted for make-up labs in cases of absence. Make-up labs are often a lot of trouble for the instructor...this makes it easy

Specific participant responses to note: Weaknesses

- More emphasis should be placed on experiments that generate data that can be graphed. Students should be able to develop concepts from the graphs of their data.
- More opportunities should be provided for student presentations
- Organization of chapters was not consistent. Chapter 7 was presented clearly and increased in difficulty as your continued; however Chapter 8 was not as clear or well defined.
- ChocolateQuest gave a lot of material to read without a lot of interaction. Needed more learner directed questions/inquiry activities.
- In a few cases if students had been required to gather (or access) actual data on which to draw conclusions, the activity would become more inquiry based.

Example: Concept 7.5 – Explore

- In terms of how to communicate data students are given few choices and are told how to present data, for example chapter 7 explore page 5. In general throughout the activities students are not asked to address or evaluate alternative explanations.
- Defending a scientific argument (eg. Most activities don't ask to explain reasoning).

OCS-2 Science and Technology

Rating: Adequate / Somewhat Addressed (3.25)

General comments

The instructional materials provide students with some opportunities that promote the understandings about science and technology. Currently, the materials do not provide learners with opportunities to develop the abilities of technological design as described in the *National Science Education Standards*. It was noted that this is a more difficult task to accomplish in a biology curriculum when compared to other science disciplines.

Recommendations

1. Exploring Life should contain some activities that enable students to identify a new problem or need in the biological sciences.
2. Use Explore! activities to allow learners to investigate current research to improve their understandings about biological science and technology.

Specific participant responses to note: Strengths

- Because this text is web based, it is utilizing so many different component of technology. It allows for all different types of learners to find a way to succeed. As far as research is concerned, there are many different outlets and related links to allow for further discovery.
- Excellent job of allowing students to visualize processes that they can't see in a lab like cellular respiration.
- Exploring the ocean floor with the Alvin submersible.

Specific participant responses to note: Weaknesses

- Where is the interaction between modern technology and the way ideas are developed?
- The role of technology in developing areas of biology is not addressed in these three chapters.
- No "cutting edge" research is mentioned.
- Minimal technology mentioned in the content of the text.
- No developing areas of biology are mentioned

OCS-3 Science in Personal and Social Perspectives

Rating: Adequate / Somewhat addressed (3.68)

General comments

The instructional materials provide opportunities for students to understand local as well as global phenomena and challenges that occur on scales that vary from quite short (aerobic exercise effects) to very long (potential result of global changes).

Recommendations

1. Exploring Life should provide at least one Science-Technology-Society (STS) issues-based approach simulation in the materials. These simulations provide students with the experience of learning science and technology in the context of human experience involving a real-life controversial issue. Engaging in authentic issues makes science instruction current and part of the real world. In STS issues-based approach simulations, students are presented with a real-world controversial issue. Students investigate the issue from differing perspectives. After students complete their investigation, they participate in a public forum or debate to determine the next course of action on the issue. Classroom debates on STS issues offer students a forum to think critically about the role that science plays in societal issues. These simulations acknowledge the connection between science and the decisions individuals make about social issues.

Specific participant responses to note: Strengths

- Web quest dealing with nutrition and Lance Armstrong material on banned substances
- Good examples used to explain biological principles (environmental, aerobic/anaerobic, global warming)
- We really liked how fitness, greenhouse effect other topics were incorporated directly into the chapter. Many textbooks have these as sidebars that often do not get read.
- Chapter 7 Web Quest asks students to compute calorie needs and intake.
- Chapter 7 Explore highlights the importance of aerobic exercise and proper diet.
- Chapter 7 teaches about anaerobic respiration as it applies to athletes.
- Concept 8.4 covers the greenhouse effect.
- Students are encouraged to relate personal experiences to the web activities. These activities engender student interest by being real-world issues that are of interest to the students and relevant to their lives.
- Examples: Calorie Quest, Aerobic exercise and dietary supplements, Effects of increasing carbon dioxide levels.

Specific participant responses to note: Weaknesses

- There could be more Explore! activities. These can allow for more connections between concepts and create a "big picture" for the students
- This style of material has potential when applied to other topics in other chapters. But it was not significantly evident in these three chapters.

- ChocolateQuest ignored the social issues related to cacao farming and its adverse impact on biodiversity and destruction of the local environment.
- Ch 8 'Effects of Increasing CO2 Levels" could have incorporated the negative effects of increased CO2 levels and directed students to think of solutions to human-created problems...i.e., increased use of fossil fuels, alternative energy sources

OCS-4 History and Nature of Science

Rating: Adequate / Somewhat addressed (3.20)

General comments

Some of the instructional materials provide students with the opportunity to develop understandings of science as a human endeavor, the nature of scientific knowledge and historical perspectives.

Recommendations

1. Use the Exploring Life text to present biological content that illustrates that all scientific ideas are subject to change as new experimental and observational data becomes available.
2. Use the Web-based *Career* sections to illustrate case studies of research scientists addressing how science differs from other ways of knowing through the use of empirical standards, logical arguments and skepticism as they strive for the best explanations about the natural world.

Specific participant responses to note: Strengths

- The nature of science is implied as students design and conduct investigations.
- Chapter 8 historical information about the work of various scientists and how that led to our current understanding of photosynthesis.
- Focus on the careers, Meet the Ecologist, was excellent. It allowed students to see how they could take part in a real scientific investigation. These materials gave the students many opportunities to work as scientists individually and in teams.
- Does present science as being collaborative. (e.g. thermal vent research team, opportunities to share/compare data and conclusions).

Specific participant responses to note: Weaknesses

- All scientific ideas are subject to change is not addressed - only present day knowledge is presented.
- The history of the scientific experiments and scientists can be explored more. This can give students perspective on where science has been, and based upon that path, they may be able to discover where science is going.
- Limited exposure to historical figures in science and scientific discoveries.
- In the three chapters that we have evaluated, we are not seeing as much use of the empirical standards and skepticism as we might have liked.
- Suggestion: the use of interactive timelines to discuss the discoveries leading to current knowledge of cells, genetics, biotechnology, etc. Inclusion of links to sites dealing with history of science and development of equipment.
- No explicit mention of scientific ideas changing or examples of past ideas changing

PEDAGOGY AND OTHER CONSIDERATIONS

POC-1 Active Learning

Rating: Excellent (4.23)

General comments

The Exploring Life materials contain many activities that correspond to the National Science Education Standards' definition of active learning: *Learning biology is something students do, not something that is done to them. In learning science, students describe objects and events, ask questions, acquire knowledge, construct explanations of natural phenomena, test those explanations in many ways, and communicate their ideas with others* (National Research Council, 1996, p. 20). The Exploring Life program engages students in activities that will help them to connect the biological sciences to current issues and events at the personal, community and global levels. The instructional materials are likely to be interesting, engaging and effective for all populations of students (e.g., gender, ethnicity, disability, rural, urban). The materials provide students with opportunities to engage in scientific inquiry, to ask questions, propose hypotheses, gather data, manipulate and analyze data.

Recommendations

1. Develop activities in which learners are provided opportunities to develop arguments and consolidate and communicate their ideas for biological phenomena.
2. Include information and guidance to assist the teacher in implementing lessons involving active learning such as vignettes or scenarios, kinds of resources, support systems and professional development opportunities.

Specific participant responses to note: Strengths

- High level of engagement expected.
- The chapters viewed were very adaptable to all learning levels of students. The chapters also contained numerous activities to promote active learning.
- This is an active way to teach students about photosynthesis and cellular respiration. The interactive pictures allow students to actually manipulate the molecules.
- Active learning appears to be the primary philosophy in the curriculum.
- Activities and labs are engaging and would be interesting to students as well as relevant to ethnic, gender differences.
- Students are encouraged to formulate, test, and revise hypotheses. (e.g. photosynthesis lab)
- A lot of student engagement on the Web through drag and drop and labs. A current issue that was explored was in the Tour de France / Lance Armstrong aerobic activity.

Specific participant responses to note: Weaknesses

- Felt that the ATP and such material was more lecture in format. Need for more interaction.
- Students aren't up and moving enough, too much sitting at the computer.
- Respirometer lab is so long it is no longer engaging, especially for low level students.
- Some sections involve too much reading for low level readers (eg. Ch 36 Career)
- [Place] more emphasis on explaining and communicating ideas (eg. Ch 7.2 lab)
- The chapters need to have the students become more involved in asking questions, proposing hypotheses, etc.

**POC-2 Depth of Understanding:
Rating: Adequate / Somewhat Addressed (3.53)**

General comments

The instructional materials provide students some opportunities to develop deep understanding of the biological concepts through the use of thought-provoking questions embedded within the instructional materials and by providing learners with opportunities to monitor their understanding with immediate feedback functions on the Website. The material contains a logical progression for developing conceptual understanding of the biology content in the reviewed chapters. In some areas of the program, the material revisits, summarizes and provides closure to the intended learning concepts. The material provides opportunities for students to apply their understanding in the Fastplants lab and in the Explore! activities.

Recommendations

1. Include diagnostic tools within the materials to determine necessary prior knowledge of the students. This can be achieved through a pretest or a concept map.
2. Provide chapter concept maps to indicate the linkage between the concepts to be learned within a chapter, unit, and book. Refer to the *AAAS Atlas of Scientific Literacy* for examples.
3. The addition of an online interactive concept mapping tool for students to use would aid in their understanding and application of knowledge. Using such a tool will be helpful for in determining concept understanding, and encouraging learners to view their own growth of understanding. Examples of an online concept mapping tool is available online in the *WISE water quality curricular materials*: <http://wise.berkeley.edu/>. Alternatively, the Exploring Life program can provide a link for teachers to download and install Model-It to use for this purpose. Model-It is available online at: <http://hi-ce.eecs.umich.edu/sciencelaboratory/modelit/>.
4. Emphasize the historical development of the biological concepts that are present in the program. Be sure to include evidence for “the way that knowledge was arrived at” and how scientific ideas are changed over time.
5. Continue to provide additional opportunities for students to apply their understanding to novel situations.

Specific participant responses to note: Strengths

- Curriculum is conceptual and moves in an inductive, logical sequence.
- General picture is given before specifics are dealt with.
- Concept checks allow students to check their own understanding
- Chapters are concise but all the major ideas are there. Allows students to pick out the important ideas.
- Overview covered in beginning of chapters in the text.
- Logical progression in each chapter.

Specific participant responses to note: Weaknesses

- No concept maps.
- No diagnostic tools to determine prelearning.
- No historical context in these chapters, and no provision for how science ideas change over time.
- Chapter 8 is not clear in several areas. The light reaction needs clarification, photosystems are not explained adequately. The capturing of electrons by different pigments and the transfer of electrons from one pigment to another are not illustrated. They should not be mentioned if the explanation is not complete and relevant. Why and how is water split? The complications of the Calvin Cycle are not included even if only for the teacher.

POC-3 Assessment

Rating: Adequate / Somewhat Addressed (3.53)

General comments

The instructional materials include traditional classroom-based assessments and scoring guides that can be used to gather student achievement and performance data on important biological concepts and abilities. Performance standards associated with the assessments are not clear and explicit. There are a few assessments included that can be used for diagnostic and formative purposes. End of chapter quizzes can be used for summative purposes.

Recommendations

1. Include assessments that can be used for diagnostic and formative purposes. See Enger, S. K. and Yager, R. E. (2001). *Assessing Student Understanding*. Thousand Oaks, CA: Corwin Press for examples.
2. Be sure to include assessments items that are deliberately designed to obtain data regarding student attainment of the intended biological concepts and abilities (this encompasses the ability to inquire and an understanding of biological concepts principles laws and theories).
3. Assessments should include a variety of ways for students to demonstrate the acquisition of intended abilities and conceptual understanding (selected response, open response, extended response, performance demonstrations, written reports, interviews, portfolios, etc.). See *Assessing Student Understanding* (listed above) for examples.
4. Include advice for teachers about using the results from assessments to modify instruction.

Specific participant responses to note: Strengths

- Particularly like word relationships at end of chapters. Some inference included not all simple recall. Students are given immediate feedback and detailed explanations.
- Questions actually applied to concepts!!! (eureka!!)
- End of Chapter tests contained a variety of question formats, including discussion and applied discussion questions.
- Web-based labs, written labs, short answer activities all provide a variety of ways to demonstrate knowledge.

Specific participant responses to note: Weaknesses

- Ways to use data to modify instruction not addressed
- Extension activities have no rubrics. No alternative assessment options besides the test and quiz.
- Need more rubrics.
- Include alternative assessments and give a variety of potential assessments.

**POC-4 Presentation and Format for Teachers:
Rating: Adequate / Somewhat Addressed (3.83)**

General comments

The existing format for the teacher support material in the *Teacher Resources section* appears to be easy to follow. The directions for implementing activities are clear.

Recommendations

1. Include additional background material for the teacher to provide sufficient information on the scientific content. Take advantage of external links on the Internet to point teachers to additional background information.
2. Include background material for the teacher that will provide sufficient information on common student misconceptions regarding each chapter topic.
3. Include suggestions for recommended sequences of instructional delivery. A recommended sequence will increase the comfort level of beginning teachers who use the program. Consider including a recommended sequence for schools involved in high-stakes testing.
4. The suggested times for instruction should be modified after the Year 2 implementation data has been summarized.

Specific participant responses to note: Strengths

- Teacher support pages gives background on concepts and gives suggestions on implementation
- Directions are clear.
- Format is easy to read.
- Excellent explanations in the teacher resource section for all labs and activities as well as additional links for teachers.
- Great ideas for teacher resources. Background material is good
- The format is easy to follow. The strongest is the implementation strategy for computer use and the time frame for each activity. The background material for the teacher is sufficient.

Specific participant responses to note: Weaknesses

- The lack of a direct link between book and National Standards.
- Demo suggestions would be useful.
- What background material???
- Need to provide teacher workshops to show teachers how to organize/present materials.
- For the techno-challenged teacher, the prospect of a web-based program may be intimidating.
- No information on student misconceptions.
- Timeframe for web-based activities is a little too optimistic.
- There is not enough background on student misconceptions and pitfalls, alternative assessments, extension activities, and instructional delivery.

POC-5 Presentation and Format for Students

Rating: Excellent (4.16)

General comments

Overall, the materials for the students are well-written, age-appropriate and compelling in content. For the most part, visuals and Web-based interactivities are used appropriately to promote learning. The materials involve students in a logical or strategic sequence of activities as opposed to just a collection of activities.

Recommendations

1. Provide a guiding question at the top of each concept or specific learning activity to encourage each student to think about the purpose of the activity.
2. Always keep the “4 E” constructivist learning cycle model in the forefront of your mind when developing each chapter. Make this model of learning more obvious to the students (and also the teachers). See box below.

The 4 E learning cycle model for Exploring Life

Engage: Students begin a new unit of study by a Web activity that requires no formal knowledge of topic. This learning phase engaged the student’s interest, and connects the student to the topic on a personal level. This phase of the learning cycle helps the student answer questions such as: Why is this topic important to me as a high school student? Why is it important to our understanding of how the living world works? These Web activities are WebQuests, half hour long directed activities that introduce new concepts to students by engaging their interest and curiosity for more. This Web activity connects to the introduction of the text chapter. A classroom discussion or demonstration will support the engagement activity.

Explore: Student reinforces understanding of concepts, applies the concepts, and practices the process of science through learning activities on the Web and laboratory or field activities in class. The teacher can select activities such as a lab/field collection posted on teacher support site and coordinated with Laboratory modules that provide pre- and post- laboratory instruction, simulation and assessment for laboratory procedures and analysis) and Web-based exploratory activities, such as the interactive concept activities. In this learning phase, students begin to construct for themselves biological meaning from the exploration activities.

Explain: Students read the text chapter, which develops a biological, social, and historical context for key concepts. This solidifies the students’ personal understanding of key concepts they generated in the Engage and Explore phases. The Explain phase is supported by Web-based tutorials, which utilize graphics, animation, and interactivity to teach key concepts.

Evaluate: Students find opportunities for self-assessment built into the Engage, Explore, and Explain phases. The Engage, Concept, and Laboratory components on the Web include self-assessment with each concept and a unit-end self-quiz. At the end of each block of material encompassed by a book chapter, we will have a customizable test bank, which includes short answer questions and problems as well as objective questions. Finally, we will develop Web-based methods of authentic assessment (such as student-generated Web-based poster presentations) that will be assessed by rubrics.

Specific participant responses to note: Strengths

- Age appropriate, well written, succinct, encourages students to think.
- The connections of hard concepts like photosynthesis and respiration to real world examples. We really liked the total lack of vocabulary lists, which can be intimidating to many students. The focus mainly on vocabulary can take away from their focus on the over all concepts. The inquiry nature of the activities provides the "think about" setting.
- The graphics and animations are visually exciting and entertaining. The sound effects are used effectively and not overly used. Meaning is given to biological concepts and the abstract processes come to life through the animations. They are interactive and engaging.
- Step by step diagrams in the text are useful as well.
- Presentation and format is a major strength of the curriculum.
- Chapter 7 lends itself to a good sequence: sunlight powers life, and then leads into how food is converted to ATP energy.
- The Webquest activity is a good anticipatory introduction to the chapters.

Specific participant responses to note: Weaknesses

- Chloroplast leads students to believe that one half carries on the light reaction and the other half does Calvin Cycle.
- Lack of relevance in the Fast Plants lab to students' lives.
- Materials do not encourage enough thinking and reasoning about the purpose of the activities (eg. Lab 7.2 Part I)
- The student does not have to think about the purpose as they click and drag. Details in certain areas are far beyond an average high school student-for example, the detail in the respiration process. Some of the graphics are below grade level and can be considered to be immature.
- The explanation and activities at times are to complex for the average student, ESOI and Learning support students.

POC-6 Implementation and System Support
Rating: Adequate / Somewhat Addressed (3.32)

General comments

Implementation issues are critical in focusing schools and districts on strategies for aligning the Exploring Life program to school adopted standards, providing professional development and meaningful assessment, working with the community and parents and evaluating the effectiveness of implementation of the particular instructional materials. The *Teacher Resources* section contains background information, time frames, suggested uses for concepts and implementation suggestions for using the materials in different technology equipped classrooms. Some alternative assessment suggestions in the reviewed materials were noted.

Recommendations

1. Provide a recommended sequence for implementing each chapter. We recommend using the data from the *Time Spent* survey and the *Just After the Pilot Test* survey to guide these decisions. Be sure to consider the time constraints biology teachers have with implementing their curriculum.
2. Provide information about the kind of resources and support system required to facilitate the district implementation of the Exploring Life program. A special section for network administrators should be developed.
3. Provide information about the kind of professional development experiences needed by teachers to implement the materials. The topic of recommended professional development will be an agenda item to discuss at the NSTA 2002 retreat meeting.
4. Provide a matrix to link the materials with district and state assessment frameworks and standards.
5. Provide guidance and assistance for involving administrators, parents and the community at large in actively supporting student learning with the Exploring Life program.
6. Continue to think about implementing an electronic support network for teachers using the Exploring Life program.

Specific participant responses to note: Strengths

- Lab setup provided teacher assistance.
- Being available on the Web, the community is able to look at the curriculum; which can lead to furthering parental involvement.
- Adequate teacher resources, good lab safety instructions, materials can be used at a variety of learning levels, for example a low level learner and a high level learner in a general biology class.
- Teacher resources and Weblinks are helpful.

Specific participant responses to note: Weaknesses

- No information about professional development and linkage of materials to standards.
- Opportunities to involve others (administrators, parents, community) is absent.
- Require more professional development in terms of implementing and appropriately using the package in a classroom.
- Needs to be linked to standards.

POC-7 Equity Issues
Rating: Excellent (3.97)

General comments

Field observations have shown that the Exploring Life instructional materials are interesting, engaging and effective for both female and male students as well as under-represented and under-served students (e.g., ethnic, urban, rural, with disabilities).

Recommendations

1. Include examples throughout the Exploring Life program to which students of diverse cultures will be able to relate.

Specific participant responses to note: Strengths

- The pictures included in the text include a variety of ethnic, socioeconomic and gender groups. Material is presented in a conceptual and logical way to avoid biases.
- There is a variety of ethnic, racial, and gender pictures are present.
- If the availability of technology resources is adequate, this program is very equitable for males and females across all backgrounds.

Specific participant responses to note: Weaknesses

- Material seems very American, not enough involvement with other cultures.
- My ethnic/rural students will not feel connected to any of the examples used in presenting the content. For example, in the wind activity in 36.1, you could allow students to choose forests in any of several other biomes.

References

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Stowell, S. 1997. Spokane, Washington School District 7-12 Materials Evaluation form.

Appendix 1. Exploring Life Materials Review Instrument

Scale of the review is based on 0.5 increments

Content Standards

OCS-1 Science as Inquiry (p.173-76 NSES) Instructional materials should provide opportunities for students to do scientific inquiry and understand scientific inquiry.

CRITERIA -

1. identify questions and concepts about objects, organisms and events in the environment that guide investigations
2. design and conduct scientific investigations
3. use technology and mathematics to improve investigations and communications
4. formulate and revise scientific explanations and models using logic and evidence
5. recognize and analyze alternative explanations and models
6. communicate and defend a scientific argument

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Science as Inquiry _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

OCS-2 Science and Technology (p 190-91 NSES) Instructional materials should provide students the opportunity to develop abilities of technological design and understandings about science and technology

CRITERIA -

- understanding the role of technology in developing areas of biology
- designing activities around biological principles

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Science and Technology _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

OCS-3 Science in Personal and Social Perspectives (p191-199 NSES) Instructional materials should provide opportunities for students to understand local as well as global phenomena and challenges that occur on scales that vary from quite short (natural hazards) to very long (potential result of global changes).

CRITERIA - fundamental concepts and principles that relate to biology include:

- a series under personal and community health including hazards, disease, fitness, mood and behavior, eating patterns, family health needs, and sexuality.
- factors associated with population growth such as linear and exponential growth, resource use, birth rates and fertility rates, carrying capacity, and technology effects on capacity of the earth systems to support human beings.
- environmental quality especially the human effects that influence that quality and how environment is affected by natural and human-induced hazards.
- science and technology in local, national and global challenges, especially as they relate to debates, land use and decisions about pollution and the effects of human activities on each other humans and other non-human organisms.

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Science in Personal and Social Perspectives _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

OCS-4 History and Nature of Science (p.200-201). Instructional materials should provide students the opportunity to develop understandings of science as a human endeavor, nature of scientific knowledge and historical perspectives.

CRITERIA - fundamental concepts and principles that relate to biology include:

- science as a human endeavor includes individual and team contributions. Scientists have ethical traditions that are influenced by societal, cultural and personal beliefs and ways of viewing the world -it is part of society!
- science differs from other ways of knowing through the use of empirical standards, logical arguments and skepticism as scientists strive for the best explanations about the natural world.
- scientific explanations require logic, respect for the rules of evidence, open to criticism, report methods and procedures and make knowledge public.
- all scientific ideas are subject to change, as new experimental and observational data becomes available.

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of History and Nature of Science _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

PEDAGOGY AND OTHER CONSIDERATIONS

POC-1 Active Learning: Learning biology is something students do, not something that is done to them. In learning science, students describe objects and events, ask questions, acquire knowledge, construct explanations of natural phenomena, test those explanations in many ways, and communicate their ideas with others (NSES p. 20). Some guiding questions are:

- Do the materials engage students in activities that help them connect the biological sciences to current issues and events at the personal, community and global levels?
- Are the instructional materials likely to be interesting, engaging and effective for ALL populations of students (e.g., gender, ethnicity, disability, rural, urban).
- Do the materials provide students the opportunity for students to engage in scientific inquiry, to ask questions, propose hypotheses, gather data, manipulate and analyze data, develop arguments, consolidate and communicate their ideas for biological phenomena?
- Do the materials include information and guidance to assist the teacher in implementing lessons involving active learning (vignettes or scenarios, kinds of resources, support systems, professional development opportunities)?

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Active Learning _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

POC-2 Depth of Understanding: Does the instructional material provide the student the opportunity to develop deep understanding of the biological concepts? Qualities to look for are:

- Is there an overview of the concepts to be learned within the instructional materials?
- Is there a concept map indicating the linkage between the concepts to be learned?
- Does the material focus on the development of a limited number of fundamental biological concepts?
- Are there diagnostic tools available within the materials to determine necessary prior knowledge?
- Are opportunities embedded within the instructional materials to help students self assess and to probe their understanding? (Thought-provoking questions embedded with the instructional materials? Opportunities to monitor their understanding and to make predictions?)
- Does the material contain a logical progression for developing conceptual understanding?
- Is historical development of concepts present, including evidence for “the way that knowledge was arrived at”?
- Does the material contain information that shows how science ideas change over time?
- Does the material revisit and summarize and provide closure to the intended learning concepts?
- Does the material provide opportunities for students to apply their understanding?

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Depth of Understanding _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

POC-3 Assessment: Instructional materials include classroom-based assessments and scoring guides that can be used to gather student achievement and performance data on important biological concepts and abilities.

- Is the primary purpose of the included assessments to provide feedback to the student, teacher, parent/guardian, and district administrators about student attainment of the intended biological learning targets?
- Are the biological learning targets to be attained and the performance standards associated with the assessments clear and explicit?
- Are there assessments included that can be used for diagnostic, formative, and summative purposes?
- Are the assessments deliberately designed to obtain data regarding student attainment of the intended biological concepts and abilities (this encompasses the ability to inquire and an understanding of biological concepts principles laws and theories)?
- Do the assessments include a variety of ways for students to demonstrate the acquisition of intended abilities and conceptual understanding (selected response, open response, extended response, performance demonstrations, written reports, interviews, portfolios, etc.)?
- Do the materials include assessments within lessons and advice for teachers about using the results to modify instruction?
- Are the assessments designed to provide valid, reliable, and fair data about student achievement and performance?

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Assessment _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

POC-4 Presentation and Format for Teachers:

- Does the background material for the teacher provide sufficient information on the scientific content?
- Does the background material for the teacher provide sufficient information on common student misconceptions?
- Is the format easy for a teacher to follow?
- Are the directions on implementing activities clear?
- Are the suggestions for instructional delivery adequate?
- Are the suggested times for instruction reasonable?

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Presentation and Format for Teachers_____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

POC-5 Presentation and Format for Students:

- Are the written materials for the students well-written, age -appropriate, and compelling in content?
- Do the materials encourage each student to **think about** the purpose of the activity?
- Do the materials involve students in a logical or strategic sequence of activities (versus just a collection of activities)?

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Presentation and Format for Students _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

POC-6 Implementation and System Support: Implementation issues are critical in focusing schools and districts on strategies for aligning curriculum across the grades, providing professional development and meaningful assessment, working with the community and parents, and evaluating the effectiveness of implementation of the particular instructional materials.

- Do the instructional materials include information and guidance to assist the teacher in implementing the lessons?
- Do the instructional materials provide information about the kind of resources and support system required to facilitate the district implementation of the required science materials?
- Do the instructional materials provide information about how to establish a safe science learning environment?
- Do the instructional materials provide information about the kind of professional development experiences needed by teachers to implement the materials?
- Do the materials provide guidance in how to link the materials with the district and state assessment frameworks and programs?
- Do the materials provide guidance and assistance for involving administrators, parents, and the community at large actively in supporting school science?
- Overall, are the materials usable by, realistic in expectations of, and supportive of teachers?

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Implementation and System Support _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.

POC-7 Equity Issues: Instructional materials benefit from an explicitly focus on equity issues with suggestions for how teachers can gain access to needed materials and supplies and an understanding about complex but useful technologies for access for all. Often materials can address how to use heterogeneous student groups effectively and thereby accommodate various learning styles. Materials can reflect race and gender illustrations that allow materials to be more inclusive for a variety of student differences.

- Are the instructional materials likely to be interesting, engaging, and effective for females and for males?
- Are the instructional materials likely to be interesting, engaging, and effective for underrepresented and under served students (e.g., ethnic, urban, rural, with disabilities)?

0	1	2	3	4	5
Not addressed			Somewhat Addressed		Well addressed
	Poor	Inadequate	Adequate	Excellent	Exemplary

Rating of Equity Issues _____

Overall strengths that meet this criteria. Provide examples - including items not discussed above.

Overall weaknesses that meet this criteria. Provide examples - including items not discussed above.