Estacada School District Science Education Plan 2003-2005

Report to the Estacada School District
Board of Directors
November 12, 2003

Prepared by:
The Science Education Sub-Task Force of the
Academic Enhancement Task Force

What we need is imagination.
We have to find a new view of the world
—Richard P. Feynman
Nobel Laureate, Physics

Executive Summary

In July 2003, a sub-task force was formed to define a path for the Estacada School District regarding the district's science education programs. This sub-task force was created as a component of the Academic Enhancement Task Force, which was created in October 2002. The recommendations contained in this report reflect the consensus of the sub-task force. The Plan has an anticipated implementation timeframe of two years, at which time it should be reviewed and extended, if necessary.

Science Education Sub-Task Force Members

Parents/Citizens	**Representing**
Kay Edwards	Clackamas River Elementary
Bridget Kluken	Clackamas River Elementary
David & Susan Gardelius	Junior High School/ Senior High School
Jean Lensch	Eagle Creek Elementary
Karen Greene	River Mill Elementary
School Board	
David Bugni	Director & Science Education Plan Facilitator
Steve Crosby	Director
Mark Greene	Director
Administrators	
Mike Call	Superintendent
Dr. Howard Fetz	The District, Curriculum & Special Services Director
Gary Lewis	Senior High School, Principal
Bob Espenel	Junior High School, Principal
Kevin Olds	Clackamas River Elementary School, Principal
Tina Rhue	River Mill Elementary School, Principal
Jan Jaqua	Eagle Creek Elementary School, Principal
Licensed Staff	
Kevin Kirchhofer	Senior High School, Physics & Chemistry
Bill Martin	Senior High School, Biology
Tom Carney	Senior High School, Biology & Environmental Science
Karen Doersam	Senior High School, Science
Dante Torgersen	Junior High School, Science
Margie Wilbur	Junior High School, Science
Debra Wexler	Junior High School, Science
Scott Sullivan	Secondary Schools TOSA 7-12
Kari Hulsey	River Mill Elementary School
Pier Parisio	Eagle Creek Elementary School
Advisory	
Mary Omberg	Gold Beach High School, Science Teacher (retired)
Barbara Bannister	Tigard-Tualatin School District TAG Specialist & Author of *Simply Science*

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Introduction

Science provides our students with a method of inquiry and a body of knowledge. It helps them utilize their imaginations and creative thinking skills. Children are encouraged to form questions, which they can then answer through scientific investigation. They look for patterns and sequences and use their scientific understanding to make predictions about the possible outcomes of events.

At times, however, the excitement of science is lost due to an overemphasis on memorization, an overemphasis on direct instruction, or the lack of proper training of the teacher. The goal of this plan is to provide a set of recommendations to identify and address any recognized deficiencies in the way our district pursues the teaching of science.

During the 2001-2002 school year, the school district researched and acquired science textbooks for all grades as part of its ongoing textbook adoption process. With the adoption of the *Simply Science* curriculum for grades K-8, it was clear that the district moved in a particular philosophical direction – a more inquiry based, or "hands on" approach to science. This does not mean that acquiring a thorough body of scientific knowledge is to be minimized; rather, it is an attempt to excite students about science and impress upon them what, in essence, science is. It is hoped that this approach will help to raise the level of appreciation of this subject among the district's students.

The Science Education Plan Process

In the planning process for implementing a successful science education program, the district must first have a clear understanding of its science education goals. The district believes these goals to be multi-faceted and the components are described within this report.

The names of members of the District's Science Education Sub-Task Force are listed in the front of this report. The sub-task force includes representation from the school district board of directors, administration, licensed staff, parents, and education consultants.

The Science Education Sub-Task Force drew from printed material and presentations by people with direct knowledge and experience with various aspects of planning for science education.

Meetings of the Science Education Sub-Task Force or the Academic Task Force that dealt with this report were held on the following dates at the school district's central office:

July 8, 2003	August 19, 2003
September 16, 2003	September 17, 2003
September 23, 2003	October 22, 2003

All meetings of the Science Education Sub-Task Force were open to the public.

The findings and recommendations presented in this report reflect the views of the entire Science Education Sub-Task Force. Task force members were invited to add any qualifying comments if they wished to do so.

District Philosophy Regarding Science Education

Philosophy Regarding Program Design, Administration and Management

Given our community's close proximity to the Portland area and the numerous research and high technology industries located there, as well as the district's recognition of the importance of science-related careers to our nation's overall economy and the need to remain the world's technological leader, this aspect of our student's education should become a major focus. Furthermore, many public policy decisions are driven by advances in science, such as genetically modified agriculture, stem cell research, the human genome/proteome projects and the effects of technology on our environment. As a result a basic understanding of these issues must be acquired by all students in order to become effective citizens.

The district believes that appropriately qualified personnel must instruct students in science. Science education must be integrated into the general education program and should create meaningful linkages at all grade levels. The science program must also include positive working relationships with interested members of the community in order to build relationships that foster mentoring and other volunteer efforts. Adequate resources and materials must be provided to support the efforts of any successful science program.

The district believes that a continuum of science education must exist across grades K-12. Appropriate educational opportunities must be provided in the regular classroom and extend into extra-curricular activities. Scientific concepts must be built upon year after year.

Science is a process that utilizes techniques of experimentation through research. Therefore, the district believes that students should be exposed to this process as much as practicable.

At the junior high and high school levels, each science department should have a department chair. The chair's duties are to assist the school's principal in understanding the department and to specifically enhance the quality of instruction in that department. The department chair should lead the department, in part by constantly evaluating the curricula and implementing improvements where required, by attending regional scientific conferences on a periodic basis, by becoming well-versed in all scientific fields taught, by aggressively seeking outside funding sources, and by assisting in the broadening and deepening of the scientific knowledge and teaching effectiveness of science teachers in the building.

Philosophy Regarding Curriculum and Instruction

The district believes that science education is fundamental to a student's education. A study conducted by the Academic Enhancement Task Force in 2003 found that the parents of students within this school district believe that science is ranked fourth in importance of academic subjects taught, behind reading, writing and mathematics. The content standards prescribed by the Oregon Department of Education direct, to some degree, the content of our district's science education.

However, the science education at the high school level should drive science education at all grades. If the program is strong at the high school, it demands that students be prepared to meet that challenge by having experienced a challenging program in their younger years. Conversely, if the science experience in the lower grades is challenging and stimulating, this will require that the program at the high school level also meet this level of intensity. Strong leadership in science within the district must come from the high school level. It is the pinnacle of our education establishment in Estacada and as a result should be the focus of the district's science program.

The high school science department faculty should constantly be seeking out opportunities for promoting the subject, acquiring additional funds, attending professional development functions, and assisting the other schools in the district in science education. Science teachers should possess a breadth and depth of scientific knowledge, in order to relate the various science disciplines to one another and promote the interconnectedness of scientific fields. The district should promote student scientific research at all levels, particularly at the junior high and high school levels.

At the high school level, sufficient science courses should be offered to provide a wide exposure to the principal disciplines including:

Physics
Chemistry
Biology
Environmental science

To further stimulate a student's interest in science, additional enrichment classes should be offered in sub-disciplines as well, including, but not limited to: astronomy, geology, entomology, and microbiology. Advanced courses in chemistry, physics, biology and environmental science should also be explored.

At the high school level, additional consideration should be given to integrating science with other subjects. Examples include: mathematics, music, social science, vocational arts (metals and electronics), and the arts. Conversely, related subjects should be infused into the science curriculum where appropriate.

Differentiated instruction should also be promoted as a meaningful tool for teaching science. Please refer to the district's recently completed TAG (Talented & Gifted) Plan for additional information.

Philosophy Regarding Professional Development

The district believes that professional development in the sciences is paramount. No subject changes as significantly from year-to-year as science. Therefore, the district should set aside adequate resources to train science teachers to keep abreast of changes. This professional development should be ongoing and include both in-district and out-of-district experiences. Attendance at regional and national conferences should be promoted. Outside consultants should be retained to introduce and assist the district in developing best practices. In addition, in-house "experts" should be utilized to maintain, refine and continue staff development in each scientific discipline. These "experts" should also be provided with ample opportunities to hone their skills and develop curriculum while attending out-of-district workshops and classes.

The district also believes that a principal component of being an excellent science teacher is one's involvement in professional development studies, allowing the teacher to incorporate research into his/her curriculum. Conducting research serves many purposes, including: Improving experimentation skills, providing a skill set to pass along to the students, and allowing the teacher to interact with scientists in their field(s) of interest.

Philosophy Regarding Funding Allocation for the Science Education Program

The majority of funding allocated for science within the school district is directed towards labor. Minimal funding remains for acquisition of equipment (new or replacement), maintenance of equipment,

professional development, or the sponsorship of students at regional or national science competitions or fairs. Equipment must be cleaned and maintained on a periodic basis; otherwise, its effectiveness is reduced. The district believes that its current annual level of funding from the state is not adequate, due to governmental funding limitations. Funding should be expanded through other means at the earliest practicable opportunity.

Findings Regarding Planning Requirements

1.1. District-wide

1.1.1. The district currently lacks a comprehensive plan (scope and sequence) for science education spanning from kindergarten through the 12th grade.

1.2. High School

1.2.1. The following science courses are taught annually at the high school:

General Science (2 trimesters)
Physical Science (2 trimesters)
Biology (2 trimesters)
Human anatomy & physiology (2 trimesters)
Environmental science (2 trimesters)
Chemistry (2 trimesters)
Physics (2 trimesters)
Astronomy (1 trimester)
Earth science (1 trimester)

1.2.2. Other than a club called "A Delicate Balance", the high school does not have any extra-curricular activities related to science (such as a science club).

1.2.3. Scientific research is not promoted.

1.2.4. A new fume hood will be installed in the chemistry room (December 2003).

1.2.5. There exists minimal career guidance into the fields of science or engineering.

1.2.6. The percentage of students meeting or exceeding the standard on the 10th grade science benchmark test has been steadily increasing from 60% in 1999 to 72% in 2001 and is consistently above the state average. The only exception to this trend occurred during the last school year (2002-2003), where scores dropped to 59% meeting or exceeding the standard, which was below the state average.

1.2.7. The following science-related periodicals are available:

1.2.7.1. For students: *Astronomy*, and *Discover*

1.2.7.2. For staff for the 03-04 year: *The Physics Teacher* by AAPT and *The Science Teacher* by NSTA

1.3. Junior High

1.3.1. The district has recently adopted a "hands on" approach to the instruction of science for grades 7 and 8 through the adoption of the *Simply Science* program, authored by Barbara Bannister. The following scope and sequence is provided in this program:

Grade	Earth Science	Life Science	Physical Science
7	<u>Geology</u> ~ Structure of the Earth ~ Wind and running water cause the Earth to change ~ Some Earth change is rapid (quakes, volcanoes, etc.) ~ Some Earth change is slow (erosion, waves, etc.)	<u>Anatomy</u> ~ Skeletal, muscular, circulatory, respiratory, urinary, digestive, nervous, endocrine, reproductive, immune	<u>Physics (Motion)</u> ~ Motion (linear, translational, rotational, projectile) ~ Newton's Laws of Motion ~ Friction & momentum ~ Work & simple machines ~ Air pressure ~ Buoyancy
8	<u>Astronomy</u>	<u>Ecosystems of Alaska</u>	<u>Physics</u>

	~ The sun moves through the sky ~ The phases of the moon ~ The orbit of the moon ~ The orbit of the planets ~ The Earth's place in the solar system	~ Elements of an ecosystem ~ Food chains & food webs ~ Plant & animal kingdoms ~ Tundra ~ Forests ~ Wetlands ~ Ocean ~ Rainforest	~ Behavior of waves ~ Sounds: pitch, resonance, Doppler effect, sound & hearing ~ Light: reflection, refraction, color, light & vision ~ Heat: expansion, conduction, convection, radiation, heat and human skin ~ Electricity: static, current, electromagnetism

1.3.2. The junior high school does not have any extra-curricular activities related to science (such as a science club).

1.3.3. Percentage of students meeting or exceeding the standard on the 8th grade science benchmark test has been flat, at about 55%, from 1999 to 2001 and consistently below the state average.

1.3.4. In May/June 2003 the district conducted a survey of the three Junior High science teachers regarding the Simply Science program. Each teacher was asked to provide a response. Instead, the following group response was provided to the survey. The survey was very similar in content to the one provided to the elementary school teaching staff (see below). The group response did not address each question in the survey; however, the following responses were provided:

1.3.4.1. 75% of curriculum is direct instruction. 20% of curriculum is hands on. 5% of curriculum is audio-visual (no guest speaker element at all).

1.3.4.2. There are many concerns we have about teaching Simply Science. We are concerned about the lack of grade level content with regards to the benchmarks. For example, the genetics section consists of one or two pages with no mention of Punnett Square, a single sentence about Mendal [*sic*], and no mention of Darwin or evolution. In general it is either feast or famine regarding information – either far too elementary or far too complex.

1.3.4.3. No, not all of the experiments are clearly described. Often there is little or no explanation of how the experiment ties in with the big picture. Additionally, the experiments are either elementary or multi-day events with no real experiments or supplementary materials, labs, or activities for the time we are waiting for the experiment to go on. In the latest curriculum packets we've received, there is a great deal of outsourced activities that look more like islands of info instead of integrated lessons.

1.3.4.4. There is a serious lack of content. We are still very concerned over the lack of reading elements. EVERY activity requires further elaboration.

1.3.4.5. It would be very unfair to rate the students' attitudes to the program since the claims of highly hands-on was not provided. I would imagine that they would enjoy some of the activities. The problem is that many of the activities are so elementary as to be offensive to 7th and 8th graders, in addition to the lack of classroom sets of hands on materials.

1.3.4.6. Additional comments:

1.3.4.6.1. Drop the Alaskan tundra and pick up Pacific Northwest forests and high deserts (relevance).

1.3.4.6.2. Assessments are 90% fill-in-the blank and 10% very short answer with no higher level thinking required.

1.3.4.6.3. This looks like an elementary curriculum attempting to pass itself off as JH curriculum.

1.3.4.6.4. All of the activities can indeed be tweaked, or made to work but we shouldn't have to tweak anything.

1.3.4.6.5. We believe it is very weak in its alignment to state benchmarks.

1.3.4.6.6. No science inquiry elements.

1.3.4.6.7. No scientific methods elements.

1.3.4.6.8. Terminology is inconsistent – swapping technical and layman terms.

1.3.4.6.9. Not user-friendly, very hard to prep for a sub when needed.

1.3.4.7. Improvements we've seen include better illustrations and graphics, better info resources, and some great demonstration materials at the 7th grade level. The web support has not been evaluated.

1.4. Elementary Schools

1.4.1. Percentage of students meeting or exceeding the standard on the 5th grade science benchmark test has been variable, depending upon the school. From 1999 to 2001, both Eagle Creek and Clackamas River have been above the state average, with Clackamas River showing increasing progress, while Eagle Creek's progress decreased slightly. At River Mill, however, the performance has indicated a slight decline and is consistently below the state average.

1.4.2. The district has recently adopted a "hands on" approach to the instruction of science for grades K through 6 through the adoption of the *Simply Science* program, authored by Barbara Bannister. The following scope and sequence is provided in this program:

Grade	Earth Science	Life Science	Physical Science
K	<u>Growing Up</u> ~ The basic needs of a plant: light, water, soil, air ~ How a plant grows when its needs are met ~ Soil is different in different places	Fluttery Friends ~ The characteristics of a butterfly ~ The habitat of a butterfly ~ The life cycle of a butterfly ~ The food chain of a butterfly ~ Why butterflies can be in danger	<u>Sense-ability</u> ~ Eyes see, ears hear, skin feels, noses smell, and tongues taste ~ Describe objects according to their physical properties ~ Communicate information, classify objects, record information
1	<u>Wild About Weather</u> ~ Daily and seasonal weather changes ~ Tools that measure the weather ~ Collecting and interpreting weather data over time ~ Predicting weather ~ Weather in other parts of the country	<u>Froggy Friends</u> ~ The characteristics of an amphibian ~ The habitat of an amphibian ~ The life cycle of an amphibian ~ The food chain of an amphibian ~ Why amphibians can be in danger	<u>What's This Stuff?</u> ~ Properties of solids, liquids and gases ~ Freezing, melting, condensing, and evaporating ~ Heating and cooling change matter ~ How to recognize simple changes in matter
2	<u>Rock and Roll</u>	<u>Feathered Friends</u>	<u>Physics FUNdamentals</u>

	~ Soil is different in different places ~ Rocks have different properties ~ Rocks have different uses	~ The characteristics of a bird ~ The habitat of a bird ~ The life cycle of a bird ~ The food chain of a bird ~ Why birds can be in danger	~ Light can be reflected, refracted, or absorbed. ~ Sound is vibration. Pitch is how high or low a sound is. ~ Heat is the vibration of tiny pieces of stuff. ~ Electricity can collect in one place or move along a path ~ Magnets attract iron, cobalt, and nickel. ~ The Earth is a magnet.
3	<u>Meteorology and More</u> ~ Daily and seasonal weather changes ~ Tools that measure the weather ~ Collecting and interpreting weather data over time ~ Predicting weather ~ Weather in other parts of the country	<u>Formidable Friends</u> ~ The characteristics of a insect ~ The habitat of an insect ~ The life cycle of an insect ~ The food chain of an insect ~ Why insects can be in danger	<u>On the Move</u> ~ How objects move based on mass and gravity ~ Recording the motion of objects ~ Acceleration of objects moving downhill ~ Friction causes things to change speed
4	<u>Earth Changes</u> ~ Wind and running water cause the Earth to change ~ Some Earth change is rapid (quakes, volcanoes, etc.) ~ Some Earth change is slow (erosion, waves, etc.)	<u>Flippered Friends</u> ~ The characteristics of a marine mammal ~ The habitat of a marine mammal ~ The life cycle of a marine mammal ~ The food chain of a marine mammal ~ Why marine mammals can be in danger	<u>It Matters</u>! ~ The properties and qualities of states of matter ~ Freezing, melting, condensing, and evaporating ~ Heating and cooling change matter ~ How to recognize simple changes in matter
5	<u>What's Up?</u> ~ The sun moves through the sky ~ The phases of the moon ~ The orbit of the moon ~ The orbit of the planets ~ The Earth's place in the solar system	<u>Furry Friends</u> ~ The characteristics of a mammal ~ The habitat of a mammal ~ The life cycle of a mammal ~ The food chain of a mammal ~ Why mammals can be in danger	<u>It Works!</u> ~ Light can be reflected, refracted, or absorbed. ~ Sound is vibration. Pitch is how high or low a sound is. ~ Heat is the movement of pieces of stuff. ~ Electricity can collect in one place (static) or move along a path (current). A circuit is a circle of electricity. ~ Magnets are a material that

			attracts iron, cobalt, and nickel. ~ The Earth acts like a magnet.
6	Look Down, Look Up ~ Daily and seasonal weather changes ~ Tools that measure the weather ~ Collecting and interpreting weather data over time ~ Predicting weather ~ Weather in other parts of the country	Forest Friends ~ The characteristics of the temperate rainforest ~ The life cycle of an alligator lizard ~ The food chain of the rainforest ~ Why bears can be in danger	Why is it Different? ~ The sun moves through the sky ~ The phases of the moon ~ The orbit of the moon ~ The orbit of the planets ~ The Earth's place in the solar system

1.4.3. In May/June 2003 the district conducted a survey of the elementary school teachers regarding the Simply Science program. Every teacher was asked to provide a response. A total of 20 responses were returned. The following findings are noted:

1.4.3.1. About how many minutes each week did your students have science instruction last year (2001-2002)?: 0-30 minutes (26%), 31-60 minutes (26%), 61-90 minutes (21%), more than 90 minutes (27%).

1.4.3.2. About how many minutes each week did your students have science instruction this year (2002-2003)?: 0-30 minutes (10%), 31-60 minutes (25%), 61-90 minutes (35%), more than 90 minutes (30%).

1.4.3.3. Think about science instruction this year. What percentage was direct instruction, teacher presenting information? Low = 10%, High = 90%, average = 45%.

1.4.3.4. Think about science instruction this year. What percentage were hands-on activities? Low = 10%, High = 90%, average = 44%.

1.4.3.5. Think about science instruction this year. What percentage was audio-video or guest speakers? Low = 0%, High = 25%, average = 9%.

1.4.3.6. What is your comfort level teaching science? Very comfortable (70%), Mildly comfortable (30%), Mildly uncomfortable (0%), Very uncomfortable (0%).

1.4.3.7. What is your comfort level teaching “hands-on” science or lab science? Very comfortable (55%), Mildly comfortable (45%), Mildly uncomfortable (0%), Very uncomfortable (0%).

1.4.3.8. What is your comfort level answering questions children have about science? Very comfortable (40%), Mildly comfortable (55%), Mildly uncomfortable (5%), Very uncomfortable (0%).

1.4.3.9. What is your comfort level having students work with messy experiments? Very comfortable (35%), Mildly comfortable (65%), Mildly uncomfortable (0%), Very uncomfortable (0%).

1.4.3.10. What is your comfort level combining science with other curriculum subjects? Very comfortable (75%), Mildly comfortable (15%), Mildly uncomfortable (10%), Very uncomfortable (0%).

1.4.3.11. What is your comfort level doing demonstrations for your class? Very comfortable (70%), Mildly comfortable (25%), Mildly uncomfortable (5%), Very uncomfortable (0%).

1.4.3.12. What is your comfort level teaching science to children with differing learning needs? Very comfortable (50%), Mildly comfortable (40%), Mildly uncomfortable (10%), Very uncomfortable (0%).
1.4.3.13. What is your comfort level giving students experiments to take home to do with their families? Very comfortable (40%), Mildly comfortable (30%), Mildly uncomfortable (30%), Very uncomfortable (0%).
1.4.3.14. I generally have enough time to prepare to teach science. Strongly agree (0%), Mildly agree (35%), Mildly disagree (40%), Strongly disagree (25%).
1.4.3.15. I like science. Strongly agree (75%), Mildly agree (20%), Mildly disagree (5%), Strongly disagree (0%).
1.4.3.16. A teacher should tell students what they have to learn and know. Strongly agree (15%), Mildly agree (35%), Mildly disagree (40%), Strongly disagree (10%).
1.4.3.17. I do not want to teach science. Strongly agree (0%), Mildly agree (5%), Mildly disagree (15%), Strongly disagree (80%).
1.4.3.18. It is important for students to do experiments to understand science. Strongly agree (75%), Mildly agree (15%), Mildly disagree (10%), Strongly disagree (0%).
1.4.3.19. I do not understand science. Strongly agree (0%), Mildly agree (15%), Mildly disagree (20%), Strongly disagree (65%).
1.4.3.20. I am afraid to teach "hands-on" science because I might not be able to do the activities. Strongly agree (0%), Mildly agree (20%), Mildly disagree (5%), Strongly disagree (75%).
1.4.3.21. I am well prepared to teach science. Strongly agree (40%), Mildly agree (45%), Mildly disagree (15%), Strongly disagree (0%).
1.4.3.22. What is your greatest concern about teaching science?
    1.4.3.22.1. My own experiment won't work
    1.4.3.22.2. Someone might be harmed by other student's carelessness or on purpose.
    1.4.3.22.3. Time and resources. (Most prevalent comment received.)
    1.4.3.22.4. Simply Science is not enough "meat". Too much time needed to round up enriching activities and materials.
1.4.3.23. Did all experiments yield the expected results (16 responses)? Yes – 81%, No – 19%. For those that answered "no, the following comments were noted:
    1.4.3.23.1. There were too many variables in my materials
    1.4.3.23.2. Cloud in a jar. (Modifications discussed with author.)
1.4.3.24. Were you provided with sufficient supplies to properly conduct each experiment (16 responses)? Yes – 50%, No – 50%. For those that answered "no, the following comments were noted:
    1.4.3.24.1. I had to buy: bottles for the sound experiment, food coloring, and fake rock and eggs for bird section.
    1.4.3.24.2. Foil not of strength needed.
    1.4.3.24.3. Not enough small batteries.
    1.4.3.24.4. Food coloring and ammonia
    1.4.3.24.5. Film canisters.
1.4.3.25. Was sufficient content provided to adequately describe each experiment (14 responses)? Yes – 86%, No 14%. For those that answered "no, the following comments were noted:
    1.4.3.25.1. Both the geology and the mammal unit required more information to the students.
    1.4.3.25.2. I think that there were a lot of gaps the teacher had to fill in.

1.4.3.26. Did your students react positively to the Simply Science program (16 responses)? Yes – 100%, No – 0%.

1.4.3.26.1. Comments: They loved it! (Most prevalent comment received.), the best science program I have ever worked with, "we're doing science" became an excited catch phrase, they love science class – it's running a "close second" to recess.

1.4.3.27. Do you have any additional comments about the "Simply Science" program?

1.4.3.27.1. Make the worksheets tougher.

1.4.3.27.2. It is very much geared to the benchmarks, which I see as teaching to a low level. The teacher must be aware of the responsibility to enrich or we are going to have weakly educated science students.

1.4.3.27.3. Barbara has been excellent!

1.4.3.27.4. My only concern is that I feel it doesn't go deep enough. MY kids report wanting more and so I had to supplement with my own stuff a bit.

Recommendations Regarding Planning Requirements

1.1. District-wide

1.1.1. Staff Development

1.1.1.1. Representative staff should be sent annually to pertinent conferences and workshops. Examples include:

1.1.1.1.1. OSTA (Oregon Science Teachers Association) conferences

1.1.1.1.2. NSTA (National Science Teachers Association) conferences

1.1.1.1.3. NABT (National Association of Biology Teachers) conferences

1.1.1.1.4. AAPT (American Association of Physics Teachers) conferences

1.1.1.1.5. ACS (American Chemical Society) education-related conferences

1.1.2. It is recommended that students be surveyed upon completion of the following grade levels to determine their impressions of their science education: 6th grade, 8th grade, and 12th grade.

1.2. High School

1.2.1. The Sub-Task Force recommends raising the science requirement for graduation from 2 credits to 3 credits. This will greatly enhance a student's knowledge of science and help to promote a student's consideration of pursuing higher education at a two-year or four-year institution. It will further reinforce our desire to indicate to others inside and outside the community that the district is serious about the academic aspects of our children's education.

1.2.2. Consider implementing additional science enrichment classes, perhaps teaching some on a bi-yearly cycle. Classes offered should be appropriate to the instructor's interest, teaching, and skill level. Possibilities include:

- Astronomy (currently taught)
- Geology,
- Entomology,
- Marine biology or zoology,
- Microbiology and bacteriology,
- Botany,
- Molecular biology,
- Advanced chemistry (further topics in organic and inorganic chemistry and further research),
- Advanced physics (further topics in electromagnetism, thermodynamics and special relativity and further research),
- Advanced biology (further topics in evolutionary biology and genetics and further research)
- Advanced environmental science (further topics in current issues and readings of prominent past and present naturalists)

In order to achieve this diversity of science classes, and to allow students with an interest in science to excel, the Sub-Task Force recommends developing a two-tracked approach, beginning in the 9th grade. Track 1 will be the conventional track. Track 2 will be for those students who demonstrate a high academic ability and have a high interest in science and/or a science-related career. Entry into Track 2 will depend upon the recommendations of the Junior High science instructors and the performance of the student on the Junior High's periodic science assessments.

A following course sequence is recommended:

7th Grade: Integrated Science
8th Grade: Integrated Science

9th Grade: **Track 1**: Physical Science
Track 2: Full year Biology with entrance based on recommendation of JHS science instructors. The third trimester of Biology will focus on increasing the depth of content and research (starts 05-06)

10th Grade: **Track 1**: Full year Biology. The third trimester of Biology will focus on increasing the depth of content and research (starts 05-06)
Track 2: Science Elective

11th Grade: Science Elective

12th Grade: Science Elective

Current Science Electives	Future Science Electives
Chemistry	Science Research
Physics	Advanced Biology
Astronomy	Advanced Chemistry
Environmental Science	Advanced Physics
Human Anatomy and Physiology	Other non-advanced elective courses, such as botany or geology

With the exception of the Science Research class, Future Science electives will require additional science FTE. We recommend that it be a minimum of 1 full FTE. The additional electives will also require additional equipment and consumable supplies. The cost of these additional materials cannot be determined until the curriculum is further along in the developmental stages. An extremely rough estimate for materials and supplies would be a 1 time capital outlay of between $20,000-$30,000, which could be purchased with grant funds. There will be an annual expense between $1500 to $2500 for consumables and maintenance. Currently, annual expenses average about $1500 to $2000.

Sample schedule for track 1 student

7th Grade: Integrated Science
8th Grade: Integrated Science

9th Grade: Physical Science
10th Grade: Biology
11th Grade: Chemistry
12th Grade: Human physiology

Sample schedule for track 2 student

7th Grade: Integrated Science
8th Grade: Integrated Science
9th Grade: Biology
10th Grade: Chemistry and a 1 trimester of Advanced Chemistry
11th Grade: 1 trimester of Advanced Biology and 2 trimesters of Physics
12th Grade: 1 trimester of Advanced Physics, ISEF competition in the spring

Electives, including those currently offered or those proposed above, need not only be confined to the senior year, but may be allowed to be taken as aptitude or interest permits.

The following model is proposed:

2003-2004 (currently 4.25 FTE):

36 physical science and biology
2 general science
4 human anatomy
4 chemistry
2 physics
1 astronomy
2 environmental
51 total sections

2004-2005 (Staffing required 4.25 FTE):

Feature: Addition of a science research elective course

34 physical science and biology (The reduced # of sections of physical science and biology comes from the reduced class size.)
2 general science
4 human anatomy
4 chemistry
2 physics
1 astronomy
2 environmental
2 science research sections (new offerings)
51 total sections

2005-2006 (Staffing required 5.25 FTE):

Features: Addition of 3rd trimester of required biology, addition of other advanced electives, and addition of 3rd required credit for graduation

38 physical science and biology
2 general science
4 human anatomy
4 chemistry
2 physics
1 astronomy
2 environmental
2 science research sections
8 science elective sections (new offerings) These courses could be offered annually or biannually (to provide for more electives or more sections of an elective).
Minimum 1 Adv. Physics
Minimum 1 Adv. Chemistry
Minimum 1 Adv. Biology
Other science electives
63 total sections

Notes pertaining to the model above:

- 1 section = 1 twelve week trimester = ½ credit
- Section numbers are estimates: they cannot be determined until class sizes are calculated and the course schedule is made.

1.2.3. The high school should promote meaningful scientific research for interested students that will culminate in the preparation of a research paper and presentation at a science fair or similar event. The following are possible examples:
- 1.2.3.1. International Science and Engineering Fair (ISEF)
- 1.2.3.2. Oregon Junior Science & Humanities Symposium
- 1.2.3.3. Seimens Science & Technology Challenge
- 1.2.3.4. Intel Science & Talent Search
- 1.2.3.5. Ultimately, students should be prepared to spend up to 4 to 5 hours per week on a research project. Projects may range in duration from a single trimester term to a multi-year effort.
- 1.2.3.6. The district should consider providing high school credit for worthy projects.
- 1.2.3.7. Pursue community links to assist in research:
  - 1.2.3.7.1. Local colleges and universities
  - 1.2.3.7.2. ODFW
  - 1.2.3.7.3. US Fish & Wildlife Service
  - 1.2.3.7.4. US Forest service
  - 1.2.3.7.5. BLM

1.2.4. The district should promote learning and research opportunities for high school students outside of the district. Examples include:
- 1.2.4.1. Caltech's "YESS" (Young Engineering and Science Scholars) program. To learn more, explore http://pr.caltech.edu/media/Press_Releases/PR12435.html
- 1.2.4.2. A number of science-related programs offered through Oregon State University during the summer session. To learn more, explore http://oregonstate.edu/summer/2003/youth.html

1.2.5. The district should also pursue entering students into regional science knowledge competitions. Examples include:

1.2.5.1. BPA Science Bowl

1.2.6. The district should create a science club to further excite students about science. The following items should be considered:

1.2.6.1. A science club allows students to find their own niche and explore their own interests. It increases the potential for students to have fun exploring science.

1.2.6.2. As a minimum, the club should meet at least once a month. If it will be used to provide time for research projects, meeting once a week for several hours each meeting may be required.

1.2.6.3. Prepare to pay a stipend for a capable advisor.

1.2.6.4. The club serves as an organizing mechanism to raise funds to send students to science fairs and other competitions.

1.2.6.5. The club can also be a time when students pursue their research activities.

1.2.6.6. Other club activities:

1.2.6.6.1. Student presentations of their scientific research or other items of interest

1.2.6.6.2. Teacher presentations

1.2.6.6.3. Guest lecturers, including college graduate student presentations

1.2.6.6.4. Field trips to local/distant areas of interest

1.2.6.6.5. Consider electing officers and creating a club charter.

1.2.7. Provide additional career guidance opportunities for students. Provide more information about careers in science and engineering. Advertise among the student body the myriad of activities in the Portland metropolitan area, the state, and the nation, ranging from potential colleges and universities to job shadowing, and to professional scientific and engineering societies that have programs directly targeted to high school students.

1.2.7.1. One specific example of an opportunity to provide additional guidance along these lines is through the National Society of Professional Engineers (NSPE) "Engineers Week". Since 1951 this weeklong activity has provided thousands of students valuable opportunities and insight into the many fields of engineering. Engineers Week is usually held during the third week of February and is sponsored by over 100 engineering-related societies and major corporations. While the focus is on high school and college students, programs do exist for K-8 as well (see below). For more information, browse http://www.eweek.org.

1.2.7.2. Explore the free career guidance program created by MIT (Massachusetts Institute of Technology) and Microsoft to introduce engineering to high school students. This program is brought directly to each high school. To learn more, review http://www.eweek.org/site/media/mit-program.shtml.

1.2.8. For high school science teachers, the district should promote additional professional development in areas of meaningful scientific research. The following programs are possibilities:

1.2.8.1. "Partners in Science" administered by the Murdock Trust. The goal of this program is to team up high school science teachers with professional researchers in various areas of science. It is a two year (during the summers) program that pays a stipend of $5000.00 each summer. The teacher works in a local science laboratory, focusing on an area of interest. Locally, those include: Reed College, PSU, OHSU, and the Primate Center. The program culminates with attendance at a national conference where the teacher presents their research. A follow-up grant is also available to continue research. Contact Bart Hadder at the Murdock Trust.

1.2.8.2. At Portland State University, SCI510 "Implementing Science Research in the High School Science Curriculum" is offered. This is a two credit class, taught over the

course of three days. Contact Mike Ellison at 503-725-8748 or 360-696-9939 for additional information.

1.2.9. The following additional periodicals should be evaluated and considered for purchase by the district for use by staff and students in order to further promote science education. These periodicals should be available for use by staff and students district-wide:

1.2.9.1. For Students: *Nature*, *Natural History*, *Science*, *Science News, Scientific American*, and *Popular Science*

1.2.10. The high school should develop a technical writing rubric to be used by science students. This would assist in honing the students' writing skills. The focus on other styles of writing should be minimized in science class.

1.2.11. Discussions should be held between the departments of Science and Health/PE to offer basic and advanced health classes by the Health/PE staff in the high school.

1.3. Junior High

1.3.1. Augment the current *Simply Science* program to provide additional reference materials for in-depth study. While the program is undergoing further development to better meet the needs of the teachers at the Junior High, the *Simply Science* program, with its inquiry-based model, should remain the focus of science at the Junior High and additional resources should be added as needed (such as the adoption of the supplementary Glencoe textbooks in June 2003). Further interaction between the Junior High science staff, the administration and the author of *Simply Science* is recommended, as appropriate, in order to continue the development and implementation of this program. The administration shall coordinate and oversee this interaction. Consideration should be given to the relevant comments contained within the evaluation document provided by the Junior High science staff (see the Findings section, above). The following recommendations are in response to the answers provided in the Junior High science teacher survey (Findings section 1.3.4):

1.3.1.1. (1.3.4.1) The percentage of direct instruction (lecture, reading and writing) versus "hands-on" activities (75% to 20%) is appropriate, but "hands-on" activities could vary up to 50%, depending upon the science subject taught.

1.3.1.2. (1.3.4.2) The concerns about benchmark content standards are currently being addressed by the author through the use of independent teaching consultants experienced in middle school science instruction and who are providing reviews.

1.3.1.3. (1.3.4.3) The experiments that require more work should be identified.

1.3.1.4. (1.3.4.4) The apparent lack of content concern should be addressed by the purchase of the reference Glencoe Science series.

1.3.1.5. (1.3.4.5) The materials that are lacking should be identified and brought to the attention of the appropriate purchasing authority.

1.3.1.6. (1.3.4.6.1) The Alaskan tundra unit should remain. Forests and wetlands are also covered in this section and attention to the Pacific Northwest forest regions, as well as others, could be addressed here. Pacific Northwest forests and the high deserts are covered in earlier grades.

1.3.1.7. (1.3.4.6.2) If additional, more in-depth assessments are needed, it is recommended that the teachers discuss these requirements with the author.

1.3.1.8. (1.3.4.6.3) Independent middle school reviewers have concluded that the curriculum meets the needs of a junior high; however, any specific concerns should be brought to the author's attention for review.

1.3.1.9. (1.3.4.6.5) Independent middle school reviewers have concluded that the curriculum meets the eighth grade benchmarks; however, any specific concerns should be brought to the author's attention for review.

1.3.1.10. (1.3.4.6.6 and 1.3.4.6.7) Other reviewers have concluded that the scientific method and inquiry are present in the program; however, any specific concerns should be brought to the author's attention for review.

1.3.1.11. (1.3.4.6.8) Any specific concerns regarding inconsistency in terminology should be brought to the author's attention.

1.3.1.12. (1.3.4.6.9) It is recommended that a discussion be held with the author to implement procedures to be utilized when substitute teachers are needed.

1.3.2. To allow more time to teach science, distribute the health component between the physical education and the science departments. The subject of health spans across both of these areas of study and activity. The science and PE staffs should discuss this with the health staff at the high school for additional recommendations.

1.3.3. Consider beginning a science club at the junior high level. Refer to the High School, above, for additional recommendations.

1.3.4. For Junior High School science teachers, the district should promote additional professional development in areas of meaningful scientific research. The following program is a possibility:

1.3.4.1. At Portland State University, SCI510 "Implementing Science Research in the Middle School Science Curriculum" is offered. This is a two credit class, taught over the course of three days. Contact Mike Ellison at 503-725-8748 or 360-696-9939 for additional information.

1.3.5. The Junior High School should promote meaningful scientific research for interested students that will culminate in the preparation of a research paper and presentation at a science fair or similar event. The following is specifically directed towards middle school students (grades 5 through 8): "The Discovery Channel Young Scientist Challenge". For more information, see http://school.discovery.com/sciencefaircentral/dysc/index.html. Also explore the information at the Intel Northwest Science Expo at www.nwse.org.

1.3.6. Explore ways to fully implement the new science laboratories through more inquiry-based methods.

1.3.7. Explore opportunities for middle school students to learn more about the many fields of science and engineering. One possibility includes the various programs surrounding Engineers Week, which is organized by the National Society of Professional Engineers. Such programs include: 1) A cooperative program with the PBS television show, ZOOM, 2) Introduce a Girl to Engineering Day, 3) Arranging to have an engineer/scientist visit the classroom to discuss opportunities. For more information, browse the information for K-12 students at http://www.eweek.org.

1.4. Elementary Schools

1.4.1. From the *Simply Science* survey, it was found that the district should instill within the teachers a sense that they have ongoing support from others experienced in teaching science and that the teachers' professional development needs will be met. The ability of a teacher to seek continuing education support to further the success of the *Simply Science* program is fundamental to its continued success. This can be seen with the response to the survey questions about one's level of comfort in answering questions about science as well as their level of preparation to teach science – the more a teacher knows, the more comfortable they will become. We recommend that periodic science in-service sessions be held and/or that the teacher enroll in science education classes of interest and utilize some of the paid tuition credits offered by the school district.

1.4.2. From the *Simply Science* survey, it was found that the amount of time spent teaching science varies widely. The following are recommended minimum time ranges to teach science (per week), as categorized by grade level range. These recommendations are

determined from surveys conducted with teachers within our school district as well as from recommendations provided by Barbara Bannister.

- K-2 40 to 90 minutes per week (broken into 2 or 3 sessions per week)
- 3-6 90 to 120 minutes per week (broken into 2 or 3 sessions per week)

1.4.3. From the *Simply Science* survey, it was found that the district should provide additional teacher professional development in differentiated instruction, in order to better address the concerns in the survey pertaining to teaching children with differing needs.

1.4.4. From the *Simply Science* survey, it was found that the district should discuss with teachers the methods to fully implement the *Simply Science* program. Some methods which could be employed to gain additional time are as follows:

- Have lab assistants to help set up equipment
- Have lab assistants to help conduct experiments

It is suggested that each school consider enlisting some students to act as lab assistants.

1.4.5. From the *Simply Science* survey, it was found that the district should impress upon all teachers the importance of experimentation in all of science. While only a minority of teachers responded to this survey question with a reduced level of importance (of the importance of experimentation in science), all should be made aware of this fundamental aspect of science and that it cannot be minimized.

1.4.6. From the *Simply Science* survey, it was found that the range of time that teachers spend on direct instruction or "hands-on" activities varies widely. In order to provide the best balance of these two necessary teaching techniques, it is recommend that about 50% to 75% of the science time be spent on direct instruction and about 25% to 50% on hands-on activities. (The variability depends upon the science subject taught.)

1.4.7. From the *Simply Science* survey, it was found that the district should provide additional science resource materials to augment the Simply Science program. This could take the shape of monographs or other books that provide reference materials to complement the *Simply Science* subjects. The following resource list was created by Barbara Bannister. These resources are grade appropriate and are tied to the *Simply Science* program by related subject matter.

SUGGESTED BOOKLIST FOR KINDERGARTEN

Growing Up			
From Seed to Plant	Gibbons, Gail	0823410250	6.95
How a Plant Grows	Kalman, Bobbie	0865057281	5.95
Fluttery Friends			
Butterflies and Moths	Kalman, Bobbie	0865057141	5.95
Life Cycle of a Butterfly	Kalman, Bobbie	077870680X	5.95
Sense-ibility			
My Five Senses	Aliki	006445083X	4.95
Five Senses Hearing	Rius, Maria	0812035631	6.95?
Five Senses Sight	Rius, Maria	081203564X	6.95?
Five Senses Smell	Rius, Maria	0812035658	6.95?
Five Senses Taste	Rius, Maria	0812035666	6.95?
Five Senses Touch	Rius, Maria	0812035674	6.95?

SUGGESTED BOOKLIST FOR FIRST GRADE

Wild About Weather			
Weather Words	Gibbons, Gail	082340952X	6.95
What's the Weather Today?	Fowler, Allan	0516449184	4.95
What Do You See in a Cloud?	Fowler, Allan	0516202227	4.95?
When a Storm Comes Up	Fowler, Allan	0516460358	4.95?
Froggy Friends			
Frogs	Gibbons, Gail	0823411346	6.95
Frogs and Toads and Tadpoles, Too!	Fowler, Allan	0516449257	4.95
What's This Stuff?			
Solid, Liquid or Gas?	Robinson, Fay	0516460412	4.95
What is the World Made Of?	Zoehfeld, K	0064451631	4.95

SUGGESTED BOOKLIST FOR SECOND GRADE

Rock and Roll			
Let's Go Rock Collecting	Gans, Roma	0064451704	4.95
How Mountains Are Made	Zoehfeld, Kathleen	0064451283	4.95?
Feathered Friends			
How Birds Fly	Kalman, Bobbie	0865057680	5.95
Life Cycle of a Bird	Kalman, Bobbie	0778706842	5.95
What Is a Bird?	Kalman, Bobbie	086505892X	5.95
Physics FUNdamentals			
Energy Makes Things Happen	Bradley, Kimberly	0064452131	4.99
Hot and Cold	Fowler, Allan	0516460218	4.95
What Magnets Can Do	Fowler, Allan	051646034X	4.95

SUGGESTED BOOKLIST FOR THIRD GRADE

Meteorology and More			
How's the Weather?	Berger, Melvin	0824953169	4.50
Reasons for Seasons	Gibbons, Gail	0823412385	6.95
Weather Forecasting	Gibbons, Gail	0689716834	5.99
Formidable Friends			
Bugs and Other Insects	Kalman, Bobbie	0865057133	5.95
Spiders	Gibbons, Gail	0823410811	6.95
What Is an Arthropod?	Smithyman & Kalman	0865059683	6.95
On the Move			
(It's Science) Forces Around Us	Hewitt, Sally	0516263900	6.95
Simple Machines	Fowler, Allan	0516273108	4.95

SUGGESTED BOOKLIST FOR FOURTH GRADE

Earth Changes			
Are Mountains Growing Taller?	Berger, Melvin& Gilda	0439266734	5.95
Earthquakes	Simon, Seymour	068814022X	6.95

Volcanoes	Simon, Seymour	0688140297	6.95
Why Do Volcanoes Blow Their Tops?	Berger, Melvin	0439148782	5.95
Flippered Friends			
What Is a Marine Mammal?	Kalman, Bobbie	0865059543	5.95
What Is a Whale?	Kalman, Bobbie	0865059535	5.95
What Makes an Ocean Wave?	Berger, Melvin	0439148820	5.95
It Matters!			
(It's Science) Solid, Liquid or Gas	Hewitt, Sally	0516263935	6.95?
Magic School Bus Gets Baked in a Cake	Cole, Joanna	0590222953	3.50?

SUGGESTED BOOKLIST FOR FIFTH GRADE

What's Up?			
Moon Book	Gibbons, Gail	0823413640	6.95
Planets	Gibbons, Gail	0823411338	6.95?
What Makes Day and Night?	Branley, Frank	0064450503	4.95?
Furry Friends			
Cats	Gibbons, Gail	0823414108	6.95
What Is a Cat?	Bishop & Kalman	0865059675	6.95
What Is a Mammal?	Kalman, Bobbie	0865058903	5.95
It Works!			
(It's Science) Full of Energy	Hewitt, Sally	0516263919	6.95

SUGGESTED BOOKLIST FOR SIXTH GRADE

Look Down, Look Up			
Exploring the Sky by Day	Dickinson, Terence	0920656714	9.95
FAQ Weather	Wyatt, Valerie	1550748157	6.95
Weather	Simon, Seymour	068817521X	6.95
Forest Friends			
Olympic Rain Forest	Kirk, Ruth	0295971878	22.50
Plants of the Pacific Northwest Coast	Pojar, J. & Macinnon, A.	1551050404	19.95
Why is It Different?			
Sparks of Life CARBON	Blashfield, Jean	0817250417	28.56#
Sparks of Life NITROGEN	Blashfield, Jean	0817250395	28.56#
Sparks of Life OXYGEN	Blashfield, Jean	0817250379	28.56#

BOOKLIST FOR ALL CLASSROOMS

(It's Science) All Kinds of Animals	Hewitt, Sally	0516263382	6.95
(It's Science) All Kinds of Habitats	Hewitt, Sally	051626446X	6.95
(It's Science) Growing Up	Hewitt, Sally	0516264486	6.95
(It's Science) Plants and Flowers	Hewitt, Sally	0516263412	6.95
Pass the Energy Please!	Shaw-McKinney	158469002X	7.95
What Are Camouflage and Mimicry	Kalman, Bobbie	0865059624	5.95
What Are Food Chains and Webs?	Kalman, Bobbie	0865058881	5.95
What Is a Biome?	Kalman, Bobbie	0865058873	5.95
What Is a Life Cycle?	Kalman, Bobbie	0865058865	5.95

These books are available for review and comment. Contact Terri Lloyd at the central Office.

Book selections and quantities should be made by the end of the 2003-2004 school year.

The following commentary to this list was provided by Barbara Bannister:

"When we weren't sure about a match, we put a question mark. We had a lot of trouble finding *anything* that would fit for fourth grade chemistry, It Matters! Every book we reviewed was activities more suited to the teacher than students reading about matter.

We can give you a 20% discount on every book ordered except for the ones in sixth grade with a # sign. For those books, which are very expensive but also very good, we can only give 5% because we don't get the regular discount."

1.4.8. From the *Simply Science* survey it was found that the district should develop a system to ensure that all teachers are provided with the materials to adequately teach the program (materials required for experiments).

1.4.9. For those students interested in scientific research (grades 5 and 6), consider participating in "The Discovery Channel Young Scientist Challenge", see 1.3.5, above, for more information.

1.4.10. Each elementary school should promote a yearly "Family Science Night". This program could be developed completely within the school, utilizing school/volunteer resources, or contracted from an outside organization such as OMSI or A.C. Gilbert Discovery Center.

1.4.11. Explore opportunities for elementary school students to learn more about the many fields of science and engineering. One possibility includes the various programs surrounding Engineers Week, which is organized by the National Society of Professional Engineers. Such programs include: 1) A cooperative program with the PBS television show, ZOOM, 2) Introduce a Girl to Engineering Day, 3) Arranging to have an engineer/scientist visit the classroom to discuss opportunities. For more information, browse the information for K-12 students at http://www.eweek.org.

Anticipated Timeline to Achieve the Recommendations

It is anticipated that all recommendations contained within this report can be met by the beginning of the 2005-2006 school year.

Very minimal costs will be incurred during the 2003-2004 and 2004-2005 school years to implement those portions of the plan. During the 2005-2006 school year, a new science teacher will need to be hired at the high school to meet the required needs as outlined in this report.

Funding Opportunities Outside of Annual General Fund Allocation

Adequate funds must be budgeted annually to implement the goals as stated in this Estacada School District Science Education Plan. It is recognized that occasionally the general fund allocation will not completely cover all costs as outlined in this Plan. Funding limitations for Science Education are prevalent throughout the state. To that end, the Science Education Sub-Task Force has identified the following additional funding sources.

- Encourage parent organizations to support Science Education through fundraisers and donations. A science club or the current PTA/PTSA/Parents' Club network could serve this purpose.
- Seek grants to be used for Science Education-related programs. Enlist the assistance of parents interested in science education to participate with the teacher in writing these grants.

Potential Science-Related Grants

  - WHM Goodman Foundation, www.goodmanfamilyfoundation.org/giving.html
  - Toyota Tapestry Grant (accessible through the NSTA at www.nsta.org)
  - American Honda Foundation, www.hondacorporate.com/community/index.html

The district must provide incentives to personnel choosing to write grants in order to increase the frequency of grant production.

Related Organizations

Professional Development

- Oregon Department of Ed Science Leader Workshop:http://www.ode.state.or.us/events/eventDesc.asp?eID=811
- Oregon Science Teachers Association Conference in October: http://www.oregonscience.org/conference.htm
- National Association of Biology Teachers conference: http://www.NABT.org/sub/convention/2003_portland.asp

Organizations and Government Sites

- American Institute of Physics: http://www.aip.org
- American Association of Physics Teachers: http://www.aapt.org
- National Science Teachers Association: http://www.nsta.org

Oregon Resources

- Oregon Museum of Science and Industry: http://www.omsi.org/
- OSU Adventures in Learning: http://oregonstate.edu/precollege/ail
- Saturday Academy: http://www.ogi.edu/satacad/

Periodic Evaluation of the Plan by the School District

The purpose of evaluating the Science Education Plan on a periodic basis is to monitor implementation, adjust to changing educational strategies and fiscal appropriations, and identify future needs.

It is the recommendation of this Sub-Task Force to have this plan reviewed by the school district on an annual basis.

The Curriculum & Special Services Director will report to the Board on an annual basis, after completing the assessment of the Plan, to inform the Board about the "State of Science Education" within the district.