

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

Elementary		
Essential Question 1: How is the allocation of time to science affecting the teaching of science across the Bedford System?		
Findings	Recommendations	Action Items
1. At the elementary schools, science teaching time and curriculum development is often pushed aside by the demands of the math and ELA curriculum.	1. Dedicate focused time to science to enhance the curriculum	
2. At the elementary level, science curriculum time is used to teach both "essential to know" and "nice to know" content.	2. Science curriculum time should set the "essential to know" content as an instructional priority.	
3. At Lane School, many projects require a dedicated space.	3. A dedicated science space would allow teachers to prepare efficiently for science activities.	
4. At all levels, Professional Development should be focused on development of curriculum that aligns with the goals of the Understanding by Design work. This curricular development takes hours and small blocks of time should not be considered adequate.	4. More extended professional development time should be devoted to curricular development that aligns with the Understanding by Design work.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

Elementary		
<b>Essential Question 2: How well are we meeting the needs of and creating a positive learning environment for all students?</b>		
Findings	Recommendations	Action Items
1. Science problem-solving/engineering opportunities are currently organized by the enrichment teacher.	1. Similar opportunities should be incorporated into the general science curriculum such that they are made available to all students.	
2. At the elementary level, the larger class sizes make it difficult for teachers to engage students in hands-on science instruction.	2. More opportunities for students to work in small group settings would enhance delivery of the science curriculum.	
<b>Essential Question 3: How well does our program reflect current research in Science Education?</b>		
1. At the elementary level, the current Bedford elementary curriculum does a fine job of addressing the Engineering Standards through the topic of Simple Machines. However, currently, even this unit is taught by some teachers in various ways, but not by all teachers in the same way.	3. Additional incorporation of the Engineering Standards into the curriculum at more grade levels and a more consistent approach to the instruction of these standards across the grades is recommended.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

Elementary		
<b>Essential Question 4: How cohesive is the articulation of the curriculum from the elementary grades through the high school level and how effectively is this communicated?</b>		
Findings	Recommendations	Action Items
1. At the elementary level, the essential-to-learning science content standards as defined by the Massachusetts Frameworks should be emphasized with science learning goals clearly stated.	1. Continued work to align the science curriculum at each grade level as well as between grade levels is recommended.	
2. At the elementary level, a core vocabulary for each grade level would enhance the current curriculum.	2. Determination and use in common assessments of a core vocabulary is recommended. This vocabulary should be shared with the middle school teachers so that students can build from previous experiences in their science class.	
<b>Essential Question 5: Given the educational value that allows teachers the opportunity to create and adapt curriculum, how do we balance educational creativity with the value of consistency to assess student knowledge across a course or grade level?</b>		
1. At the elementary and middle school levels, a set of common assessments for each unit would be most helpful in measuring student learning.	1. Additional assessments on core science topics should be developed with consistency across grade levels.	
2. Some examples of common experiences upon which teachers can build in later years are Cattail Corner, the electricity unit and Science Journaling.	2. Additional common experiences should be developed.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

Elementary		
Essential Question 6: How well do the current equipment, technology, and other resources support the science program?		
Findings	Recommendations	Action Items
1. At the Lane School in particular, there is a need for a dedicated science space for storage and lab work. Teachers have larger classes and minimal organization of the material because of the lack of space.	1. A dedicated science space should be developed for the Lane School.	
2. At the Lane School, there is a lack of adequate science equipment to meet the essential standards.	2. Purchase of equipment, such as a class set of balances, graduated cylinders, microscopes for student use and a class set of meter sticks, should be considered.	
Essential Question 7: How effective are our efforts to make learning authentic and expose students to current "real world" issues in science?		
1. At the elementary level, there was a consistent thread of teachers asking students to problem solve; however, the connection between the experiments and scientific concepts was not always clear to the observer.	1. Further training for classroom teachers on essential scientific concepts is recommended.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

Elementary		
Essential Question 8: How well do we assess the student understanding of science?		
Findings	Recommendations	Action Items
1. Carefully crafted common assessments - whether formative or summative - give teachers feedback on what students are learning. The high school had the greatest emphasis with teachers collaborating across sections.	1. While assessments need not be common, a greater number of common assessments would help teachers now what students comprehend. Additional development of common assessments is recommended.	
2. Senteo Clickers are available at the high school and are a very useful tool for gathering this data; however setting up the question bank does take time.	2. It is recommended that teachers at the elementary level consider exploring the advantages of this device.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

Middle School		
<b>Essential Question 1: How is the allocation of time to science affecting the teaching of science across the Bedford System?</b>		
Findings	Recommendations	Action Items
1. At the Middle School, ensuring the use of additional dedicated time for subject area meetings at each grade level for curriculum development as well as building in more time between the high school and middle school teachers would help teachers manage curriculum coordination.	1. The establishment of additional dedicated time for teachers to meet within and across schools is recommended.	
2. At all levels, Professional Development should be focused on development of curriculum that aligns with the goals of the Understanding by Design work. This curricular development takes hours and small blocks of time should not be considered adequate.	2. Continued extended professional development time should be devoted to curricular development that aligns with the UBD work.	
<b>Essential Question 2: How well are we meeting the needs of and creating a positive learning environment for all students?</b>		
1. At the middle school level, removal of the in-class Special Education co-teachers may decrease the teacher's ability to meet the needs of all students.	1. This situation should be monitored and professional development should be considered so that teachers can address the needs of all learners.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

Middle School		
<b>Essential Question 3: How well does our program reflect current research in Science Education?</b>		
Findings	Recommendations	Action Items
1. At the middle school level, teachers support an inquiry-based science program.	1. Further coordination between teachers at each grade level would supplement the current activities in this area.	
<b>Essential Question 4: How cohesive is the articulation of the curriculum from the elementary grades through the high school level and how effectively is this communicated?</b>		
1. At the middle school, there has been improvement in strengthening the connection with the high school.	1. Continued work in this area is recommended as high school teachers can build on what middle school teachers have taught.	
2. The abstract and mathematical concepts involved in physical science are a better fit for Grade 8.	2. The Visiting Team recommends that the district consider a sequence with more focus on physical science at the 8th grade and the design of a 2 year physics curriculum at the high school.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

Middle School		
<b>Essential Question 5: Given the educational value that allows teachers the opportunity to create and adapt curriculum, how do we balance educational creativity with the value of consistency to assess student knowledge across a course or grade level.</b>		
Findings	Recommendations	Action Items
1. At the elementary and middle school levels, a set of common assessments for each unit would be most helpful in measuring student learning.	1. Additional assessments on core science topics should be developed with consistency across grade levels.	
2. At all levels, students should have a set of common experiences that can be built on by other teachers. An example already in place at the middle school is specific labs.	2. These labs should be identified as core experiences to ensure that all students have access to these important learning opportunities.	
<b>Essential Question 6: How well do the current equipment, technology, and other resources support the science program?</b>		
No findings for this question at Middle School.		
<b>Essential Question 7: How effective are our efforts to make learning authentic and expose students to current "real world" issues in science?</b>		
1. At the middle and high school, there is a tension between teaching the required content and connecting it with the authentic learning. Some teachers could do this with ease and others focused more on the content.	1. Sharing best practices should be a greater part of professional development.	



# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

Middle School		
Essential Question 8: How well do we assess the student understanding of science?		
Findings	Recommendations	Action Items
1. Carefully crafted common assessments - whether formative or summative - give teachers feedback on what students are learning. The high school had the greatest emphasis with teachers collaborating across sections.	1. While all assessments need not be common, a greater number of common assessments would help teachers know what students comprehend. Additional development of common assessments is recommended.	
2. Senteo Clickers are available at the high school and are a very useful tool for gathering this data; setting up the question bank does take time.	2. It is recommended that teachers at the middle school level consider exploring the advantages of this device.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

High School		
Essential Question 1: How is the allocation of time to science affecting the teaching of science across the Bedford System?		
Findings	Recommendations	Action Items
1. At the high school professional time should be dedicated to common course structure and vertical alignment of curriculum.	1. Additional time dedicated to this important area is recommended.	
2. At all levels, Professional Development should be focused on development of curriculum that aligns with the goals of the Understanding by Design work. This curricular development takes hours and small blocks of time should not be considered adequate.	2.. Continued extended professional development time should be devoted to curricular development that aligns with the UBD work.	
Essential Question 2: How well are we meeting the needs of and creating a positive learning environment for all students?		
1. At the high school, instruction could be differentiated to accommodate different learning styles, particularly when the teacher is presenting information.	1. This is also an area on which to focus professional development.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

High School		
Essential Question 3: How well does our program reflect current research in Science Education?		
Findings	Recommendations	Action Items
1. At the high school, many teachers have participated in professional development opportunities focused on the use of technology in the science class. This has resulted in many curricular innovations, including the use of Smart Boards and Senteo Clickers in a number of classes.	1. Additional professional development supporting interactive applications of technology in the classroom would help teachers expand their understanding and appropriate use of these important tools.	
Essential Question 4: How cohesive is the articulation of the curriculum from the elementary grades through the high school level and how effectively is this communicated?		
1. The abstract and mathematical concepts involved in physical science are a better fit for Grade 8.	1. The visiting team recommends that the district consider a sequence with more focus on physical science at the 8th grade and the design of a 2-year physics curriculum at the high school.	
2. At the high school, the current sequence works well. High school curriculum should be building on what students have experienced as well as building skills for future course work at the high school.		

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

High School		
<b>Essential Question 5: Given the educational value that allows teachers the opportunity to create and adapt curriculum, how do we balance educational creativity with the value of consistency to assess student knowledge across a course or grade level?</b>		
Findings	Recommendations	Action Items
1. At all levels, students should have a set of common experiences that can be built on subsequent teachers. An example already in place at the high school is specific science labs.	1. These labs should be identified as core experiences to ensure that all students have access to these important learning opportunities.	
2. The high school faculty coordinates carefully at each grade level.	2. Continued coordination of skills across disciplines would strengthen this already strong pattern.	
<b>Essential Question 6: How well do the current equipment, technology, and other resources support the science program?</b>		
1. At the high school, the facilities and equipment are excellent. Effective teacher use of the materials varies, particularly for engaging students in the class discussion using the technology.	1. We agree with the self assessment that more Professional Development time is needed for continuous improvement in this area, as well as data collection on best practices.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

High School		
<b>Essential Question 7: How effective are our efforts to make learning authentic and expose students to current "real world" issues in science?</b>		
Findings	Recommendations	Action Items
1. At the middle and high school, there is a tension between teaching the required content and connecting with the authentic learning. Some teachers could do this with ease and others focused more on the content.	1. Sharing best practices should be a greater part of professional development.	
2. The extracurricular science activities are particularly notable in their use of problem solving.	2. Additional incorporation of these kinds of activities into the curriculum is recommended.	
<b>Essential Question 8: How well do we assess the student understanding of science?</b>		
1. Carefully crafted common assessments - whether formative or summative - give teachers feedback on what students are learning. The high school had the greatest emphasis with teachers collaborating across sections.	1. While all assessments need not be common, a greater number of common assessments would help teachers know what students comprehend. Additional development of common assessment is recommended.	
2. Senteo Clickers are available at the high school and are a very useful tool for gathering this data; setting up the question bank does take time.	2. Continued work with these important tools is recommended.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

High School		
Essential Question 9: How can we improve our process for assigning placements?		
Findings	Recommendations	Action Items
1. There is no perfect solution for this problem; we recognize any system will result in someone being dissatisfied. Parents and students become anxious about appropriate placement. There is a lack of understanding amongst parents and students regarding differences between the top level courses in different disciplines.	1. We suggest consideration of school-wide curriculum night where a complete picture of a challenging schedule is shared. This would occur before scheduling begins.	
2. Teachers support blending Level 3 and 4 for scheduling purposes, particularly for science electives. It does muddy the waters, however, as students are asking about what other levels are doing since there is not always a clear delineation of what is expected.	2. More attention to this issue is recommended.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

High School		
<b>Essential Question 10: The High School currently has four levels of science; the two highest levels for required core courses are level 4, which is equivalent to honors, and the level 5, which is Advanced Placement. Are these courses instructed at a level that meets an appropriate standard and level of rigor?</b>		
Findings	Recommendations	Action Items
1. The AP courses observed have been approved by the College Board and appeared not to exceed the expectations of this group. However, there appears to be a lack of understanding by parents and administration about the difference between courses such as AP Environmental Science and AP Biology.	1. Efforts at communicating the differences between these and other courses should continue, particularly as there appears to be a lack of consistency between departments. Additionally, requiring students to take the AP exam to receive AP credit would give the teachers more feedback about the appropriateness of their course expectations.	
2. Level 4 courses did not appear to consistently challenge the students to higher order thinking skills required for preparation for an AP course or college.	2. Continued curriculum development to increase the independent learning expected of the students is recommended.	
3. The time needed to prepare the content, organize labs and grade lab reports for AP courses is well above the time needed for typical science courses.	3. AP teachers should have a maximum of 2 preparations. Additionally, the administration should continue to encourage teachers to take AP training beyond the initial course. The College Board offers workshops for experienced AP teachers who have different questions than do novices.	

# SCIENCE CURRICULUM REVIEW ACTION PLAN

## Winter 2010

High School		
Essential Question 11: How well does science curriculum and instruction at the High School serve to enable students to achieve the school-wide academic expectations?		
Findings	Recommendations	Action Items
1. There is a clear emphasis in the high school science department to focus on the whole student as learner and to design curriculum that challenges the student. The amount of lab work expected of students is highly commendable. The respect accorded the Department Program Administrator speaks highly of his efforts to hire qualified teachers and build collegiality amongst the faculty. The faculty is, on the whole, new to teaching and excited about the possibilities. They are justifiably proud of their work with students.	No recommendations	
2. Inquiry is a strong theme in the BHS science curriculum.	2. Continued professional development that builds more open-ended inquiry into the curriculum and high expectations that students communicate their understanding in this area will make the classwork even more dynamic.	