Strategies for Science Student Achievement & Productive School Management

By

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Abstract: There is an increasing literature pertaining to student achievement and school productivity. This session will present school and classroom strategies used in high school science classes at Robert E. Lee High School (5A) in Tyler, Texas. This year, 84% of the students at Lee passed the science TAKS test. Lee is also ranked in the top 1500 high schools in the United States. With the advent of EOC beginning with incoming freshmen in the 2011-12 school year, the session will briefly explore transferring current strategies into the new the structure.

From the school leadership and management literature, there is probably no one best way to lead and manage all organizations. However, my experience in the public schools has shown that a concern for others (relationships) and a focus on student success is the best style that will work for administrators and teachers in the majority of schools. This presentation will focus briefly on productive school management then on strategies for science student achievement.

Part 1-- Productive School Management

Schools, districts, and states are obviously under great pressure to improve student performance. Increased scrutiny by state legislatures, the media, business, and special interest groups has made school improvement and student achievement a top priority. In 2001, the federal government expanded its role in public education with new legislation motivating annual student performance testing, teacher improvement programs, and a plan to identify under-performing schools. It is now even more urgent that Texas school officials address the weaknesses of their present instructional programs and adequately prepare students for the new educational requirements. Given the complexity of educational systems, many researchers posit using systems strategies to address educational needs.

General Systems Thinking-- A system is defined as a group of interdependent items that interact regularly to perform a task, an established or organized procedure, or a method. A system is also defined as an arrangement (pattern or design) of parts which interact with each other within the system's boundaries (form, structure, or organization) to function as a whole. The nature (purpose or operation) of the whole is always different from, and more than, the sum of the unassembled collection of parts. As noted, a system brings together parts or members into a relationship that adds up to a whole. Furthermore, the whole is often a common way to then look at or study the system itself.

At a more technical level, a system can be said to consist of four elements. The first is objects: the parts, elements, or variables within the system. These may be physical, abstract, or both, depending on the nature of the system. Second, a system consists of attributes: the qualities or properties of the system and its objects. Third, a system has internal relationships among its objects. Fourth, systems exist in an environment. Thus, a system is a set of things that affect one another within an environment and form a larger pattern that is different from any of the parts.

In 1990, Senge wrote that the ways that organizations think about the world are built on systems thinking. A systems model provides a framework from which an organization can see the patterns and interrelationships that surround its particular problems and help solve those problems much more effectively. Furthermore, a systems model is necessary when attempting to find long-term solutions since linear thinking often results in short-term solutions that may prove to be ineffective over time (National Staff Development Council, 1995). That model must now be superceded by the more complex systems model since the classical model was designed historically for much simpler societies. The systems model allows individuals in organizations to work together instead of working competitively. Working together, individuals become aware of the value of the interconnectedness that exists in the world, and they experience the dynamic energy that is released using systemic models.

Interestingly, our culture refers to refer to schools as school systems since there are interdependent functioning administrative units like payroll, transportation, personnel, and curriculum. Unfortunately, for many districts this is where systems theory ends. What is urgently needed is to apply systems thinking operationally throughout the school district. Iwill now examine research-based systemic models that have been shown to improve student success. The leadership challenge for school administrators and teachers is to effectively implement one or more of these systemic models.

Effective Schools Systemic Model

For more than two decades, many Texas school districts relied on the effective schools research as the framework for managing and improving their schools. It was the late Ronald Edmonds' (1979) description of the first-generation correlates of effective schools that launched the effective schools movement in the United States. The effective schools movement has been a major force in American education, and it continues to exert enormous educational influence today. Furthermore, today I see many districts expanding the first-generation correlates to include second-generation correlates. Following is a summary of both the first- and second-generation correlates of effective schools.

Shared Vision and Purpose − In the first-generation correlates it was noted that effective schools have a clearly stated and focused school vision, including the school's curricular and instructional goals and priorities. While the first-generation correlates focused on teaching students, the second-generation correlates will focus on learning for everyone in the school.

A Safe and Orderly Environment – The first-generation correlates focused on a school climate that was free from physical harm and was not oppressive to teaching and learning. For the second generation, learning for all will imply a positive, cooperative, collaborative learning environment for both students and adults.

Instructional Leadership – In the first generation, the principal managed the school's instructional program in addition to the daily management duties. In the second generation, top-down bureaucratic management will be replaced by bottom-up leadership that is driven by a vision of success and encourages shared decision making. The instructional leadership role of the principal and the administrative staff will be broadened to include all the campus staff. All teachers will become instructional leaders. Districts may also employ curriculum specialists at campuses to help teachers in various departments. In the principal's instructional leadership role, the distinguishing characteristics will be a set of attitudes and beliefs (symbolic aspects of leadership) rather than just a set of skills and behaviors.

High Expectations for Students – In the first-generation correlates, all students were expected to master the essential academic skills. In the second generation, the expectations will be broadened significantly to implement additional teaching strategies to ensure that all students achieve academic mastery.

Student Time on Task – In the first generation, a large amount of class time was devoted to instruction in essential skills and content mastery. With state testing and the federal legislation, teachers will have to spend more time prioritizing curriculum content.

Monitoring Student Progress − In the first generation, a variety of assessments were used to improve both student performance and the instructional program. In the second generation, we will see a greater emphasis on curriculum alignment and the use of technology to monitor student progress. We will see a greater use of curriculum-based, criterion-referenced measures of student progress and less use of standardized norm-referenced tests. We will also see the implementation of comprehensive, customizable, and user-friendly systemic curriculum management systems built on the most current research-based practices.

Positive Home-School Relations – In the first-generation correlates, parents were reluctantly brought into the school to help the school achieve its mission. In the second-generation correlates, there will be a genuine effort to establish an authentic partnership between the home and the school. Team building, trust, and communication are critical in establishing authentic partnerships.

Districts should begin the school improvement process by conducting surveys, collecting data, and asking the following questions: what is our vision/mission; what are our goals; who are our customers; what do our customers value; what have been the results of our previous endeavors; and what is our plan for addressing our school-and-student needs. Setting measurable school goals and devising plans to accomplish those goals will likely be the most positive and the most difficult tasks schools will face. The key is making data-driven decisions. The effective schools correlates provide a time-tested comprehensive framework for identifying, categorizing, and solving the problems that schools and districts face.

School Work Culture Systemic Model

The author has found in exemplary schools that productivity is inextricably linked to four interdependent components: planning, people development, program development, and assessment. These components provide the foundation for more fundamental statements about productive schools. I refer to these components as elements of school work cultures.

Planning

Principals and teachers together transform common concerns into specific goals. Planning tasks include setting organizational goals that relate to primary outcomes and visions for the schools (Snyder, Anderson, & Johnson, 1992). Tasks are dispersed to permanent and ad hoc working groups. Peters and Austin (1985) found the intensity of leaders' commitment to organizational goals was the chief difference between great and not-so-great organizations.

Professional Development

Development plans that are linked to organizational goals have the power to enhance individual and group performance (Johnson, Snyder & Johnson, 1991). Teams become learning centers as school managers and employees share, plan, act, and critique programs and coach one another. As organizational structures flatten, teams are replacing many hierarchical structures. For a team to perform well, the core tasks that move it toward its goals must be interdependent. Its members must work together very well, and each team member must understand the others' strengths and weaknesses. Professional development, which accounts for 40 to 60 percent of the total variance of student achievement after taking demographics into account (Darling-Hammond, 2000), is the most important component of a school's culture. In a study of 900 districts, Ferguson (1991) found that teacher expertise accounted for 40 percent of the difference in student achievement in math and reading.

Program Development

Program development plans that are linked to a school's goals address challenges by coordinating program development, implementation, and evaluation activities (Chrispeels, 1992). School leaders who agree on a common purpose for educational outcomes and work in a cooperative team effort to reach their goals experience higher student achievement than those who do not (Kaplan & Evans, Sr., 1997). To have effective team collaboration, there must be a high degree of confidence, trust, and open communication. Furthermore, teamwork is enriched when team members are treated as equals.

Productivity Assessment

Assessment guidelines focus on progress, standards, and student-growth expectations. All systems need feedback to remain viable, and feedback requires information about student success in relation to the purposes, goals, and output of the school. Successful schools are those that are designed to improve student learning by participating in on-going planning and evaluation.

The expansion of the school excellence literature shows that administrators and teachers together must assume responsibility for changing students' achievement patterns. Resources, information, opportunity, involvement, support, collaboration, planning, development, and assessment are vital materials and forms of power that fuel school productivity. A typical production model might divide the school year into three parts: planning (September/October), staff and program development (November through April), and evaluation (May/June).

From my research and observations of exemplary schools, it now seems to me that a school's future success rests on agreement about a school vision and a systemic model for improving student success. My experience in the public schools has shown that a concern for others (relationships) and a focus on student success is the one best leadership and management style that will work for the majority of schools. Built on a systemic relationship model, if needed or desired, one can implement other systemic models like the effective schools systemic model or the school work culture systemic model. Whatever is done, one must remember that all systemic models must focus on promoting norms of collegiality that respect individuality and collaboration among all members of the school community. This collegiality will be evidenced by support, trust, confidence and credibility, openness and candor, interpersonal skills, team building, opportunity, accountability, empowerment, total quality, participative decision making, and an emphasis on high performance goals. Successful school change will require the collaborative support of the entire school community. Never forget that effectiveness with people is the key to increased efficiency, productivity, and the growth of our schools

Part 2--Science School Improvement (Research & Design Program)

In 2008, nearly 40 percent of 10th grade students in Texas failed to meet science or math TAKS standards. This was over 100,000 students. The same year, the science faculty at Robert E. Lee High School (5A) in Tyler, Texas piloted a class for 11th and 12th grade students who had failed science TAKS. Of 82 juniors who had failed science TAKS, after the first year of the program all but seven students passed TAKS retesting. Of 280 sophomores who had failed science TAKS, 67% passed science retesting. Only 33 of over 600 seniors failed to pass science TAKS as of the May retesting. The 2008 overall passing rate for all science students was 73%.

The passing rate for the yearly iterations of the program stands at 70%. Sophomores or juniors who fail science TAKS are required to enroll in the yearly zero-credit class. If they pass the science TAKS, they can drop the class if they elect to do so. I estimate the continued success of the program is based on the following three factors: program curriculum design (50%), relationship management and student motivation (25%), and instructional/test strategies (25%). I refer to these past two components as exocurricular factors.

Program Curriculum Design

The course curriculum consisted of eight major areas that covered the five science TAKS objectives. These major areas and number of supporting labs follow: introduction to science (eight labs), classification (six labs), the cell (two labs), water/fluids (five labs), science and sports (five labs), genetics (two labs), interactions among species (six labs), and problem solving (activities working with formulas). Since science objective four (chemistry) was the lowest objective score for the students' previous TAKS testing, objective four was taught first in the class. The intent was to help the seniors with their fall TAKS testing.

Our previous experience in teaching had shown that a lab approach was the best method to help unsuccessful students. The block-scheduled class consisted of 83 lab activities comprised of 34 labs supported by class discussions, skill activities, and lab preparatory lessons. Sample labs included, for example, staining and observing cell types, working with slinkies, launching chemical rockets, performing an ice cube lab to teach density and buoyancy, performing an osmosis and diffusion egg lab, building paper helicopters, making DNA and RNA models, and running school bleachers to calculate energy expended in physical activities. The R&D teachers ordered the several excellent free DNA-interative DVDs (www.dnai.org) funded by the Howard Hughes Medical Institute (www.hhmi.org). See Appendix A for a course outline.

As noted previously, the 83 activities included student discussions designed to challenge students to ask questions and develop higher-level thinking skills. The activities and discussions both were well received by the students who asked each class period what lab or activity we would do. Overall, we felt the curriculum itself accounted for approximately 50% of the success of the program. The lab approach and discussions generated active student engagement (a macrostrategy) as well as cooperative learning and higher-order thinking skills (microstrategies). No homework was assigned in the class. Thus, we stressed that class attendance and class participation were very important to the students' success.

Relationship Management and Student Motivation

I felt that approximately 50% of the program's success was directly linked to the lab hands-on approach and the class discussions that tied science theories and concepts to the real world. The next question would be accounting for the other 50% of the success of the program.

I refer to these areas as exocurricular factors. Referring to the planting of seeds of success, the Swiss psychiatrist Carl Jung once stated: "The curriculum is so much necessary raw material, but warmth is the vital element for the growing plant and the soul of the child."

From several years of teaching, I observed that schools are not buildings, time tables, and technology. At the most fundamental level, schools are about relationships. In their study of school districts involved in substantive change, Spillane and Thompson (1997) referenced the research of economist, J. Coleman (1988), that "local capacity" for substantive change is based on three things: (a) physical capacity (financial resources), (b) human capital (administrators and teachers), and (c) social capital (internal and external district relationships). Ball and Cohen (1995) wrote that physical capital is observable, but human capital, represented in the skills and knowledge of individuals, is less tangible. And last, social capital, represented in the relationships among persons, is even less tangible. Ball and Cohen noted that human and social capital are essential elements in understanding what makes a school exemplary.

Writing in the September 2004 issue of *The School Administrator*, Jim Peters, former superintendent of the Shelby, Michigan Public Schools asked which elements made the difference in a highly successful and a less successful school: involved parents, socioeconomic status of students, a highly trained staff, or a caring environment where everyone felt connected and respected. Dr. Peters noted the answer was all of the above; however, he commented that parental involvement and SES were outside the control of the schools. He explained how his district received numerous state awards for exemplary student achievement. He noted that his district's highest achieving schools were those where the students and teachers trusted, respected and cared about each other. This was also true for his principals and their staffs: they trusted, respected, and cared for each other and worked toward the same goals of student success.

As his district made connections and relationships a district wide focus, more of their schools received Michigan's highest awards for student achievement and improvement. Overall, Peter's administrators worked with their staffs to support three district wide objectives: every student was greeted as he or she entered the classroom; every teacher posted a daily agenda in the classroom; and every teacher made at least two positive calls or parent contacts each week. Administrators also made greeting students a priority, had agendas for all meetings, and made positive contacts with students, staff, and parents. These ideas make a lot of sense to the author. I have observed that teachers who get to know their students, build positive relationships and work to make their classes enjoyable places to work and learn have been successful, and their students have excelled both academically and socially.

Having observed the results of positive school environments, Johnson and Johnson (1995) studied the second-order factor structure of the Charles F. Kettering School Climate Profile (CFK), a popular measure of school climate. They found that the higher-order structure was composed of two factors: cognitive and affective components. The emotional components were comprised of respect, trust, morale, and student input questions. These emotional components are essentially the characteristics that Peters observed in his district's exemplary schools. These characteristics are fundamental relationship components that foster a sense of school community, cooperation, and student achievement. In our program, we focused on achievement (hands-on lab activities and discussions) and relationship management. We greeted students at the door, put daily agendas on the board, and generally made about 75 parent contacts each six weeks. We felt relationship management was a missing dimension in student achievement.

Instructional/Test Strategies

Finally, there was one more area I addressed. This might be called instructional and test strategies. I knew from the research literature that the single most effective instructional strategy was teaching students to compare and contrast (identify similarities and differences). To compare and contrast, students must work with information at high levels of Bloom's taxonomy. Examples would include teaching use of the periodic table by comparing and contrasting metals and nonmetals. In biology, one would teach the binomial classification system. I explained Bloom's Taxonomy of Knowledge and Lynn Erickson's Structure of Knowledge to show the students how the science TAKS test was designed. I also talked about all the five science objectives and number of questions on each objective. I told my students our estimate of the number of questions needed to pass the yearly science TAKS and gave them strategies for answering questions. I found many students had no idea what to do if they didn't know the answer to a question; thus, I shared specific heuristics for answering questions and modeled using the heuristics. I also gave each student a summary sheet of their past scores, noting areas of strength or weakness. I then gave each student remedial material based on their past scores.

I next shared Lee's previous summary test scores. I found, for example, if students answered 10 or more questions correctly on objective one (out of the 17 questions on the first objective), then 95% of our students passed science TAKS. If they answered less than 10 questions correctly of the first objective, they still had an excellent chance to pass science TAKS if they answered seven or more questions correctly on objective five. For our students, objective five had been the easiest objective to raise test scores. This information provided strategies for the students. The authors also had questions about the factor structure of the science TAKS test.

Therefore, I conducted a factor analysis of our pool of TAKS scores. I shared my findings with the students and showed them the significance of further clarification of the test structure.

Furthermore, I explained why students often fail science TAKS. Reasons included: class attendance, student background, students' analytical skills, science vocabulary, language problems, and an inability to plan, organize, and project one's life into the future (versus living only in the present). Some of the students in the classes had failed every science TAKS test they had ever taken. Everyone in the classes had at least failed their last science TAKS test. The seniors were especially burdened with anxiety, fear, and self doubt since failure to pass TAKS meant they would not graduate with their senior class. No wonder so many of these students checked out of school, many of them bored, angry, and deliberately not learning. I observed that dealing with interpersonal skills was a key in getting these students again involved in the learning process. Many of these students were at-risk students who survived friend-to-friend. They are the sensing/feeling and intuitive/feeling personality types on the Myers Briggs Type Indicator (MBTI). To connect with these students, one must show empathy, be genuinely concerned, and empower the students. Caring comes first with most of these students. See www.personalitytypes.com for additional information about personality types. It is little wonder that teachers holding credentials in the field in which they teach, the teachers' experience and education, and the teachers' professional development are so important for student success.

Part 3- Expanded R&D Model for All Science Students (2009-2010)

This year, the Research and Design classes continued as before; however, a new program was implemented at the beginning of the year. The district employed a campus science instructional specialist who worked with the science department. She developed five objective tests (with SE categories) for all science classes and implemented a data scoring and reporting system. The TAKS objective test assessment for objectives 1-5 was implemented the second semester. A new objective was tested, scored and tutorials taught every two weeks. Also, the school science specialist conducted morning, noon and afternoon tutorials for students who didn't score at the 70% passing level for each objective. Teachers also covered designated SE content at the beginning of their classes and gave credit for each SE if students completed the class work. Beginning two weeks before the spring TAKS test, science teachers spent each class period reviewing for the TAKS test. Each teacher prepared a review plan for the science department chairman. The plan justified what would be covered in the two-week review period. The plan was based on student assessment scores. For this year, the science TAKS passing rate for students at Lee was as follows: African American 69%, Hispanic 81%, economically disadvantaged 74%, white 92%, and all Lee students 84%.

Strategies Contributing to Program Success

Considering the year's activities, following is a listing of strategies that contributed to the students' success: (1) the new science TAKS preparation program, (2) R&D continued as before for students who had previously failed science TAKS, (3) final exam exemptions for all students passing science TAKS in addition to their meeting the district's rules of a 70 semester average and adherence to the attendance/suspension school rules, (4) following Dr. Jim Peter's three points, (5) explaining classical test development as applicable to the science TAKS test, (6) special education techniques helpful to special inclusion (SI) mainstreamed students, (7) distribution of the one-page science TAKS summary sheet to all students listing their previous science TAKS scores by objective and extra-credit remedial objective assignments if requested, (8) teachers doing a summative evaluation detailing science TAKS material to cover during the two weeks prior to spring TAKS testing, (9) the district's computerized AWARE system listing all students past and present district and state assessment scores, and (10) teachers turning in their parent phone logs to their assistant principals at the end of each six weeks.

Program Areas to Further Explore

The EOC exams will allow students to be tested right after completing each course rather than the current TAKS exit tests asking questions in subjects that students took two or three years before. However, 58,000 Texas students who took the 2009 preliminary biology EOC exam answered only about 60 percent of the questions correctly; therefore, it is going to take some work to master the new exams. Richard Kouri of the Texas State Teachers Association commented that we're going from one high-stakes test to 12 high-stakes tests. In this light, following are areas to consider after this year: (1) student attendance at morning, noon or afternoon objective tutorials, (2) guidelines for requiring additional science TAKS work for weak students, (3) correlation of objective 1-5 district assessment test scores with the actual science objective and composite TAKS test scores, (4) science program revision considering the EOC testing program soon to be implemented per Senate Bill 1031 (spring 2007), (5) modifying EOC teaching strategies especially for the SI mainstreamed students; (6) test expectations for SI students exempted in their ARDs from taking the science TAKS and the new EOC exams, (7) balancing district curriculum guidelines with TAKS and EOC test preparation, (8) teaching thinking skills, (9) teacher summative reports listing which students failed science TAKS and why the teacher thinks they failed, (10) a time line detailing what data is really needed, and by what time, for predicting statistically if students will pass or fail the science TAKS or EOC exams, and (11) score reliability and validity measures for the district's assessments. Interventions should be 'put in place" to deal with the expected failures. This will eliminate a lot of testing that may not really be needed. At a minimum, teachers should be asked to list which students they think will fail science TAKS and why they will fail science TAKS or the EOC exam. By midterm, most teachers have a very good idea about which of their students will pass or fail science TAKS. Realistically, it will take some students more than one year to pass TAKS. For some students, if they leave class at the end of the year identifying with the teacher, the teacher will have been successful with that student for the year. If our science TAKS passing rates are to increase, we need to look closely at which students will likely fail (and why). We need to statistically determine passing benchmarks by specified dates. There is much more to raising test scores than just telling the teachers that test scores are going up and they had better work harder (as though most teachers are not working day-and-night and weekends). Such statements show a systemic failure at the leadership level.

Using these strategies outlined in this presentation, the science faculty at Robert E. Lee certainly met this year's challenge with a passing rate of 84% for all science students. However, we must next seriously examine why students failed and what specifically can be done at what time during the year to reduce the failure rate. We obviously have answered a large part of the question with the programs that have been implemented. However, more needs to be done. Having applied the strategies presented today in the chemistry classes I taught last year, 94% of my 100 on-level chemistry students passed science TAKS on the spring 2009 science TAKS test. Two more students passed retesting later last summer. This year, with more than 30 SI students in my on-level chemistry classes, more than 90% of all the students passed the April 2010 science TAKS test. This percent included three SI students who failed science TAKS but were included in the three percent district ARD cap. The passing rate would have been more like 95% if these students were not counted as failing science TAKS because of their SI status. This passing rate attests to the validity of the strategies outlined in this presentation.

Appendix A

Research & Design

Course Outline

I. Introduction to Science – Scientific method, graphing, measurement, and evaluate hypotheses (obj 1)

II. Classification –
Chemical Classification -- Element/compound, chemical/physical change, classification with the periodic table, bonding, acid/base classification, and conservation of mass (obj 4)
Biology Classification – Kingdoms/phylum, and characteristics of kingdoms (obj 2)

III. Cell – Parts of the cell, cell types (animal/plant), cellular process, and bacteria/viruses (objs 2 and 3)

IV. Water – density/buoyancy, properties of fluids, structure of water and solutions, water in cell, and waves (obj 2, 4 and 5)

V. Science and Sports – Newton's laws, motion in 1D, body systems, connections between body systems, football (acceleration, momentum, etc), and rock climbing (work, power, lever, energy) (objs 2 and 5)

VI. Genetics – properties of DNA, transcription/translation/replication, and mutations (obj 2

VII. Interactions among species and their environment – ecology/biomes, evolution, adaptations, plants, respiration & photosynthesis, flow of energy and matter, symbiosis, food webs, types of energy/conservation of energy, renewable resources, & movement of heat (obj 5)

VIII. Problem solving – formulas in IPC (obj 5)

I. Introduction to Science
Activities -- Chemical rockets lab 2 days; LTF come fly with us lab ½ day; LTF graphing skills 1 day
Lessons – Independent/dependent variable ½ day; measuring devices ½ day; and safety in the science lab ½ day

Test ½ day
Test corrections ½ day
Total days for unit 6.5 days

II. Classification (Chemical taxonomy and biology taxonomy)
Chemical Taxonomy
Activities -- chemical/physical change lab/change of state demos ½ day; model of your atom 1 day; ionic or covalent lab 1 day; a massive problem lab 1 day; and acid test lab 1 day

Lessons -- element/compound, etc ½ day; chemical/physical change ½ day; classification with the periodic table 1 day; formula writing 1 ½ day; bonding ½ day; conservation of mass/count atoms ½ day; balancing equations 2 days; and acid/base and pH ½ day

Test 1 day; Test corrections 1 day

Total days for unit 13.5 days

Biology Taxonomy

Activites – LTF granimals 1 day; card games ½ day

Lessons – kingdom/phylum ½ day; characteristics of kingdoms 1 day

Test ½ day

Test correction ½ day

Total days for unit 4 days

III. Cell

Activities – cell city ½ day; observing cell types lab 2 days

Lessons – cell parts ½ day; bacteria/viruses 1 day

Test ½ day

Test corrections ½ day

Total days for unit 5 days

IV. Water

Density and buoyancy

Activities – ice cube demo ½ day; objects of different density lab ½ day

Lessons – density lecture/individual practice 1 day; density and buoyancy group practice ½ day

Properties of Fluids

Activities – properties of water lab 1 day

Lessons -- power point notes properties of fluids ½ day; water and other fluids worksheet ¼ day; and wonders of water ¼ day

Water in the Cell

Activities – osmosis and diffusion in an egg lab 20 minutes for four days = 1 day

Lessons – movement of water in the cell power point ¼ day

Waves

Activities – slinky lab ½ day; properties of waves station lab ½ day

Lessons – power point on waves ¼ day; properties of waves ½ day

Test ½ day

Test corrections ½ day

Total days for unit 12 days

V. Science and Sports

Activities -- Newton's laws demo ½ day; graph matching lab 1 day; universe within ½ day; body systems card game ½ day; physics olympics lab 2 days;

work and power running stairs ½ day; and lever ½ day
Lessons – Newton's laws ½ day; displacement, velocity, and acceleration 2 day; body systems ½ day; and work, power, momentum 1 day

Test 1 day
Test corrections ½ day
Total days for unit 10.5 days

VI. Genetics

Activities – toilet paper DNA lab ½ day; DNA, mRNA, & protein synthesis 1 day; banana split lab 1 day; and mutations 1 day
Lessons – DNA ½ day; replication, transcription, & translation 1 day; mutations 1 day

Test 1 day
Test corrections ½ day
Total days for unit 7.5 days

VII. Interactions among species and their environment

Activities – videos on evolution and group questions 2 days; plant structures and adaptations lab 1 day; owl pellets lab 1 day; symbiosis game ½ day; project wild: energy flow lab ½ day; and energy transfer video game ½ day.
Lessons -- evolution/natural selection card game: vocabulary scenarios ½ day; plant parts and adaptations ½ day; photosynthesis and respirations ¼ day; ecology graphs/worksheet 1 day; ecology & flow of energy power point ¼ day; cycles (flow of mater) power point ¼ day; food webs power point lab ¼ day; energy sources power point ¼ day; energy transfer power point ¼ day; symbiosis power point ¼ day; energy transfer/energy sources ¼ day; movement of heat power point ¼ day; and heat worksheet ½ day

Test 1 day
Test corrections ½ day
Total days for unit 11.5 days

Total days for class 72 days

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