

C₃ BONDS

VOLUME 3, ISSUE 4

SPRING 2005
YEAR 2

C₃ SCORES SECOND SEMESTER CLASSROOM IMPLEMENTATION

With the second and final round of classroom visits completed and the second semester of the 2004-05 academic year underway, C₃ takes another look at the implementation of its strategies and concepts within the classrooms of its Year 2 teacher participants. From data collected during the Program Coordinator's observations, the following statistics were noted: 85% of the classes were engaged in investigative experiences with 70% of them done within one class period and 15% considered ongoing experiences. 20% of these experiences included data that was analyzed mathematically through graphing or other means. 100% of the C₃ teachers were using materials and information gained from the project with 60% focusing on higher level questioning techniques and 55% implementing sponge activities or class openers. 65% of the classrooms were using science activities from the summer project or follow up workshops while 95% incorporated classroom management techniques emphasized in the program. 100% demonstrated that their supplies and materials were in use and 85% had highlighted laboratory safety procedures. 15% of all teachers were integrating science disciplines while 65% integrated math with science, 55% integrated history with science, and 50% were integrating science with other subjects. 90% of lessons observed utilized the learning cycle



and 75% of the lessons were taught through inquiry, a HUGE accomplishment in two of our most critical areas. GREAT JOB! 2% of the students were engaged in experimental design, 5% had engaged in a jigsaw and 25% in a carousel. 25% had learned through demonstrations, and 15% had completed molecular



level drawings, another big improvement area. 95% of classes observed were utilizing cooperative learning, 40% of those with assigned tasks and 10% with group grading. 70% of the teachers emphasized student communication skills and 90% had incorporated alternative assessment techniques. 15% were using student journals and 20% learning logs. 5% of classes used concept-test items, 25% of teachers had implemented concept maps and 50% card sorts. 5% used demonstration assessment while 15% had students engaged in performance assessment. 10% used rubrics and 5% completed student portfolios. 5% of the students had completed individual projects with 40% of the students engaged in group projects. 40% of all teachers emphasized real world connections during their learning experiences; 20% highlighted careers in chemistry and 10% included technology integrations. It looks like everyone is doing an excellent job with their classroom implementation and the C₃ team thanks each teacher for the dedication and the terrific work done so far. Super!



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EQUILIBRIUM EQUITY



C₃ Year 2 continued its academic year workshop series over the weekend of March 5-6, 2005. Saturday's session focused on "Equilibrium Equity" as the group revisited points from the summer session that may have left the teachers' "mental equilibrium" needing attention. After "breaking the ice" by assembling cooperative groups based on families from the periodic table, each small group engaged in a series of learning experiences designed to clarify and reinforce concepts related to chemical equilibrium. A "Conductivity of Solutions" exploration kicked things off before the whole group became fully immersed in the lively and hilarious "Marshmallow Equilibrium." With marshmallows flying back and forth across the hall in an equilibrium simulation, there's no doubt that the folks in this group will never look at



marshmallows in the same way again! "Fish Tank Equilibrium" followed as each cooperative group extended a demonstration shared during the summer course. Le Chatelier's Principle was then introduced through a demonstration presented by Bill; this opened the door for the teachers to explore "Acid-Base Indicators and Equilibrium." After a refresher look at the pH scale, each group then investigated "Buffer Solutions and Equilibrium." Because of the enthusiastic response and involvement of the teachers, the C₃ team was able to facilitate a workshop that successfully modeled how to bring an abstract and difficult concept to life for the students that the teacher participants work with each day. Thank you C₃ gang, for always going the extra mile and doing your part to make the program work—your participation is the KEY TO IT ALL!!



CRUISIN' INTO CHEMISTRY CAREERS



The Year 2 C₃ crew wrapped up the 2004-05 project during its final academic year meeting on March 6, 2005. The Sunday session featured a half day workshop that focused on the project's newly developed resource publication, "Chemistry Careers in Louisiana." The C₃ team engaged the teachers in an experience that not only modeled effective classroom strategies, but also exposed participants to the professional opportunities related to chemistry in Louisiana. Beginning with a whole group activity that featured chemistry related careers found in pop culture, the participants were then arranged in cooperative groups based on the popular feature "You Might Be a Chemist If." Each group



then engaged in a carousel designed to peak interest in different areas of chemistry careers. An interactive card sort allowed the teachers to match different professional titles with job descriptions before each individual delved into a scavenger hunt through their own copy of "Chemistry Careers in Louisiana." The workshop culminated with "Computer Cruisin' For Chemistry Careers" where the teachers explored the Louisiana Works web site and the resources it provides. The teachers' enthusiastic response to the materials shared indicated that it was time well spent; no doubt their students will be the true winners from it all. Thank you everyone—it was an excellent way to wrap things up!



BREAKING DOWN THE BOARD—C₃ YEAR 2 IS 100%!



As the 2004-05 academic year component of C₃ comes to an end, so does the program's Blackboard learning community. But not before Cathi congratulates the Year 2 gang on REACHING 100% this year—OUTSTANDING!!! A big round of applause goes out to everyone for a **job well done** along with a big **thanks** for the efforts put forth. At the end of the final weekend, the group was **100% across the Board**, something we've found to be commonplace for this terrific community of teachers and learning

partners. In fact, Cathi honored the group with a pizza party during its last meeting in honor of its Blackboard achievements following the summer project. This year's electronic component certainly proved to be both integral and exciting—your commitment and involvement was not only admired, but appreciated. Hats off to a group that has always made us proud and provided such a rich and collaborative forum for learning and sharing. The bar continues to be set high for those that will follow!!



DYNAMITE DATA!! YEAR 2 FINAL SURVEY SAYS . . .

The results of the final Year 2 C₃ classroom implementation survey are in and here's how you stacked up with the strategies presented:



100% use of investigative experiences, 79% for one class period, 68% ongoing learning experiences, and 95% having data analyzed mathematically; **100% use of project materials and information**, 100% using higher level questioning techniques, 79% sponge activities and class openers, 100% utilizing activities from the project, 95% implementing project classroom management techniques, 100% with all supplies and materials in use, 95% focused on laboratory safety procedures, 79% integrating science disciplines, 89% integrating math with science, 95% integrating history with science, 68% integrating science with other subjects, 100% focused on the learning cycle, 95% teaching through inquiry, 89% implementing experimental design, 58% using jigsaws, 79% engaging students through carou-

sels, and 95% using demonstrations, and 74% featuring molecular level drawings; **100% use of cooperative learning**, 84% with assigned tasks, 68% utilizing a group grading process, and 89% emphasizing student communication skills; **100% implementation of alternative assessment techniques and tools**, 53% using student journals, 58% learning logs, 47% conceptests, 89% working with concept maps, 90% using card sorts, 68% presenting demonstration assessments and performance assessments, 58% using preassessments, 89% rubrics, 26% with student portfolios, 74% focused on individual student projects and 84% group efforts; **95% emphasized real world connections**, **47% introduced careers in chemistry**, and **84% integrated technology into their science learning experiences**. Excellent work everyone and many thanks for your commitment to the continued implementation of C₃ strategies and techniques.



Lincoln Parish Gets "Outside the Box"

With certified teachers of chemistry and physics at a premium in most districts, administrators are having to get creative in order to provide the excellent classroom experiences for the students enrolled. And Lincoln Parish has shown that it's not afraid to adopt a "non-traditional" method of doing just that.

Michelle Hopkins, Ruston High School, is piloting a special Physics class that is being taught via compressed video. With direct instruction from her classroom at **RHS**, the extension class is housed at Dubach High School. **Michelle** shares that a total of 16 students are involved—12 in her physical classroom and 4 in the Dubach setting. And while the new project is obviously a challenge, she also reports that the teaching strategies she learned through C₃ have made the entire situation much easier to handle.



And the kids seem to love it! Based on overwhelmingly positive feedback, it looks like the course will not only be repeated next year, but possibly expanded as well. Congratulations on a job well done, **Michelle**, and for being will to do "ANYTHING FOR SCIENCE!"



HAPPY EASTER, HAPPY SPRING, HAPPY, HAPPY EVERYTHING!



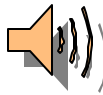
NEED A CLUE? Check out "The CATALYST CLUE Capers," a special three day workshop based around forensic science strategies and concepts. For more information about this exciting opportunity offered June 28-30, 2005, contact Cathi ASAP!!



SPOTLIGHT ON C₃ SUCCESS



David Hough, Weston High School, has his students really in the groove with molecular level drawings. And this is music to the ears of the C₃ team! In fact, Dr. Bill can't wait to get **David's** students at Tech!! Super! . . . **Lamar Cranston, Pinecrest Middle School**, adapted his excellent learning cycle lesson



on music/sound to form the basis of what he will present at the Library Science Day. It's called "Sound Learning." Wonderful! . . . **Jimmie Bond, Rayville High School**, is using a Van de Graaf Generator in his physics lab, giving students a "real charge" as they learn about hollow conductors, ion wind, and charges. Great! . . . **Steve Gann, Airline High School**, shares that applying history to science has been a terrific addition to his lessons. He just warns everyone to be sure students understand the difference between "BC" and "AD!" Fantastic! . . . **Judy Madden, Bossier High School**, reports that the H₂O₂ Rockets were a HUGE success in her classes and the principal even stopped by to see what was going on, and HE loved it!! Awesome! . . . **Michelle Woodruff, Huntington High School**, team taught with a Physical Science teacher at her school and did the "Tell Tale Colors" from the cabbage juice series. And it was a huge hit!! Terrific! . . . **Chris Hightower, Summerfield High School**, did Rube Goldberg Machine illustrations with his students as well as K'NEX car projects. Plus, he's looking at implementing the Cardboard Chair Project. Super! . . . **Trish Tidwell, Dan F. Long Middle School**, facilitated the school's First Annual Egg Drop where the students tested containers dropped 15 meters and measured force, speed, and acceleration. And there was NO egg breakage! Wonderful! . . . **Christina Riley, Breaux Bridge High School**, incorporated the "Storm the Castle" event in physics. Fun! . . . **Tommy McFarland, Woodlawn Junior High School**, implemented a rocket launching and data collection experience in all of his classes. Out of this world!! . . . Excellent job everyone. Way to really let your light shine as you continue to implement exciting and effective strategies into your classrooms!!



Teachers, Students, and Bickham Dixon Park: A Learning Partnership!

Cindy Tolliver, Airline High School, was chosen to attend the two-day LSU-S Watershed Project. Held at Bickham Dixon Park in Shreveport, the program enabled her to spend time in the classroom learning before going out into the lake to test for dissolved oxygen, pH, water clarity, and other conditions. The following day, **Cindy** and two of her students returned to work together as they repeated the tests she had conducted during the previous day. They all explored a history of the park before using water testing kits to collect data that was then analyzed and compared to data from other dates of collection. **Cindy** received a water testing kit for her classroom that will allow 30 students at a time to collect data. The students who shared in the special project returned to the classroom to report on their experience, something that will no doubt inspire others to get involved as well. Great job **Cindy**!!



SCIENCE FAIR SUPERSTARS!

Lamar Cranston, Pinecrest Middle School, had five students qualify and enter the Regional Science Fair at ULM. **Lamar** shares that science fair has grown into a wonderful experience for the **Pinecrest** students and no doubt, the excellent work that he has done with them in the classroom has influenced this. So, just as **Lamar** is certainly proud of his students, C₃ is proud of him for his efforts in challenging his students to excel in this area. Wonderful work!!



COLLEGIAL COACHING DRAWS TO AN END!

REMEMBER TO HAVE ALL PAPERWORK COMPLETED AND TURNED IN TO THE C₃ OFFICE BY March 31, 2005, IF YOU PLAN TO RECEIVE THE STIPEND!!!

BE READY WHEN ADVENTURE CALLS . . .

CONGRATULATIONS

C₃ congratulates **Chris Baker, Choudrant High School**, who recently completed all class work for his Master's Degree program at Louisiana Tech University, maintaining a 4.0 GPA throughout. In addition, **Chris Hightower, Summerfield High School**, will complete his Master's Degree in Administration at Tech this summer. Fantastic work guys! . . . **Christina Riley, Breaux Bridge High School**, led the Science Olympiad team to a 5th place finish at the Regional Tournament for the second year in a row. Excellent! Super work! Hats off to all our C₃ stars and those who they impact daily!



GOING FOR THE GRANTS!

Tommy McFarland, Woodlawn Junior High School, collaborated with his GK-12 Teaching Fellow, Travis Woodard, to write and fund a GK-12 Mini-grant. Using the funds, the guys were able to implement exciting science investigations in **Tommy's** classroom. Congratulations, **Tommy**, and keep up the good work. Your students will certainly thank you for it in the long run!!



TECHIE TRACKS

Trish Tidwell, Dan F. Long Middle School, was tapped to receive a technology cart for her classroom that is complete with a projection data camera, DVD, VCR, and computer. In addition, a CPS System is being added, enabling **Trish** to do conceptest items with her students. Fantastic! In addition, **Jimmie Bond, Rayville High School**, has been selected to field test a unit on Nanotechnology in his physics class. The company involved is developing a series of modules that will be offered to Science teachers for classroom use. Obviously a great opportunity for students and teachers alike, the project should be an exciting addition to **Jimmie's** classroom. Great!



C₃ YEAR 2 GOES NATIONAL!

Following the example of **David Hough, Weston High School**, two other C₃ folks are getting on board the "National Board Express." **Christina Riley, Breaux Bridge High School**, has almost completed her packet while **Michelle Woodruff, Huntington High School**, is just getting started. We wish these outstanding teachers the best of luck with their national certification and encourage others to "get on board." GO FOR IT!!



We Do Extra Curricular, Too!



Still reveling in the sweet success of a record breaking Indoor Track competition, **Chris Baker, Choudrant High School**, is now immersed in the exciting Outdoor Track and Field season. With athletes holding records in several events, the **CHS** athletes' prospects are looking excellent for 2005. Good luck, Aggies! . . . **Nola Schmidt, Nacogdoches High School**, serves as Ecology Club advisor, as well as Junior Class sponsor. Which means she now is gearing up for the **NHS** prom next month. And **Michelle Underwood, Chatham Jasper Henderson High School**, is also preparing for her job as **CJHHS** prom sponsor. Get some rest, girls, and HAVE FUN!! And keep up the great work everyone!



AS THE WORLD TURNS: EARTH DAY 2005

Tommy McFarland, Woodlawn Junior High School, is involved with sponsoring an Earth Day Fair at **Woodlawn** on April, 22. **Tommy** has recently participated in a number of experiences (the JASON Workshop and a trip to LUMCON) which will no doubt enhance the planning of the fair. In addition, **Nola Schmidt, Nacogdoches High School**, and her Ecology Club will be sponsoring and assisting with local Earth Day activities in her area. Wonderful work folks! And may we all commit to continuing to make the earth and its condition matter to each student that we teach!!



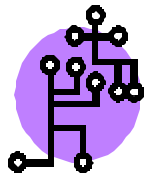
ROAD TRIP CENTRAL . . .

C₃ folks manage to balance both work AND play! And their travel plans tell it all! **Michelle Underwood, Chatham Jasper Henderson High School**, is headed to the beautiful Italian country side in June. Enjoy some pasta for all of us, **Michelle!** And **Jimmie Bond, Rayville High School**, is off to Hong Kong for a first time visit with a friend he's been in communication with for almost a year! Safe travel to you both and have a great time!



TRICKS OF THE TRADE . . .

Want to make grading cooperative groups easier? **Michelle Woodruff, Huntington High School**, modified the Cooperative Group Grade Sheet found in her "Tricks of the Trade" Manual in order to have one sheet per day. Instead of it reflecting group work for a M-F week, now it's 1-6 class periods with fewer points available. And working great! . . . **Mike Strange, El Dorado High School**, has asked parents to be involved as part of his lab experiences. Not only do they serve as monitors, but also can assist the students when needed. The pictures in his portfolio provided evidence that this idea really works! And **Oretha Whitley, Lincoln Elementary School**, held a "Parental Involvement in Science Night" at her school. Looks like we're onto something here! . . . After using "Cousin Bill" with her freshman Physical Science students last year, **Judy Madden, Bossier High School**, reworked it this year for "repeat" students—they now have "Aunt Jill" and different picture placement. Good thinking, Judy! . . . Thanks for the tips everyone and we look forward to ways that others are developing new things in their classrooms. Good job!



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PROMOTING PROFESSIONAL DEVELOPMENT

Michelle Woodruff, Huntington High School, attended a workshop for chemistry activities in Dallas, TX, that featured Alfred Guenther, Science Consultant for the popular TV show *Beakman's World*, as its presenter. **Michelle Hopkins, Ruston High School**, traveled to Hot Springs, AR, for the Teachers Teaching With Technology Convention and shares that the technology presented was wonderful. And one week after completing C₃, **Oretha Whitley, Lincoln Elementary School**, wrapped up her first year of IMPACTS!, an ongoing professional development project for Monroe City Schools Middle Grades teachers, before attending the "Eye Spy" workshop. Wonderful job, ladies!



Did you know that **Melvin Landry, Woodlawn High School**, is showing that learning cycle lesson plans can be adapted to all content areas, and **Oretha Whitley, Lincoln Elementary School**, uses the learning cycle every week in multiple subjects!

COLLABORATION IS THE KEY!

Because of her noted classroom achievements,



Judy Madden, Bossier High School, is serving as a mentor for new teachers across ALL curriculums on her campus. Certainly both teachers working with her now will benefit immensely from her expertise.

Melvin Landry, Woodlawn High School, is "coaching" the entire science department, as well as mentoring all first and second year teachers.



Lamar Cranston, Pinecrest Middle School, is teaming up with teachers from four different schools to develop and present a Science Day at the Ouachita Parish Library during April. **Oretha Whitley, Lincoln Elementary**, worked with her faculty on cooperative learning.

Trish Tidwell, Dan F. Long Middle School, has shared everything from chemistry related activities to classroom strategies such as carousels, newsprint presentations, and more with three teachers on her campus.



Nola Schmidt, Nacogdoches High School, reports that C₃ activities, along with all types of hands-on experiences, are sweeping through the NHS Science Department. And **Michelle Underwood, Chatham Jasper Henderson High School**, adds that the word is out and teachers everywhere are curious about how to become involved in courses or projects like C₃ for their curriculum. YOU ARE THE KEY to all this and we salute your sense of collaboration and collegiality—keep up the good work!



GETTING STUDENTS IN THE PICTURE

Nola Schmidt, Nacogdoches High School, is working as a helper for the Texas Accelerated Science Achievement Program (ASAP) grant project. If it is funded, at-risk students will be targeted for a summer science program and Bill and Cathi have already been invited to represent C₃ there! Let's keep our fingers crossed!!

BULLETIN BOARD:

INSULTINGLY STUPID MOVIE PHYSICS

<http://www.intuitor.com/moviephysics/>
According to Tom Rogers, a former mechanical engineer who now teaches high school physics, many of the spectacular scenes you see in movies are just bad science. Tom founded an educational Website called Intuitor, which included Insultingly Stupid Movie Physics, reviews on the physics of movies. In order to protect the innocent minds of children from bad physics, Tom created The Movie Physics Rating System that rates movies from GP (good physics in general) to XP (obviously physics from an unknown universe). The site also explains generic bad physics you frequently see in movies such as: flashing bullets, flaming cars, glass force, and falls, just to name a few. Next time you're watching a movie and find yourself thinking, "That was unbelievable," check out how the Intuitor rated the movie.

DID YOU KNOW?

<http://www.uhs.uga.edu/nutrition/iron.html>
Did you know that spinach has more iron per calorie than meat? Unfortunately, most of the iron in spinach is bound up with oxalic acid and phytate, compounds that prevent iron from being usable and absorbed in the bloodstream. In order to increase iron intake when eating spinach, include citrus fruits that will enhance iron absorption. Avoiding coffee and tea with your meals will also help you absorb more iron. Both of these drinks contain tannins and calcium, which interfere with iron absorption. Iron is essential in making new cells, amino acids, hormones, and neurotransmitters. Iron deficiency typically causes tiredness, apathy, and a tendency to feel cold. A simple blood test can identify iron deficiency.

STATE FARM DONATES \$1,500 TO LPB TEACHERLINE PROGRAM

State Farm Insurance has made a \$1,500 contribution that will allow 100 Louisiana teachers to take professional development courses as part of the LPB and PBS TeacherLine program. These on-line courses allow teachers to take the courses they need to get or maintain their certification in their particular subject area. If you are a teacher and want to find out more about this program, contact Nancy Thompson at 1-800-272-8161, ext. 4445 or e-mail her at nthompson@lpb.org. There is also information on our website (www.lpb.org).

Looking for a bank of over 7000 Chemistry test questions? "Bank of Chemistry Questions and Problems" at <http://www.boshf.org/>

Halfpipe Physics with Vernier

Have you ever wondered about accelerations during a skateboard ride in the halfpipe? We have data for you! Last fall we helped with data collection at an event filmed by the Discovery Channel. Professional skateboarders and BMX bikers wore our Data Vest with our LabPro and a 3-Axis Accelerometer. They collected acceleration and video data as they rode. They experienced g-factors comparable to five times that of Earth gravity--much more than we expected. Check out the URL below for more information. You'll find a short video clip of a BMX rider, synced to the accelerometer data. The rider does a flare (a sort of back flip) at the end. Very cool!
<http://www.vernier.com/innovate/innovativeuse33.html>

Beef Up Your Labs with This Innovative Chemistry Activity
Hot dogs once again move to the top of the list of prepared meats used as objects of research in this simple, yet illuminating, activity. By measuring the rate of cooling of various types of hot dogs, your students can investigate the heat retention abilities of various organic substances. Will the veggie dog prevail over the all-beef hot dog? Frankly, only time will tell.
<http://www.vernier.com/innovate/innovativeuse34.html>

Looking for standards based lesson plans? The LPB/LDE Video Series "Teacher-to-Teacher" has complete lesson plans that include all necessary handouts and references. Ten different science lesson plans for secondary teachers can be downloaded from the LDE web site:
<http://www.doe.state.la.us/DOE/assessments/standards/LPBmenu.htm>

THE DOSE MAKES THE POISON - OR DOES IT?

Nancy Trautmann, of Cornell University, asks how the degree of toxicity in substances should be determined. She examines two opposing views: One maintains that all chemicals are toxic at high enough doses; the other says that chemical sensitivity varies considerably, depending on species and life stages.
<http://www.actionbioscience.org/environment/trautmann.html>

Check out the Challenger Learning Center located in the Louisiana Art and Science Museum. The Challenger Learning Center simulation programs are educational, effective, and exciting! Based on your student needs and educational goals, select between "Rendezvous with Comet Halley", "Return to the Moon", or "Encounter Earth". Inservices for teachers are conducted in July for each mission and more information can be obtained by contacting Director Gayle Glusman by calling 225-344-5272, FAX to 225-344-9477, or e-mail gglusman@lasm.org. Visit the web site at www.lasm.org and see what all is on tap as the Challenger Center enters its second decade of going where no teacher has gone before. It's an experience you and your students will never forget!

Connected Math

<http://www.mth.msu.edu/cmp/Overview/Glance.htm>
Help students develop an "understanding of important concepts, skills, procedures, and ways of thinking and reasoning in number, geometry, measurement, algebra, probability, and statistics.

THE INDY CARD CAR

Developed From a Learning Experience Shared by Andrew Coleman, Northwood High School



Putting Design Into Motion

Objective:

Using only materials provided, students work cooperatively while developing problem solving and critical thinking skills. A limited number of materials are made available therefore providing a certain level of difficulty that the students must overcome in order to complete the challenge: constructing a functional car.

Getting Started:

1. Gather the materials needed for the experience.
2. Identify additional supplies that may or may not be available for students to use.
3. Determine whether students will work in groups of two, three, or four.
4. Identify an appropriate work space for car construction, as well as an adequate place for testing the final products.
5. Construct the ramp that cars will be tested on.
6. Prepare a data table to collect class data.
7. Determine the timeframe required to complete the challenge.
8. Develop an appropriate means of assessment for the project.
9. Identify appropriate concepts to be developed using the learning experience.

Materials Needed Per Group of Students:

3 X 5 index cards
Plastic straws
One cubic inch rubber eraser
Tape
Additional classroom supplies (optional)

Materials Needed Per Class:

Test ramp
Measuring tool (meter stick or tape)
Data table for class results

Procedure:

1. Arrange students into cooperative teams; assign tasks within the groups as appropriate.
2. Provide each group with the design challenge:

THE COOPERATIVE GROUP CHALLENGE:

Using the materials provided, design and construct a car that adheres to the following guidelines:

- the car must be made from only the approved materials
- the car must be able to roll down a ramp, it's distance traveled beyond the ramp being measured
- the car must be able to carry a one cubic rubber eraser

The cooperative group must perform according to these guidelines:

- all members of the cooperative group must participate
 - members of the group must come to a consensus on the design and construction of the car
 - the car design and construction must be completed within the timeframe stated
 - the group's car must be tested in front of the whole group, passing the same test as all other cars
3. Have materials managers gather the needed materials.
 4. Initiate the learning experience.
 5. Following the time limit, assess each car by rolling it down the test ramp and measuring the distance traveled beyond the end of the ramp.
 6. Facilitate a discussion and develop concepts as needed.

Safety Notes:

Students will need ample space to not only construct but test their cars. Be certain that there are no dangerous obstacles in the work area. Exercise caution when moving around the test ramp and be sure the area is clear for testing the cars. Be careful with scissors and have a first aid kit available for class use.

Teacher Notes:

The learning experience can be used for cooperative learning, consensus building, problem solving and/or critical thinking exclusively; or identified science concepts can be connected and developed. Examples of science content to be addressed are as follows:

- because a ramp is used during the test, inclined planes and simple machines may be an appropriate connection
- calculations for speed, momentum, and other measurements associated with force and motion may be used
- different surfaces at the base of the ramp may be used and friction explored

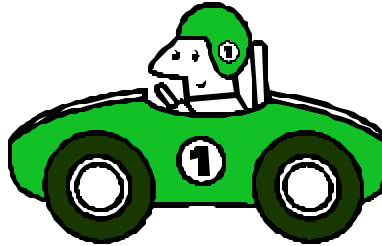
Teachers are encouraged to be creative in their use of this type of learning experience and make as many connections as possible.

Because data can be collected, it may also be appropriate to include graphing and graphical analysis at the conclusion of the learning experience.

In addition, students can be challenged at the conclusion of the experience to list what additional materials would have made the construction of the car easier for them. After writing their summary, allow students or groups of students to independently design and construct another car as an outside project.

THE INDY CARD CAR

Student Sheet



THE COOPERATIVE GROUP CHALLENGE:

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- all members of the cooperative group must participate
- the members of the group must come to a consensus on the design and construction of the car
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- the group's car must be tested in front of the whole group, passing the same test as all other cars

**THE CAR MEASURING THE GREATEST DISTANCE
WINS THE CHALLENGE!**