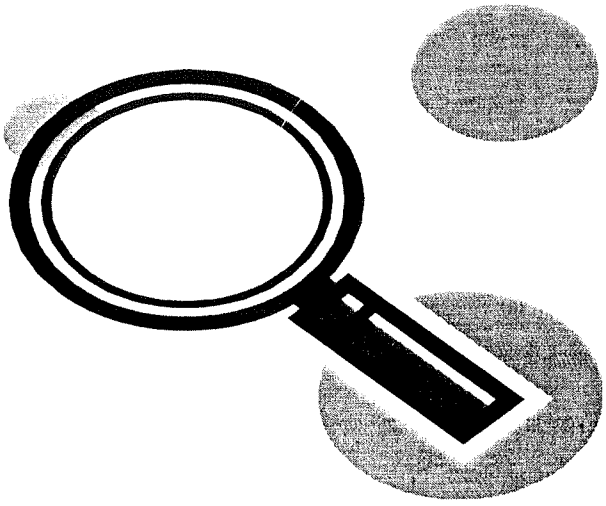
The Road To KIC

The Kids' Inquiry Conference



Connecting Science and Literacy
in the K-8 Classroom

September, 2005

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The *Kids' Inquiry Conference* relates to the following *National Science Education Standards* (NRC 1996)

Content Standards

Grades K-4 and 5-8

Content Standard A: Science as inquiry

Content Standard G: Science as a human endeavor

Additional Content Standards may relate depending upon student-selected investigations.

Teaching Standards

Teaching Standard A: Teachers of science plan an inquiry-based science program for their students.

Teaching Standard B: Teachers of science guide and facilitate learning.

Teaching Standard E: Teachers of science develop communities of science learners that reflect the intellectual rigor of scientific inquiry and the attitudes and social values conducive to science learning.

030615

Student Survey

Name _____

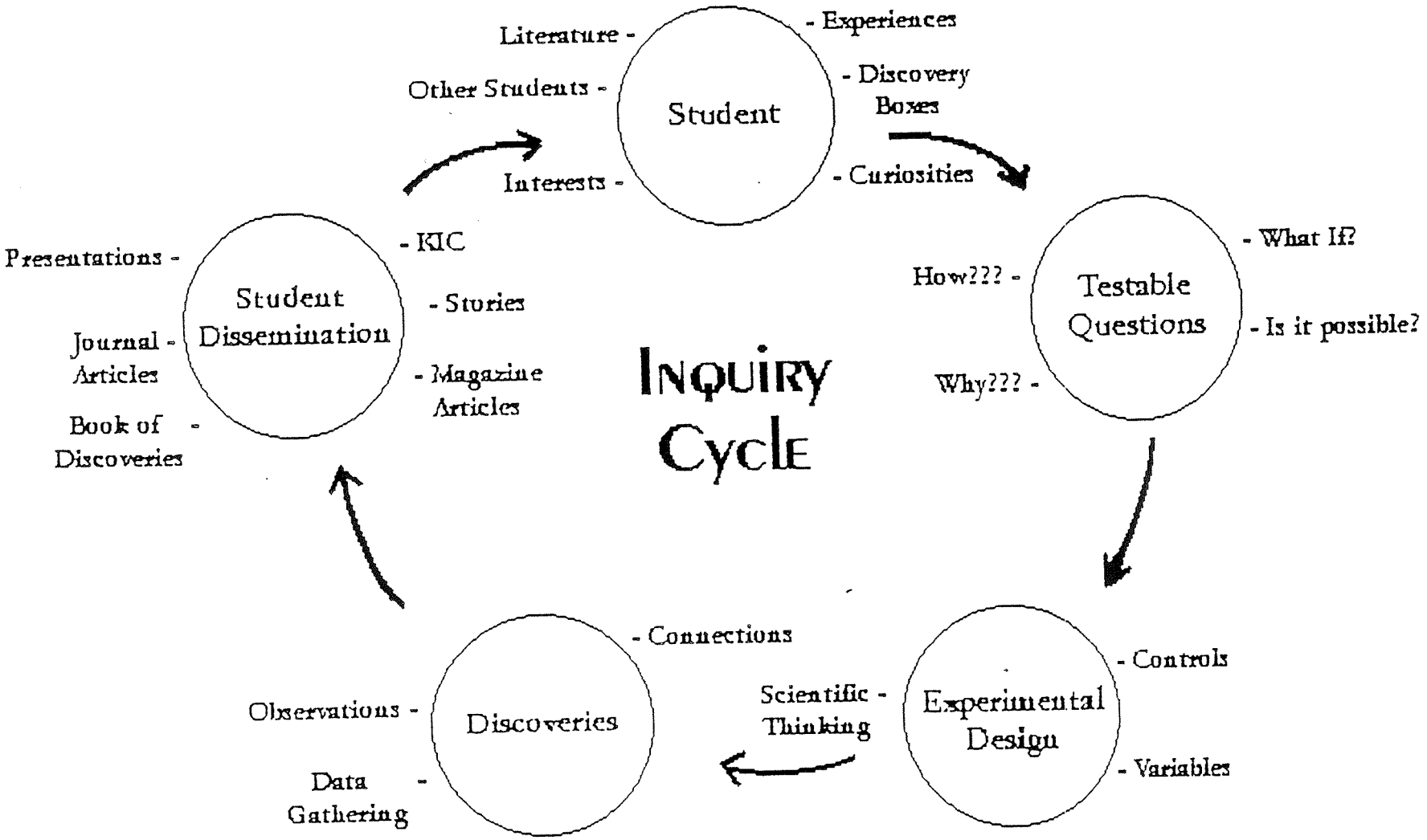
920310

Read each statement and circle the appropriate response.
SA - strongly agree A - agree D - disagree SD - strongly disagree N - no opinion

1. Learning is boring.	SA	A	D	SD	N
2. I learn best by reading chapters and answering questions.	SA	A	D	SD	N
3. As I learn, it is important to think about my thinking.	SA	A	D	SD	N
4. I learn more if I have a choice about what I will be learning	SA	A	D	SD	N
5. When I talk things over with my partner I understand more about what I am learning.	SA	A	D	SD	N
6. I learn more when I work in a group and share ideas.	SA	A	D	SD	N
7. Discovering answers to my own questions is interesting.	SA	A	D	SD	N
8. The best way to measure learning is for my teacher to give tests.	SA	A	D	SD	N
9. My teacher can measure my learning by reading my journal.	SA	A	D	SD	N
10. I like to discuss what I have discovered.	SA	A	D	SD	N
11. Learning is finding out about things that interest me.	SA	A	D	SD	N
12. Learning about science is only important for kids who want to become scientists.	SA	A	D	SD	N
13. I am a scientist.	SA	A	D	SD	N
14. I enjoy reading science picture books.	SA	A	D	SD	N
15. A scientist asks questions.	SA	A	D	SD	N
16. Science textbooks are the best books to read to learn about science.	SA	A	D	SD	N
17. Scientists should answer old questions before asking new ones.	SA	A	D	SD	N
18. I can learn more by reading than by doing.	SA	A	D	SD	N
19. Facts I discover on my own are more memorable than facts someone tells me.	SA	A	D	SD	N
20. Reading, math, and social studies are all part of science.	SA	A	D	SD	N

21. What do you think science really is? (use the back for more space)

Thank you for your responses!


Inquiry Cycle
Student
Literature -
Other Students -
Interests -
- Experiences
- Discovery Boxes
- Curiosities
Testable Questions
How??? -
Why??? -
- What If?
- Is it possible?
Experimental Design
Scientific Thinking -
- Controls
- Variables
Discoveries
Observations -
Data Gathering -
- Connections
Student Dissemination
Presentations -
Journal Articles -
Book of Discoveries -
- KIC
- Stories
- Magazine Articles

Student Questions

FALL 2002

021026

From the Question Board

1. How does a camera work? Mary *What kind of camera works best?*
2. If I crack a seed in half and plant it in two different places will it grow two plants? Chris
3. What is inside a battery? Emily
4. What if UV beads are under water, will they still change? Corey
5. What other things did Pascal make besides the triangle? Samantha
6. What makes the seasons change? Cierra *When do our seasons change?*
7. Will sunblock keep UV beads from changing color? Samantha
8. Are there other sources of UV light besides the sun? Megan
9. Was the Trojan War real? Adam
10. What does friction have to do with hurricanes? Suzanne
11. How does television work? Madeline
    What if I looked at a TV screen with a magnifying glass?
12. How do clouds form? Mary *How many kinds of clouds are there?*
    Can I shine a light on a cloud at night?
13. How do meteors form? Ben
14. How old was Fibonacci when he died? Joey
15. Why does the earth spin? Katie
16. Is there a scale to measure tornadoes? Joey
17. Why does a sailboat float? Renee
    How much cargo can different sized boats carry?
18. Will the drinking bird continue to go up and down if the glass of water is taken away? Allison
19. Can you test the pH of everything? Tim
20. When you look through the smoke from a grill, why does everything look fuzzy? Alyson *Can I read while looking through smoke?*
21. How big is the sun? Tim
22. Is there a chance a meteor will hit the earth soon? Nicholas
23. How do radios work? Mary *How far can walkie-talkies transmit?*
24. Why is there gravity? Shannon
25. Why are clouds white? Madeline *Do all clouds bring rain or snow?*
26. Is there ever a time when there are no clouds in the sky? Allison
27. How big was the biggest meteor ever to hit the earth? Ben
28. What happened to comet TT? Timmy
29. Why is there no gravity on the moon? Katie

Questions italicized are testable questions suggested during class discussion.

TOPICS: cameras, batteries, Pascal, Trojan War, television, boats, pH, number systems, meteors, simple machines, earth, seasons, the moon, snow, tornadoes, comets, Fibonacci, drinking bird, hurricanes, plants, gravity, the sun, clouds

TESTABLE QUESTIONS_____ RESEARCH QUESTIONS_____

Science and Questions

961117 Name _____

Think of some science topics you studied in school earlier this year or in past years. Complete the spaces below.

1. One science topic we studied was _____.
   I am still wondering ... (write two or three testable questions):

2. Another topic we studied was _____.
   What if...? (write two or three 'what if' questions):

   What if ...

   What if ...

3. Another science topic I remember studying was _____.
   I never had a chance to try ... (write two or three things you would like to do):

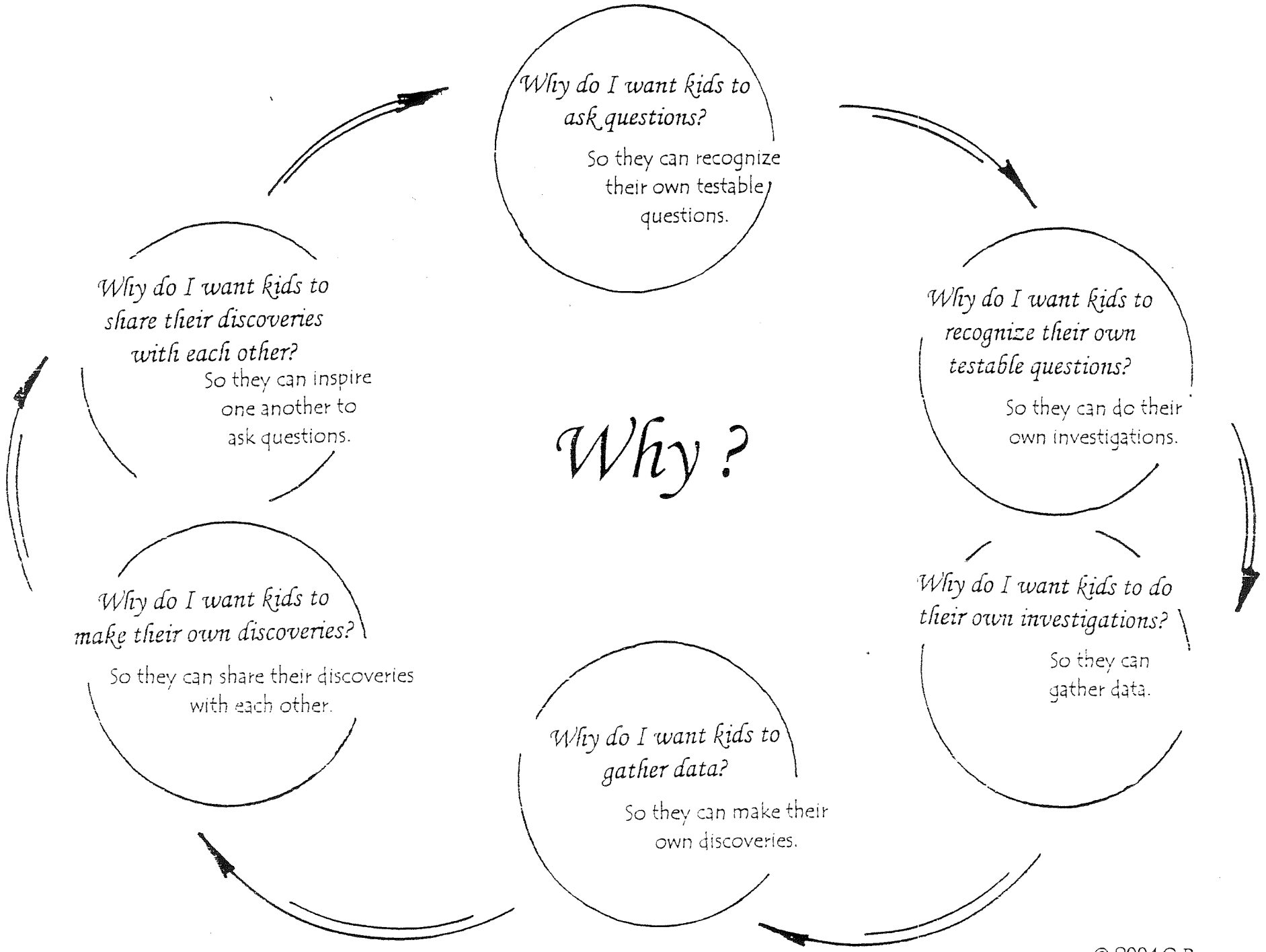
4. I remember another science topic was _____.
   (Think about the materials you used. If you could have any of those materials again, what would they be and what would you do with them?)

   I would like to have (materials) _____

   _____

   Then I would ...

Use the back if you need more space.



Official Guide to the *KIC* Website

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Visit the KIC website at www.esiponline.learnserver.net/kic *for these features.*

Ask Meg – Meg is a high school student who attended *KIC* as a grade four student. Ask questions, seek advice, or read about past *KICs*.
Be ready to enter your name, school, and your teacher's name.

Message Board - Read and/or leave messages. Use the message form provided.

Just For Teachers - (not available for student use)

Just For Kids - Read about books and websites recommended by other students.
ALSO, recommend your own books and websites that you have found useful or enjoyed.
CLICK, "Add to list" and complete the form.

About KIC - Information about the conference and why it is held.

Calendar - Important dates leading up to the conference.

KIC Gallery – See pictures from past *KICs*.

KIC Journals - Search for student articles from past years. Read for fun or to help with your own research. Enter your name and the password.

Our password to access journal articles is:

_____

KIC is Coming !

990310

Our class has been invited to attend the *Kids' Inquiry Conference* to be held on May 25, 2004 at UMBC. *KIC* is an opportunity to:

* meet with students from different schools
* share our own discoveries with others
* hear about the discoveries of other students
* discuss shared interests in science and research.

How will our research be shared with others?

Students are invited to prepare presentations in which they will tell about their own questions and what they did to answer those questions. Hands-on activities are also welcome.

Who will attend the presentations?

Other students with interests similar to yours will attend your presentation. They will be invited to ask questions and to comment on your research.

Am I required to present at *KIC*?

No. Students who attend are not required to present. However, all are invited to prepare a presentation if they have engaged in original research of testable questions and are excited about their own discoveries. Bus seats are limited and will be reserved first for presenters, second for hands-on activity providers, and then (if seats remain) for others.

Can I work with a partner?

You may work alone or in a group of up to three students total. Many students feel more comfortable when they work with a partner.

How will I decide which presentations to attend?

A listing of presentation topics and presenters will be published before the conference. Students may sign-up for those presentations which seem interesting to them.

What kind of science topics might be appropriate for *KIC*?

Any testable question which you have actually investigated is a suitable topic. Sources of investigation topics could be from old KIC *journals, topics from science class (this or past years), topics experienced at the* Science Expo, *the question board, or from books you have been reading.*

If I decide to present, what should my presentation include?

First, you will want to share with your audience the question that you researched. Then you will tell about your adventures of discovery: what you did to answer your question and what you discovered from your research. A question and answer period will follow your presentation in which your audience will be invited to discuss your investigation and discoveries.

Can I do both a presentation and a hands-on activity?

YES! Many students at KIC do a presentation (which is only about 8 minutes) and then invite their audience to visit their table during the hands-on times. You can do either a presentation or a hands-on activity, or you can do both.

I really want to do a presentation and/or a hands-on activity at *KIC*. What do I do now?

Tell Mr. Pearce! Gather your information and prepare for the big day. You will receive an application which will be sent to and reviewed by the KIC COMMITTEE. *Then, if your application is selected, you will become an official* Kids' Inquiry Conference *participant. Between now and May Mr. Pearce will help you prepare for the conference!*

Have a wonderful day at KIC!

Application to present at the

Kids' Inquiry Conference

KIC

The *KIDS' INQUIRY CONFERENCE* Committee is eager to hear about your scientific research and discoveries. In order to plan the conference, your assistance is needed. Please complete the spaces below.

Name _____ Date _____

School _____

Teacher _____ Grade _____

1. Describe any scientific reports, projects, or activities that you have prepared within the past two years.

_____

_____

_____

_____

2. List any science articles or booklets that you have published in recent years (such as class or school magazine or newspaper).

_____

_____

_____

3. List two or three discoveries you have made within the past two years, either at school or elsewhere.

_____

_____

_____

_____

4. Describe the question you are researching and would like to present at *KIC.*

_____

_____

_____

5. Briefly discuss your investigation. What are you doing to attempt to answer your question?

6. How is your research progressing? How would you evaluate the success of your investigation thus far?

7. What will you include in your presentation to convince your audience that your discoveries are valid?

Please sign below if you are willing to present your findings at the *KIDS' INQUIRY CONFERENCE*. Your application will be reviewed by the *KIC* Committee and you will be notified of the committee's decision.

SIGNATURE OF APPLICANT

PARENT SIGNATURE

SIGNATURE OF TEACHER

Thank You and Good Luck!

KIC Progress Report

970310

Name _____

Date _____

Your teacher has provided class time for you to prepare for KIC. Please complete the spaces below to tell about your progress.

1. Are you doing a presentation, hands-on, or both? _____

2. What is your topic? _____

3. So far, what have you accomplished?

_____

_____

_____

_____

4. Describe any difficulties you are having (unable to get materials, problems with partners, not enough time, etc.).

_____

_____

_____

_____

5. If KIC were to be held tomorrow would you be ready? YES NO

6. If NO, list the things you still have to do to get ready.

_____

_____

_____

_____

_____

_____

7. On a scale of 0 to 10 (with 0 being perfectly calm), how nervous are you about KIC?

(circle) 0 1 2 3 4 5 6 7 8 9 10

8. How many days remain until KIC? _____

Thank you for your answers.

Inquiry Grant Proposal Application

Students who are engaged in, or planning a scientific investigation are invited to apply for financial assistance to further their research. The PTA Inquiry Grant Committee is interested in all areas of scientific inquiry. Please describe your investigation by completing the spaces below.

Names of students working together on this project _____

_____

Teacher(s) _____ Grade level ____ Date_____

Describe the testable question that this research will attempt to answer.

_____

_____

_____

_____

BUDGET- List the materials needed, the quantities, approximate costs, and sources.

MATERIALS	QUANTITY	APPROXIMATE COST	SOURCE
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

TOTAL AMOUNT OF GRANT REQUEST $_____

Describe how your group plans to use the materials to answer the question. (Provide a step-by-step procedure.)

_____

_____

_____

_____

_____

_____

Provide a schedule of your project. (Include start date, major milestones, and completion date.)

Describe your plans for evaluating the success of your investigation. (How will you know if you are successful?)

Has your group applied for, or received financial support from other sources? If so, please describe.

If this grant request is approved, a written report will be required upon the completion of the project. The report is to describe the testable question, materials used for the investigation, how the investigation was conducted, and results of the investigation.

By signing this grant request, the students agree to the provisions described and indicate that the information contained in this application is accurate.

SIGNATURES OF STUDENT SCIENTISTS

A RESPONSE TO THIS GRANT REQUEST WILL BE PROVIDED WITHIN 2 - 3 WEEKS.

KIC Presentation Description Guide

980414

The *KIC* Committee is pleased that your presentation has been accepted for this year's *Kids' Inquiry Conference*. Among your responsibilities will be to write a short description of your presentation (about 35 words or less). The description you write will be used to help other students decide which presentations they would like to attend.

Presentation descriptions are like advertisements. They should be clever and snappy, yet truthful. Read the presentation descriptions below from past years.

A moldy experience
What grows on cheese, bread, and juice?
It's *mold* and it's on the loose! Come see
for yourself.
Sue Miller & Mary Thompson

Mealworms: The Uninvited Visitors For Breakfast
What do you do if you can't find information on a bug you like? Research it yourself! See how a group of students gathered data about this interesting creature.
Peter Zumbrum & Tommy Manheim

Would these descriptions attract you? Think about why or why not.

Now think about your own description. Talk about some ideas with one or two friends. Try to write a description that you think will make people want to attend your presentation.

Presentation descriptions will be due on _____.

Parents' Guide To the *Kids' Inquiry Conference*

The *KIDS' INQUIRY CONFERENCE* is an opportunity for children to present discoveries made during scientific investigations based upon original questions. This guide is designed to help parents who are curious about how to best assist their children.

How did the children select the questions being investigated?

Students have been invited to record their own testable questions. A testable question is one that can best be answered by designing an experiment or by conducting observations. Sources of questions have been from our science units, books students have been reading, science articles written by students in past years, and from experiences at school and elsewhere. Your child selected a particular question of special interest.

How can I best assist my child during the investigation and planning for the conference?

Since the question selected by your child is one of particular interest, he/she is curious about finding the answer on his/her own. Minimal guidance from parents may be helpful, but permitting space for children to investigate and gather data on their own is an important part of the scientific process.

As your child plans for the conference, Please

DO:

- Be available for guidance *IF* your child should need your help
- Ask questions about your child's investigation and how it is progressing
- Be ready to supply materials that your child may need for the investigation or the conference
- Help your child schedule meetings with partners
- Trust your child's judgment as he/she investigates the question

DO NOT:

- Change or revise the question being investigated
- Offer advice beyond that sought by your child
- Gather data, make posters, write the article, or prepare the presentation
- Arrange partners for your child
- Attempt to make the investigation more than your child originally planned

On the day of the conference, Please

DO:

- Plan to visit and see your child's presentation or hands-on activity
- Help with carrying of materials, set-up, and clean-up
- Have lunch with the students
- Visit other presentations and hands-on activities
- Take photographs

DO NOT:

- Sit in the front of the presentation rooms
- Ask questions following presentations before student participants have asked theirs
- Help your child with the presentation or with the answering of questions
- Assist behind the hands-on tables

Thank you with you assistance in helping to make the KIDS' INQUIRY CONFERENCE a success !

KIC Classroom Timeline

031222

Charles Pearce

A classroom environment which values student questions and encourages and provides opportunities for student investigations will, by default, prepare the children for an inquiry conference. Authenticity is the key. Student scientists doing real science will want to share their discoveries. *KIC* is an authentic place to do so.

First day activities set the stage for the inquiry that is to follow.

DAY 1 – Early Investigations

Ultraviolet detecting beads
Question Board
Read Aloud (especially high interest science stories which provide opportunities for question modeling by teacher)
A variety of items around room (any or all)
-Brock microscope (available with no directions or activities)
-Beach sand display (items from a beach with fieldguides)
-Tornado tubes
-Oversized hourglass
-Growlights with seeds
-Aerobie (for recess activity)
-Happy/Sad balls
-Airzooka

These items and others like them provoke numerous questions. The classroom teacher can model questioning techniques with these items and record several questions on the question board to get the process started (priming the pump).

EARLY WEEKS – Teacher directed investigations (based heavily upon curriculum) are introduced as well as early student explorations with familiar materials from previous years. The explorations are generally informal with the emphasis on questions; much class discussion with modeling by teacher. *(Students value what is important to their teacher. A classroom teacher who is genuinely interested in science, reading, questioning, wondering, and finding out more will influence his students.)*

After the first few weeks the Question Board will be filled. Printing the questions for class examination and discussion will enhance more questions to follow. Understanding the difference between research and testable questions is essential at this early stage so further questions can be analyzed and possibly selected for future investigation.

The use of past *KIC Journals* is a valuable link to past years and the students who asked and investigated earlier questions. Almost as science texts, the journals provide authentic student models of young scientists at work. A class culture is developing into which the present students are drawn.

END OF FIRST MARKING PERIOD – Investigations are more directed yet not as in-depth as those which will follow. *Discovery Boxes* (details in NI) are introduced which provide opportunities for short investigations (50 – 60 minutes) during inquiry periods. Students ask questions, use materials to investigate and discover, record results and share with class. The use of trade books to find additional information will spur even more questions which may be investigated later (and recorded on the Question Board.)
The *Book of Student Discoveries* has been introduced which is a compilation of discoveries from previous years to which current students are invited to contribute. As discoveries are made, authentic means of recording are essential. Log pages, dialogue journals, and the book of discoveries are important places to record data and provide sources for future research.

MID YEAR – Many Question Boards have been filled and transcribed, the *Book of Student Discoveries* has become a valued place to record data as well as a reading book of interest to many students.
The *Science Review Board* has by now been established which is a committee of students who review entries in the book of discoveries and who later will review proposals for student grants.
The use of *Discovery Boxes* continues with the added opportunities for student contracts which allow more in-depth investigations over longer periods of time.
The idea of a *Kids' Inquiry Conference* is introduced for students to begin thinking about ways they might participate.
The *KIC* website is introduced.
Shortly after mid-year applications to present at *KIC* and/or provide hands-on experiences arrive.

LATE FEBRUARY – Applications to present and/or provide hands-on experiences are due and sent to the *KIC Committee.* Responses are anxiously anticipated.
Investigations continue.
Students apply for inquiry grants from PTA.

SPRING – Acceptances are received from the *KIC Committee.* Although investigations continue, the emphasis gradually shifts toward preparing the students for their presentations. Going back to contract journals, Discovery Box log pages, dialogue journals, and the Book of Students Discoveries help students gather and assemble the data they will use to convince others of the validity of their research.
Students begin writing their articles for the *KIC Journal.*
Also, as the weeks progress toward the conference, a variety of communications take place among the classes who plan to attend. Letter writing, shared videos of students describing their investigations, use of the *KIC* website, emailing one another, asking questions about one another's topics are ways for students to prepare for the conference and gain a sense of shared interest and community.
Also by now, students have been communicating with Meg through the *Ask Meg* section of the *KIC* website. Meg helps to calm fears and offers suggestions on ideas for the conference.
Blurbs are prepared which describe each presentation and are used in the sign-up sheets which soon follow.

A variety of letters, reminders, guidelines, etc. from the *KIC Committee* have been arriving. The classroom teacher has been gathering data with the weekly *KIC Progress Report* which helps the teacher assess progress and possible problems and also helps students to maintain focus.

1 WEEK BEFORE THE CONFERENCE – Students sign-up for presentation sessions based upon descriptions. Presentations are given to one another in the classroom and in neighboring classes (especially classes in the earlier grade – these practice presentations are great models for next year's students). Overheads and hand-outs are prepared.
Students providing hands-on experiences show sample activities to classmates.
Checklists are developed so nothing is forgotten on the day of the conference.

THE DAY OF *KIC*!

KIC FAQs 1

How do the National Science Education Standards *support an inquiry conference for kids?*

The national science standards are clear about inquiry. Science instruction must include an inquiry component. "Inquiry into authentic questions generated from student experiences is the central strategy for teaching science." (NRC, page 31)

In April 2000, *Inquiry and the National Science Education Standards* was released as an addendum to the original standards. This volume, focusing on the importance of inquiry in the classroom, provided additional details about the two parts of the content standards for science as inquiry; a) fundamental abilities necessary to do scientific inquiry and, b) fundamental understandings about scientific inquiry. Classroom experiences, which lead to the *Kids' Inquiry Conference*, parallel the activities and scientific thinking stressed in the standards. Listed below are the content standards and two similar student investigations.

Content Standard for Science as Inquiry:
Fundamental Abilities Necessary To Do Scientific Inquiry

Grades K-4

~ **Ask a question about objects, organisms, and events in the environment.**
Peter had a question about seeds which his teacher helped to write on the classroom question board. His question was, "How long does it take for a seed to grow?" His teacher helped him to refine his question to, "How long does it take for a radish seed to grow?"

~ **Plan and conduct a simple investigation.**
Peter planted several radish seeds and planned to observe their growth.

~ **Employ simple equipment and tools to gather data and extend the senses.**
In his journal, Peter recorded the day the seeds were planted and noted when they began to grow. He then measured the seedlings daily and recorded their progress until flowers appeared. Peter then wondered about fertilizer and how it might enhance growth. He decided to plant more seeds in separate containers and fertilize those in one container and observe differences in growth.

~ **Use data to construct a reasonable explanation.**
From his observed data, Peter explained that fertilizer did not seem to speed up germination but did seem to make the seedlings grow at a faster rate.

~ **Communicate investigations and explanations.**
Peter reported his data about seed growth and the effects of fertilizer at the Kids' Inquiry Conference.

Grades 5-8

~ **Identify questions that can be answered through scientific investigations.**
Sarah was curious about the effects of saltwater on the growth of plants. On the question board she wrote, "How will saltwater affect the growth of grass?" Her question was identified as a testable question that could be answered through an investigation.

~ **Design and conduct a scientific investigation.**
Sarah and her two friends designed an investigation in which ten different strengths of saltwater were to be compared as they were used to water samples of grass.

~ **Use appropriate tools and techniques to gather, analyze, and interpret data.**
The team decided upon the intensity of saltwater and prepared ten containers of varying strengths. They gathered ten samples of identical grass and watered each sample daily with the same amounts of the respective saltwater. Daily analysis was recorded based upon observations of each grass sample.

~ **Develop descriptions, explanations, predictions, and models using evidence.**
Initially the team thought that the grass watered with freshwater (no salt) would remain the most healthy (greener with vigorous growth) while the grass watered with the highest concentration of salt would not survive. The observations were somewhat different. Although the grass watered with the highest concentration of salt withered and died, the grass watered with water containing a trace of salt seemed to fare better than the grass watered with fresh water (no salt).

~ **Think critically and logically to make the relationships between evidence and explanations.**
The team decided that for some reason, a small amount of salt enhanced the growth of the grass.

~ **Recognize and analyze alternative explanations and predictions.**
The team realized that their original predictions were not supported by the data and planned to try the investigation with other plants.

~ **Communicate scientific procedures and explanations.**
The story told at the Kids' Inquiry Conference *and published in the KIC journal explained the original question, methods of investigation, and the observed data. The seeming puzzling results of the investigation were offered to others to replicate and try to explain.*

Consider the student investigations described above and how they relate to the fundamental understandings about scientific inquiry.

Content Standard for Science as Inquiry:
Fundamental Understandings About Scientific Inquiry

Grades K-4

~ **Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.**
The link with non-fiction tradebooks is an important one. As students read about the discoveries of others, they compare what is already known with the results of their own investigations.

~ **Scientists use different kinds of investigations depending on the questions they are trying to answer.**
As students share their questions and investigations with one another they

come to realize that a fair test may require differing means of investigating.

~ **Simple instruments such as magnifiers, thermometers, and rulers, provide more information than scientists obtain using only their senses.**
Traditional classroom instruction is not to be replaced by exclusive use of inquiry methods. Indeed, students must be taught the use of scientific tools so that their own meaningful inquiry can follow.

~ **Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge).**
Prior knowledge is crucial, not only for the development of questions, but also for relevant explanations of data. That knowledge can come from the established science curriculum, science tradebooks, or from teacher explanations.

~ **Scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigations.**
Students report the results of their investigations at KIC *and record their stories in the* KIC *journal. Readers of the* KIC *articles critically analyze the description of methods and decide if sufficient information was provided to replicate the investigation. This assessment of others leads to a more thorough self-assessment as new articles are written.*

~ **Scientists review and ask questions about the results of other scientists' work.**
An important part of KIC *is the question and discussion time that follows each presentation. Students are invited to participate in discussions of described investigations.*

Grades 5-8

~ **Different kinds of questions suggest different kinds of scientific investigations.**

~ **Current scientific knowledge and understanding guide scientific investigations.**
The science curriculum is important as an inspiration for testable questions that may lead to investigations and discoveries.

~ **Mathematics is important in all aspects of scientific inquiry.**
As students record their observations they come to realize the importance of numerical data. Presenting those data quantitatively enhances credibility. As students analyze what is convincing to themselves they see the importance of mathematics in the gathering and display of their own data.

~ **Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.**

~ **Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories.**
Students strive for credibility. They are the experts because the investigations are their own and their explanations must be logically portrayed.

~ **Science advances through legitimate skepticism.**
Students are encouraged to question one another. They are astutely aware of what is fair and are able to distinguish a fair test from one that is biased. Being skeptical is a need to be convinced. As students come to understand how they are convinced themselves, they come to understand how to convince others.

~ **Scientific investigations sometimes result in new ideas and phenomena for study, generate new methods or procedures for an investigation, or develop new technologies to improve the collection of data.**

The use of the KIC *journals containing articles from past years have inspired students to embark on investigations based upon the gathered data of others. As a result, new questions have been asked with innovative means of data collection. Our scientific community has not only been developed within one class during one particular year, but has been extended from year to year with students building on the investigations and discoveries of those who preceded them.*

Students in classrooms in which inquiry is valued as described in the standards are, by default, being prepared for an inquiry conference. Conversely, students in classrooms who are being prepared for an inquiry conference are naturally meeting the goals set out in the standards.

KIC FAQs 3a

How can I fit inquiry and the planning for an inquiry conference into an already busy day?

Inquiry science in the classroom addresses far more than just science. The activities and behaviors exhibited by kids who are involved in their own science begs the question, "How can we *not* include inquiry for our students?"

One morning before the start of school a student asked if later that day we were going to be doing "school science" or "real science". I wasn't sure what he meant until he explained.

"School science," he said, "is when we all do the same things together and follow the teacher's directions. Real science," he went on to describe, "is when we get the chance to do our own explorations."

We were doing both. The school science in our classroom addressed the traditional, content oriented science curriculum. The real science provided a means to extend and enrich what was already started.

When our students set out on their own investigations they are using what they have already learned to discover new things. Benjamin Bloom identified this as application and synthesis on his taxonomy of thinking. Inquiry science, the "real" science in our classrooms, enhances these higher levels of thinking. Time in the day other than that reserved for traditional science is well spent in these endeavors.

Adult scientists communicate extensively. They read to find what is already known and to see what others have been doing, and they write to record their own investigations and discoveries. As kids are given opportunities to engage in authentic science, they too are drawn into the genuine needs to communicate. What better time in the school day to address these needs than during language arts time? For many teachers, inquiry science activities are actually pre-writing activities because of the writing opportunities they provide. There is no reason why science cannot be exploited to enhance our students' desire to read and to write.

As students prepare for *KIC*, they must plan their presentation. Data must be displayed and communicated in ways that are accurate and credible. Hand-outs are planned, overheads and note cards are prepared and organized, and the actual presentations are practiced before the class prior to the conference. In addition, the *KIC* journal articles must be written and revised along with research of background information to tell what others have already discovered. These may be things adult scientists do as they plan for their own conferences, but much of these planning activities are, in reality, language arts related. I have had no difficulty justifying my use of language arts time to engage in inquiry science and to plan for the inquiry conference. By doing so, I am able to squeeze so much more into each school day.

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My Own Questions

Science and Questions

961117 Name _____

Think of some science topics you studied in school earlier this year or in past years. Complete the spaces below.

1. One science topic we studied was _____.
   I am still wondering ... (write two or three testable questions):

2. Another topic we studied was _____.
   What if...? (write two or three 'what if' questions):

   What if ...

   What if ...

3. Another science topic I remember studying was _____.
   I never had a chance to try ... (write two or three things you would like to do):

4. I remember another science topic was _____.
   (Think about the materials you used. If you could have any of those materials again, what would they be and what would you do with them?)

   I would like to have (materials) _____

   _____

   Then I would ...

Use the back if you need more space.