兴华科学技术教育协同创新平台
Rise-China STEM Education Alliance

The STEM Study Contest：*New Initiative to Make a Large-scale Performance-based Assessment Reliable & Feasible in China*

LUO Xingkai罗星凯
Research Institute of Science Education
Guangxi Normal University, Guilin 541004, P. R. China
xingkailuo@vip.163.com ww.risechina.org

University of Macau, Macau, April 26, 2017

This is Guilin where we come from

No. 2 Science Buliding in Yucai Campus of Guangxi Normal University

We call ourselves RISE-China Science Education Team at Guilin

Living in such scenery, we have to make the science education here beautiful.

However，what is a beautiful science education?

参观德国Flensburg大学Fiesser教授创办的科学博物馆PHÄNOMENTA (1996年)

PHÄNOMENTA

参观德国Flensburg大学Fiesser教授创办的科学博物馆PHÄNOMENTA (1996年)

PHÄNOMENTA

雏形

（1997年前后，广西师大物理实验楼一间50平方米的实验室）

雏形

（1999-2003年，广西师大物理实验楼一间80平方米的实验室）

现状

（2009年-现在，广西师大第二理科综合楼二间187平方米的实验室）

学生为来访的泰国科教专家作讲解

学生们与来访的泰国科学教师互动

2003年韦钰院士再次莅临
法国科学院盖雷和雷纳院士一同前来

两位高校国家名师也被“迷”住了

南京大学物理系卢德馨，北京大学物理系吴思成2007年到访

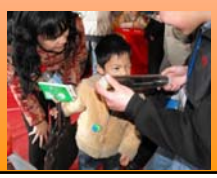
美国密歇根大学
科学教育代表团参观探究馆

2010国培学员扬州大学附中物理特级教师杨在探究“影子的颜色”

http://blog.risechina.org/u/1567/archives/2010/12326.html
http://www.chinaqking.com/yc/2011/188764.html

科普活动--第十八届广西科技活动周

2009年 南宁



科普活动--第十九届广西科技活动周

2010年 南宁







科普活动--2010年桂林市科技活动周





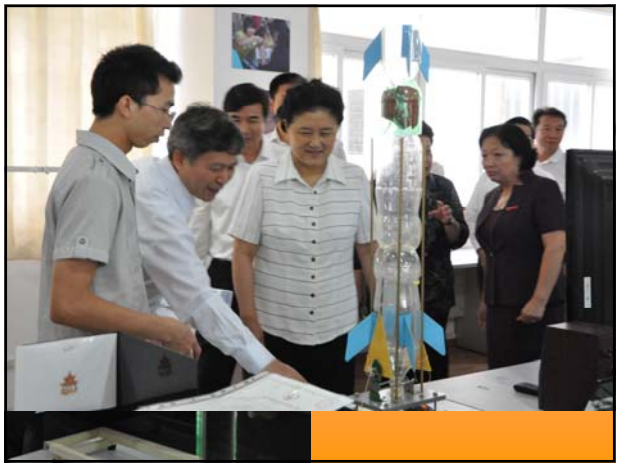



The 1 of 20 most favorable science education projects for visitors to the 2014 National S&T Fair

The 1 of 20 most favorable science education projects for visitors to the 2014 National S&T Fair

The 1 of 20 most favorable science education projects for visitors to the 2014 National S&T Fair

广西师大2008级本科生尤海军、陈春禧、周晓庆和2011级硕士生陶世海、王来的“新型二级水火箭”和“改进型射猴演示器”分获第八届全国优秀自制教具展评一等奖和二等奖。



水火箭
Water Rocket with Parachute invented by a Japanese Teachers Group “Stray Cats”

Pursing a beautiful science education: Starting from avoiding those we dislike

Pursing a beautiful science education: Starting from avoiding those we dislike

己所不欲，勿施于人

Don't do to others what you don't want them to do to you.

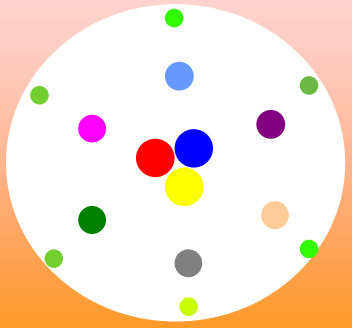
— 孔子 Confucius

Pursing a beautiful science education: Starting from avoiding those we dislike

- ✓**The school education for "Gaokao"**(the National Unified University Entrance Examination) **followed by a course hierarchy**(in most school curriculum a subject is actually treated according to its weight in "Gaokao")

  For instance, *Elementary Science*, senior high *General Technology* and informal S&T education are marginalized in most schools

The Course Hierarchy



Pursing a beautiful science education: Starting from avoiding those we dislike

- ✓ **The school education for "Gaokao"**(the National Unified University Entrance Examination) **followed by a course hierarchy**(in most school curriculum a subject is actually treated according to its weight in "Gaokao")

✓**Learning becomes memorizing**
Teaching becomes training

✓**Practice,** including hands-on experiments, **becomes marginazed**

The Rise-China Strategy for Pursing a Beautiful Science Education: Departure from the Marginalized Subjects: 从被边缘化课程向回归教育本质进发

兴华
科学技术教育协同创新平台
Rise-China STEM Education Alliance

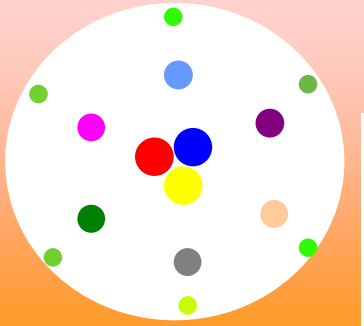
In the mind of architect
Ludwig Mies van der Rohe（米斯·凡德洛）

Less is More

Concerning Education for STEM literacy

Less Privilege is More Powerful

The Course Hierarchy



舍
abandon

得
gain

Systemic Action of Updating S&T Teacher Education Program

- Teacher Education Idea: university academic orientation → university + school & academic + practice
- Teacher Education Content: Science by Inquiry--- a school-based curriculum that make the real changes
- Teacher Students' Learning Environment: supporting inquiry

创新驱动技术教育
探究引领实践育人

探究科学与技术

Science & Technology by Inquiry

——广西创新实施《通用技术》新课程战略选择

Guangxi Initiative for promoting GT implementation in a STEM Integration Way

广西通用技术新课程创新实施核心内容

Project Major Initiatives

广西普通高中《通用技术》创新实验

- 以科学与技术探究实践为核心的高度综合性课程（STEM）
  Teaching S&T in a inquiry and integration way focusing on practice & authentic problem Solving
- 以实践育人价值驱动、靠小规模实验的成功带动的新课程攻坚
  Confronting problems by pilot schools modelling instead of unified examination
- 教育行政、高中学校与专业支持力量协同一致的创新行动
  - Alliance of university and school
  - Coherence effort of bottom-up-and-down

Having gained by turning attention to margin

- School development toward a education for S&T literacy initiated by students changes in learning GT

探究科技——广西普通高中《通用技术》课程创新实施行动

探究科技——广西普通高中《通用技术》课程创新实施行动

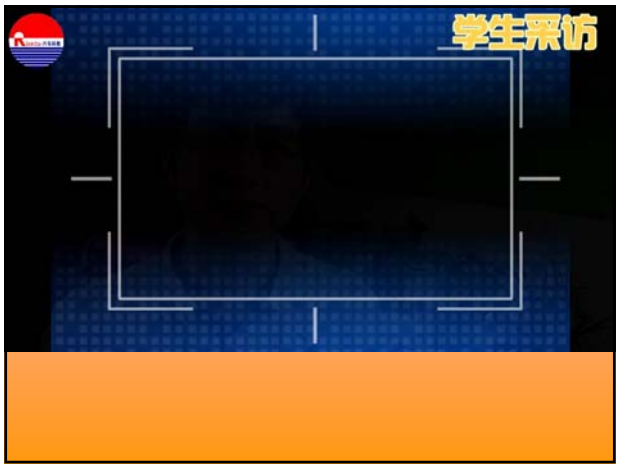
首期师资班学员罗柱在师大附外执教片段

探究科技
S&T by Inqury

可以是：有技术含量的科学课
May be：Science integrated with E & T

或：有科学含量的技术课
or：Technology integrated with Science

必须是：让厌学的孩子喜欢、
好学的孩子着迷的探究课
Must be：Inqury-based learning for and liked by all students



Having gained by turning attention to margin

- **School development toward a education for S&T literacy initiated by students changes in learning GT**
- **S&T teacher students professional development toward a IBE practioner with much stronger self-confidence for their future career, innovation capacity and most importantly the positive attitude to problems faced**

ZHOU Xiaoqing, a beginner teacher, was sharing his proud story of producing students not ony excelling teachers but also breaking through the “record”.

用一枚回形针可以做什么？
What can be made of a paper clip?

活动一

挑战任务内容

用一枚回形针做一个陀螺，看谁的陀螺转得最久！

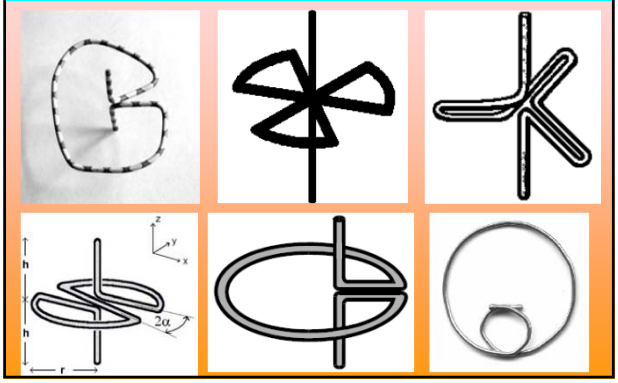
Making a top with a paper clip trying to let it spinning as long as possible

工具： 回形针一枚、尖嘴钳和三角尺各一把

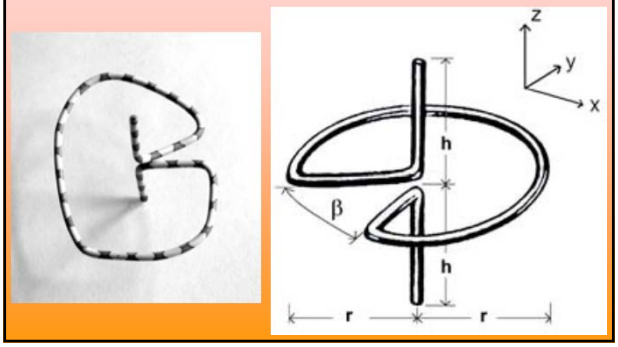
规则： Launch can be done only bare-handed and the lasting time and presentation takes the same count for assessment

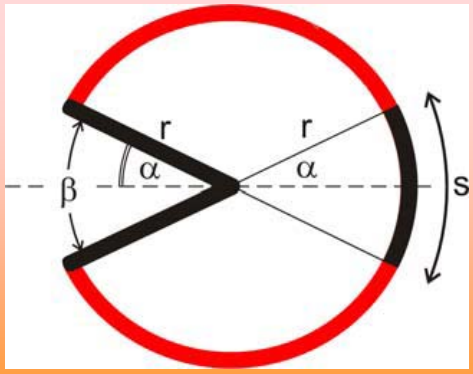
陀螺只能徒手启动，转动持续时间和设计思想各占50%的成绩。

The same paper clip, but different top
同样的回形针，不一样的陀螺



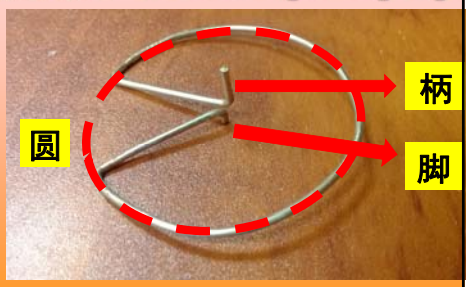
更不一样的科学与技术含量
Different S&T contents embedded





Christian Ucke. Professor Sakai's Paper-Clip Tops. Physics Education, July-September, 97-100(2002)

完美的陀螺？ A Pefect Paper Clip Top?



91班陀螺王，2分零08秒

直至有一天晚上，有几个不信邪的家伙。。。。

创新做法一

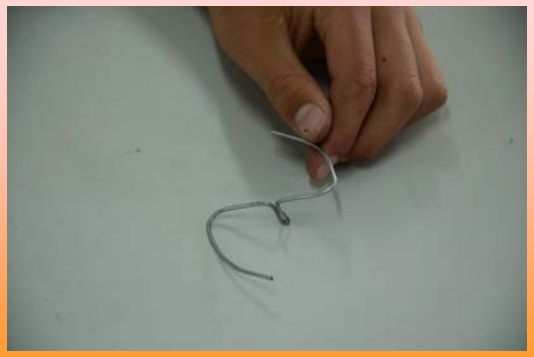
V字圆形陀螺　　半V无柄陀螺

（这也是陀螺？）

成绩：2分56秒

教室里

电扇下旋转：35分钟



Assessing Inquiry Science Learning in a Large-scale Academic Achievement Test

—the 10 Years' Explorations in SAAE Project

大规模科学探究学习测评研究与实践

LUO Xingkai罗星凯
College of Physics & Technology, Guangxi Normal Univ.
Guilin 541004, P. R. China

14:30-15:00 July 4, 2013EASE at HKIEd

Assessment Reform：A big & challenging task

- Assessment plays a vital role in school education in the present Chinese society.
- Inquiry-based science teaching is more difficulty than traditional way for most teachers
- Assessing inquiry science learning is a big challenge, especially in a large-scale assessment

"建立中小学生学业质量分析、反馈与指导系统"
---教育部课程中心自2003起组织的大规模测评项目
SAAE---A project coordinated by MOE Center for Curriculum Development since 2003

Project Goal

- Gradually build the provincial-norm of students' academic achievement based on high-quality testing instruments
- Using testing data for policy-making & teaching/learning improvement

该项目的目标是在抽样测试的基础上，逐步建立对中小学生学业质量进行分析、反馈与指导的工作机制，探索基于实证数据的教学研究与提高学业质量

Formal Assessment since 2005

Subjects：

Chinese & Mathematics *for* Grade 3 and 8

Science & English *for* Grade 8 (14~15 years old)

Instrument：

Paper-and-pencil test + Questionnaire

Samples Coverage (Science)

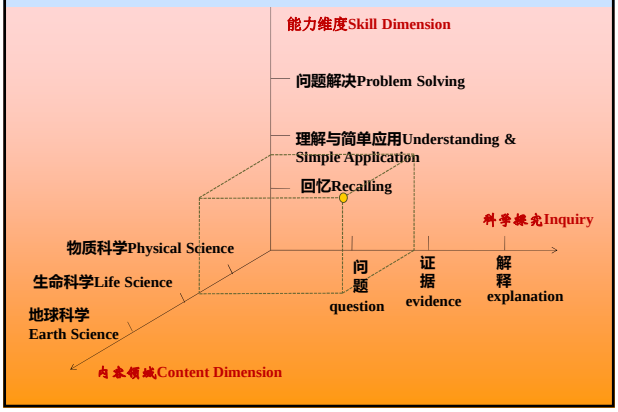
- ✓ Assessing annually since 2004
- ✓ More than 600,000 students (G8) assessed covering 16 provinces

2004年至今，已积累辽宁、上海、江苏、福建、甘肃、天津以及青岛、潍坊、海口、克拉玛依、大连、深圳南山、西安、温州、北京昌平、株洲等16个省、市、自治区60余万8年级学生先后参加的9次测试的数据。

To minimize the shortcomings of a paper-and-pencil test

- To be consistent with the national curriculum standards
- More attention to students' conceptual understanding and high-order thinking.
- More attention to linking student learning to real life situation around them
- Much attention to assessing inquiry in science
- Much attention to multi-level test item (分级计分题) development instead of multiple-choice

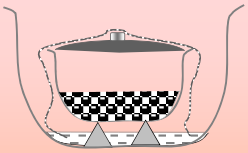
Assessment Framework for G8 Science



8年级科学测试框架的维度划分及比例

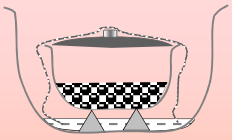
维度划分		比例	
内容领域 Content	Life Science	40～45%	100%
	Physical Science	30～35%	
	Earth Science	20～25%	
能力维度 Skill	Recalling	25～30%	100%
	Understanding & simple Application	35～40%	
	Problem Solving	30～35%	
科学探究 Scientific Inquiry	问题Question	5～10%	20～30%
	证据Evidence	5～10%	
	解释Explanation	10～20%	

E1. 如图所示，把装饭菜的碗加盖后放入一盆中，盆内盛有一定量的水，将一块纱布铺在碗盖上，纱布的边缘浸入到水中。南方有的地方，夏天用这种方式来延长食物保存的时间。请说明这样做的科学道理。



The above diagram illustrates a self-made refrigerator used for keep food fresh longer in hot summer time in some southern areas, please use your scientific knowledge to explain why that device has such a function.

【例2】如图所示，把装饭菜的碗加盖后放入一盆中，盆内盛有一定量的水，将一块纱布铺在碗盖上，纱布的边缘浸入到水中。南方有的地方，夏天用这种方式来延长食物保存的时间。请说明这样做的科学道理。（05辽宁试题）



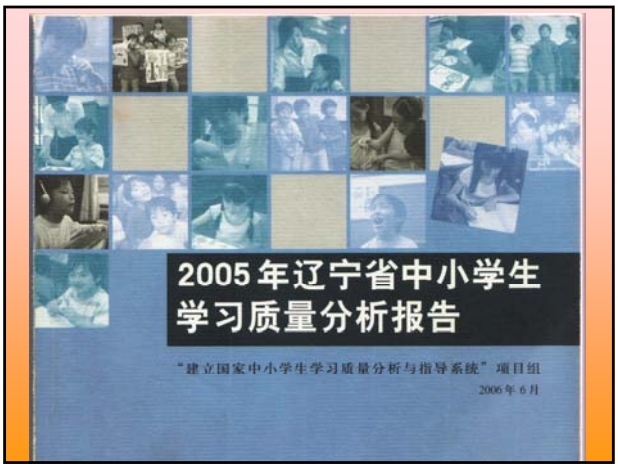
内容领域：物质科学Physical Science

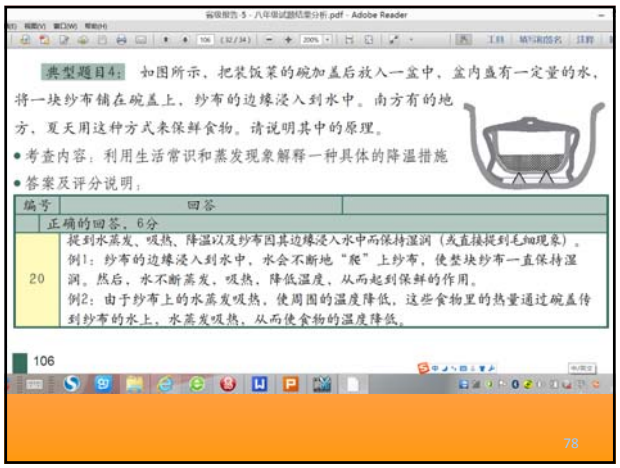
具体内容:利用常识和蒸发现象解释一种降温措施

Explain a specific cooling with experiences and knowledge about evaporative cooling

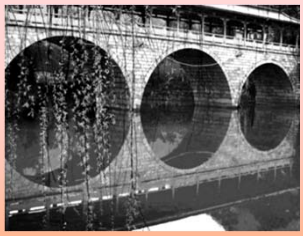
能力维度：问题解决Problem Solving

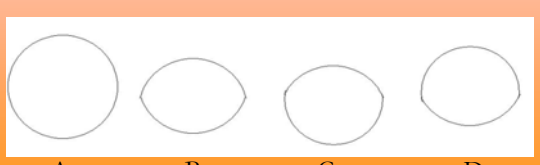
科学探究：解释Explanation



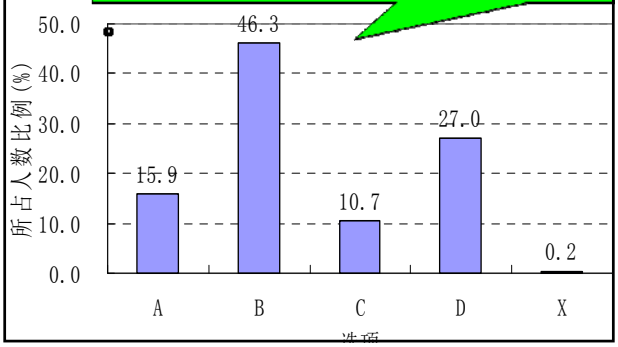


如图，平静的水面上有一座石桥，桥孔看上去是圆形的。当水面上升时，看到桥孔的形状是 （ ）





测试结果：2007年上海市、大津市、海口市、青岛市、甘肃省等地40728名学生选答A、B、C、D、X选项的分别为6457（15.9%）、18850（46.3%）、4341（10.7%）、10985（27%）和95(0.2%)，正确率46.3%



如图所示，物体S在平面镜前，所成的像为S’。 若在镜后AB处放一块不透明的塑料，则像S′将会（ ）

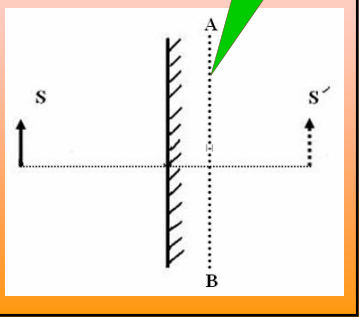
opaque sheet

A．不变 Same

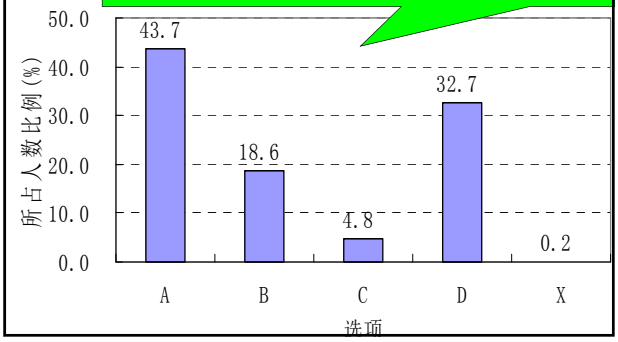
B．变暗 Dim

C．只剩一半 half left

D．消失 disappear



测试结果：2008年江苏省、上海市、新疆克拉玛依市、大连市等地75854名学生选答A、B、C、D、X选项的分别为33184（43.7%）、14123（18.6%）、3606（4.8%）、24820（32.7%）和121(0.2%)，正确率43.7%。



面对近乎常识的情境性试题，学生的表现为何如此失常？罗星凯.学生面对情境性试题为何如此失常[J].人民教育，2010(11):32-35.

Why the students accessed performed so abnormally while dealing with contextual problem?

山有多高？水有多深？

How high the hill and how deep the water is?

Investigation on Students' Conceptual Understanding of Plane Mirrors and images

- Driver R, Guesne E and Tiberghien A. Children's Ideas in Science. Open University Press, 1985.
- Galili I, Goldberg F, Bendall S. Some Reflections on Plane Mirrors and images. The Physics Teacher，1991, 29(7):471-477
- Langley S, Ronen M, Eylon B S. Light propagation and visual patterns. Journal of Research in Science Teaching,1997,34:399-424
- 杨小红：《大中学生对几何光学中的某些概念理解的研究》，广西师范大学硕士论文，2003。

小宝宝们第一次照镜子时的反应，萌坏了

http://www.poluoluo.com/qq/201408/305339.html

小宝宝们第一次照镜子时的反应，萌坏了

http://www.poluoluo.com/qq/201408/305339.html

小宝宝们第一次照镜子时的反应，萌坏了

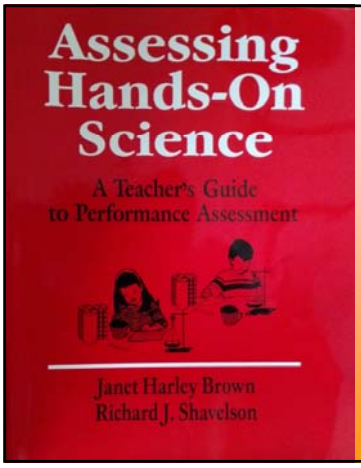
http://www.poluoluo.com/qq/201408/305339.html

小宝宝们第一次照镜子时的反应，萌坏了

http://www.poluoluo.com/qq/201408/305339.html

小宝宝们第一次照镜子时的反应，萌坏了

http://www.poluoluo.com/qq/201408/305339.html



93

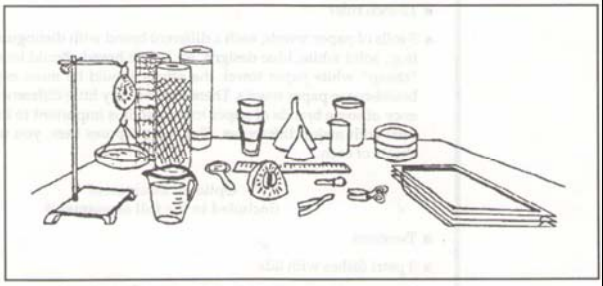
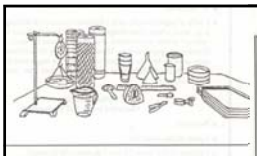


Figure 4.1. Paper Towels Setup

94



How Do You Score Student Performance? 35

Paper Towels

Name _____

You have three different kinds of paper towels in front of you and some equipment for doing scientific experiments.

Problems:

1. Find out which paper towel can hold, soak up or absorb the most water.
2. Find out which paper towel can hold, soak up or absorb the least water.

Look at each piece of equipment. Think about how you might use some of it to do an experiment to solve the problems. You don't need to use all the equipment.

When you are finished you will be asked to write what you did so one of your friends can repeat the experiment exactly as you did it. You may want to keep notes on a sheet of paper to help you remember what you did and what you found out.

NOTES

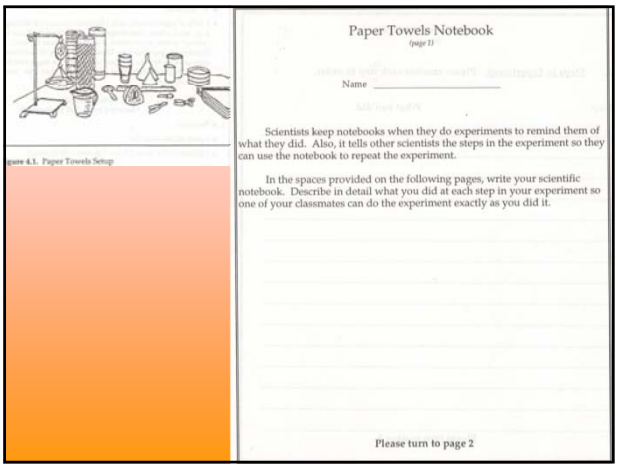
RESULTS: When you think you know which paper towel can hold, soak up or absorb the most water and least water, write **"most"** and **"least"** beside the name of the towel.

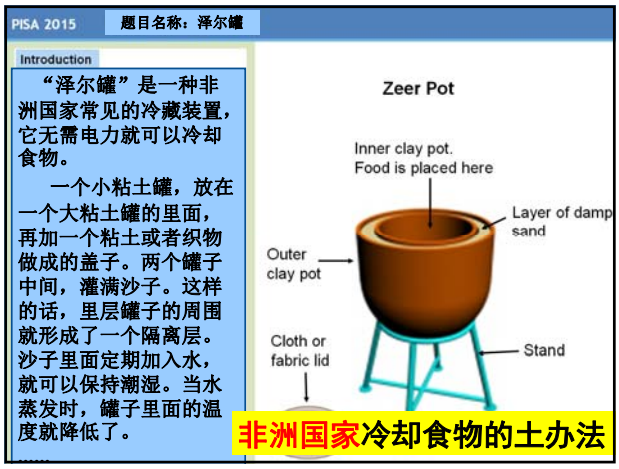
White _____ Blue _____ Yellow _____

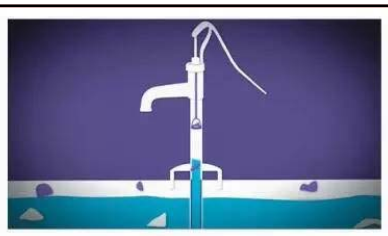
How did you know from the experiment which paper towel holds, soaks up or absorbs the **most** water and which paper towel holds, soaks up or absorbs the **least** water?

Most

Least





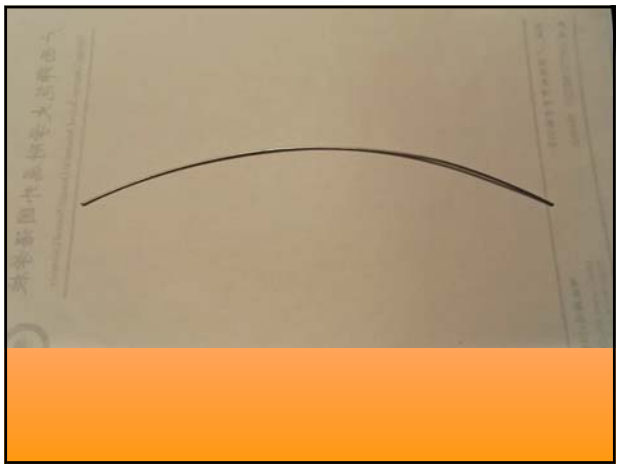


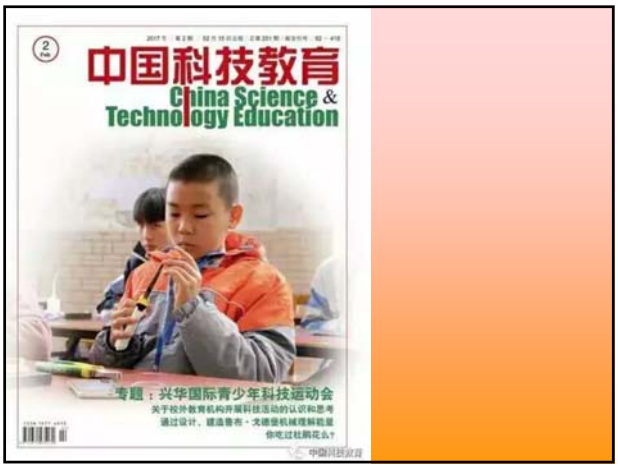
NAEP(TEL) 2014 Sample Scenario-Based Tasks

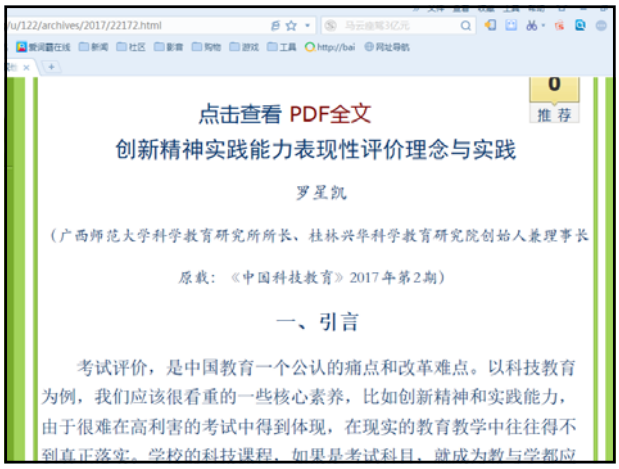
http://www.nationsreportcard.gov/tel_2014

In the NAEP TEL assessment, students were tested using computer simulations of technology and engineering problem-solving tasks set in a variety of real-world contexts. Through interaction with these multimedia scenario-based tasks, students used an assortment of tools and applied their TEL knowledge and skills to solve problems across the content areas and practices.

Development of an instant height measuring system for water-roket contest by RISE technology innovation team

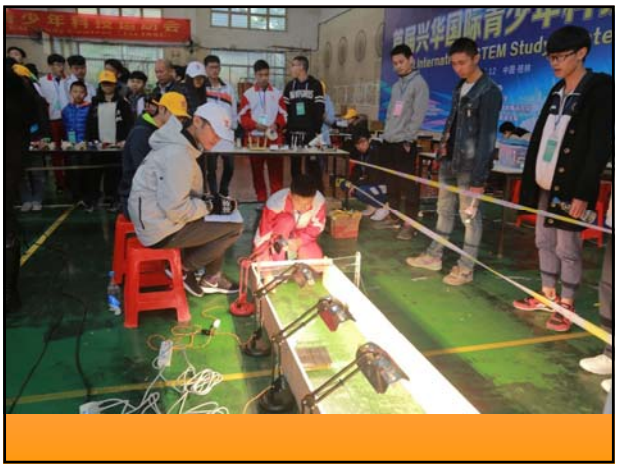



中国科技教育
China Science & Technology Education
专题：兴华国际青少年科技运动会


点击查看 PDF全文
创新精神实践能力表现性评价理念与实践
罗星凯
（广西师范大学科学教育研究所所长、桂林兴华科学教育研究院创始人兼理事长
原载：《中国科技教育》2017年第2期）
一、引言
考试评价，是中国教育一个公认的痛点和改革难点。以科技教育为例，我们应该很看重的一些核心素养，比如创新精神和实践能力，由于很难在高利害的考试中得到体现，在现实的教育教学中往往得不


首届兴华国际青少年科技运动会


首届兴华国际青少年科技运动会
The 1st International STEM Study Contest (1st ISSC)
闭幕式暨颁奖仪式



“首届兴华国际青少年科技运动会”特别邀请赛

The 1st International STEM Study Contest Beijing Special Preliminary

第一轮通知

主办单位

桂林兴华科学教育研究院、中国教育创新成果公益博览会组委会

承办单位

广西师范大学科学教育研究所、北京师范大学中国教育创新研究院

协办单位

国际科学教育协会理事会（ICASE）

中国青少年科技辅导员协会、中国教育学会科学教育分会

比赛时间：2016 年 9 月 23-25 日

比赛地点：北京师范大学部季琦体育馆、东操场

报名、联系方式

官方网站：www.risechina.org 微信公众号：risechina-1

统一直接联系渠道

电话/传真：0773-5833180 手机：13907730643

邮箱：risechina@163.com 联系人：杨家奥 王金利

附件：“首届兴华国际青少年科技运动会”竞赛手册

2017决赛2017Fanal：
11月18-19日， 桂林
Nov. 18-19, at Guilin
广西初赛Premiliary：
10月21-22日， 南宁
Oct. 21-22, Nanning
北京等地初赛信息
More Premilary at Beijing, ...etc.， To be announced soon

www.risechina.org

Thanks for your attention