

# **Teaching Learning Resources For International Standard of Schooling**

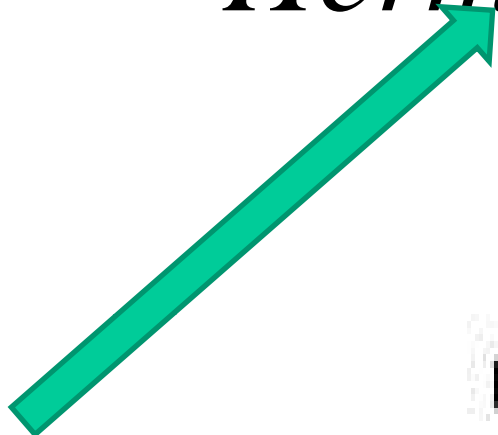
*To be presented  
at the workshop at UNNES Semarang  
May, 26, 2010*

***OLEH***

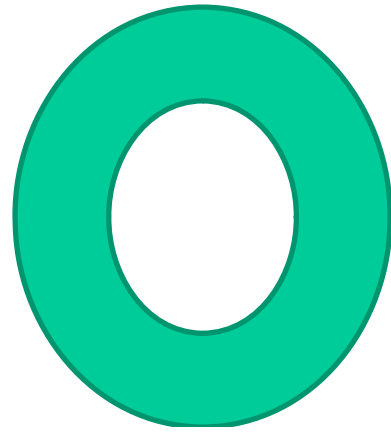
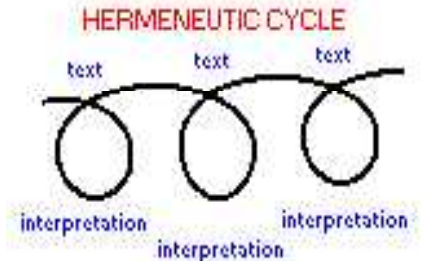
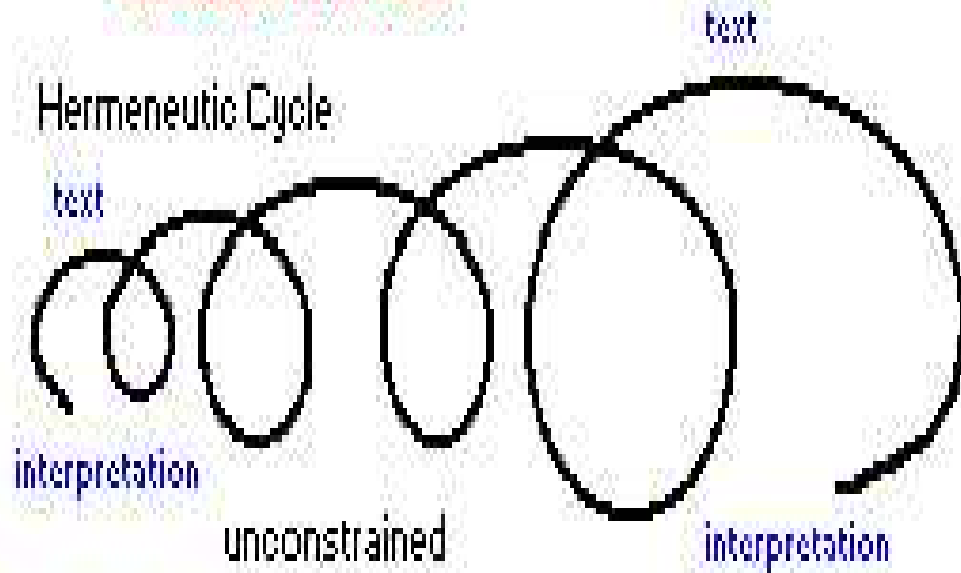
**Dr. Marsigit, MA**  
**Universitas Negeri Yogyakarta**

Website: <http://powermathematics.blogspot.com>

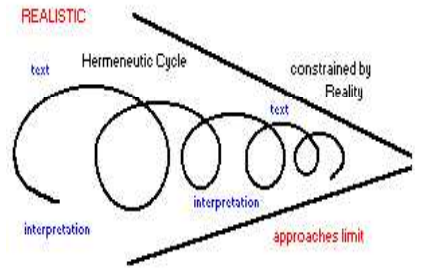
# Hermeneutics of *SBI* theory



DECONSTRUCTION

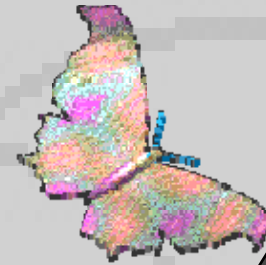


*empirical evidence*



**Philosophy, Policy/Theory Educ., Vision,  
Math.Content, Curriculum, Syllabi,  
Lesson Plan, Text Book**

***Will***  
***Attitude***  
***Knowledge***  
***Skill***  
***Experience***



**National/International  
Cooperation/Networking**

**International Standards**

**Facilities, ICT,  
Research, Budget,  
Staff, Resources,**

**Institutional Supports  
(Dept, Faculty, Univ.)**

**Improved Student  
Participation and  
Achievement**

**Empirical Evidences**

	<i>Industrial Trainer</i>	<i>Technological Pragmatist</i>	<i>Old Humanist</i>	<i>Progressive Educator</i>	<i>Public Educator</i>
<i>Politics</i>	<b>Radical right</b>	<b>Conservative</b>	<b>Conservative/liberal</b>	<b>Liberal</b>	<b>Democracy</b>
<i>Mathematics</i>	<b>Body of Knowledge</b>	<b>Science of truth</b>	<b>Structure of truth</b>	<b>Process of Thinking</b>	<b>Social Activities</b>
<i>Moral Value</i>	<b>Good vs Bad</b>	<b>Pragmatism</b>	<b>Hierarchies Paternalistics</b>	<b>Humanity</b>	<b>Justice, Freedom</b>

	<i>Industrial Trainer</i>	<i>Technological Pragmatist</i>	<i>Old Humanist</i>	<i>Progressive Educator</i>	<i>Public Educator</i>
<i>Theory of Society</i>	<b>Hierarchy, Market Orientation</b>	<b>Hierarchy</b>	<b>Hierarchy</b>	<b>Well-fare</b>	<b>Un-justice need a reform</b>
<i>Genesis of Students</i>	<b>Empty Vessel</b>	<b>Empty Vessel</b>	<b>Character Building</b>	<b>Student Orientation</b>	<b>To develop/grow seed plant</b>
<i>Theory of Students' Ability</i>	<b>Talent and Effort</b>	<b>Talent</b>	<b>Talent Development</b>	<b>Need</b>	<b>Aspect of culture, Relatives</b>

	<i>Industrial Trainer</i>	<i>Technological Pragmatist</i>	<i>Old Humanist</i>	<i>Progressive Educator</i>	<i>Public Educator</i>
<i>Aim of Mathematics Education</i>	<b>Back to Basic (Arithmetics)</b>	<b>Certification</b>	<b>Transfer of knowledge</b>	<b>Creativity</b>	<b>To develop people comprehensively through math.</b>
<i>Theory of Learning</i>	<b>Work Hard, Exercises, Drill, Memorize</b>	<b>Thinking And practice</b>	<b>Understanding and Application</b>	<b>Exploration</b>	<b>Discussion, Autonomy, Self,</b>
<i>Theory Of Teaching</i>	<b>Transfer of knowledge (transmission)</b>	<b>External Motivation</b>	<b>Expository</b>	<b>Construction, Development</b>	<b>Discussion, Investigation</b>

	<i>Industrial Trainer</i>	<i>Technological Pragmatist</i>	<i>Old Humanist</i>	<i>Progressive Educator</i>	<i>Public Educator</i>
<i>Resources</i>	<b>White Board, Chalk, Anti Calculator</b>	<b>Teaching Aid</b>	<b>Visual Teaching Aid for motivation</b>	<b>Various resources/environment</b>	<b>Social Environment</b>
<i>Evaluation</i>	<b>External Test</b>	<b>External Test</b>	<b>External Test</b>	<b>Porto-folio, Assessment</b>	<b>Porto folio, Social Context</b>
<i>Diversity</i>	<b>Monoculture</b>	<b>Desentralisation</b>	<b>Competent Based Curriculum</b>	<b>Multiple Solution, Local Culture</b>	<b>Heterogonomous</b>

# **HAKEKAT MATEMATIKA SEKOLAH**

(Ebut And Straker, 1996)

MATEMATIKA ADALAH ILMU TENTANG  
POLA DAN HUBUNGAN  
MATEMATIKA ADALAH KEGIATAN  
PROBLEM SOLVING  
MATEMATIKA ADALAH KEGIATAN  
INVESTIGASI  
MATEMATIKA ADALAH ALAT  
KOMUNIKASI



<b>Instrumental Curriculum</b>	<b>Interactive Curriculum</b>	<b>Individualistic Curriculum</b>
<b>Packages (subj. discipline)</b>	<b>Problems (interdiscip. enquiry)</b>	<b>Personal eksploration</b>
<b>Berorientasi Kerja</b>	<b>Kesejahteraan Masy</b>	<b>Kebahagiaan Hidup</b>
Materi sangat terstruktur	<b>Struktur materi longgar</b>	<b>Materi tak terstruktur</b>
<b>Guru Mendominasi</b>	<b>Guru sbg Manager</b>	<b>Guru melayani kebut belajar siswa</b>
<b>Teachers as passive recipients</b>	<b>Teacher as represent. Participants</b>	<b>Teacher as developers</b>
<b>Attain. of specif. goal</b>	<b>Anthropological studies</b>	<b>Indiv. case-histories</b>
<b>MANUSIA DAPAT DIREKAYASA</b>	<b>MANUSIA SBG MAKHLUK SOSIAL</b>	<b>MANUSIA SEBAGAI PRIBADI</b>
<b>DUNIA NYATA</b>	<b>DUNIA YANG BERUBAH</b>	<b>DUNIA YANG TIDAK DIKETAHUI</b>



# Karakteristik Sekolah Berstandard Internasional

*Sumber: <http://www.satriadharmawordpress.com>*

l Akredit Berakredit Berakreditasi tambahan dari  
asi asi A dari badan akreditasi sekolah  
BAN- pada salah satu lembaga  
Sekolah akreditasi pada salah satu  
dan negara anggota **OECD** dan/  
Madrasah atau negara maju lainnya  
yang mempunyai keung-  
gulan tertentu dalam bidang  
pendidikan

<p>" Kurikulum (Standar Isi) dan Standar Kompetensi lulusan</p>	<p>Menerapkan KTSP</p>	<p>Sekolah telah menerapkan system administrasi akademik berbasis teknologi Informasi dan Komu-nikasi (TIK) dimana setiap siswa dapat meng-akses transkripnya masing-masing.</p>
	<p>Memenuhi Standar Isi</p>	<p>Muatan pelajaramn (isis) dalam kurikulum telah setara atau lebih tinggi dari muatan pelajaran yang sama pada sekolah unggul dari salah satu negara diantara 30 negara anggota <b>OECD</b> dan/atau dari negara maju lainnya.</p>
	<p>Memenuhi SKL</p>	<p>Penerapan standar kelulusan yang setara atau lebih tinggi dari SNP  Meraih mendali tingkat internasional pada berbagai kompetensi sains, matematika, tekno-logi, seni, dan olah raga.</p>

III Proses Memenuhi  
Pembelajaran Standar  
Proses

- Proses pembelajaran pada semua mata pelajaran telah menjadi teladan atau rujukan bagi sekolah lainnya dalam pengembangan akhlak mulia, budi pekerti luhur, kepribadian unggul, kepemimpinan, jiwa kewirausahaan, jiwa patriot, dan jiwa inovator
- Proses pembelajaran telah diperkaya dengan model-model proses pembelajaran sekolah unggul dari salah satu negara diantara 30 negara anggota **OECD** dan/atau negara maju lainnya.
- Penerapan proses pembelajaran berbasis TIK pada semua mapel
- Pembelajaran pada mapel IPA, Matematika, dan lainnya dengan bahasa Inggris, kecuali mapel bahasa Indonesia.

IV Penilaian Memenuhi Standar Penilaian

Sistem/model penilaian telah diperkaya dengan system/model penilaian dari sekolah unggul di salah satu negara diantara 30 negara anggota **OECD** dan/atau negara maju lainnya.

- V Pendi Memenuhi . Guru sains, matematika,  
dik Standar dan teknologi mampu  
Pen-didik Pen-didik mengajar dengan bahasa  
Inggris
- . Semua guru mampu memfasilitasi pembelajaran berbasis TIK
  - . Minimal 20% guru berpendidikan S2/S3 dari perguruan tinggi yang program studinya terakreditasi A



VI Tenaga Kependidikan Memenuhi Standar Tenaga Kependidikan

- Kepala sekolah berpendidikan minimal S2 dari perguruan tinggi yang program studinya terakreditasi A
- Kepala sekolah telah menempuh pelatihan kepala sekolah yang diakui oleh Pemerintah
- Kepala sekolah mampu berbahasa Inggris secara aktif
- Kepala sekolah memiliki visi internasional, mampu membangun jejaring internasional, memiliki kompetensi manajerial, serta jiwa kepemimpinan dan enterprenual yang kuat

V Sara Memen . Setiap ruang kelas dilengkapi  
II na uhi sarana pembelajaran berbasis  
Pras Standar TIK  
aran Sarana . Sarana perpustakaan TELAH  
a Prasara dilengkapi dengan sarana  
na digital yang memberikan akses  
ke sumber pembelajaran  
berbasis TIK di seluruh dunia  
. Dilengkapi dengan ruang multi  
media, ruang unjuk seni  
budaya, fasilitas olah raga,  
klinik, dan lain-lain.

VIII Pengelo-  
laan Memenuh-  
i Standar  
Penge-  
lolaan

Sekolah meraih sertifikat ISO  
9001 versi 2000 atau  
sesudahnya (2001, dst) dan ISO  
14000

- Merupakan sekolah multi kultural
- Sekolah telah menjalin hubungan “sister **school**” dengan sekolah bertaraf/berstandar internasional diluar negeri
- Sekolah terbebas dari rokok, narkoba, kekerasan, kriminal, pelecehan seksual, dan lain-lain
- Sekolah menerapkan prinsip kesetaraan gender dalam semua aspek pengelolaan sekolah

A CRITICAL LOOK AT  
*International Level of*  
MATHEMATICS EDUCATION

**Empirical Evidences**  
**on**  
**Students' Learn Mathematics**

# Third International Mathematics and Science Study (TIMSS, 1995)

- Elaborate international comparison of mathematics and science education
- Large amount of data, unusually careful methodology
- Comparison of student performance, teacher preparation, textbooks, teaching styles

# Conclusions drawn from TIMSS: US student performance

- Relative performance declines drastically in later grades
- Students do relatively well on one-step problems, but not well on multi-step problems
- Students do relatively well on “data analysis” problems
- Students do badly on problems requiring conceptual thinking

*Wilfried Schmid, 2009*

Implication to  
Method and Model of  
**TEACHING LEARNING  
PROCESSES**



The learner experiences an activating event, one that exposes the difference between what they thought they knew and what is actually happening. Earlier versions of this theory identified this as a single event, later work has noted that “several events may converge to start the process”

(Baumgartner, 2001, p. 19 in Patricia Cranton, 2002)

The learner then begins to “articulate assumptions” about their current mental models and how this new information fits with their currently thinking.

The learner then begins  
to investigate  
alternative viewpoints.

The learner then engages others in discussion about both previously held assumptions and new information learned during their search for facts and ideas.

The learner revises his or her assumptions to make them fit better with new situation.

The learner begins to put  
the new assumptions into  
practice.

# PCMI (Park City Mathematics Institute) Model of Professional Development

- Continue to learn and do mathematics
- Analyze and refine classroom practice
- Become a resource to colleagues and the profession



PCMI professional development is research based----

- is grounded in mathematics content
- has students' learning as the ultimate goal
- is centered on what teachers do in their practice
- encourages teacher collaboration
- draws on outside expertise
- makes use of teacher knowledge and expertise
- is sustained, coherent and continues over teacher's entire career

Smith,2000; Darling Hammond, 1999;  
King et al, 2003; Desimone, et al, 2003



# National Council of Teachers of Mathematics (NCTM)

- Professional organization of mathematics teachers
- Many teachers are *required* to become members and to pay dues
- Relatively inactive until the eighties, now very active
- In recent years, most leaders of the organization have been *mathematics educators*, not *teachers*

*Wilfried Schmid, 2009*

# NCTM 1989 Curriculum Guidelines

- Elaborate document, written by a large committee of mathematics educators and teachers
- Promoted by supporters as de-facto national mathematics curriculum guidelines
- Includes social agenda: make mathematics likable and approachable, involve boys and girls equally, address needs of disadvantaged students

*Wilfried Schmid, 2009*

# After NCTM 1989 guidelines

## **Reformers demand:**

- develop students' "mathematical thinking"
- less emphasis on paper-and-pencil computations
- use calculators at all times
- much less memorization
- reduce or eliminate direct instruction
- emphasize "group learning" and "discovery learning"

*Wilfried Schmid, 2009*

# Quotes from TERC manuals

In old-style class, students:

- worked alone
- focused on getting the right answer
- recorded by only writing down numbers
- used a single prescribed procedure for each type of problem
- used only pencil and paper, chalk and chalkboards as tools

In new-style class, students:

- work in a variety of groupings
- consider their own reasoning and the reasoning of other students
- communicate about mathematics orally, in writing, and by using pictures, diagrams and models
- use more than one strategy to double-check
- use cubes, blocks, measuring tools, calculators, and a large variety of other materials

*Wilfried Schmid, 2009*

# Quotes from TERC manuals

The teacher's role is:

- to observe and listen carefully to students
- to try to understand how students are thinking
- to help students articulate their thinking, both orally and in writing
- to establish a classroom atmosphere in which high value is placed on thinking hard about a problem
- to ask questions that push students' mathematical thinking further
- to facilitate class discussion about important mathematical ideas

*Wilfried Schmid, 2009*

# Ingredients of a good mathematics education

- Well-trained teachers
- Balance between computational practice, problem solving, and conceptual understanding
- Sensible balance between direct instruction and “discovery learning”
- Good textbooks
- Addressing the needs of students with various degrees of mathematical competences

*Wilfried Schmid, 2009*

# Recommendation for Developing Mathematics Teaching

1. Ask for professional experiences from experiences colleagues
2. Change activities often  
Research currently shows the attention span of a typical adult to be 15-20 minutes at best
3. Tap into the technological savvy and interest of Millennials
4. Assign group roles for the first few team projects
5. Work to foster a team environment  
Consider the use of formal groups with clearly defined roles that are rotated throughout the group

# **Recommendation for Developing Mathematics Teaching**

6. Enforce individual accountability for group projects
7. Require participation in some form each class period
8. Find the right mix of guidance, structure, and visibility for all groups
9. Encourage discussion between the groups
10. Recognize excellent performers individually
11. Give individual work in addition to group work



# Knowledge of Mathematics for Teaching

- Not everything a teacher needs to know ends up on the chalkboard.  
— Mark Saul
- The ability “to think deeply about simple things” (A. Ross)  
*What’s really behind the geometry of multiplying complex numbers?*
- The ability to create activities that uncover central habits of mind  
*What do  $5^{3/2}$  and  $5^{\sqrt{2}}$  mean?*

# Knowledge of Mathematics for Teaching (cont'd)

- The ability to see underlying connections and themes
  - ❖ Connections
    - Linear Algebra brings coherence to secondary geometry
    - Number Theory sheds light on what otherwise seem like curiosities in arithmetic
    - Abstract Algebra provides the tools needed to transition from arithmetic with integers to arithmetic in other systems.
    - Analysis provides a framework for separating the substance from the clutter in precalculus
    - Mathematical Statistics has the potential for helping teachers integrate statistics and data analysis into the rest of their program

# Knowledge of Mathematics for Teaching (cont'd)

➤ The ability to see underlying connections and themes

## ❖ Themes

- Algebra: extension, representation, decomposition
- Analysis: extension by continuity, completion
- Number Theory: reduction, localization

# **Mathematical competencies (PISA)**

**C1. Mathematical thinking skill**

**C2. Mathematical argumentation skill**

**C3. Modelling skill**

**C4. Problem posing and solving skill**

**C5. Representation skill**

**C6. Symbolic, formal and technical skill**

**C7. Communication skill**

**C8. Aids and tools skill**

**Horizontal mathematisation (Treffers, 1986).**

**It requires activities such as:**

- identifying the specific mathematics in a general context**
- schematising**
- formulating and visualising a problem**
- discovering relationships and regularities**
- recognising similarities between different problems (de Lange, 1987)**

**Vertical mathematisation and can be recognised in the following activities:**

- representing a relationship by means of a formula**
- proving regularities**
- refining and adjusting models**
- combining and integrating models**
- generalising**







# How can we develop students' centered learning?

Pedagogical Knowledge

Lesson Study  
For Developing  
Classroom  
Communication

Content Knowledge

Developing Pedagogical Content Knowledge

Plan

Research Lesson

Reflection



# Open Source Lesson Study

[http://hrd.apecwiki.org/  
index.php/Main\\_Page](http://hrd.apecwiki.org/index.php/Main_Page)

Presentasi ini didukung Pemutaran Video Clip  
untuk mereview tentang:

RPP

Silabus

Teaching Learning method

LKS

Dsb.

**TERIMAKASIH**