



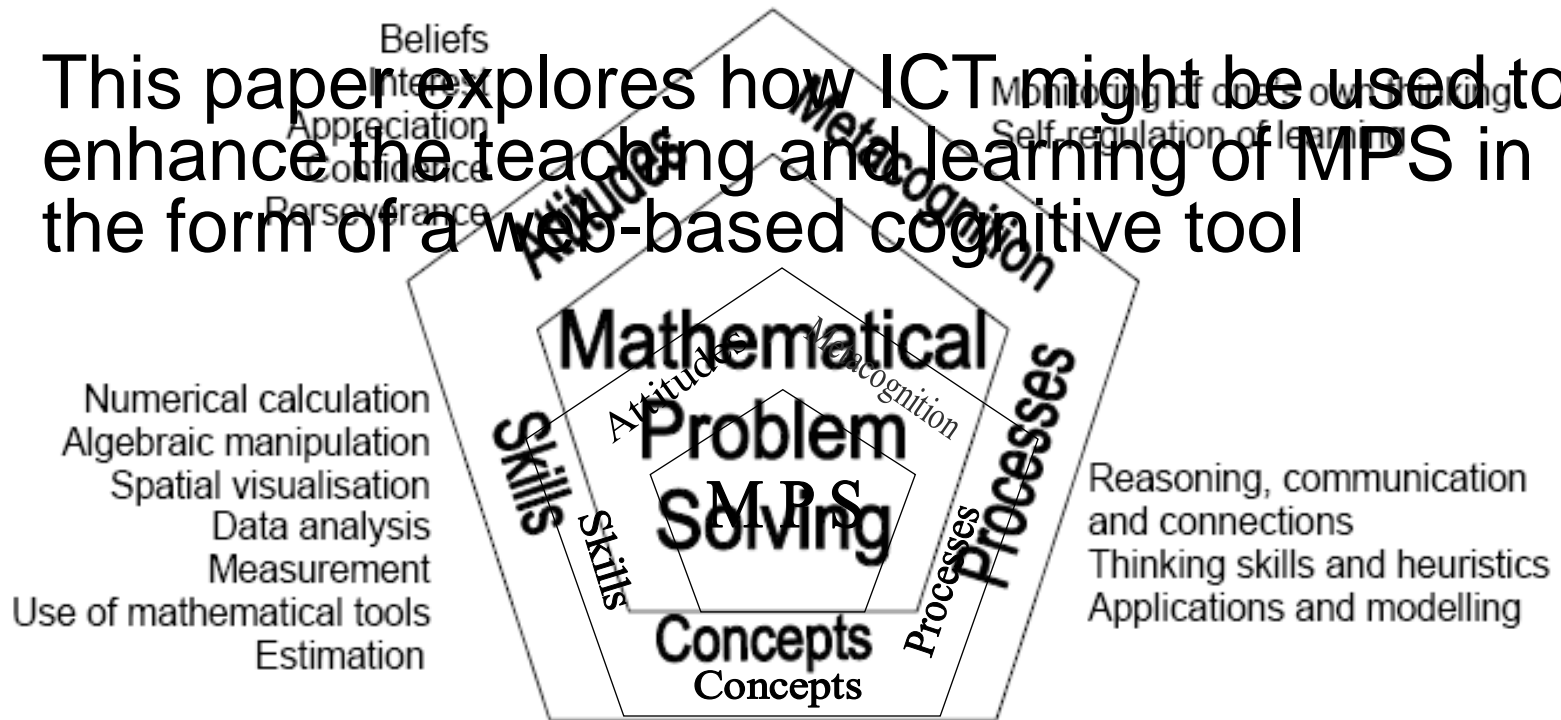
Designing a web-based cognitive tool to enhance mathematical problem solving

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Introduction

- The Singapore curriculum places emphasis on mathematical problem solving (MPS)
- This paper explores how ICT might be used to enhance the teaching and learning of MPS in the form of a web-based cognitive tool



Note:

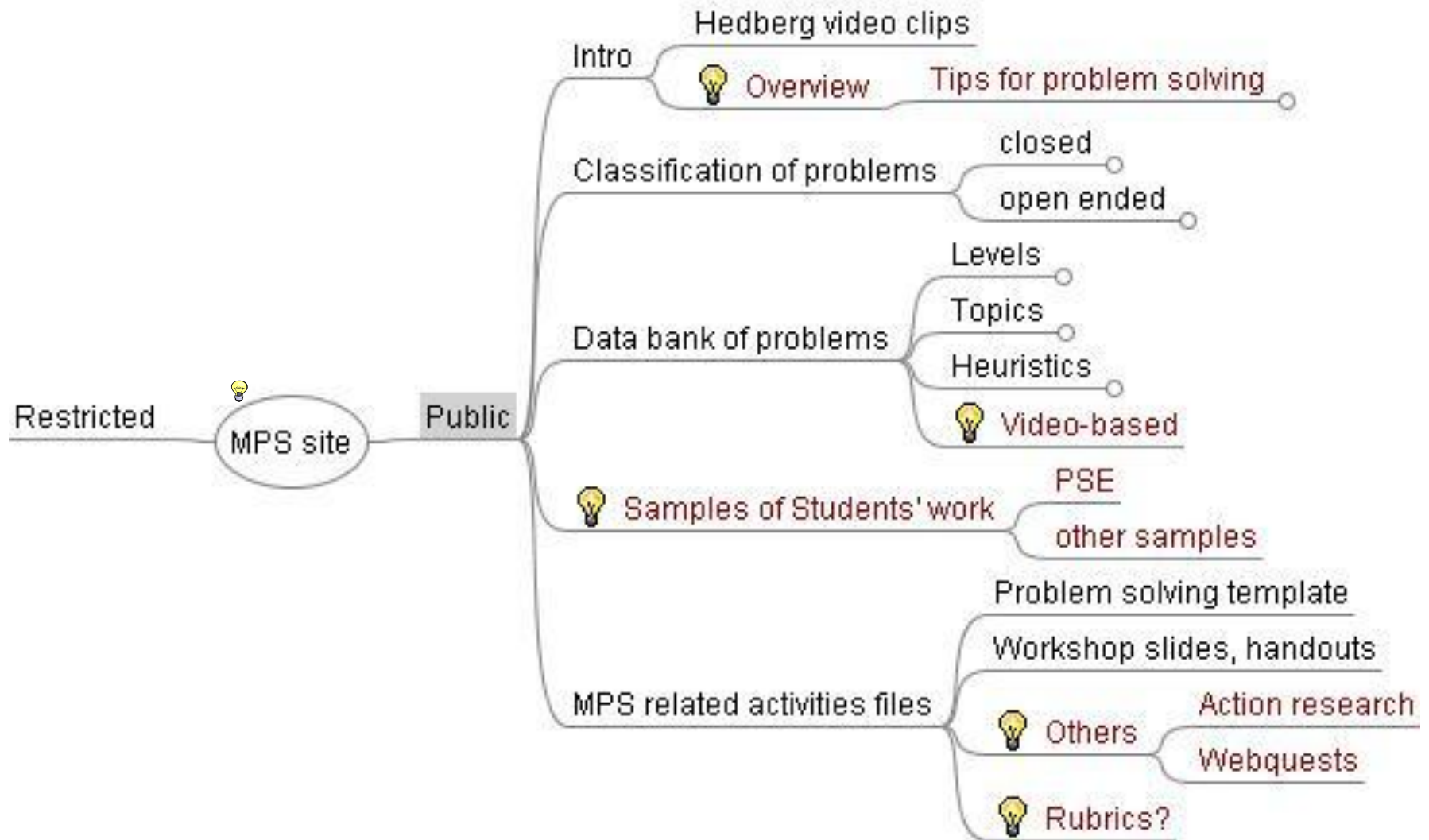
Cognitive tools “refer to technologies, tangible or intangible, that enhance the cognitive powers of human beings during thinking, problem solving, and learning.”


Devt of the Web-Based Cognitive Tool

The tools comprise two main parts:

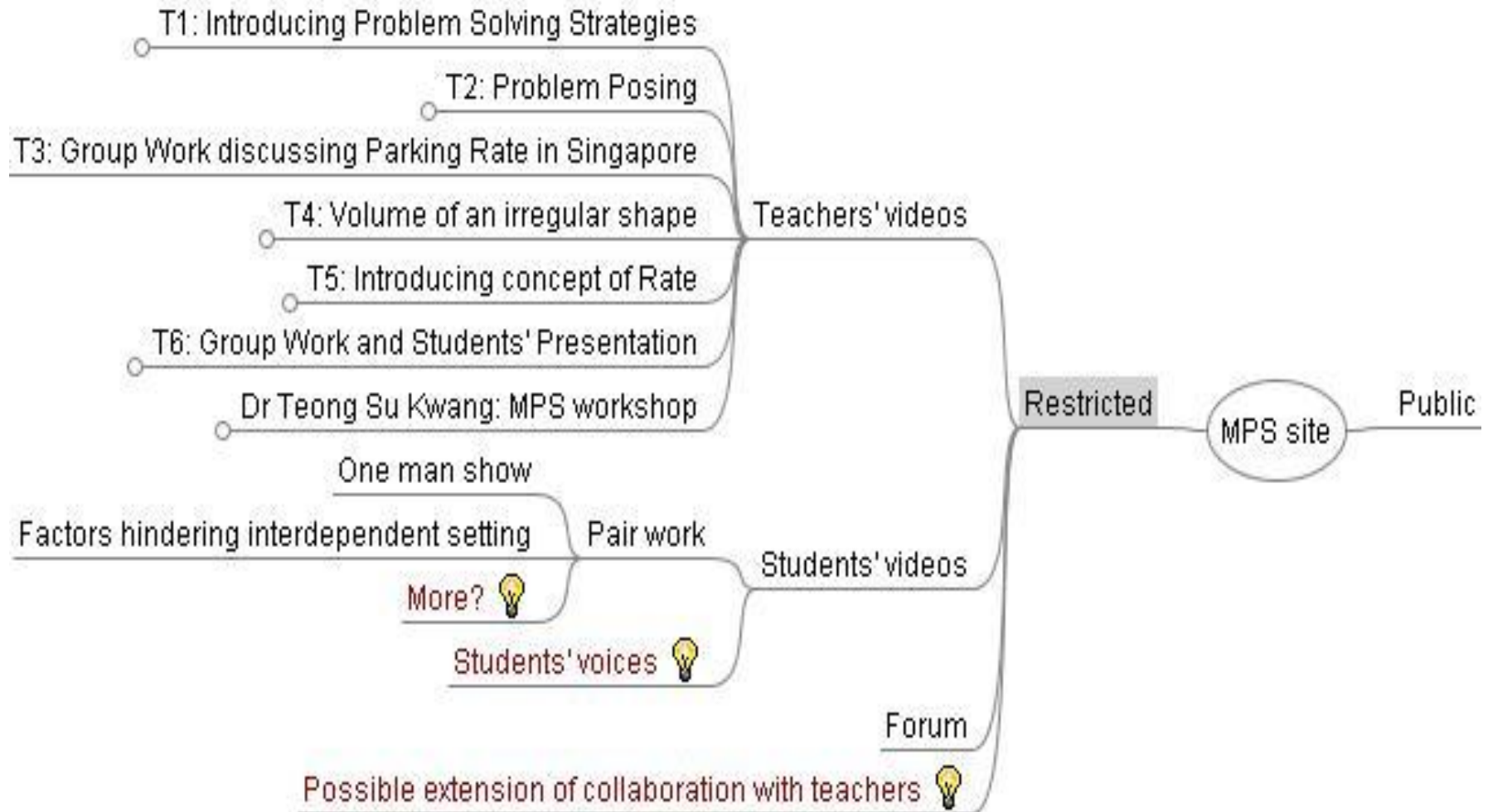
- a public-accessible part comprising a searchable databank of word problems, and
- a restricted-access (RA) part comprising sampled video clips and a forum.

The map of the website: Public parts



Branches with an  icon indicate generated ideas that need further action;

The map of the site: RA part



The front page



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HOME

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FORUMS

MEMBER LIST

VIDEO

Menu

- Primary 5
- Secondary 1
- Heuristics

Contact Us

MPS Team

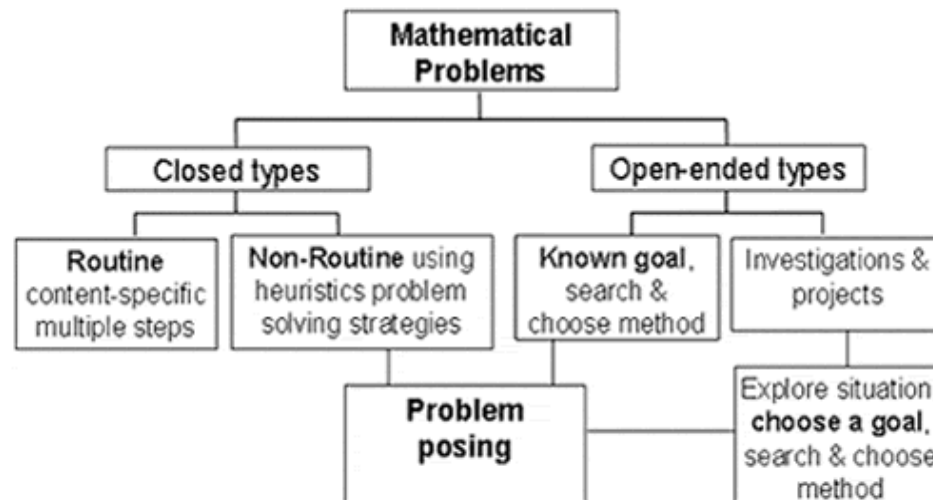
- Prof John Hedberg
- Ho Kai Fai
- Luis Liu ([web admin](#))
- John Tiong

Chat Room

Users In Chat 0
Who Is Chatting

Welcome to the MPS Website

Types of Mathematical Problems



Introduction

- About Our Project
- About This Website



* You need Quick Time to watch these clips. Click the image below to install the player in your computer.



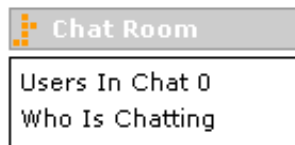
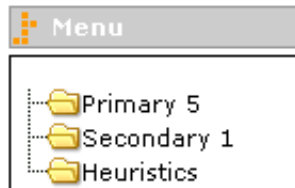
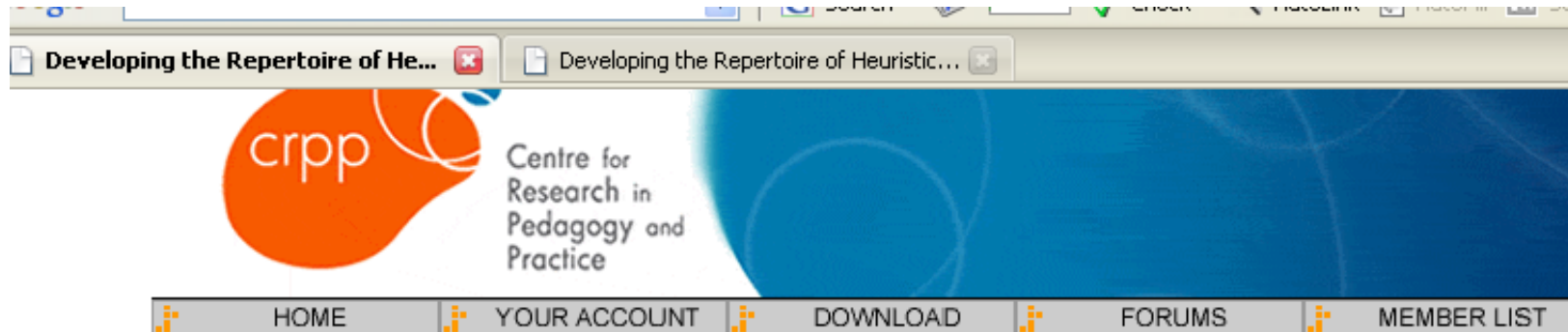
Please choose and click on one of the question block to proceed.

Software used

- PHP-Nuke version 7.4
- Problems in the databank were done in *Microsoft Powerpoint*[™] and
- *Impatica for Powerpoint*[™] version 3.3.2 was used to render the *Powerpoint* slides to *Java* files to be read by an Internet Browser

[An example...](#)

The video section



Video Clips Section

LCW: Introducing Problem Solving Strategies



Teacher briefly introduces problem solving and some heuristics. She gave an example and guided students with the working backwards strategy...

question discussed

 Please write your comments (0 comments)

DN: Problem Posing

The forum

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Menu

- Primary 5
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MPS Team

- * [Ho Kai Fai](#)
- * [Luis Lioe](#)
- * [John Tiong](#)

Chat Room

Users In Chat 0
Who Is Chatting

Developing the Repertoire of Heuristics for Mathematical Problem Solving: Forums


[Forum FAQ](#) [Search](#) [Usergroups](#) [Profile](#) [Log out \[luis \]](#)

You last visited on Fri Mar 02, 2007 2:07 pm
The time now is Fri Mar 02, 2007 2:09 pm

[View posts since last visit](#)

Developing the Repertoire of Heuristics for Mathematical Problem Solving Forum Index

[View your posts](#)
[View unanswered posts](#)

Forum	Topics	Posts	Last Post
Announcement			
 Supporting Media Some media players used to view video clips	2	2	Wed Oct 06, 2004 3:11 pm luis →
 Tutorials Some guidance in using important features in this forum.	1	2	Fri Sep 22, 2006 6:33 am Anita →
Review of Recorded Clips			
 Video Clips Contains clips of teaching practices in the classroom. Moderator luis	7	9	Thu Oct 07, 2004 9:47 am kaifai →
 Pair Work Clips Clips of students solving problems in pairs Moderator luis	2	2	Mon Mar 28, 2005 3:22 pm luis →
Problems			
Problems' Discussion			

Video clip of pair work

Example of one-man show setting

[new topic](#) [post reply](#)





Developing the Repertoire of Heuristics for Mathematical Problem Solving Forum Index -> Pair Work Clips

[View previous topic](#) :: [View next topic](#)

Author	Message
luis MPS Team Joined: Aug 11, 2004 Posts: 16 Location: NIE (CRPP)	<div>Posted: Mon Mar 28, 2005 3:22 pm Post subject: quote edit x ip</div> <div>Pair of students solving word problem(.wmv format) Pair's working</div> <div>This is an example of Pair, with predominant interaction as one-man show setting, solving the following problem:</div> <div>Quote: In a certain town, two thirds or the adult men are married to three fifths of the adult women. What fraction of the adults in the town are married?</div> <div>This example also highlights students' tendency to disregard situations described in the problem, and their immediate exploration of possible combinations of numbers to infer directly the needed mathematical operations.</div>
Back to top	profile email www

Display posts from previous: [All Posts](#) [Oldest First](#) [Go](#)

Other MPS Activities

 questions bank, you may post them here.				
MPS Activities Related Files				
	MPS Templates Templates and other related files that are used in scaffolding mathematical problem solving process.	1	1	Wed Mar 23, 2005 11:28 am luis →
	Workshop Slides Slides presented by MPS team in our workshops.	1	1	Wed Mar 23, 2005 11:24 am luis →
	Other Contributions Slides or files contributed by our teachers and other people, and they were used/presented in MPS project activities.	2	2	Wed Mar 23, 2005 11:35 am luis →

Example: Other MPS Activities

[? Forum FAQ](#) [Search](#) [Usergroups](#) [Profile](#) [Log out \[luis \]](#)

N2 Cluster Mathematics Conference



Developing the Repertoire of Heuristics for Mathematical Problem Solving Forum Index -> Workshop Slides

[View previous topic :: View next topic](#)

Author	Message
luis MPS Team Joined: Aug 11, 2004 Posts: 16 Location: NIE (CRPP)	<p>Posted: Thu Sep 08, 2005 3:37 pm Post subject: N2 Cluster Mathematics Conference quote edit x ip</p> <p>1. Teaching for problem solving, about problem solving, and via problem solving Workshop: Teaching for, about, via Problem Solving (.pdf format) Workshop: Teaching for, about, via Problem Solving(presentation format)</p> <p>2. A website resource for mathematical problem solving Website Resource - Sharing Session (.pdf format) Website Resource - Sharing Session (presentation format)</p> <p>Back to top profile email www</p>

Display posts from previous: All Posts Oldest First Go



Developing the Repertoire of Heuristics for Mathematical Problem Solving Forum Index -> Workshop Slides

All times are GMT + 8 Hours

Some issues

- Actual usage: limited.
Anecdotal feedback – troublesome to access internet during 'normal' lesson; not in the scheme of work; approaches to teaching MPS
- Issue of confidentiality in the RA part
- Type of software used:
PHP-Nuke version 7.4 required further patches; weakened security; website hacked into twice

Recommendations

- Rebuilding of website using MediaWiki 1.6.8
- Extending the video clips databank using MPS1 findings.
- Creating awareness of the public part of the website to local and international educators (search engines, advertise to targeted audience) and open up for collaboration.

The proposed front page

<div>Luislloe my talk preferences my watchlist my contributions log out</div> <div>article discussion edit history protect delete move watch</div>									
Mathematical Problem Solving									
<p>Mathematical Problem Solving (MPS) website provides a database of mathematical problems that are organised along related topics and various heuristics approach. The classification of problems follow a range of routine type, non-routine type, open-ended type, and investigative type. The database aims to expand repertoire of heuristics for mathematics educators, researchers, students, and anyone who have an interest in mathematics especially in the teaching and learning of mathematical problem solving area.</p>									
About the Website					Types of Mathematical Problems				
Provides information on the history and rationale behind the website as well as theoretical framework in the design to help users understand its purpose and fully use the content. Enter <i>About the Website</i>					Navigate the content of the website according to different problem type Enter <i>Mathematical Problem Type</i>				
Topics related to the Mathematical Problems					Heuristics for Mathematical Problems				
Navigate the content of the website according to specific topics that are related to each problem. Some problem has multiple topic relevance. Enter <i>Mathematical Problem Topic</i>					Navigate the content of the website according to various heuristics that are used to approach each problem. Enter <i>Mathematical Problem Heuristics</i> .				
Samples of Students' Work					MPS project Activities				
Find out samples of how students approach mathematical problems Enter <i>Students Work Sample</i> .					Find out activities that the MPS team have conducted Enter <i>MPS Activities</i> .				

The proposed video section

Luislioemy talkpreferencesmy watchlistmy contributionslog out

articlediscussionedithistoryprotectdeletedeletemovewatch

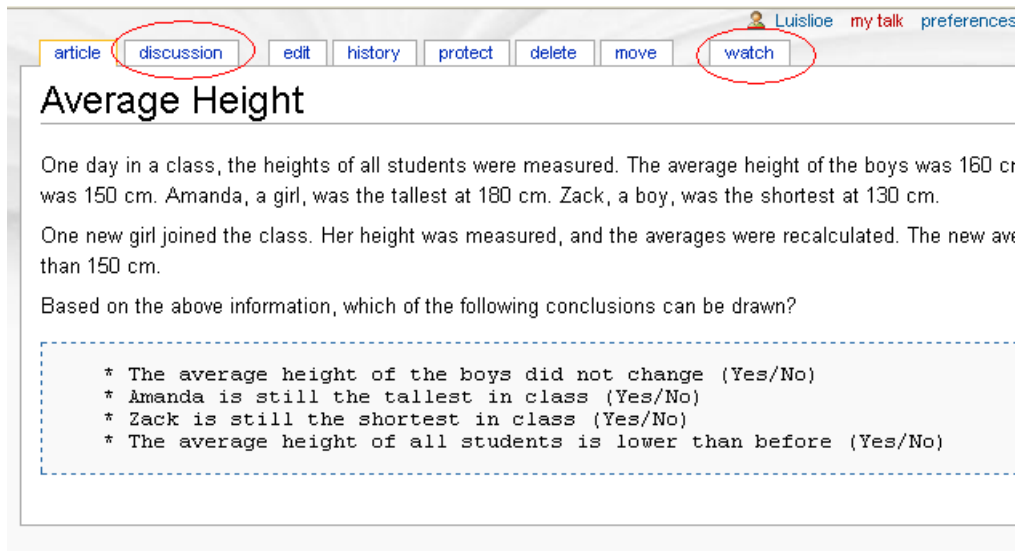
Video Resource

Video resource section consists of clips of exemplary teaching practices in the classroom that promote the learning of mathematical problem solving as well as samples of students' problem solving progression when they work in pairs. Some samples of the workshops that have been conducted by MPS team are also stored in this section.

Classroom Video Database of exemplary practices. Enter <i>Classroom Video</i>	Problem Solving Progression Database of students' problem solving progression Enter <i>Problem Solving Progression</i>
Workshop Resource Clips from the workshops that were conducted by the MPS team Enter <i>Workshop Resource</i>	Other Resources Other related resources Enter <i>Others</i> .

The proposed forum

A page on word problem:



The screenshot shows a Wikipedia article page for "Average Height". The navigation tabs at the top include "article", "discussion", "edit", "history", "protect", "delete", "move", and "watch". The "discussion" and "watch" tabs are circled in red. The article text describes a word problem about average height in a class. Below the text, there is a dashed box containing four multiple-choice questions.

article discussion edit history protect delete move watch

Average Height

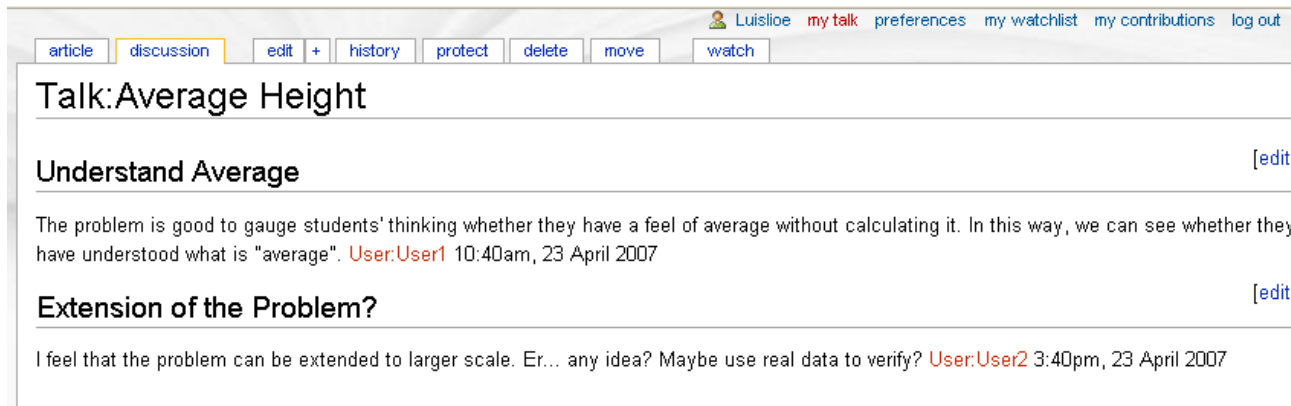
One day in a class, the heights of all students were measured. The average height of the boys was 160 cm and the average height of the girls was 150 cm. Amanda, a girl, was the tallest at 180 cm. Zack, a boy, was the shortest at 130 cm.

One new girl joined the class. Her height was measured, and the averages were recalculated. The new average height of the girls was more than 150 cm.

Based on the above information, which of the following conclusions can be drawn?

- * The average height of the boys did not change (Yes/No)
- * Amanda is still the tallest in class (Yes/No)
- * Zack is still the shortest in class (Yes/No)
- * The average height of all students is lower than before (Yes/No)

A forum on this page



The screenshot shows the "Talk:Average Height" page. The navigation tabs at the top include "article", "discussion", "edit", "history", "protect", "delete", "move", and "watch". The "discussion" tab is highlighted. The page content includes a section titled "Understand Average" and another titled "Extension of the Problem?".

article discussion edit history protect delete move watch

Talk:Average Height

Understand Average [\[edit\]](#)

The problem is good to gauge students' thinking whether they have a feel of average without calculating it. In this way, we can see whether they have understood what is "average". User:User1 10:40am, 23 April 2007

Extension of the Problem? [\[edit\]](#)

I feel that the problem can be extended to larger scale. Er... any idea? Maybe use real data to verify? User:User2 3:40pm, 23 April 2007

Moving Ahead

- Web-based cognitive tools, such as video cases on classroom teaching and student learning, are forefront PD innovations capable of promoting a stance of inquiry which transforms teacher and student learning for mathematical problem solving.
- The iterative design cycles in building such cognitive tools will be a rich site of research inquiry which we will embark on.

Thanks!

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enhance mathematical problem solving

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