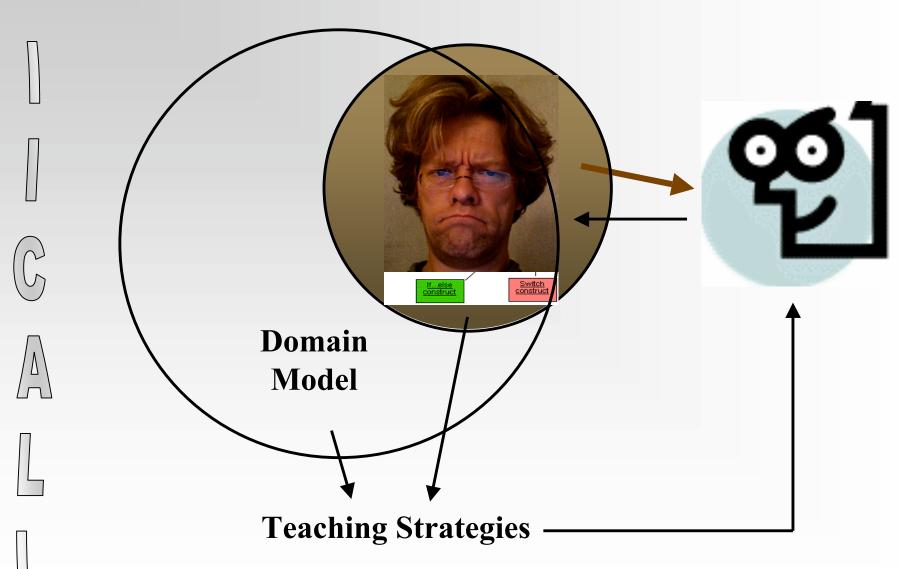


# Open Learner Models for Language Learning

Susan Bull University of Birmingham, U.K.

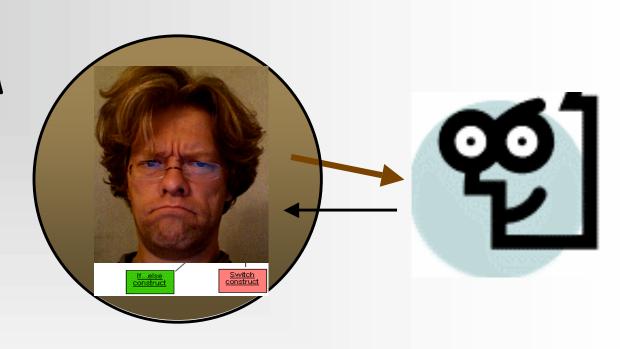
# Reminder: open learner models





# Reminder: open learner models

OLMlets Flexi-OLM





OLM as learning resource:

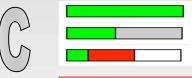
- reflection on knowledge and learning
- encourage learner autonomy/independence

# OLMIets Results

8 courses 2005-2006 (all levels, range of subjects)



- 245 user models
- 35,467 questions answered



• 33,759 inspections of knowledge level



- 1,872 inspections of misconceptions (5 courses)
- 3,668 inspections of peer comparison
- 2,167 inspections of lecturer expectations (7 courses)



# OLMIets Results

First completed course 2006-2007 (3<sup>rd</sup> year Interactive Learning Environments)

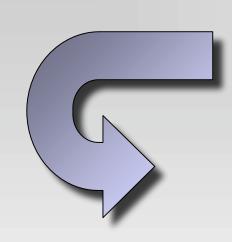
Assessing learner model - early completion

Opening the learner model to others:

- 31 learner models
- opened to all instructors (25 named) 81%
- 23 opened to all peers (19 named, 2 anonymously, 2 mixed)
- opened to some peers (1 named) 77%
- 23-25 peer models available per person 77-83%



# Overview



Second Language Acquisition Issues & Theory

Open Learner Modelling

**OLM:** 

**REFLECTION** → language awareness / noticing

examples

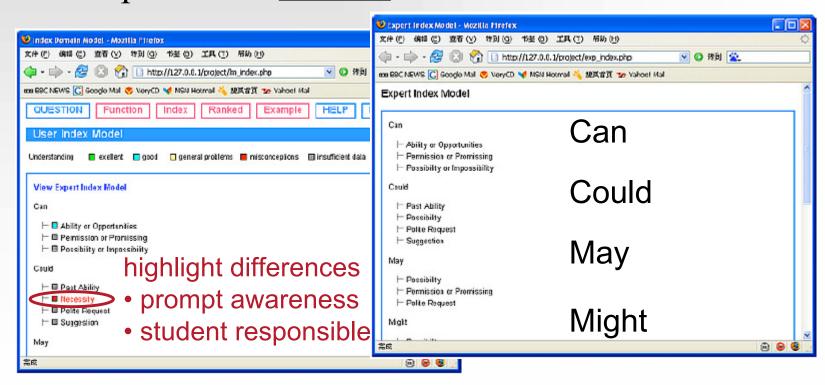
second language writing collaborative language learning language learning strategies language transfer



# Multiple Language Views

(MSc Project: Xu, 2006)

- 4 views (function, <u>index</u>, skill meter, example)
- Comparison to domain

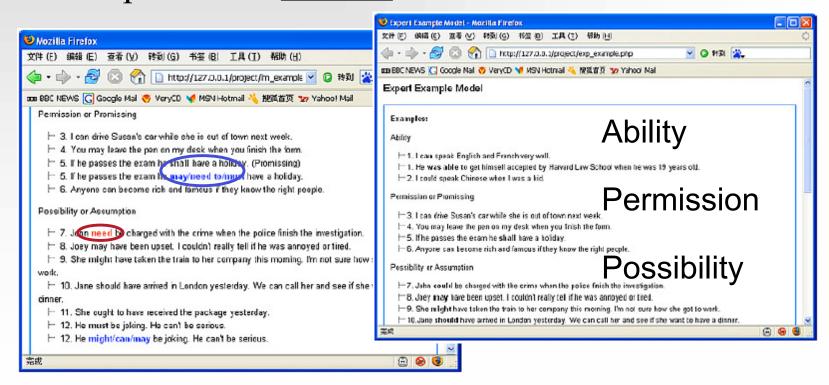




# Multiple Language Views

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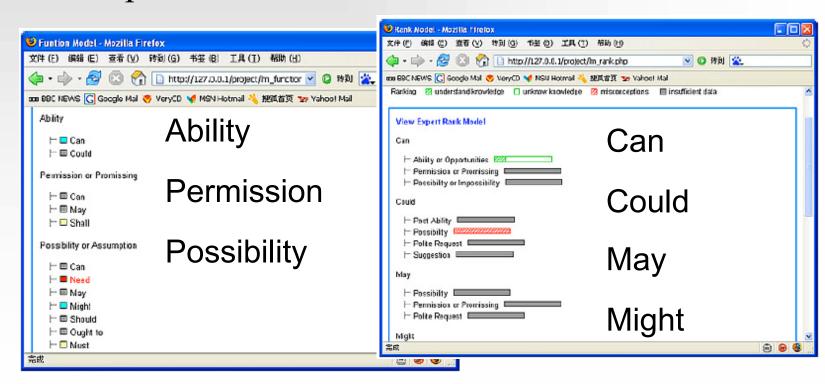




# Multiple Language Views

(MSc Project: Xu, 2006)

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- Comparison to domain

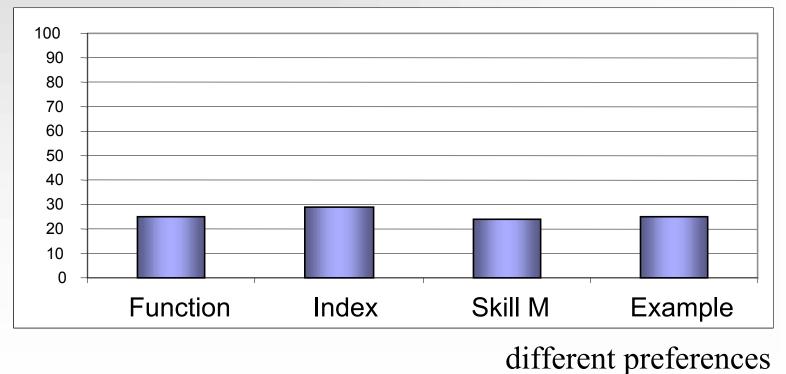




#### Multiple Language Views

(MSc Project: Xu, 2006)

learner model inspections (logs: % viewings, 15 users)

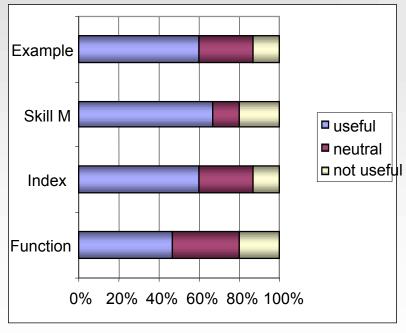




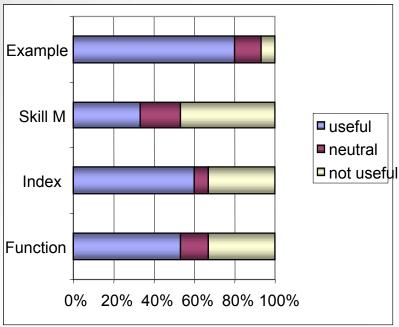
#### Multiple Language Views

(MSc Project: Xu, 2006)

#### help identify knowledge



#### compare to domain useful



different purposes



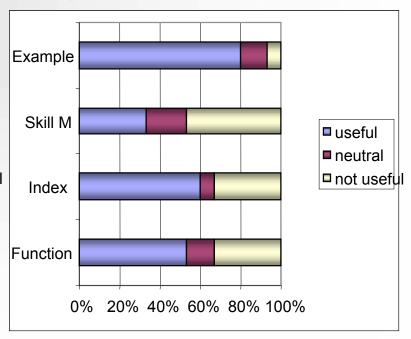
#### Multiple Language Views

(MSc Project: Xu, 2006)

#### help identify what to learn

# Skill M Index Function 0% 20% 40% 60% 80% 100%

#### compare to domain useful



different purposes

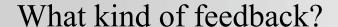


- Weaker students little attention to feedback (Cohen, 1987)
- Mental note of feedback (Cohen, 1987; Cohen & Calvacanti, 1990)
- Not know how to handle feedback (Cohen & Calvacanti, 1990)
- Should act on feedback / interactive feedback (Hyland, 1990)
- > Promote reflection on feedback with OLM
- ➤ Update learner model *after* draft/assignment completed: Information to aid *future* performance

See Yourself Write (Bull, 1997)

Teacher's template - feedback





- Address meaning-level first (Dheram, 1995; Zamel, 1985)
- Feedback on grammar ineffective, demotivate (Truscott, 1996)
- Feedback on form & content useful (Fathman & Whalley, 1990)
- Learners expect / want grammar correction (Cumming & So, 1996; Hedgcock & Lefkowitz, 1996; Radeki & Swales, 1988)
- Feedback in SYW <u>up to instructor</u> as fits context genre, ability, point in time, student personality (Ferris et al, 1997)

See Yourself Write (Bull, 1997)

Teacher's template - feedback



- Qualitative feedback
- Quantitative feedback
  - → system inference over time

LM: assignment 1

LM: assignment 1+2/2 = X

LM: assignment 3+X/2=Y

LM: assignment 4+Y / 2 ...

good okay

weak

See Yourself Write (Bull, 1997)

Teacher's template - feedback



<u>See Yourself Wi</u>	teacher's temprate	et student profile teacher's template
student name		
student number		
date		
assignment title		
assignment type		
assignment number		
o content	good coverage	o give example
o structure / argument	inconsistent	o give example
o style / vocabulary	appropriate	o give example
o grammar		$\overline{}$
o spelling	Please select the level of grammar	
o punctuation	good okay	weak
<ul> <li>general comments</li> </ul>		
teacher's notes	send information	Quit

See Yourself Write (Bull, 1997)

Teacher's template - feedback



See Yourself Write (Bull, 1997)

	See Yourself Write	T1 assignment 1	T2 assignment 2	T3 assignment 3		erall t model	
•	content coverage	SUPERFICIA	L SUPERFICIAL	GOOD	OKA'	Overall your gran	
	structure / argument	INCONSISTEN	TINCONSISTEN	TINCONSISTEN	L INCC	In your first assig ment your gramn was very good, h	ın- nar
	grammar	GOOD	OKAY	OKAY	OKA'	ever you have no managed to kee	ot
	spelling	most areas,	nar tends to be qu but you are havi	•	GOO	up consistently. You have demon that you CAN do	this
	punctuation	sometimes	ah and biji approp forget the other o	distinctions.	OKA'	well, and you she able to repeat the standard with a li	is high
			eably.		APPF	more effort.	
(	make notes	\	Vhy do you think	vou are now hav	ina more	difficulties than b	efore?

Why do you think you are now having more difficulties than before?

how to improve

comments

batang: long thin things

bilah: things with blades

- I did not refer to grammar information
- · I got help previously
- I did not check my work
- I took more risks this time
- other

UNSURE

I don't understan difference between bilah and batang.

I thought both are for long thin objects.



See Yourself
Write
(Bull, 1997)

	See Yourself Write	T1 assignment 1	T2 assignment 2	T3 assignment 3		verall nt model
-	content coverage	SUPERFICIAL	. SUPERFICIAL	GOOD	OKA'	Overall your grammatends to be okay.
	structure / argument	INCONSISTENT	INCONSISTEN	TINCONSISTEN	T INCC	In your first assign- ment your grammar
	grammar	GOOD	OKAY	OKAY	OKA'	was very good, how ever you have not managed to keep th

Overall your grammar tends to be okay.

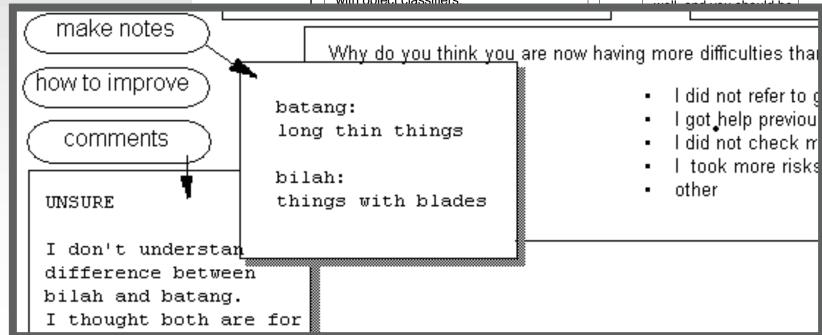
ment your grammar was very good, however you have not managed to keep this

See Yourself Write	T1 assignment 1	T2 assignment 2	T3 assignment 3	up consistently. You have demonstrated that you CAN do this well, and you should be able to repeat this high standard with a little more effort.
content			GOOD	more enort.
coverage	SUPERFICIAL	SUPERFICIAL		e difficulties than before?
structure / argument	INCONSISTENT	INCONSISTENT	INCONSISTENT	
grammar	GOOD	OKAY	OKAY	s this time
spelling	_ ~	ar tends to be qu but you are havir lassifiers.	~	





See Yourself Write	T1 assignment 1	T2 assignment 2	T3 assignment 3		rerall nt model		
content coverage	SUPERFICIAL	. SUPERFICIAL	GOOD	OKA'	Overall you	our grammar oe okav.	
structure / argument	INCONSISTENT	INCONSISTEN	TINCONSISTEN	L INCO	In your first assign- ment your grammar was very good, how- ever you have not managed to keep th	In your first assign- ment your grammar was very good, how- ever you have not managed to keep thi	st assign- r grammar
grammar	GOOD	OKAY	OKAY	OKA'			ever you ha managed to
spelling		ar tends to be qu but you are havi lassifiers				e demonstrated CAN do this	





See Yourself Write (Bull, 1997)

system inference

Overall your grammar tends to be okay. In your first assignment your grammar was very good, however you have not

Overall your grammar tends to be okay.
In your first assignment your grammar was very good, however you have not managed to keep this up consistently.
You have demonstrated that you CAN do this well, and you should be

verall nt model

IF student started well
AND IF performance decreased
THEN choose template good-decreasing

State: good start, decreasing performance, demonstrated ability, potential future good performance



#### See Yourself Write (Bull, 1997) instructor

comments

meaningfocussed

- Surely to make your point you need to argue that expansion of tourism has led to excessive development of transport systems?
- Yes, but it also works the other way around in that transport systems have allowed tourism to spread to more remote parts of the world.
- That's fine. But in your essay you've first said that transport has developed, then suggested that tourism was the cause of people wanting to travel rather than the means of travelling (i.e. transport) leading to more tourism. The organisation of your ideas is confusing.
- > clarified intention to instructor
- > clarified to student organisation, not content, is a problem





#### See Yourself Write

(Bull, 1997)

instructor comments

formfocussed • Generally good, but please give correct preposition after:

il est nécessaire il est important penser

beaucoup

- il est nécessaire + de
- il est important + de ...

> perceived as further task – encourages attention to feedback







# Peer Feedback on Writing

**S/UM** (Bull, 1997)

offer feedback

S/UM suggests matches according to:

- knowledge
- availability
- preferences

offer/receive feedback, collaboration, cooperation

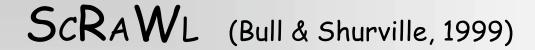
G

seek feedback

availability cooperate, collaborate

feedback: Humphrey						
l will give feedback on:	l would like feedback on:	Availability:				
⊠ content	□ content	available				
⊠ structure	☐ structure	Opossibly available				
☐ argument	□ argument	O not available				
□ style	⊠ style	Match for cooperation?				
□ other	other other					
general	⊠ general	⊚ yes				
	_,	O no				
	Open for general feedback	Metch for collaboration?				
l	yes	⊜ yes				
Cancel OK	O no	<b>®</b> no				





Student Concerns, Reader Attitudes and Writer Leanings



- encourage audience/reader awareness
- advice to create reader-based text
- fits user's existing writing strategies



ScRAWL (Bull & Shurville, 1999)

Student Concerns, Reader Attitudes and Writer Leanings

Student/reader/writer models for second language writing

"The first step in designing your writing to be read is to understand the needs, attitudes, and knowledge of your particular reader, and to help that reader turn your written message into the meaning you intended" (Flower, 1993)

Advice should be given at the *right moment* 





ScRAWL (Bull & Shurville, 1999)

Student Concerns, Reader Attitudes and Writer Leanings

Chandler (1995) & Wyllie (1993):



- Architects plan first, not correct as write, edit later
- Bricklayers rework sentences & paragraphs as they go
- Oil painters not plan, write ideas as occur, revise later
- Water colourists single draft requiring little revision
- Sketchers rough plan at start, later revised











ScRAWL (Bull & Shurville, 1999)

Student Concerns, Reader Attitudes and Writer Leanings



Planning not necessarily important (Torrance et al, 1994)



- Individuals have preferred approaches (Snyder, 1993)
- Not necessarily easy to alter strategies (Wyllie, 1993)
- Experienced writers: variety of strategies (Chandler, 1993; Snyder, 1993)









SCRAWL (Bull & Shurville, 1999)

Student Concerns, Reader Attitudes and Writer Leanings

Questions for Writer Model

	Always	Usually S	Sometime	s Rarely	Never
Does writing help you to organise your thoughts? Do you correct slips as you write? Do you complete a draft at the first attempt? Do you start with the easiest part? Do you find the screen restrictive? Do you consciously choose your writing strategies?	000000	000000	000000	000000	000000
How much do you revise your text at the end of writing How much do you plan at the beginning?	Very Much g? O	Muich	Same O O	Very Little	Not At All

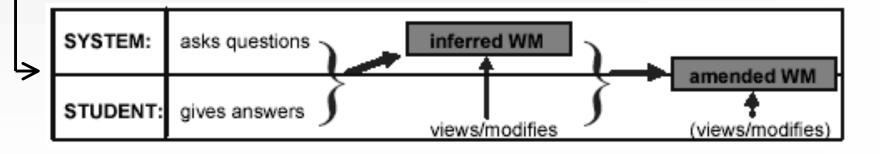
Writing – organise thoughts, correct as write, revise at start/end...?



SCRAWL (Bull & Shurville, 1999)

Student Concerns, Reader Attitudes and Writer Leanings

- Writer Model: cooperative construction
- Reader Model: student answers questions about readers
- Student Model: inferred from help viewed + student given







Student Concerns, Reader Attitudes and Writer Leanings

- Writer Model: cooperative construction
- Reader Model: student answers questions about readers
- Student Model: inferred from help viewed + student given

Questions about readership  $\rightarrow$  advice at appropriate time

Your readers are not experts:

- Is it clear *what* is important?
- Is it clear *why* it is important?
- Have you defined your terms?











Student Concerns, Reader Attitudes and Writer Leanings

- Writer Model: cooperative construction
- Reader Model: student answers questions about readers
- Student Model: inferred from help viewed + student given

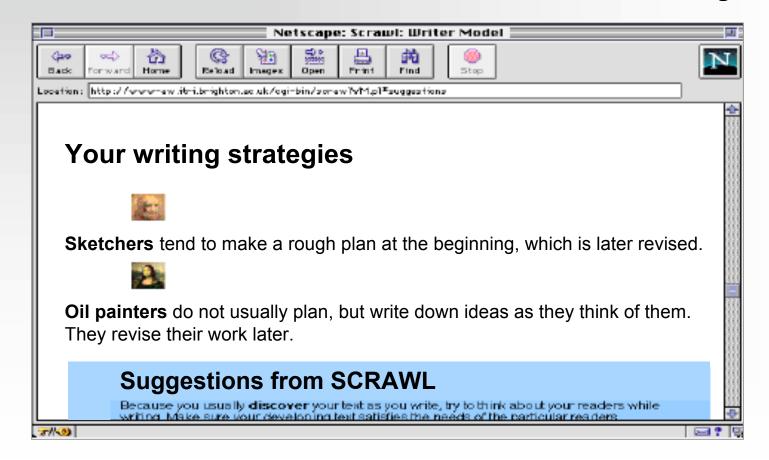
Standard learner modelling



ScRAWL (Bull & Shurville, 1999)

49 users 82% agreed

Student Concerns, Reader Attitudes and Writer Leanings

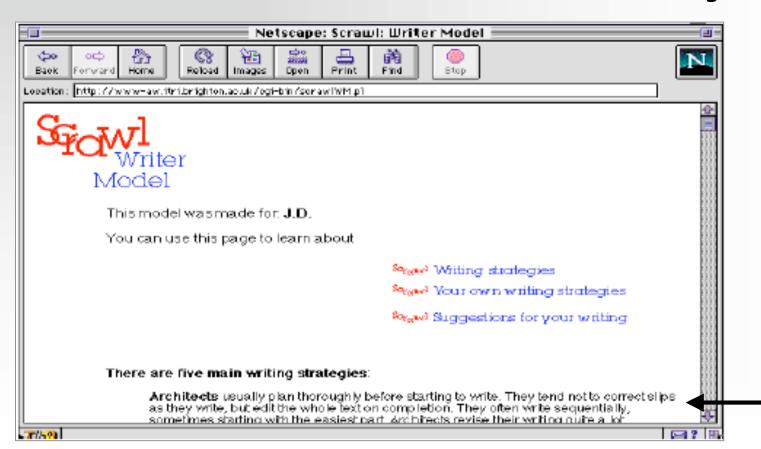




SCRAWL (Bull & Shurville, 1999)

49 users 82% agreed

Student Concerns, Reader Attitudes and Writer Leanings





# Learn one set of words:

#### Portuguese

- 1. cow vaca
- 2. cat gato
- 3. dog cão
- 4. rabbit coelho
- 5. bird passaro

#### Chinese (Mandarin)

- 1. cow muniu
- 2. cat māo
- 3. dog gou
- 4. rabbit tùzi
- 5. bird niǎo
- How did you approach learning this vocabulary?
  - o repetition
  - imagery, auditory link
  - o place words in a sentence

- o flashcards/test
- o transfer
- o co-operation

# M An Example: Portuguese

- 1. cow vaca, vaca, vaca, vaca, vaca, vaca
- 2. cat gato, gato, gato, gato, gato, gato
- 3. dog cão, cão, cão, cão, cão, cão, cão
- 4. rabbit coelho, coelho, coelho, coelho
- 5. bird passaro, passaro, passaro, passaro

# An Example: Portuguese

- 1. cow vaca
- 2. cat gato
- 3. dog cão

- 4. rabbit coelho
- 5. bird passaro

# An Example: Chinese (ME!)

- 1. cow muniu
- 2. cat māo
- 3. dog gou
- 4. rabbit tùzi
  - 5. bird niǎo

"The cow jumped over the moon"

m[e]ow

listening to language CD











#### Grouping

**Academic** 

university

lecturer / professor

module / course

assessment

examination

**Opposites** 

friendly / unfriendly

helpful / unhelpful

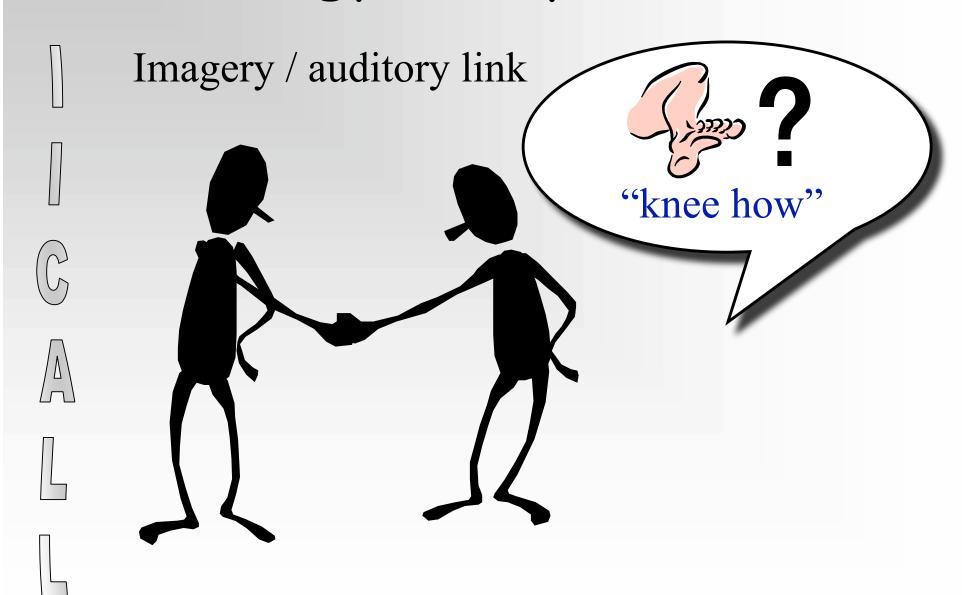
satisfied / dissatisfied

interested / disinterested

polite / impolite

Placing new words in context

"boring" — This presentation is quite boring



Analysing expressions

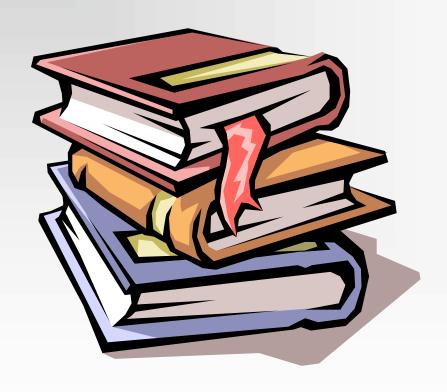
"Handschuh" —— Hand shoe: glove (German)

Finding out about language learning









Cooperating with peers



Seeking practice opportunities



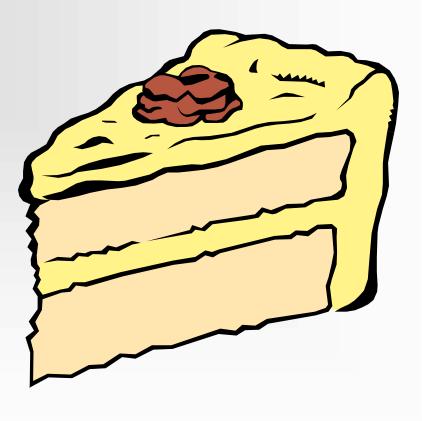


Rewarding yourself











### Language Learning Strategies

Language learning strategies are:

"concerned with how learners use their brains consciously and purposefully to handle their learning and make it more effective"

(Fox & Matthews, 1991)

Approaches to language learning:

- believe in <u>using</u> the language
- wish to <u>learn about</u> the language
- consider <u>personal factors</u> important (emotion, aptitude)

(Wenden, 1987)



#### Successful/Unsuccessful Learners

- 6

- Beliefs about language learning can affect strategy choice (Abraham & Vann, 1987; Wenden, 1987; Yang, 1999)
- Not all successful learners use same strategies (Stevick, 1989)
- Successful and unsuccessful learners may use similar strategies (Vann & Abraham, 1990)
- Effective language learners have a larger repertoire of strategies, use more effectively (O'Malley & Chamot, 1990)
- Does broader strategy use facilitate learning, or does proficiency allow broader strategy use? (Griffiths, 2003; Skehan, 1989)
- ➤ Provide information about language learning strategies (Oxford, 1990; Rubin & Thompson, 1982; Wenden, 1991)

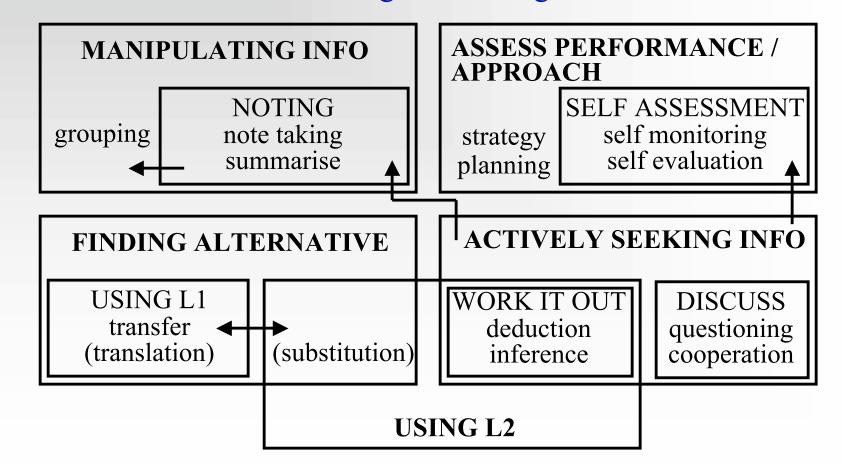


### Adaptive Strategy Suggestions

Mr Collins (Bull, 1997)

strategies based on O'Malley & Chamot (1990)

Suggests new strategies based on those already used - likelihood of understanding new strategies





### Adaptive Strategy Suggestions

Mr Collins (Bull, 1997)

strategies based on O'Malley & Chamot (1990)

Suggests new strategies based on those already used - likelihood of understanding new strategies

#### **MANIPULATING INFO**

grouping no

NOTING note taking summarise

#### ASSESS PERFORMANCE / APPROACH

strategy planning

SELF ASSESSMENT self monitoring self evaluation

The combination of your use of the strategies of note-taking and summarization show that you are very keen on noting down new or relevant information. It would be useful also to consider the grouping of information - i.e. organising new or important information in some manner which is meaningful to yourself.



### Negotiating Strategy Use in LM

Mr Collins (Bull, 1997)

strategies based on O'Malley & Chamot (1990)

As you already use deduction effectively, you might like to try a complementary strategy: inferencing

- try inferencing
- no
- find out more no (& comment)

evidence: student views rules in system

#### Find out more

Deduction is based on rules - e.g. from the rule the pronoun is pre-verbal in negative clauses, you know that... Inferencing is similar, but you use examples rather than explicit rules - e.g. from the example sentence  $N\tilde{a}o$ os compra... Do you wish to try inferencing?

• yes

no

• no (& comment)

#### No (& comment)

Please select one of the following

- it does not feel right for me
- it does not feel right for me (& comment)
- I would prefer to try another
- I would prefer to try another (& comment)
- I want to come back to this
- I want to come back to this (& comment)



### Negotiating Knowledge in LM

Mr Collins (Bull & Pain, 1995)

Reflect on knowledge & learning

The pronoun is:	Your confidence	System confidence
<ul> <li>Pre-verbal in negatives</li> <li>e.g. Não os compra</li> </ul>	unsure	very sure
• Post-verbal in positive main clauses e.g. Compra-os	almost sure	unsure

This new confidence value is too high. Your last five attempts to place the pronoun in positive main clause statements were:

- \*O Manuel a mostrou no mapa. \*O homem o comeu rapidamente.
- O Manuel mostrou-a no mapa. O homem comeu-o rapidamente.
- \*O Manuel mostrou a no mapa.

You have probable transfer from Spanish twice.

You have omitted the hyphen once.



## Negotiating Knowledge in LM

Mr Collins (Bull & Pain, 1995)

Modelling interlanguage (Selinker, 1972)



Consciousness-raising, noticing (Rutherford & Sharwood Smith, 1985; Smith, 1990)



Currently: task-based instruction

• some focus on form likely useful (Ellis, 2005; Swan, 2005)



### Language Transfer

Mr Collins (Bull, 1994)

target language: Portuguese

→ 1. verb, pronoun.

> 2. neg, pronoun, verb.

3. aux, pronoun, verb.

other language: English

1. verb, pronoun.

2. neg, verb, pronoun.

3. aux, verb, pronoun.

other language: Spanish

1. pronoun, verb.

2. neg, pronoun, verb.

3. pronoun, aux, verb.

Other languages: English, Spanish, Catalan, French

eg. Compra-os.

eg. Não os compra.

eg. Tem-nos comprado.

eg. He buys them.

eg. He does not buy them.

eg. He has bought them.

eg. Los compra.

eg. No los compra.

eg. Los ha comprado.

→ You have probable transfer from Spanish twice.



#### Language Transfer

Mr Collins (Bull, 1994)

Other languages: English, Spanish, Catalan, French



"Transfer is the influence resulting from similarities and differences between the target language and any other language that has been previously (and perhaps imperfectly) acquired." (Odlin, 1989)

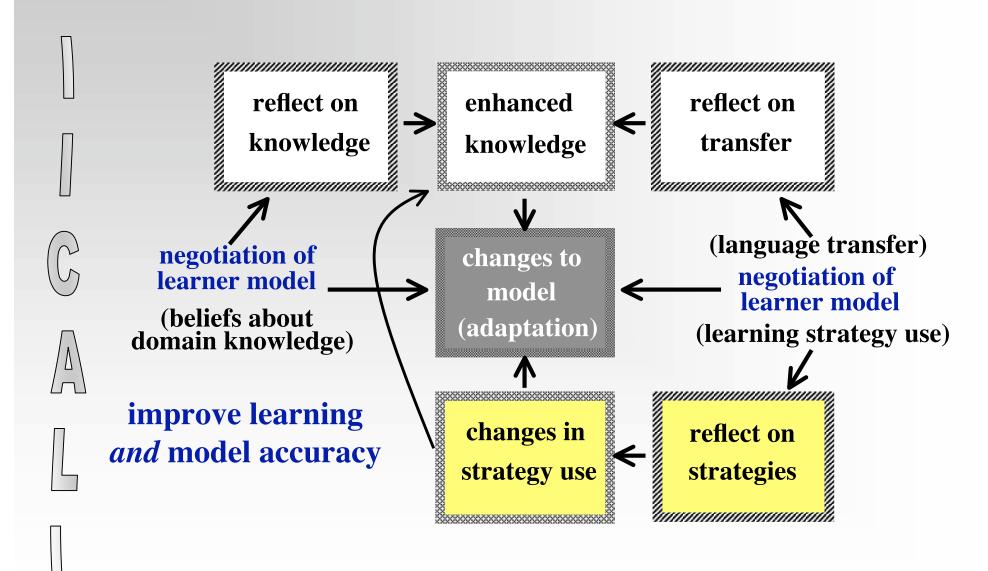


Likelihood of transfer affected by:

- proficiency (Ringbom, 1983)
- perceived language distance (Kellerman, 1977)
- diagnose transfer correctly (appropriately for <u>individual</u>)
- raise awareness of transfer-related problems
- > prompt positive transfer



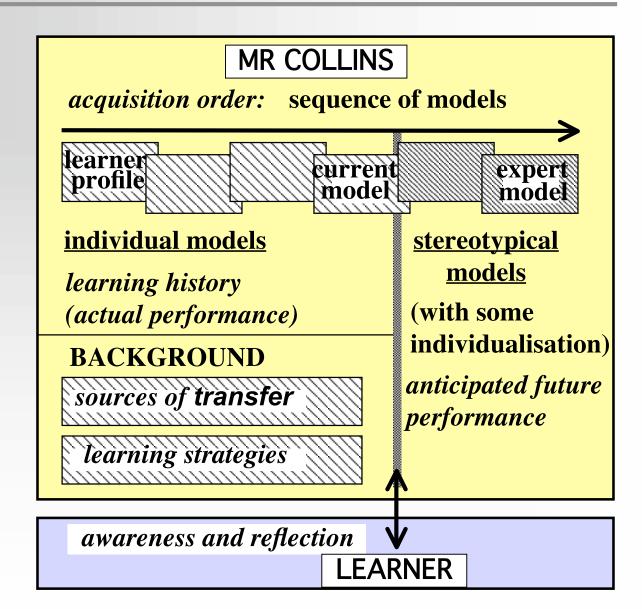
#### Mr Collins: Focus on Language Issues





#### Mr Collins: Focus on Language Issues

- knowledge
- acquisition sequence
- CS
- language transfer
- language learning strategies
- language
   awareness





#### Mr Collins: Focus on Language Issues

9 users negotiating the learner model

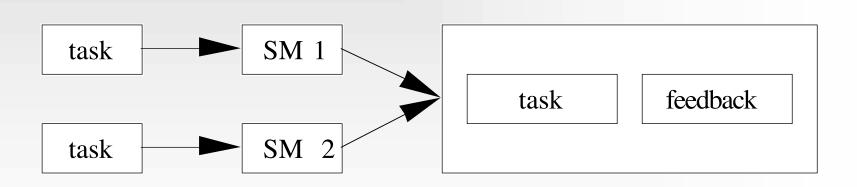
	changed	would	challenged	would
	own	change own	system	challenge
1	<u>yes</u>		<u>yes</u>	
2	<u>yes</u>		<u>no</u>	<u>yes</u>
3	<u>no</u>	<u>?</u>	<u>no</u>	<u>yes</u>
4	<u>no</u>	<u>?</u>	<u>yes</u>	
<u>5</u>	<u>no</u>	<u>?</u>	<u>yes</u>	_
<u>6</u>	<u>no</u>	<u>yes</u>	<u>no</u>	<u>yes</u>
7	<u>no</u>	<u>yes</u>	<u>no</u>	<u>yes</u>
8	<u>no</u>	<u>yes</u>	<u>no</u>	<u>yes</u>
9	<u>yes</u>		<u>yes</u>	-



25M (Bull & Broady, 1997)

French perfect/imperfect tenses

- difficult for anglophone learners (Andrews, 1992)



> spontaneous peer tutoring



#### 25M

(Bull & Broady, 1997)

#### STUDENT 1

answer 2: savais

answer 3: m'est arrivé

perfect is usually used for completed events; imperfect is sometimes used for completed events; imperfect is always used for continuous events; imperfect is used after 'si' in hypothetical clauses.

#### STUDENT 2

answer 2: as su

answer 3: m'est arrivé

perfect is always used for completed events; imperfect is usually used for continuous events; perfect is occasionally used for continuous events; perfect is used after 'si' in hypothetical clauses.



25M (Bull & Broady, 1997)

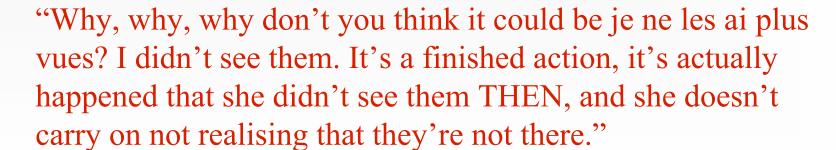
French perfect/imperfect tenses - pen and paper study

explicit statement of language rules

(C)



"Oh yeah, it's right because um, if you've got something happening and something else is going on, then you have the something else is going on in the imperfect and something happening in the perfect, don't you?"





25M (Bull & Broady, 1997)

French perfect/imperfect tenses

- pen and paper study

explanations even when students agree

6

"Si tu savais."

"Yeah, I put that as well."

"You put that as well."

"How sure are you of that?"

"I was, I'm quite sure, yeah."

"Quite sure."

"But why, though?"

"Because it was a state..."

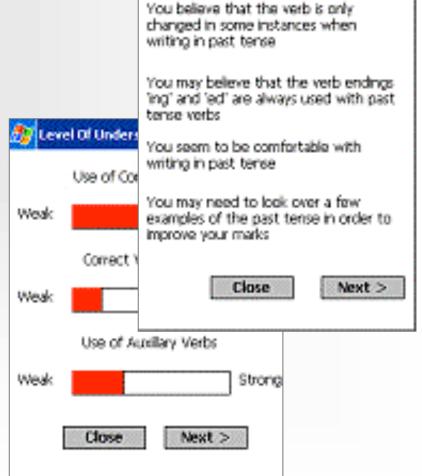




- skill meter
- you believe...
- you may believe...

(knowledge & misconceptions)

individual and collaborative use



BeliefModel

**4€ 10:25** 



Mobile 25M (Bull et al, 2005)

C

"I think it is used to describe something that has happened before you do something else, so when you talk about two things. What score did you get for it?"

"You do better in the past perfect, can you tell me what it is? I did not do well on that."



#### 25M & Mobile 25M

- richer interactions with 2SM
- due to lack of information about relative strengths / weaknesses of partners?

> restrict information about correctness?

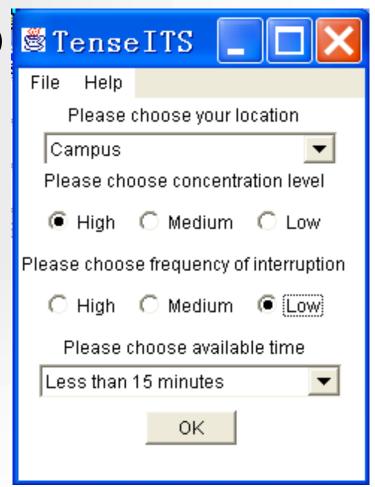


TenseITS (Cui & Bull, 2005) TenseITS

Adaptation according to:

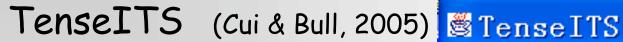
- learner model
- time available
- contextual features / location ability to concentrate likelihood of interruption

Chinese learners of English



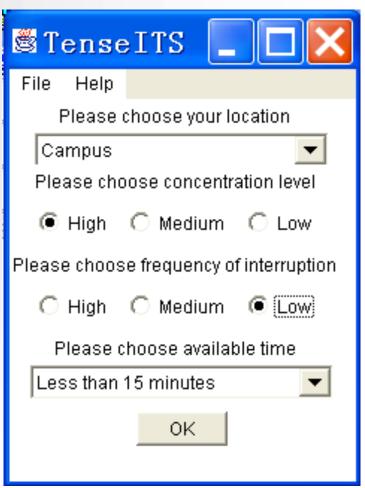
> Suitable for use in a range of locations





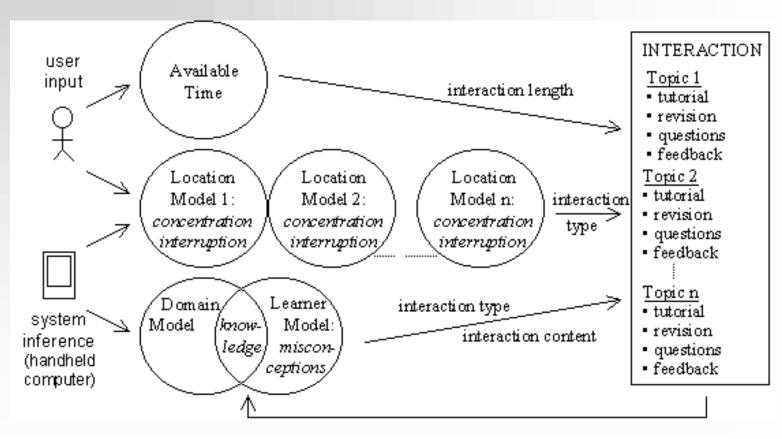
Individualised learning opportunities *between* other activities

- between lectures
- waiting for friends
- in bed

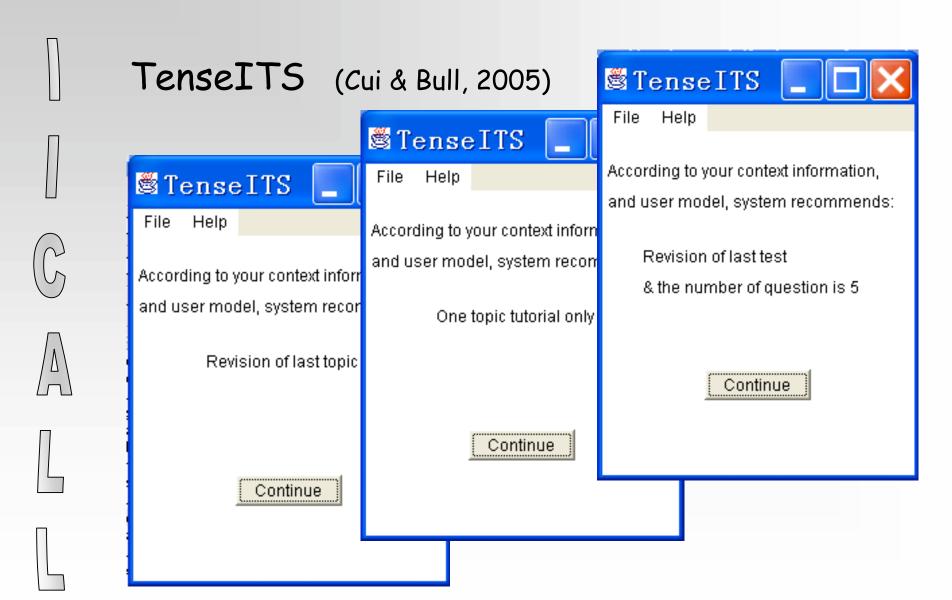




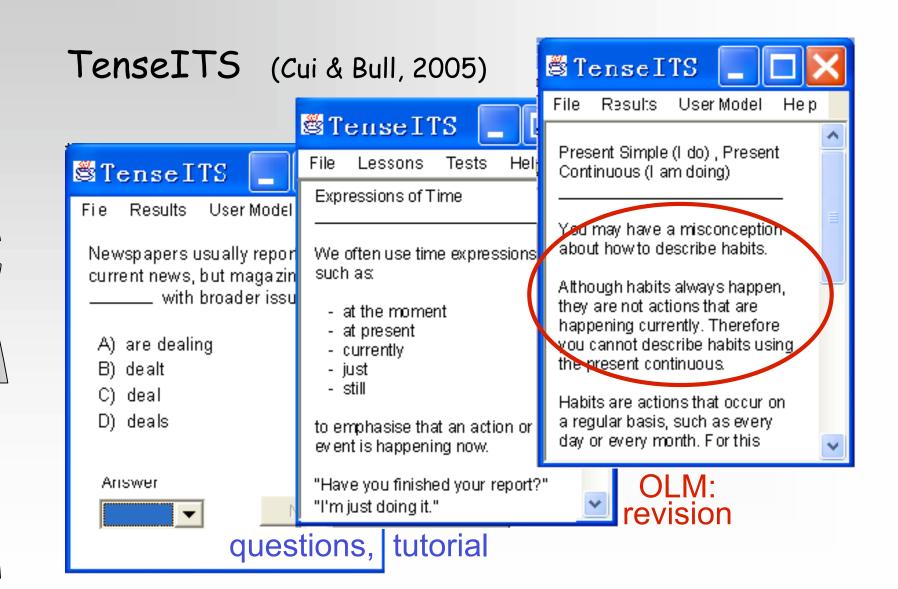










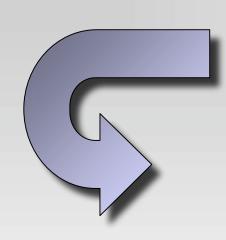




- TenseITS (Cui & Bull, 2005)
  - 8 Chinese students at University of Birmingham
- G
- 8: suitable for mobile learning needs
- 6: context/location analysis useful
- 8: system recommendations helpful
- 7: would use for short periods
- 7: would use for long periods



#### Summary



Second Language Acquisition Issues & Theory

Open Learner Modelling

**OLM:** 

**REFLECTION** → language awareness / noticing

second language writing collaborative language learning language learning strategies language transfer

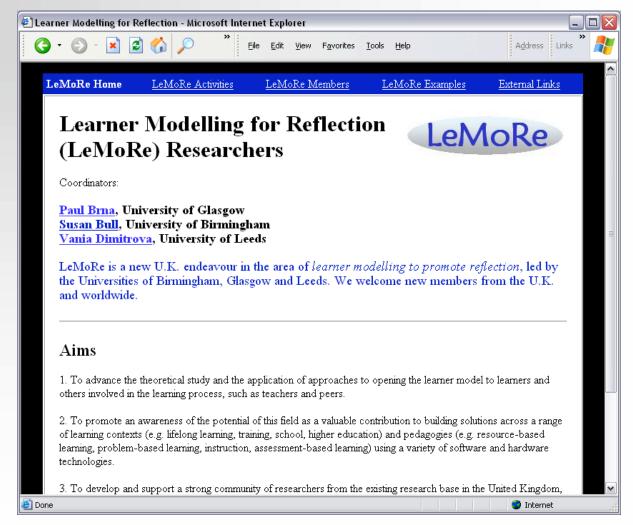


#### Join LeMoRe?

#### http://www.eee.bham.ac.uk/bull/lemore/

If you are interested in open learner models, take a look at the LeMoRe website and then join.

Send me an email requesting to be added. s.bull@bham.ac.uk





Can we make
Detmar happy
with an open
learner model?



- Purpose of presenting learner model data user's right, navigation, accuracy, reflection, planning, monitoring, collaboration, competition, control, trust, assessment?
- Degree of openness of the learner model inspectable negotiated editable; who initiates?
- Which learner model data to present which contents? what level of detail? what point in time? uncertainty?
- How to present the learner model information: modelling technique, nature of domain, learner preference graphical, textual? overview, details (all details/targeted details)?
- How the OLM integrates with the instructional approach
- Who should have access to learner model data learner, another program, instructor, peers, parents? control over access?



Purpose Elements	Properties Description	Acc- uracy	Reflec- tion	Plan/ Monitor	Collab/ Comp	Navig- ation	Right, control, trust	Assess- ment		
Extent of model accessible	Complete Partial									
	Knowledge level Knowledge Difficulties Misconceptions									
	Learning issues Preferences Other Other users' LM	1	– ac	curac	V					
Presentation	Textual (i.e) Graphical (i.e)		- reflection							
	Overview Targeted/all Details All Details				g, mo	nitori	ng			
	Support to use		-co	llabor	cation	, com	petiti	on		
Match underlying rep	Similar		<ul> <li>– collaboration, competition</li> <li>– navigation</li> <li>– user's right, control, trust</li> </ul>							
Access to uncertainty	Complete Partial									
Role of time	Previous Current Future		- assessment							
Access method	Inspectable Editable Student persuade System									



Purpose Elements	Properties Description	Acc- uracy	Reflec- tion	Plan/ Monitor	Collab/ Comp	Navig- ation	Right, control, trust	Assess- ment
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Role of time	Previous Current Future					Other	naora!	T N/I
Access method	Inspectable Editable Student persuade System					Other	users	



## SMILI for Language?

❖ In groups, using the SMILI OLM Framework as a starting point, design an open learner model that would be

particularly suitable for language learners.

Present your group's design to the other groups



- Purpose of presenting learner model data user's right, navigation, accuracy, reflection, planning, monitoring, collaboration, competition, control, trust, assessment?
- Degree of openness of the learner model inspectable negotiated editable; who initiates?
- Which learner model data to present which contents? what level of detail? what point in time? uncertainty?
- How to present the learner model information: modelling technique, nature of domain, learner preference graphical, textual? overview, details (all details/targeted details)?
- How the OLM integrates with the instructional approach
- Who should have access to learner model data learner, another program, instructor, peers, parents? control over access?