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# Flow, Interactivity and Online Learning

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# Overview

**Expt One:** *Interactivity, Motivation  
and Engagement*

**Expt Two:** *Exploring online  
learning using 'flow'*

**Expt Three:** *A qualitative  
study of flow*

**Discussion**

# Research Aims

- ◆ To identify groups of students with different profiles on the *Waves* emotion and goal probes.
- ◆ To identify whether specific learner characteristics were associated with the emotion and goal probe profiles.
- ◆ To identify whether specific learning outcomes were associated with the emotion and goal probe profiles.

**Learner Characteristics**

```
graph TD; A[Learner Characteristics] --> B["Task Reactions  
(interest, emotions, goals)"]; B --> C[Learning Outcomes]
```

The diagram illustrates a three-stage process. It begins with a box labeled 'Learner Characteristics', which has an arrow pointing to a larger box labeled 'Task Reactions (interest, emotions, goals)'. This central box then has an arrow pointing to a final box labeled 'Learning Outcomes'. The boxes are arranged vertically, and the arrows indicate a downward flow of influence.

**Task Reactions**  
(interest, emotions, goals)

**Learning Outcomes**

## Probe Questions:

Before you go any further with "When waves meet" answer the following.

(Please answer **every** question)

**Right now I'm feeling:**

Not at all

A lot

- |            |                       |                       |                       |                       |
|------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Surprised  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Confused   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Bored      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Challenged | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Frustrated | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Interested | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Pleased    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**Right now**

**my aim is to:**

- |  |                       |                       |                       |                       |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| Learn enough to do well on the questions at the end. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Understand what this topic is all about.             | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Finish as quickly as I can.                          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Make sure I don't appear to be too dumb at this.     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**Now, click on submit- click only once and be patient.**

Submit

# Analyses

- ◆ Factor analysis of emotion and goal probe responses - Probe 1 and Probe 2 separately
- ◆ Indicated 3 factors for each probe - similar factors
- ◆ Cluster analysis using 6 probe factors (3 factors x 2 probes)
- ◆ 5 clusters

*Pooled within groups Correlations between Discriminating Variables and the Significant Standardized Canonical Discriminant Functions.*

Standardized Canonical  
Discriminant Functions.

**Discriminating variables:**      **Function 1**      **Function 2**

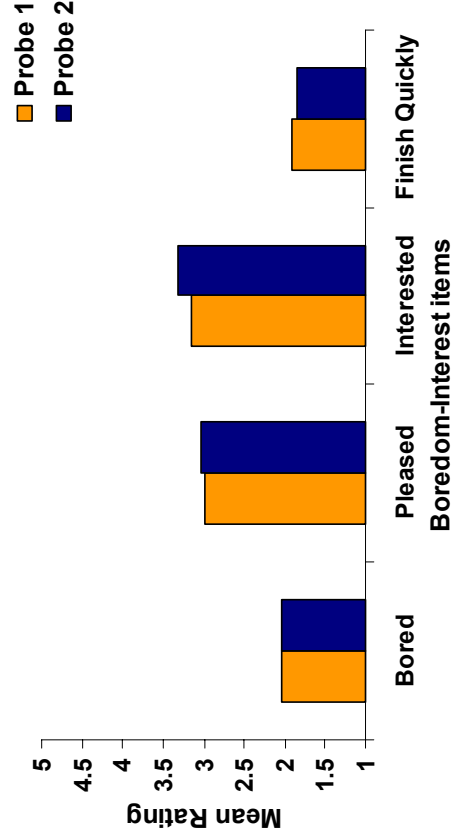
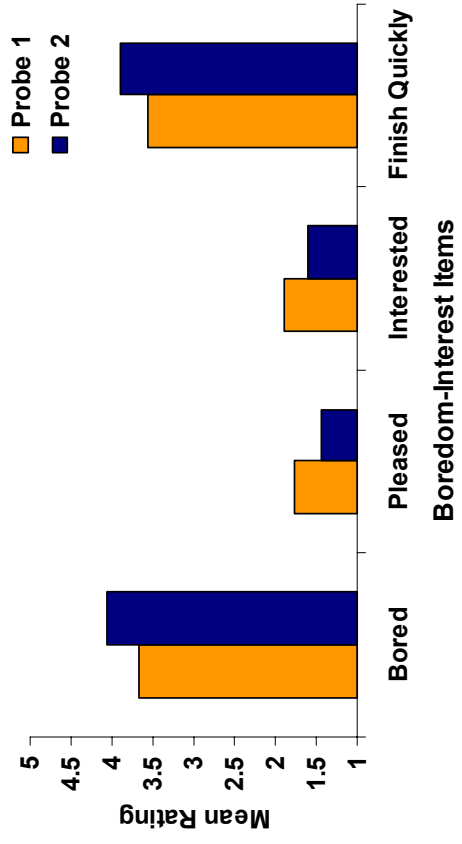
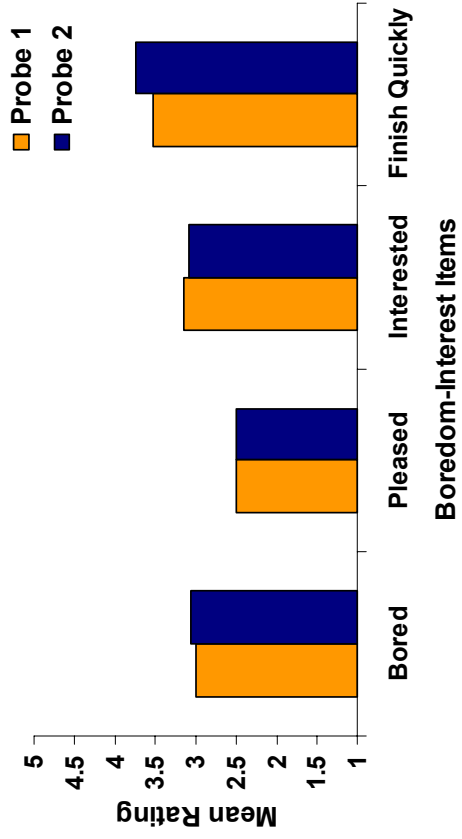
<b>Performance goal orientation</b>	<b>-.59</b>	<b>.52</b>
<b>Mastery goal orientation</b>	<b>.55</b>	<b>.52</b>
	<b>.54</b>	<b>.02</b>
	<b>.39</b>	<b>-.04</b>
	<b>.16</b>	<b>-.17</b>
	<b>.08</b>	<b>.85</b>
	<b>.42</b>	<b>.33</b>
	<b>54.0</b>	<b>30.2</b>

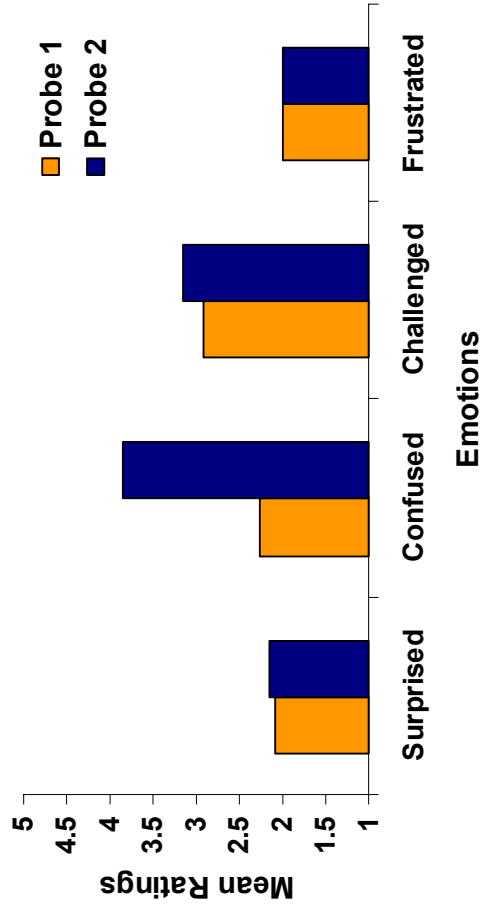
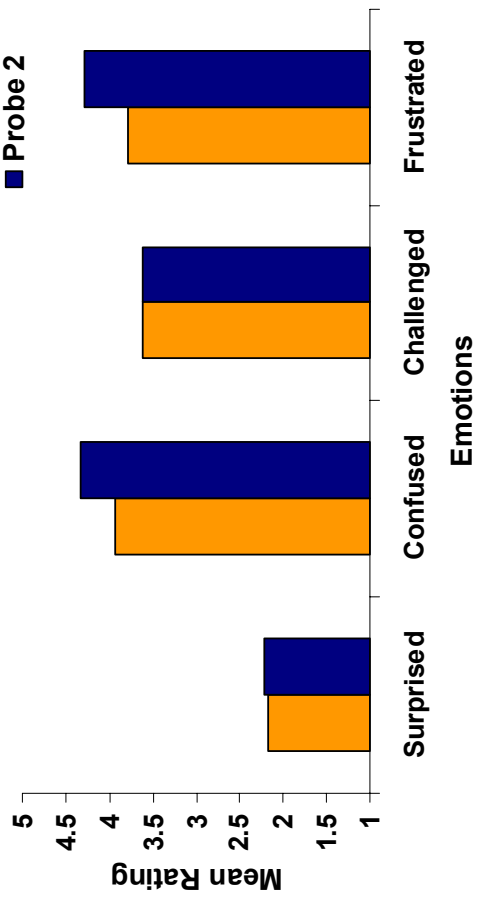
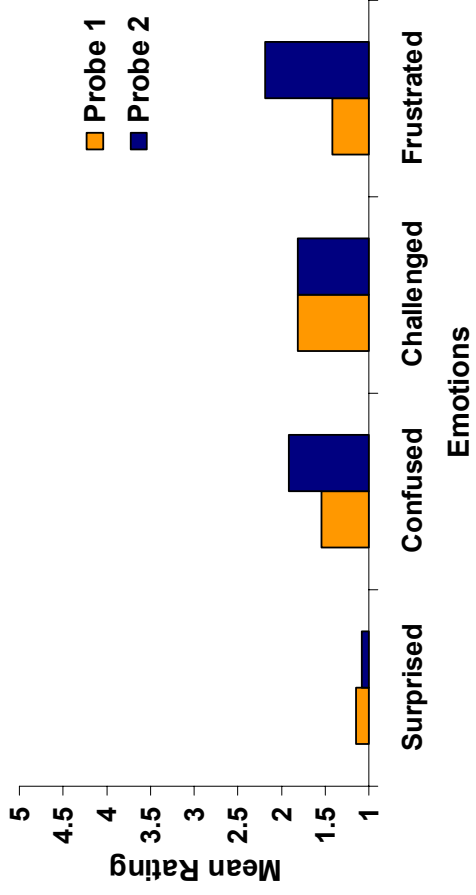
*Means and Standard Deviations (in parentheses) for Prior Knowledge and Learning Measures: Probe Profile Clusters*

	Probe Profiles				
	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
<b>Pre-test Physics Knowledge (1-8)</b>	3.61 (1.59)	4.53 (1.73)	4.10 (2.00)	4.08 (1.70)	2.94 (1.06)
<b>Post-test Physics Knowledge (1-8)</b>	5.00 (1.72)	6.20 (1.82)	5.33 (1.37)	5.52 (1.38)	4.07 (1.53)
	1.93 (2.21)	2.87 (2.07)	<b>3.17<sup>a</sup></b>	<b>3.35<sup>b</sup></b>	<b>0.87<sup>ab</sup></b>
			<b>(1.95)</b>	<b>(2.37)</b>	<b>(1.41)</b>
					18

**Note: groups with same superscript significantly different at  $p < 0.05$ .**









# Flow



*About flow*

*An experiment*

*Findings*

# What is flow?

- ◆ Mihalyi Csikszentmihalyi, 1980

- ◆ One description:

*“The stream of ordinary experiences, ranging from the faintly pleasant to the boring, and the anxious, is made up of a random collection of discordant notes. Occasionally the notes fall into a harmonious chord – when that happens, information in the consciousness is ordered, and we experience flow.”*

Massimini and Carli 1988

- ◆ From a flow-er:

*“My mind isn’t wandering. I am not thinking of something else. I am totally involved in what I am doing. My body feels good. I don’t seem to hear anything. The world seems to be cut off from me. I am less aware of myself and my problems.”*

# Elements of flow

*clear goals*

*feedback*

*matching skills & challenges*

*merging of action and awareness*

*deep concentration*

*sense of control*

*autotelic*

*lack of self-consciousness*

*time flies!*

**“antecedents”**

**“experiences”**

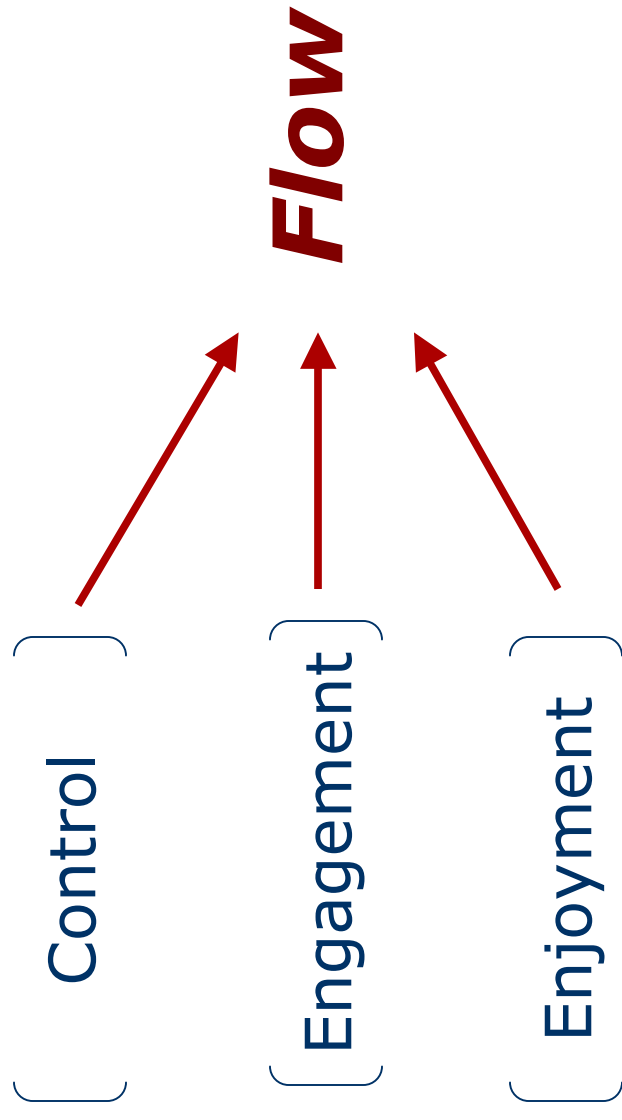
**“effects”**

# Who cares about flow?

Everyone!

- Web use and navigation
- Web marketing
- Everyday life activities
- *Technology use in information systems*
- Human Computer Interactions, esp. *affective* computing
- Instructional design and learning
- Opposition to the Communication Decency Act (1996/7)!

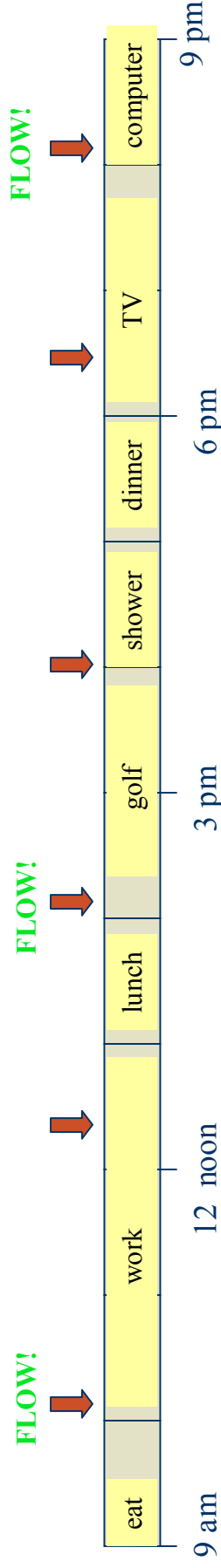
# Models of flow (1)



# How to measure flow

- ◆ Experience Sampling Method (ESM)

in 'real life'

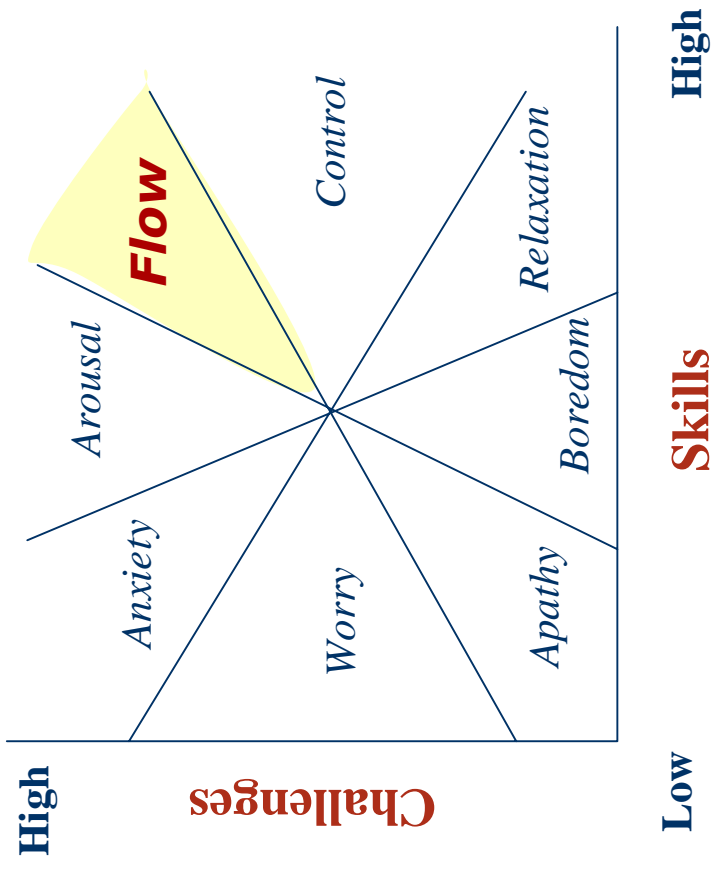
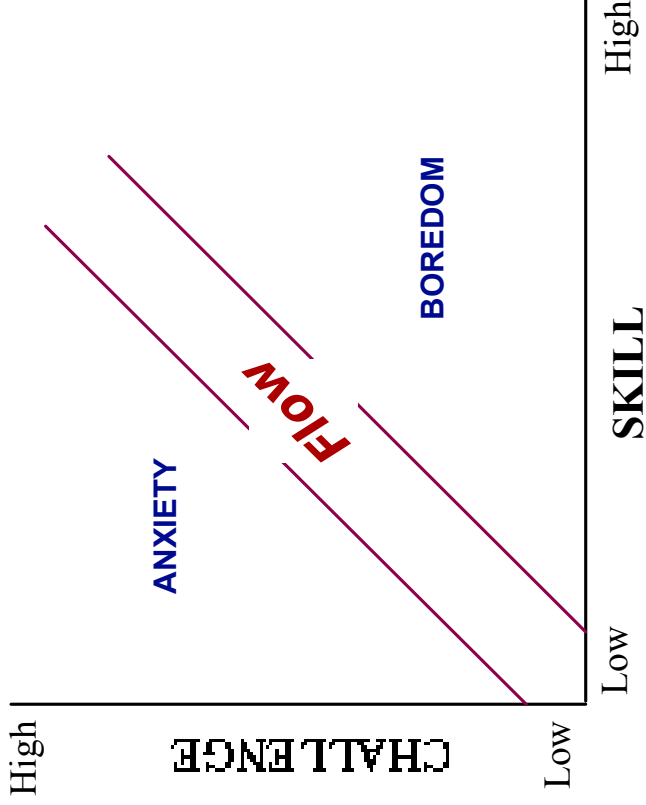


- ◆ Surveys
  - after activity
  - after Web experience
  - ESM via the Web



# Models of flow (2)

*“Channel models of flow”*



# We have a problem...

- ◆ Flow is not static - we have no measure for how it changes throughout an activity
- ◆ Three research questions:

*How do students' challenge-skill measures change throughout an online learning exercise?*

*How does this challenge-skill view of flow compare to post-survey measures?*

*How does flow relate to learning outcomes?*

# Experiment

**Students:**

Physics (17)

IS (42)

**Interactivity:**

‘simulation mode’

‘movie mode’

**Measurements:**

Challenge-skill probes:

➔ *flow frequency*

➔ *flow intensity*

Post-survey:

➔ *flow intensity*

**Constant acceleration**

Jump to exercise...  
1 2 3 4 5 6 7 8 9

**Activity 6: Slowing down, other way - checking**

Set up the simulation by attaching a fan to the cart that will apply a force on the cart towards the *right* (click the *lower fan* 'Attach' button).

(a) Give the cart a gentle push to the left. Make sure that the cart does not go so far as to bounce off the far end of the track.

(b) For the time while the cart is travelling to the left, sketch the blue parts of the **velocity-time** and **acceleration-time** graphs on top of your predicted ones *using a different coloured pen*.

(c) **Now again think** about how your **velocity** and **acceleration** graphs compare. By now you should be getting a picture of how a constant force affects motion - no matter in which direction the cart moves, and no matter what its initial speed is. Play around a little; jot notes if you want to.

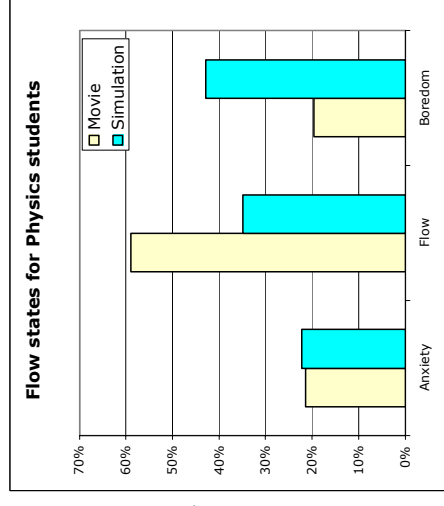
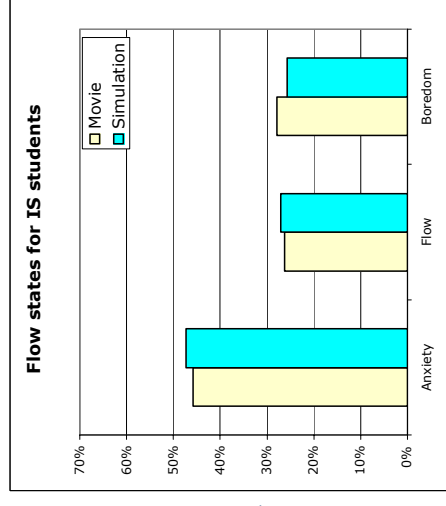
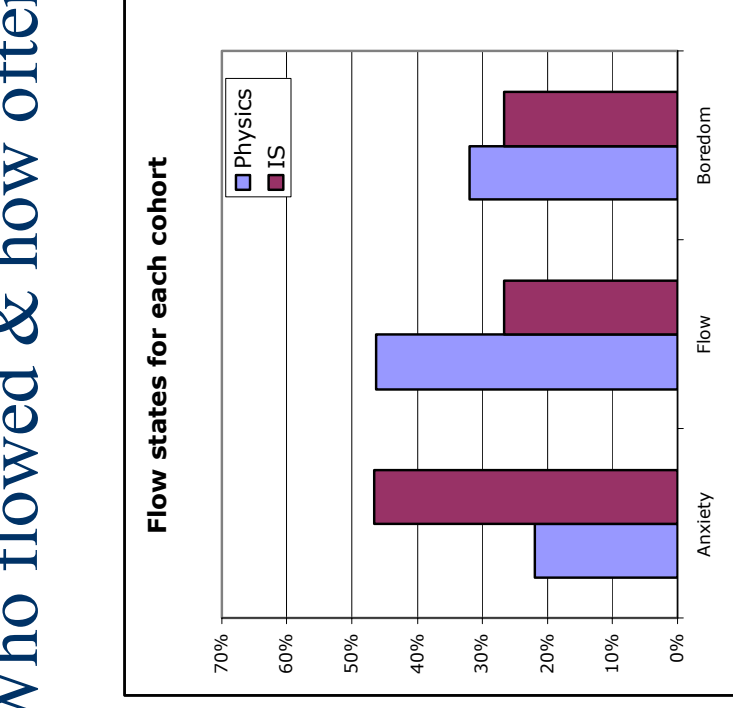
You have now completed *an activity*.  
Before you continue please answer the following...  
(a) How **challenging** did you find this last activity?  
challenge too low  just right  challenge too high

(b) Were **your skills** appropriate for understanding this last activity?  
my skills too low  my skills just right  my skills too high

# Results: from Challenge-skills

a) Who flowed & how often?

Split by mode:

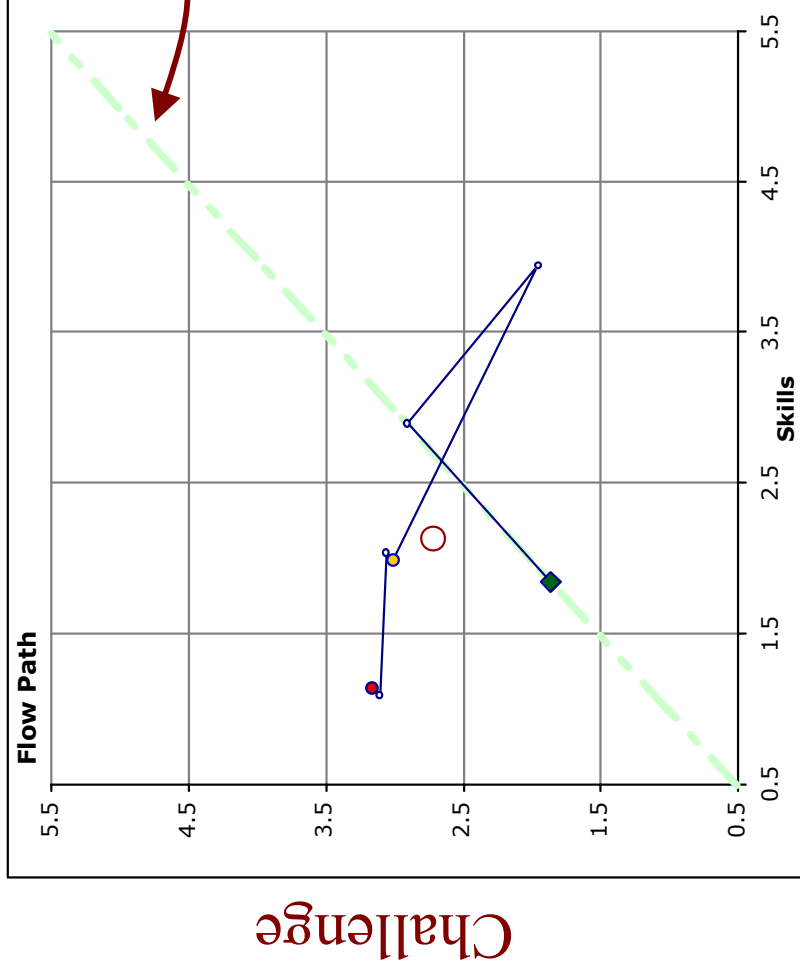


IS

Physics

# Results: flow as a process

Flow paths  
(movie?)



Skills

# Results: types of learning

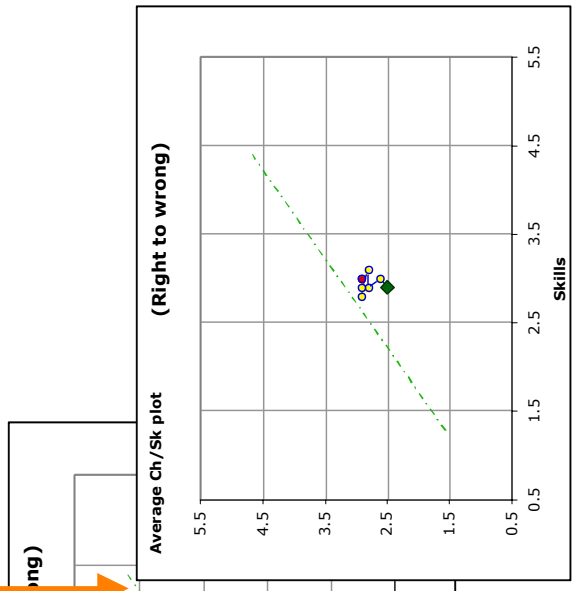
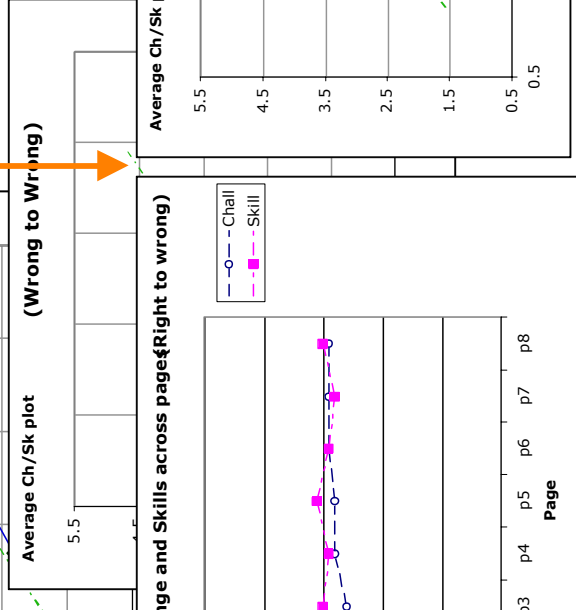
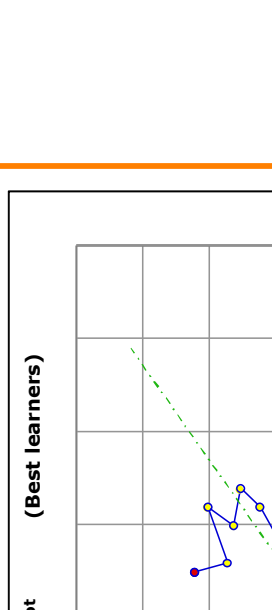
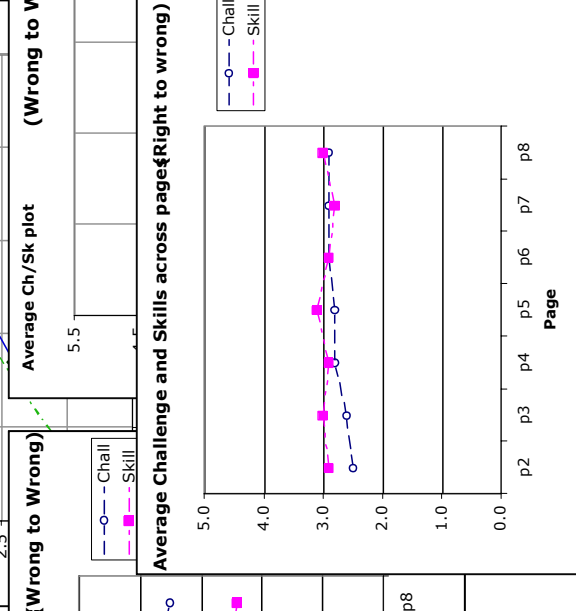
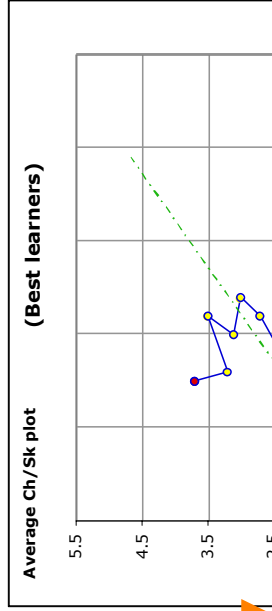
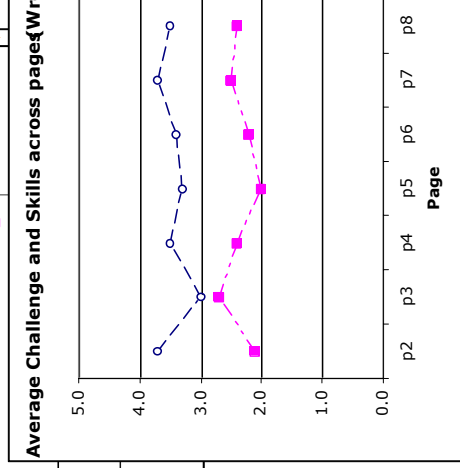
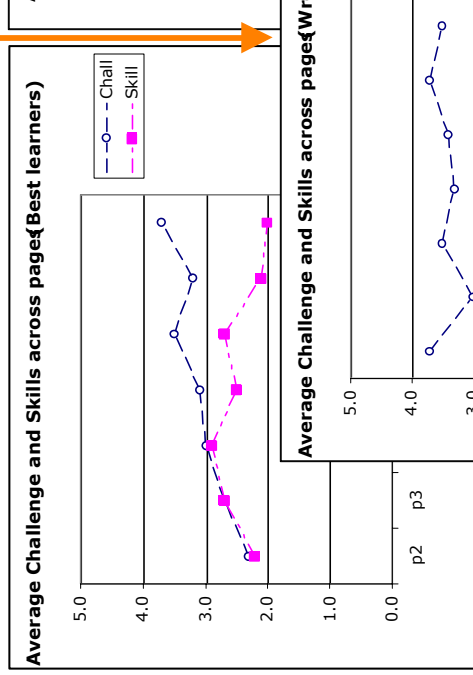
Learners

Changers

Unlearners

No learners

Top scorers

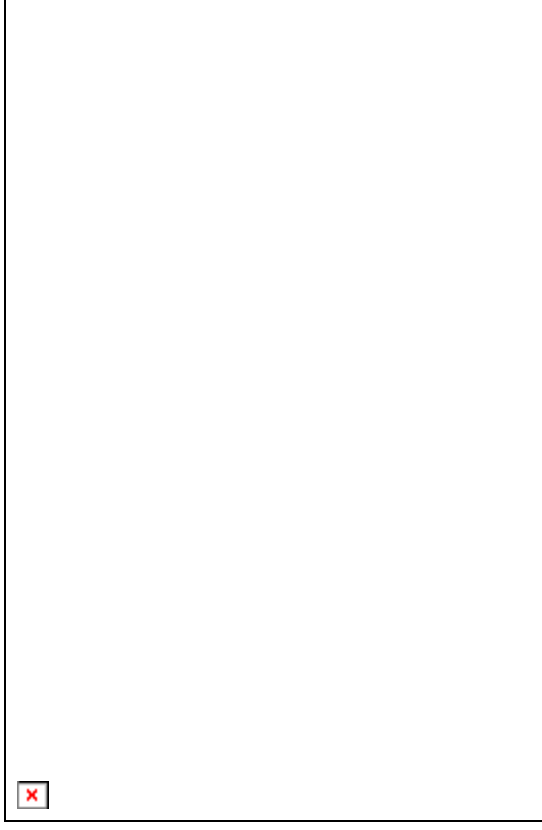


# Relating flow-paths to final flow value

Flow value from post-survey...

Flow value from (*skill - challenge*)...

Correlation:



...interpretation?

recency effect? primacy effect?

'challenging event' effect?

# So what?

- ◆ About flow...
  - process vs states
  - measuring flow?
  - getting lost on the Web
- ◆ About learning...
  - insights into what happens
  - gourmet design
- ◆ Next step...



# Discussion



# Flow-path movie



QuickTime™ and a Video decompressor are needed to see this picture.

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