

What Does 'Optimal Learning' Look Like in the Mathematics Class?

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Mathematics Education

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Overview

- Background
- Optimal learning (via Flow Theory)
- Examples from math classrooms
- Questions? (last 10 mins)

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Background

- Mihalyi Csikszentmihalyi
- Senior artists who intensely created paintings with no (visible) reward.
- Experience Sampling Method (ESM).
 - Time budget : types of activities and time on task
 - Research in everyday situations

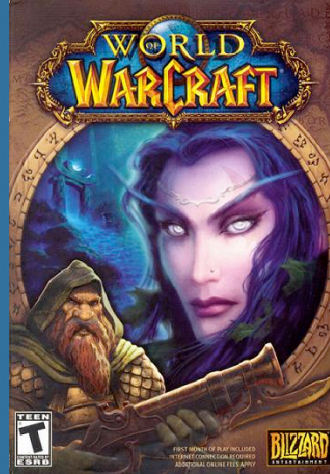
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Background

- Originally part of Csikszentmihalyi's doctoral research.
- Observed aging artists. Intense concentration where they even forgot to eat. Paintings were not sold nor shown – the process was the reward.
- Developed ESM
 - Subjects are randomly signaled throughout the day
 - When signaled they complete a short questionnaire regarding their activity and perceptions of the activities.
 - Minimal intrusion.

To be in the "flow" means:

- Focus
- Interest
- Control
- Goals/feedback



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Flow = "In the zone" (sports metaphor)

Focus

- Intense focus on task, time appears to "fly" by.
- Some seniors forgot to eat.

Interest

- Task is interesting, curiosity is invoked.
- "Curious, passionate people can learn anything." -- Jason Fried, of *37 Signals*
- In problem solving research, this is similar to "accepting" the problem.

Control

- Sense of control regarding the task.
- Intrinsic motivation when locus of control is closer to one's self.
- Shift is starting towards more project-based learning (guide on side vs. sage on stage)

Feedback

- Clear goals.
- Immediate feedback (metacognition)
- Our goal is to have students provide their own feedback.

Summary

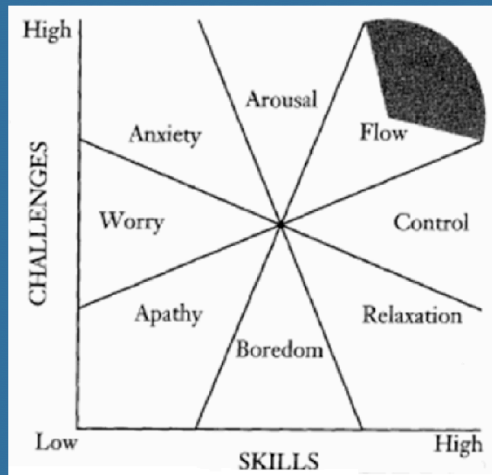
- Perception is important
- Challenge and skill best predictors of "flow state".

Video games are good example of flow, example WoW

- Gamers report intense focus. In fact there are documentaries on this fact.
- Fantasy realm / avatar in unknown setting
- Avatar controlled by player

Flow theory

(aka. optimal experience)



Source: Csikszentmihalyi, 1997

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High challenges and high skills best indicators of flow state.

Perception is important. What is challenging for me may not be challenging for you.

Examples:

- LC-LS, making bed does not require advanced skills, not is challenging
- LC-HS, revisiting the first level of a video game
- HC-LS, test frustration (avoid!)
- HC-HS, FLOW! (e.g., rock climbers, surgeons, chess players, etc.)

Example #1

How is time spent in mathematics class?

- Lecture
- Individual work
- Assessments

(Source: Csikszentmihalyi, Rathunde, & Whalen, 1997)

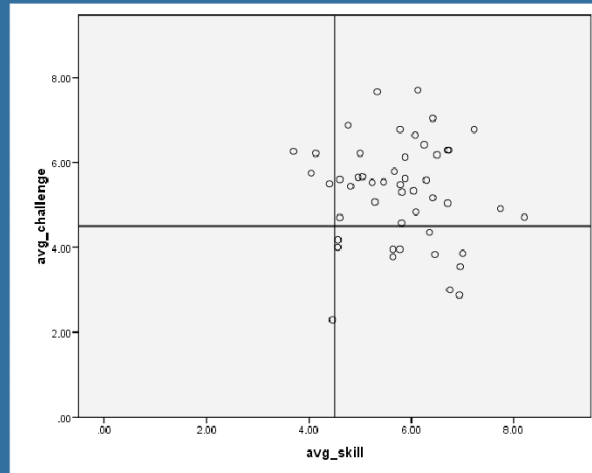
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Roughly 33% split. Study in Arizona.

Minimal time spent in groups or other activities.

Example #2

(calculus students completing homework)



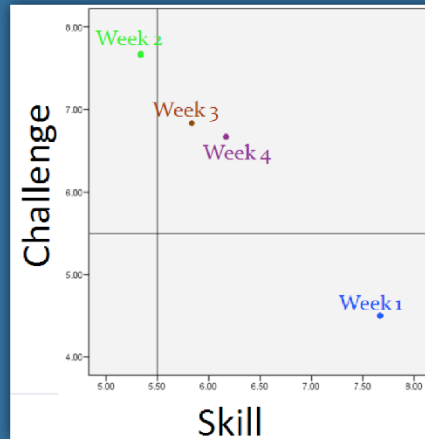
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Lines represent median of scale (0-9). Most students in flow? Not exact indicators.

Odd result: Students that were bored did better on the exam.

Example #3

(case study student, promising results)



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Attempted to adjust HW based on students' responses

- LC-HS, more problems w/o answers
- HC-LS, more problems w/ answers
- HC-HS or LC-LS, balance between answers and not

Finding #1. Difficult to adjust homework. Ethical concerns for giving students same exam yet different HW.

Finding #2. Students can move around. States are dynamic and constantly changing based on stimulus.

Summary

“Some people climb mountains whereas others make up tunes at a piano or push chess pieces across a board is in a sense incidental to the fact that they are all exploring the limits of their abilities and trying to expand on them.”

(Csikszentmihalyi, 1975, p. 30)

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Exploring the limits of own abilities is when optimal learning occurs.

References

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- Shernoff et al. (2003). Student engagement in high school classrooms from the perspective of flow theory. *School Psychology Quarterly, 18*, 158-176.

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1990 – reads like self-help book, repetitive, but accessible

1997 – Talented Teens, interesting look in top 10% of students (wonder how results would change for today's Internet age?)

Questions?

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