



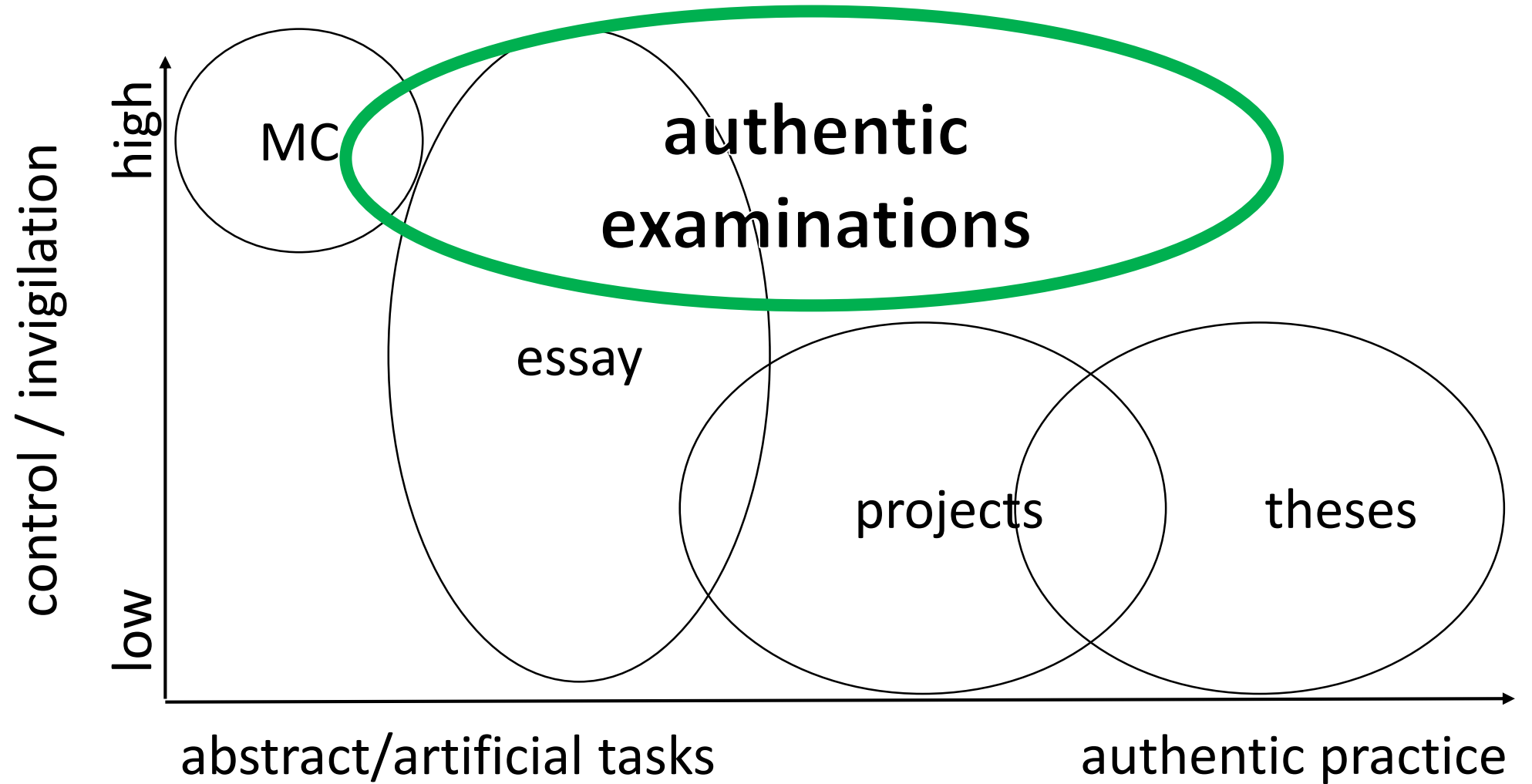
# Finding Solutions for Computer-Based Assessment of Collaborative Skills: Gamification as Inspiration

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# Introduction


# Context





# Computer-Based Examinations

- Digitally mediated innovation of examinations at ETH, current status
- Resource-mediated examinations (Halbherr, 2020)
  - Tools
  - Information
  - Collaboration
- Covid-19
  - Remote online examinations
  - Widespread (forced) experimentation with tool-mediated, open-book and/or open-Internet examinations
  - Collaboration**



**Tools**   
 Tools aid us in manipulating and interacting with the world. They come in many functions and levels of complexity and are becoming increasingly powerful, adaptive, intelligent, and autonomous with technological advancements.

**Information**   
 Data and information help us understand the world and exchange knowledge. The amount of information available is ever increasing while information access is becoming more ubiquitous, instantaneous, and affordable.

**Collaboration**   
 Countless disciplinary practices depend on collaboration and productive interaction with peers.

# Challenges



# Challenges



## Socially mediated individual competencies

- Isolating individual competencies from group performances
- Freeriders, social loafing, ghostwriting

## Equal and comparable conditions vs. unequally skilled students

- Ensuring fairness
- Ensuring comparability of individual performances across different teams

## Group performances

- Collaborative tasks that depend on contributions from all team members
- Noise, cross-group disturbance, etc.

## Logistics, complexity

...

# Break-Out Session 1: Challenges

[Towards computer-based assessment of collaborative skills,  
Online Whiteboard for Visual Collaboration \(miro.com\)](#)

# Inroads



# Inroads: Law of Large Numbers



$$n! - (n - x)!$$

- Theoretical solution
- Sample group performances of all possible groups of size  $x$  (e.g. 3) in class of  $n$  students
- For each student, calculate the mean group performance

# Inroads: Counterbalancing



- Pragmatic solution
- First, individual competency assessment
- Sample group performances of few groups
- Counterbalance group compositions such that for each student, the group peers have comparable average individual competency
- For each student, calculate the mean group performance

# Inroads: Collaborative Examination Preparation



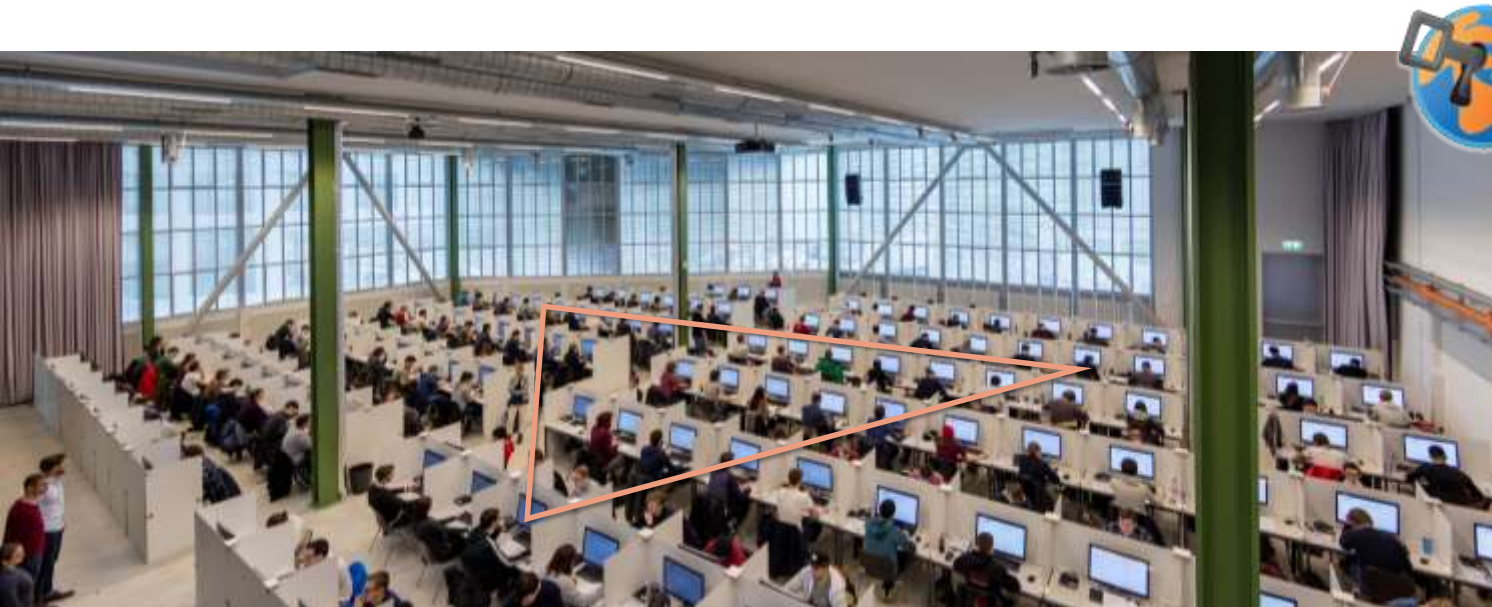
- Encourage collaborative examination preparation, e.g.
  - Shared artifact creation for open-notes examinations
  - Group analysis of advance examination case studies
  - Student formed groups
  - Individual preparation also possible
- Examination performed individually
- Preparation for future learning (Schwartz & Martin, 2004)
  - Conceptual understanding as preparation for future [collaborative] learning
  - Learning as collaborative endeavour

# Inroads: Dividing up a Pie (Game Theory)



- Game theoretical solution
- Combination of group & peer assessment
  - Assessment of group performance
  - Group performance as pie
  - Each team member assigns shares of (remaining) pie to other team members
  - Game theory mathematical formula calculates individual contributions to pie

# Inroads: Computer-Supported Collaborative Assessment



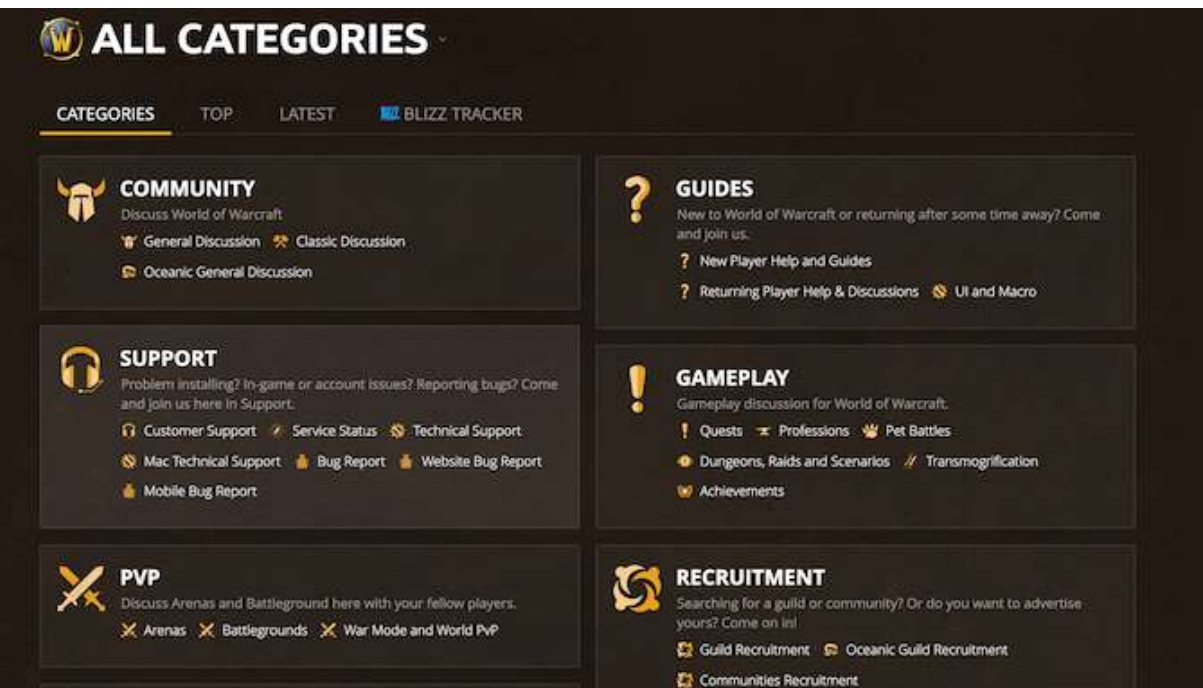
- Video-Conferencing connects teams
- Headsets
- Dynamic & changing teams

# Break-Out Session 2: Inroads

[Towards computer-based assessment of collaborative skills,  
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# Inspiration: Games

# Inspiration: Fan Culture, Forums, Walkthroughs, etc.



- Encourage collaborative examination preparation, e.g.
  - Shared artifact creation for open-notes examinations
  - Group analysis of advance examination case studies



# Inspiration: Simulation games



- Complex, interactive environments
- Simulate social interactions / group performances in gameified form
- Different roles
- High degrees of freedom

# Inspiration: Scripts, NPCs, Embedded Assessment



- Simulate where authentic social interactions not possible
- Simulated social interaction with NPCs
- e.g. OSCEs

# Inspiration: Ranking, Skill-Based Matchmaking



- for
  - Counterbalancing
  - Fairness
  - Motivation
  - ?

# Break-Out Session 3: Inspiration

[Towards computer-based assessment of collaborative skills,  
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Thank you for participating!

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