The Challenge of making Theory Relevant

Strategies to Increase Student Engagement

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Summary

- Why Are There Issues?
- The Strategy
- Case Study- Math 213
- The Implementation
- The Results
- Conclusions

Why Are There Issues?

- Students struggle with theory
  - Poor background in fundamentals in secondary school
  - Little attention span (computer games, wiki)
  - Lack of grit
- Difficulties connecting theory to practice
  - No “hands-on” experience before high school
  - On the other hand, cooperative education can minimize the importance of theory

The Strategy

- Present recurring capstone examples for each key threshold concept
- Pick interesting examples
- Use multi-media to generate excitement
- Eventually solve a simplified version of the capstone example

Case Study- Math 213

- Math concepts to software engineering class
- Two somewhat disconnected topics
- Motivation to learn was difficult
- Offered in 2004, 2005, 2007, 2010, 2011, 2012
- Between 2007 to 2010, there was significant reduction of material
- Every year, the course material was cut back except 2012 , where the amount of material was restored to 2004 levels

The Implementation

- Topics
  - Laplace transforms (differential equations)
  - Fourier Transforms (frequency domain)
  - Impulse responses and convolution
- Examples used
  - Segway

    https://www.youtube.com/watch?v=sztUuNNBxbc

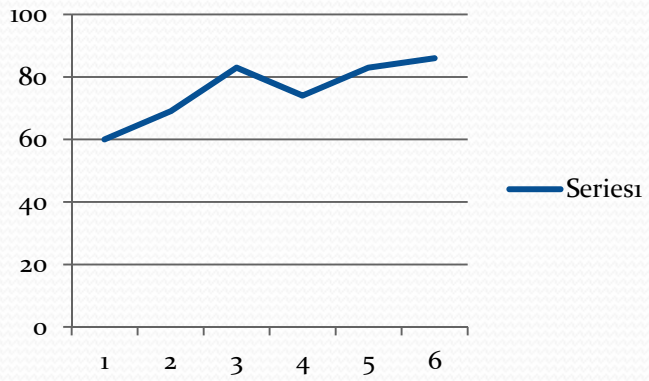
    https://www.youtube.com/watch?v=GtrsBsJsPuw
  - Autotune

    http://www.youtube.com/watch?v=eaIvk1cSyG8

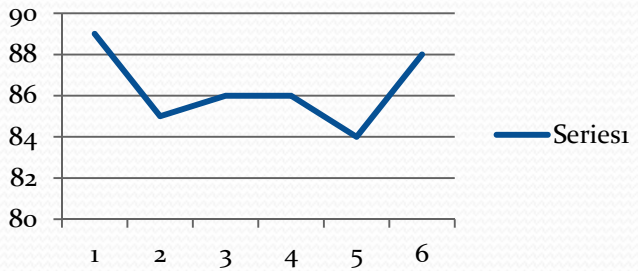
    https://www.youtube.com/watch?v=F2ZShmt19uQ
  - 3-D recordings (search binaural)
    - http://youtu.be/uQ446kKm2u4

The Results

- Level of Professor's explanation

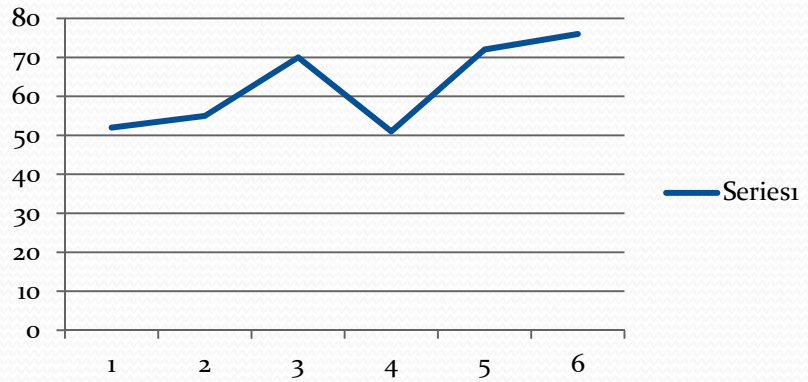


- Students encouraged to think

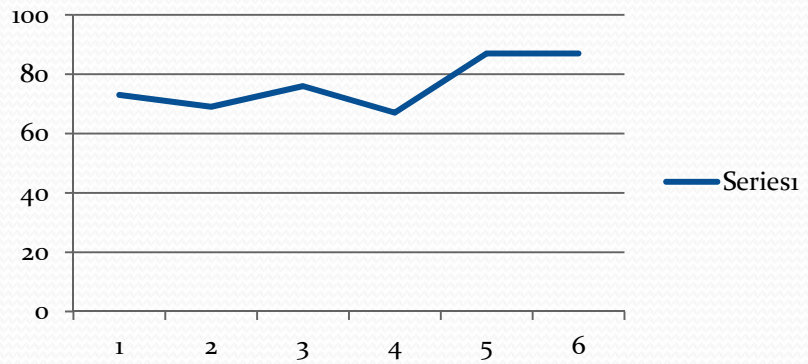


The Results

- Difficulty of course

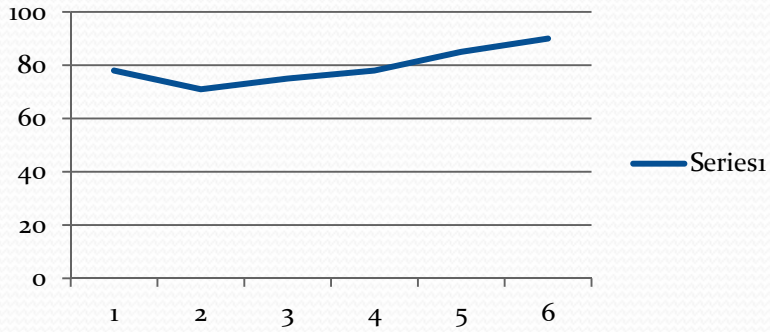


- Workload of course

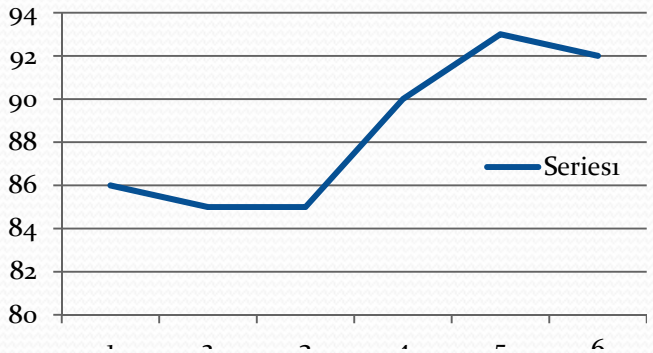


The Results

- Overall Appraisal of Course

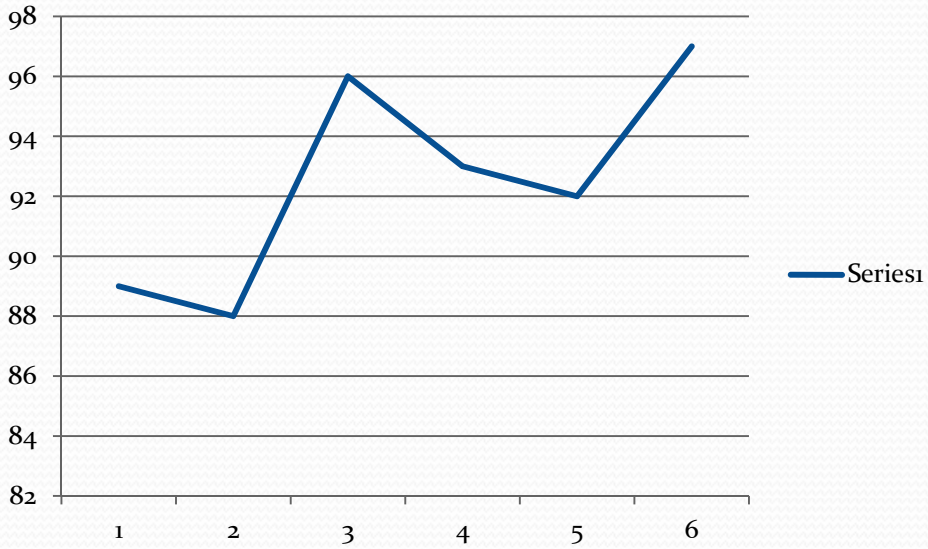


- How many classes did you attend



The Results

- Overall quality of teaching



Conclusions

- Positive impact on the use of recurring capstone examples when combined with threshold concepts
- Preliminary but gives promise
- Future work is to continue to expand these ideas into other courses