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Peer Assessment Experiment in OO Design

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Computer Science

Problems

- Difficulty to create software design after taking the OOD class
- Feedback was given only by instructors
- Students makes same mistakes despite of the feedback
  - Experts forget how hard it is to learn the concepts from scratch
- Grading is an expensive task

Peer Assessment

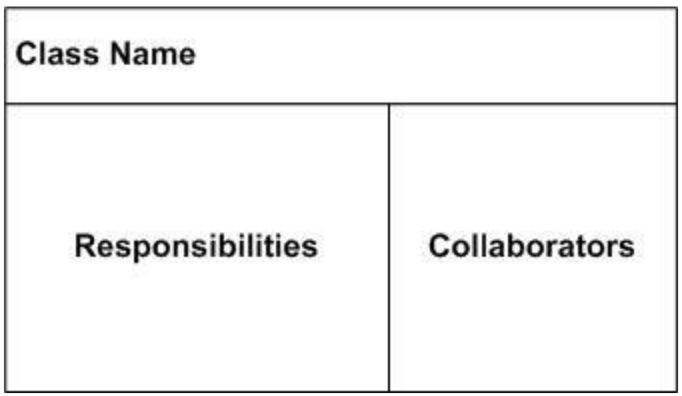
- Students learn more by reviewing others' work
- Students exercise what they learn to find defects and suggest improvements
- Improves transparency of the assessment process, thus student trust
- More.. Topping 1998

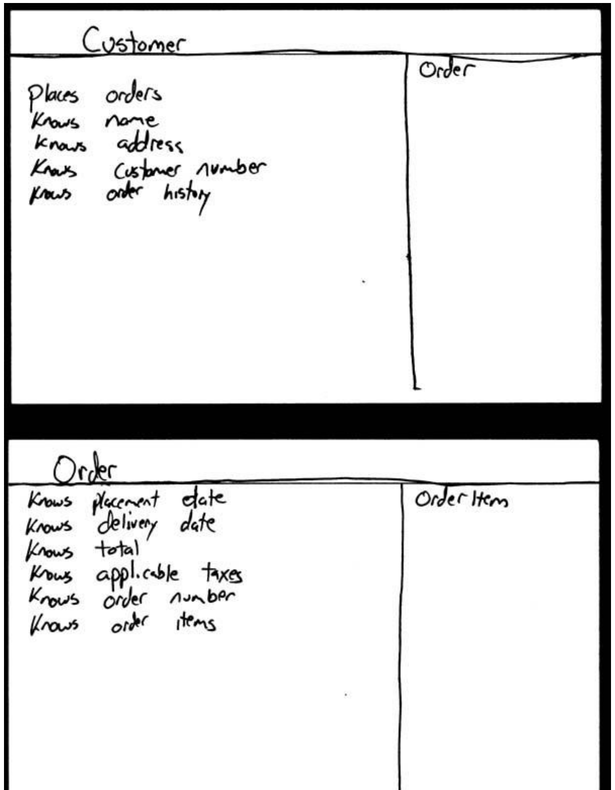
Experiment

- Show an example of CRC (Class-responsibility-collaboration) cards
- Present students with common errors
- Students run through a design of a portfolio-manager system (6 classes).
- Worked in teams and submitted their design to expertiza
- Identify 8 errors in 3 designs (2 with defects, created by the instructor, 1 by another team)

CRC cards

- Show an example of CRC cards





Requirements

- The mission is to keep track of a set of stock or bond holdings, to calculate their current value and other relevant statistics like annual rate of increase, *gain* or loss, and tax liability.
- A *portfolio* is a set of stock positions. Each *position* is a quantity of a particular *stock*.
- A quantity is expressed as a certain number of *shares*.
- Each stock has a *purchase price* and a *current price*.
- The gain is defined as the difference between the *value* of the stock when it was bought and its current value. A negative gain is called a loss.
- Depending on how long the position was held, the gain may either be *short term* or *long term*. This matters, because short-term gains and long-term gains are taxed at different rates.
- When a stock is bought, it is added to the portfolio.
- When a stock is sold, it is removed from the portfolio, and a *record* is generated that records the gain and calculates the tax due on the gain.
- A stock may also pay a *dividend*. A dividend is not taxed like a gain, but it is used in calculating a stock's *total return*.
- Bonds in the portfolio manager can be treated like stocks; they have a purchase price, current price, and gain (or loss). But instead of dividends, they pay *interest*.
- The portfolio manager should calculate the total *earnings* (which is defined as gain + interest + dividends) for a portfolio, and use this to calculate the total return (average percentage earnings per year).

Common Errors

- Using a class name that is **not a singular noun**.
  - “Customers”, “Segments”, “Buy”
- **Naming a system class** as a key abstraction of the program.
  - “String”, “Date”
- Defining a new class where **an existing (usually primitive) object would suffice**.
  - “Cost”, “Time”
- Thinking that something can’t be a key abstraction because it is part of a larger abstraction.
  - E.g., “Seat” can’t be a key abstraction, because it’s part of the plane.

Common Errors

- Confusing inheritance with aggregation.
  - "Seat" inherits from "Plane"
- Confusing an object with an aggregation of such objects.
  - E.g., Responsibilities of Seat include knowing the available number of window, aisle, and exit-row seats
- Confusing ambiguity with synonyms.
  - E.g., "Segment" and "leg" are ambiguous with regard to flights, because they mean the same thing.
- Treating collaboration as a transitive relationship.
  - E.g., Class: Customer Responsibility: Buy ticket Collaborators: Passenger, Flight, Segment, Airport

Experiment

- Students run through a design of a portfolio-manager system (6 classes).
- Worked in teams and submitted their design to expertiza (peer review system)
- Then they received 3 designs
  - 2 with defects, created by the instructor
  - 1 by another team
- Students got to see the instructor's answers & revise

Results

- Over half the time, the students identified the correct number of defects of each type
- but most students missed both responsibilities that had too many collaborators (Error #8)
- Similar OOD questions were included in the exam
  - The students in Fall ’15, 82.5% (no PA), Spring ‘16 scores 82.4% (with PA)

Conclusion

- A single exercise in a one class period is not enough
  – We’ve seen some learning gains in ethics (writing assignments)
- Students seemed more engaged in the exercise

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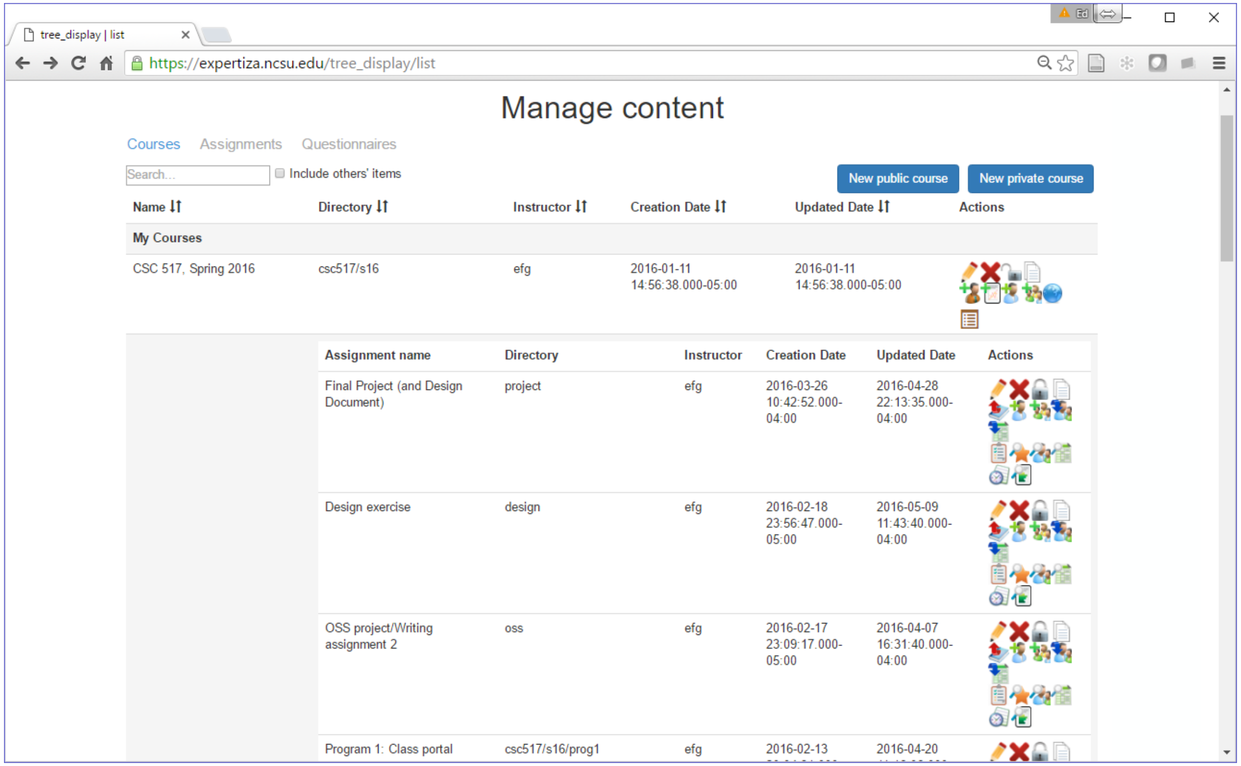

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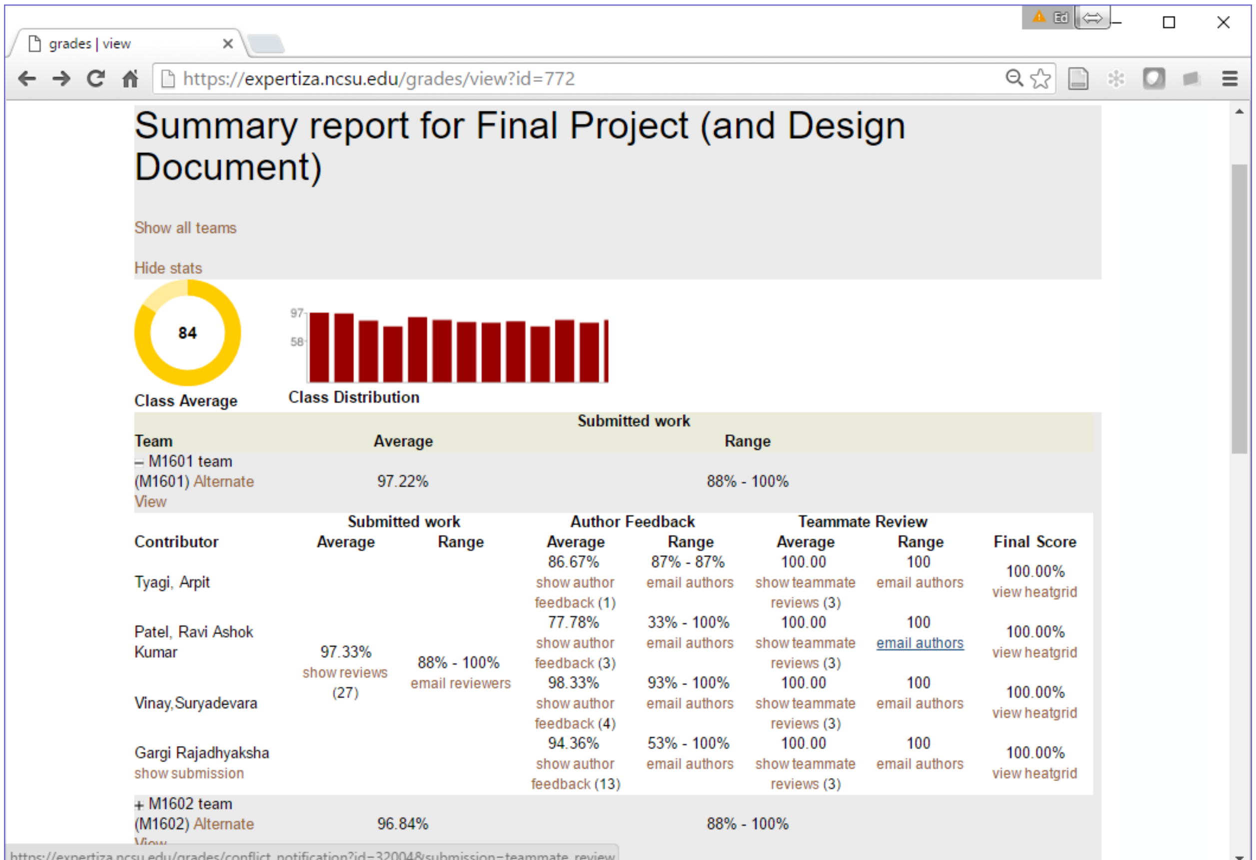

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https://expertiza.ncsu.edu/grades/view_team?id=31969

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Summary Report for assignment: Final Project (and Design Document)

Team: M1604 team

Review (Round: 1 of 3) toggle question list color legend interaction legend

Criterion	Max	Albashir, Mohamed Alfatih	Asher, Pooja Mahesh	Defisher, Jr. Daniel Edward	Jin, Ye	Kumbum, Harini Reddy	Pan, Xing	Rajadhyaksha, Vaibhav Dharmendra	Ritwika,Roychoudhury	Shah, Sneha Mahesh	Shaikh, Shais	Verma, Manav	Vysyaraju, Krishna Prajeeth	Xu, Michael	Xu, Yiqiao	Avg	metric-1
1	5	5	4	5	5	4	4	4	5	3	3	4	4	4	3	4.07	11
2	5	4	5	3	5	5	5	4	5	5	5	5	5	5	3	4.57	9
3	5	5	4	2	5	5	5	4	4	4	5	4	4	4	3	4.14	9
4	5	5	3	2	4	4	5	5	5	5	5	4	4	3	3	4.07	12
5	5	5	3	5	0	2	3	2	0	0	1	4	2	2	3	2.29	11

Sort by total review score

Team members: (Nayak, Vasant Akshay) (Gala, Krunal Dhanji) (Kunapareddy, Sai Sri Harsha) (Dhanireddy, Narasimha Reddy)

Review (Round: 2 of 3) toggle question list color legend interaction legend

Criterion	Max	Albashir, Mohamed Alfatih	Defisher, Jr. Daniel Edward	Jin, Ye	Pan, Xing	Ritwika,Roychoudhury	Shah, Sneha Mahesh	Shaikh, Shais	Verma, Manav	Xu, Yiqiao	Avg	metric-1
1	5	5	3	5	5	5	3	4	4	4	4.22	6
2	5		4	5	5	5	3	4	5	4	3.89	6
3	5		3	5	4	5	2	5	5	4	3.67	4
4	5		3	3	3	0	0			3	1.33	3
5	5	5	2	5	5	5		5	5	5	4.11	6

Sort by total review score

Team members: (Nayak, Vasant Akshay) (Gala, Krunal Dhanji) (Kunapareddy, Sai Sri Harsha) (Dhanireddy, Narasimha Reddy)

Author Feedback toggle question list color legend interaction legend

Criterion	Max	Hagar, Brandon Gabriel	Jani, Ketankumar Pushkarbhai	Jani, Ketankumar Pushkarbhai	Kavodkar, Rakesh	Mahishi Srinath ,Preetham	Shah, Gaurav	Shah, Gaurav	Shendge, Anurag Sadanand	Shendge, Anurag Sadanand	Avg	metric-1
1	5	5	5	5	5	5	5	5	5	5	5.0	0
2	5	4	5	5	5	5	5	5	5	5	4.89	2
3	5	5	5	5	5	3	5	5	5	5	4.78	0

Sort by total review score

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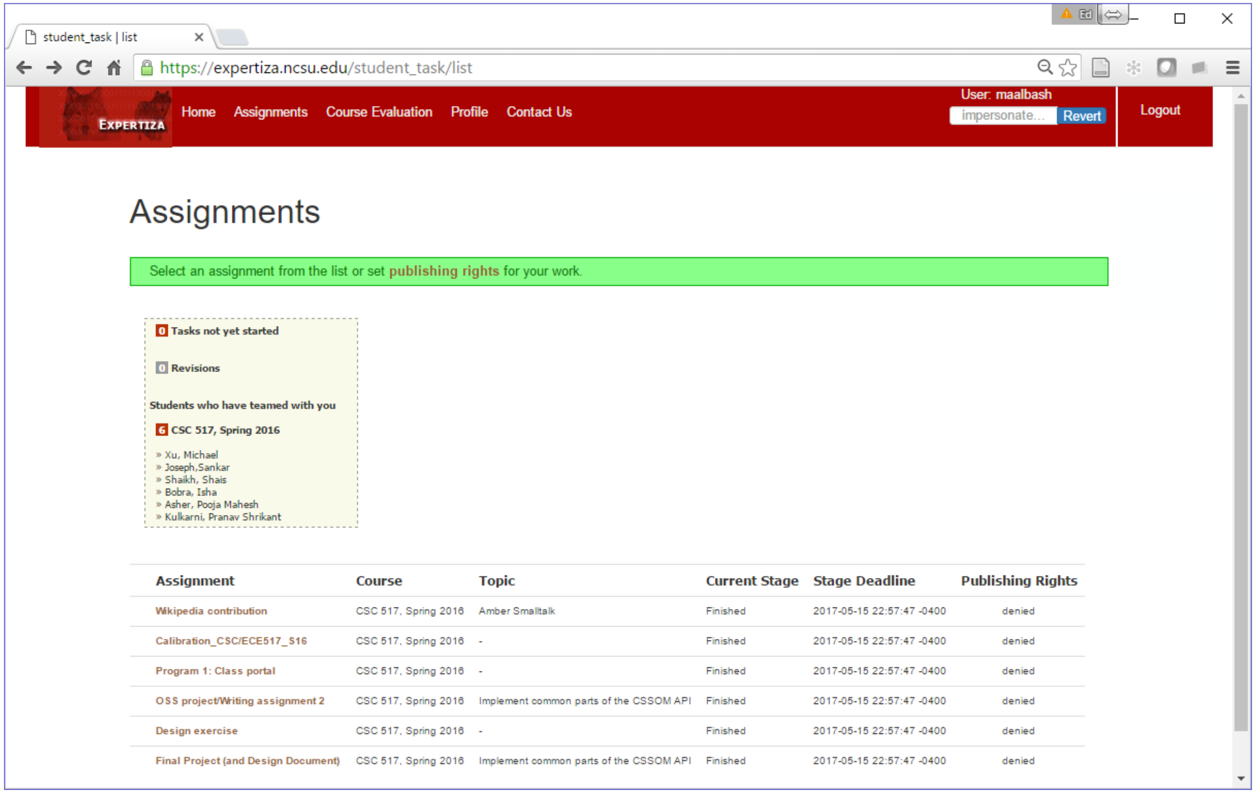

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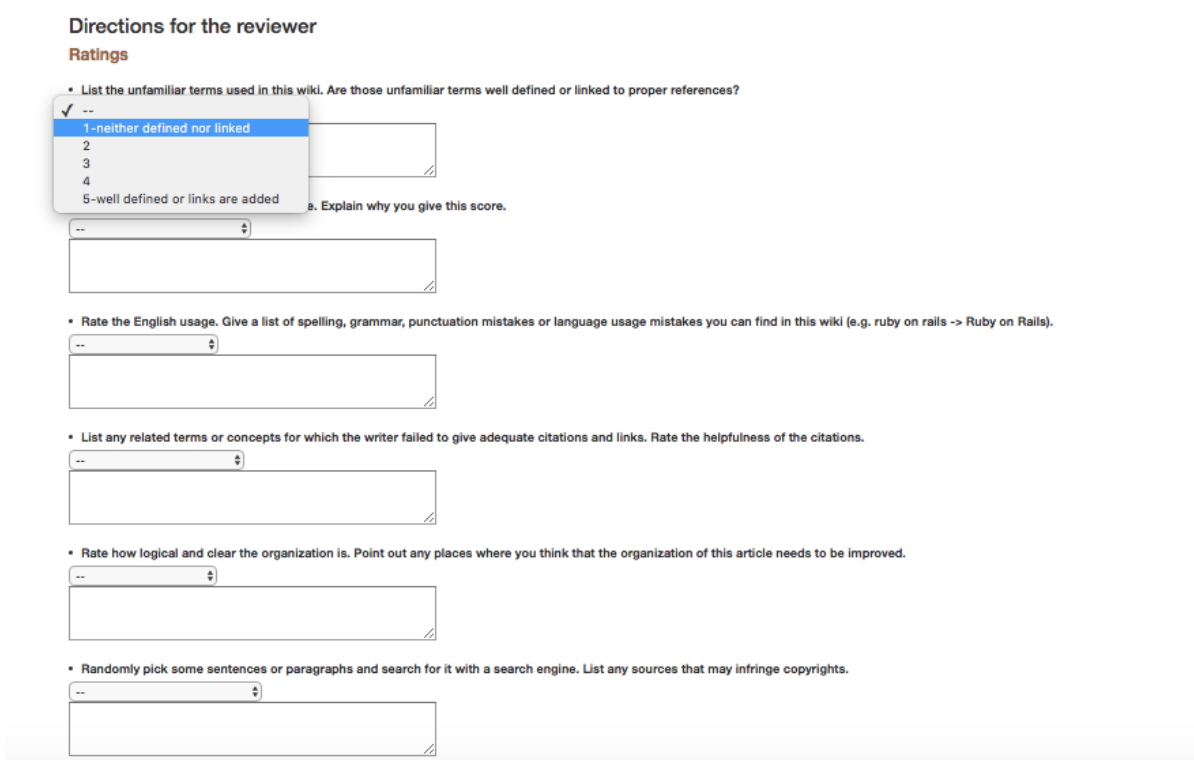

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