Assessment & Peer Grading

August 23, 2013 Dr. Danny Lynch

Traditional Assessment

Let's consider the traditional assessment model. An instructor has set an assessment for his class which consists of thirty students. Upon collecting the completed assessments, the instructor then corrects each one individually and assigns a grade.

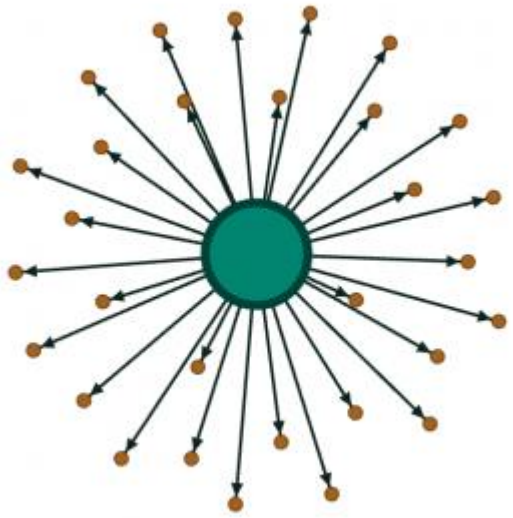

Figure 1: The traditional assessment model – The green node represents the instructor while the brown nodes are the learners. Each edge represents who graded whom.

This process can be easily visualized using graph theory, where each node represents a person and a directed link between two nodes indicates the first person graded the second person's work. The graph shown in Figure 1 demonstrates the characteristic radial shape associated with an instructor grading all assessments.

As any instructor would contest, this grading process is quite time consuming and can take an incredible amount of effort. Now imagine how this would escalate if any one of the following scenarios occurred.

- The number of students taking the assessment jumps from 30 to 100 (or more)
- The assessment topics become more granular resulting in more frequent assessments
- The questions become more open-ended, resulting in multiple correct answers and strategies

Understandably any combination of these will result in a much larger workload for the instructor. As these scenarios are becoming a reality (often from external pressures or movement

to online learning), the traditional grading model is no longer feasible and quite unmanageable. A new paradigm is required.

Peer Assessment

One potential solution to this issue is the introduction of peer assessment, where the learners correct each other's assessments based on the instructor's benchmarks. This is not a new idea and does come with its own list of pros and cons. However a modern implementation of this grading process has the potential to advance learning while negating these flaws.

First and foremost, peer assessment saves the instructor time and allows for feedback in a timely manner. However its main strength is how it contributes to skill development and critical thinking. By assessing another peer's work, learners gain insight into their own learning and advance the ability to compare and contrast ideas [1]. The assessment process becomes part of the learning experience.

Nonetheless, are these grades fair and can we trust them? Research suggests that the grades of higher performing learners suffer when graded by peers rather than the instructor [2]. One idea to help combat this is to have multiple peers correct a piece of work and then take an appropriate statistical average. Going back to our thirty learners, we can imagine the peer assessment models represented in Figure 2. Each learner is graded by two peers, and in the latter, the instructor also grades a sample of the class to check for consistency.

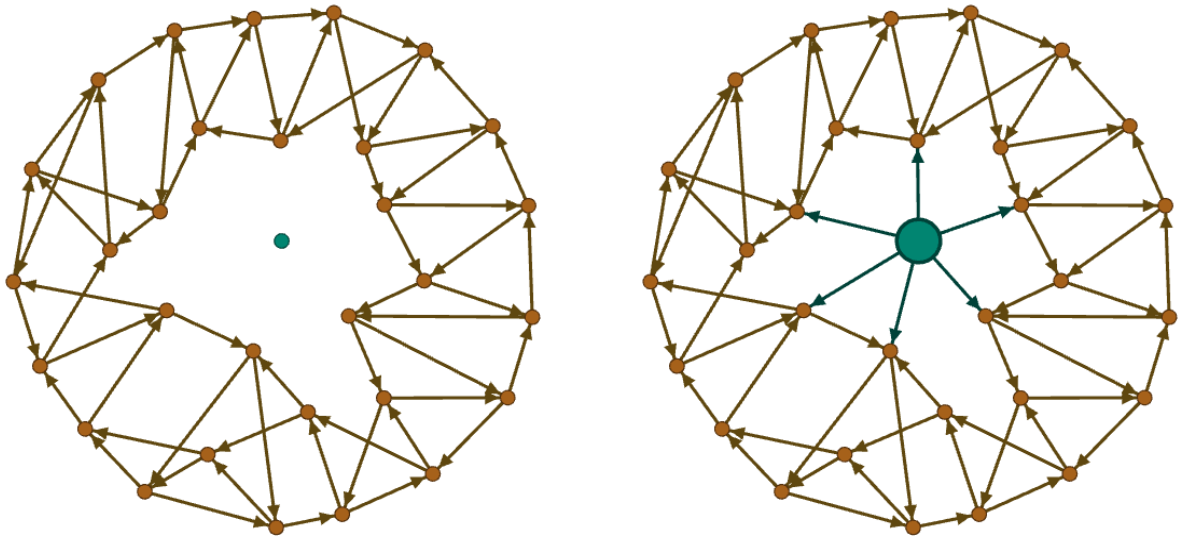

Figure 2: The peer assessment model – Each learner grades the work of two peers while their work is similarly peer graded. In the first, the instructor does not grade at all while in the second a sample of the class are graded for consistently.

Accuracy is fundamental to trusting such a system, and more sophisticated techniques are needed to account for the inherent learner biases that exist. This is the exact problem currently facing massive open-access online courses (MOOCs) that use open-ended assessments. Peer grading is essential to handling the tens or even hundreds of thousands of learners using these courses. Work presented last July [3] applied a model of peer assessment that utilized a probabilistic framework for estimating and correcting for grader biases. This in turn resulted in significant improvement of grading accuracy.

This is an exciting field to be involved in and shows one technique for assessing open-ended questions in an accurate and timely fashion. The advancement of these ideas allow for learning to blossom both online and in blended environments. It just goes to show that the old methods, once given a technological twist, might lead to some of the best ways forward.

References

[1] A. A. Russell. "Calibrated peer review – a writing and critical thinking instructional tool." *Teaching Tips: Innovations in Undergraduate Science Instruction* (2004) 54

[2] P. M. Sadler, and E Good. "The Impact of Self- and Peer-Grading on Student Learning." *Educational Assessment* 11, no 1 (2006): 1-31.

[3] C Piech, J Huang, Z. Chen, C Do, A Ng, and D Koller. "Tuned models of peer assessment in MOOCs."*Proceedings of the 6th International Conference on Educational Data Mining*, (2013).

Dr. Danny Lynch

Danny forms part of the research team at Realizeit. His work focuses on advancing the algorithms and technology that are central to driving the Realizeit ecosystem, while also exploring new and novel components. He strives to further the research field of educational technology with the ultimate aim of benefiting the learner. Danny holds a Joint Honors Bachelor's Degree in Mathematics and Theoretical Physics from University College Cork, and also has a PhD in Mathematics from University College Dublin. He is a Government of Ireland Scholar, and has completed specialized research projects in several areas such as Homomorphic Encryption, Nano-transistor Design, and Data Analysis. Moreover, Danny has also spent numerous years in the education field. He has lectured at University College Dublin, and has taught high school students at various settings.