The Distributed Esteemed Endorser Review: A Novel Approach to Participant Assessment in MOOCs

Abstract
One of the most challenging aspects of developing a Massive Open Online Course (MOOC) is designing an accurate method to effectively assess participant knowledge and skills. The Distributed Esteemed Endorser Review (DEER) approach has been developed as an alternative for those MOOCs where traditional approaches to assessment are not appropriate. In DEER, course projects are certified in-person by an “Esteemed Endorser”, an individual who is typically senior in rank to the student, but is not necessarily an expert in the course content. Not only does DEER provide a means to certify that course goals have been met, it also provides MOOC participants with the opportunity to share information about what they have learned with others at the local level.

Author Keywords
Assessment; MOOC; DEER; Esteemed Endorser; Robot Programming; Educational Robotics.

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Robot Programming for Absolute Beginners

What: Two MOOCs that introduce the basics of LEGO Mindstorms Robot Programming (NXT & EV3).

Asynchronous: Participants can join at any time, and have unlimited time to complete the course.

Target Demographic: School teachers with no prior experience in robotics or programming.

Participation to Date:
NXT MOOC: ~7K participants
EV3 MOOC: ~2K participants

Figure 1. The EV3 MOOC

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Introduction
One of the most challenging aspects of developing a Massive Open Online Course (MOOC) is designing an accurate method to effectively assess student knowledge and skills. As she was developing the two Robot Programming for Absolute Beginners MOOCs (RoboMOOCs)[5], Kay realized that traditional MOOC assessment techniques were inappropriate for these MOOCs, and so she developed an alternative approach, the Distributed Esteemed Endorser Review (DEER). In DEER, MOOC students are required to have course projects certified in-person by an individual (the “Esteemed Endorser”) who meets certain qualifications specified in the MOOC. Typically, an Esteemed Endorser would be both senior in rank to the MOOC student and also a respected member of the student’s community, but is not necessarily an expert in the course content.

Not only does DEER enable MOOC participants to receive course certification, but DEER also provides MOOC participants with the opportunity to share information about what they have learned with others at the local level.

Traditional Approaches to Assessing Student Learning in MOOCS

Automated Assessment Systems
One of the biggest benefits of automated assessment is the speed of its response. However, as the complexity of the assessment increases, the implementation of automated grading systems becomes correspondingly complex and has the potential to be controversial. For example, consider automated scoring of essays and free-response questions. Proponents of automated grading cite its value in high stakes writing tests, which by their very nature follow a very specifically designed format, [4] and claim that results are at least as consistent as human raters [1]. Nevertheless, despite automation’s potential for vast cost savings, organizations such as the College Board continue to use human experts to grade free-response sections of the SAT college entrance exams [2] and there is strong opposition to automated essay grading by the National Council of Teachers of English [6].

Peer (and/or Self) Assessment
The accuracy of peer (and self) assessment is still an open question. In his 1998 review of (pre-MOOC) literature, Topping [8] found 18 studies that concluded that it was reliable, and 7 others that concluded that it was unreliable. More recently Wilkowski, et. al. [10] found that most self assessments in their two MOOCs were accurately graded. However, in their first MOOC, where students may have perceived the rewards of success to be significant, almost 20% of the students awarded themselves full credit for work that was blank, nonsense, or a duplicate of the work of others.

Peer assessment brings with it the potential to benefit both the assessor and the assessed. Sadler and Good concluded that the self-assessment process improves learning, but peer-assessment does not! [7] However, Topping [8] suggests that there is improved test and skill performance as the result of peer assessment.

Assessment by Subject-Matter Experts
There has been some experimentation with the use of online experts to grade in the MOOC and not-quite-so-massive course domain. Vogelsang and Ruppertz [9] experimented with hiring “Cloud Teaching Assistants” and Brooks et. al. [3] suggest that grading burdens can be eased by automatic clustering of similar responses.
The Distributed Esteemed Endorser Review
We developed the DEER review as the result of recognizing that in the RoboMOOCs:
1. Our target demographic (K-12 teachers) had a supervisor that was easily identifiable (their school principal) and who would see their MOOC participation as beneficial.
2. We could create projects that would demonstrate understanding of MOOC content, but could be evaluated by individuals without an understanding of that content.

Assessment in the RoboMOOCs
In brief, the DEER assessment process that we implemented for the RoboMOOCs works as follows:

Simple Automated Assessments to Support Learning
Most lessons consist of a short video followed by some automatically graded multiple choice questions, intended to help participants assess their understanding of the material presented. Questions can be attempted multiple times without penalty, helpful feedback is provided for incorrect responses, and they have no effect on the participants’ “final grade” in the course.

DEER Programming Projects for Participant Certification
At the beginning of the course, participants are introduced to the DEER process and provided with a letter of explanation to give to their school principal. The principal is asked to either assess the work him or herself, or to assign a trusted delegate to do so.

Over the course of the final 3 weeks of our 5-week course, participants are assigned a total of 5 robot programming projects, each of which includes:

- A clear specification of the work to be accomplished, designed to be understood by course participants.
- A second specification of how to assess a demonstration of the project, written for someone who is not familiar with the course material.

For example, in their second project, MOOC participants must program their robot to move back and forth to specific positions on a line while the robot displays specific images and plays specific sounds. While the participant can only achieve success by correctly programming the robot to do these tasks, an evaluator does not need any domain knowledge to confirm that the robot’s performance meets the specification.

Following each project, participants are asked to answer the following question:
- Did you successfully complete Robot Project <number> and demonstrate it to a colleague?

With one of the following three responses:
- Yes
- Not yet, but I intend to do so later
- No, I have no plans to do so. I do not want a certificate.

Once participants have affirmed successful completion and demonstration of all five projects (and optionally completed some survey information) they are eligible to download a certificate of completion which has a space for the principal’s signature and clearly states “Not Valid Without Principal’s Signature.”

The principal’s letter and project specifications for our MOOCs can be found at:
http://www.rowan.edu/cs4hs
Conclusions
The DEER review is appropriate for populations of MOOC participants where:

- The typical MOOC participant is expected to be a part of a group that has supervisors or mentors
- The supervisors or mentors recognize a value in MOOC participation
- MOOC assignments can be designed in a manner that they can be assessed by non-experts.

Beyond K-12 teachers, we can envision DEER reviews of students by their teachers, club members by their leaders, workers by their supervisors, etc.

In addition to facilitating assessment, the DEER review process expands the reach of a MOOC by introducing a senior member of the local community to what an individual participant learned in a MOOC that was developed thousands of miles away. Learning to program a robot on your own can be fun and educational, but sharing your success with your colleagues and supervisors has the potential to benefit both you (as others recognize your accomplishments) as well as the larger community - it is our hope that principals will get excited about the potential for introducing robots and programming into their schools!

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References

DEER Guidelines
Specify the Esteemed Endorser (EE). Ideally the EE is senior in rank to the MOOC participant, a respected member of the participant’s community, and has reason to value participation in the MOOC. The EE does not need to be an expert in course content.

Inform the EE about the Process through an open letter to EEs that is available outside of the MOOC.

Define the Assessment Criteria by providing clear specifications for the EE (or the EE’s chosen delegate) of how to evaluate participant’s work, which are available outside of the MOOC.

Provide a Certificate that participants can download when they self-report completion of course requirements. The certificate must have a space for the EE’s signature and state that it is not valid without the EE’s signature!