This evaluation brief provides a summary of the first implementation of two Massively Open Online Courses for Educators (MOOC-Eds) developed with support from the Hewlett Foundation. Fraction Foundations and Disciplinary Literacy for Deeper Learning are designed to help educators better understand math and literacy core academic content respectively. By modeling and supporting instructional practices such as inquiry-based learning and reflection with peers, they are also designed to promote collaboration, critical thinking, and problem solving in the classroom.

Sections in this brief are directly aligned to the evaluation questions outlined in the grant proposal. They address the impact on educators’ understanding of content and pedagogy, as well as their effectiveness in supporting changes in classroom instruction. Initial findings suggest that MOOC-Eds have indeed been effective in supporting the professional growth of a relatively small (in MOOC terms) and demographically diverse group of educators. Specifically, the vast majority of educators report that, as a result of their participation, they have deepened their understanding of fractions and literacy instruction, and have applied new knowledge and skills to make positive changes to their professional practice. To improve future MOOC-Eds, participants recommended improvements to the discussion forums, more models of practice, and greater differentiation.

Major findings reported in this brief are drawn from registration data, surveys, site analytics, interviews, and a pre-post math assessment. These data sources are described at the conclusion of this report and links are provided to online reports for readers interested in a more detailed breakdown of the data.
Illustrative Quotes

Professional Roles

“I am excited to get started as this is my first MOOC-Ed course! I teach 5th grade at a blended online school. I’m always looking for new instructional strategies to teach math.”  
- Fraction Foundations

“Hi, my name is Gita from Indonesia. I was a university lecturer in Indonesia... My goal is to dig further into what disciplinary literacy application is like in a real setting”  
- Disciplinary Literacy

“I am an Assistant Superintendent in an elementary K-8 district. I work with administrators and teachers to support teaching and learning for all students.”  
- Fraction Foundations

Personal Motivation

“I have been teaching biology. Honestly, I don’t include enough reading or writing into my classes. However, I definitely recognize the literacy skills that most of my students are lacking. I am here to learn new ways to expand my teaching to include more literacy.”  
- Disciplinary Literacy

“I was very interested in this course as our students struggle with fractions at all levels. As a math coach I felt this would add more tools in my belt to assist our upper grade teachers in re-teaching fractions with more conceptual understanding rather than another set of procedures to memorize.”  
- Fraction Foundations

“My team and I have been working with the Common Core and we’re looking for materials that will best meet those standards... I could see very clearly how Disciplinary Literacy and the CCSS ELA work together well. Our team is definitely looking for ways to bring both of these into our teaching... Since the Common Core is so new to us, we’re struggling a bit.”  
- Disciplinary Literacy

Participation

MOOC-Eds appealed to both U.S. and international educators. In Fall of 2014, Fraction Foundations and Deeper Learning in Disciplinary Literacy enrolled 808 and 659 educators respectively. Internationally, participants from the two courses represented over 40 countries, with the bulk of participants (90%) residing in the United States. Nationally, educators represented 47 of the 50 United States registered for the course with North Carolina, California, and Georgia as the top three states. Among those registered, 74% from Disciplinary Literacy and 80% from Fraction Foundations actually participated in the course by accessing one or more units after the courses opened.

Educators represented various roles, and indicated a wide range of goals. Participants were asked during registration to indicate their primary role in education. The majority of participants were working professionals, and consisted of educators in the following roles: Classroom Teachers (50%), Curriculum Specialists (15%), Professional Development Facilitators (11%) and Special Educators (6%). Participants were also asked to select up to three professional goals they hoped to achieve as a results of their participation in the course. The most frequently selected were: acquiring new knowledge/skills (28%), collecting new resources/tools (21%), and engaging in fun and inspiring activities (15%).

As access by users declined over time, engagement with course increased. During the first week of the each course, roughly half of registered participants accessed Unit 1. Following a pattern typical of MOOCs in general, the number of participants accessing the course declined over time. As the course progressed, however, there was a gradual increase in engagement as measured by the average number of actions per educator (e.g. video views, discussion posts, resource access). Moreover, educators accessed the course for several weeks beyond the final week. By course end, 7% of Fraction participants and 8% of Literacy participants successfully completed all course requirements and requested a certificate to obtain CEUs. Upon registration, only 3% had indicated this as a primary goal.

Educators Accessing the MOOC per Week

<table>
<thead>
<tr>
<th>Week</th>
<th>Fractions</th>
<th>Disciplinary Literacy</th>
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</thead>
<tbody>
<tr>
<td>Start</td>
<td>353</td>
<td>297</td>
</tr>
<tr>
<td>9-Oct-14</td>
<td>90</td>
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<tr>
<td>Midterm</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Final</td>
<td>30</td>
<td>20</td>
</tr>
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Average Educator Actions per Week

<table>
<thead>
<tr>
<th>Week</th>
<th>Fractions</th>
<th>Disciplinary Literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>400</td>
<td>300</td>
</tr>
<tr>
<td>9-Oct-14</td>
<td>250</td>
<td>175</td>
</tr>
<tr>
<td>13-Oct-14</td>
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<tr>
<td>Midterm</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>Final</td>
<td>100</td>
<td>75</td>
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Impact on Educators

*Educators reported courses were effective in supporting their learning goals.*

On Unit Feedback Forms, 90% (693) of educator responses agreed that course units helped them progress toward their personal learning goals, of which 76% “agreed” or “strongly agreed,” and 14% “somewhat agreed.” On End-of-Course surveys, 90% (97) of educators also agreed that, as a whole, MOOC-Eds were effective in supporting their personal and/or professional learning goals, with 84% reporting them as “effective” or “very effective” and 6% as “somewhat effective.”

*Educators reported improved understanding and development of new skills.*

Educators frequently reported, both in interviews and on open-ended survey items, that the content and activities helped them “grow,” “develop,” and “deepen” their understanding, particularly around students’ common misconceptions about fractions and the use of inquiry-based learning to support literacy. On Unit Feedback Forms, 90% of educators agreed that course units helped deepen their understanding of the content. Beyond self-report measures, Fraction participants were administered a pre- and post-course assessment adapted from the Mathematical Knowledge for Teaching (MKT) assessment. Preliminary results suggest a slight improvement in the percent of correct responses (+3.3%) across all items, with the greatest gains (+6.9%) on items related to fair-sharing concepts. A more detailed statistical analysis will be provided in the summative report.

*Educators reported applying course strategies, projects, and content in their professional practice.*

When asked on end-of-course surveys if they had attempted to make changes in their professional practice as a result of participation, 97% of educators answered “Yes.” During interviews and on open-ended items, educators often cited using instructional strategies and course content from the MOOC-Ed, and incorporating lessons and projects they developed. In Literacy, educators noted applying close reading strategies with students and increased use of technology to support inquiry. Participants also reported implementing or planning to implement the inquiry-based lessons they designed. In Fraction Foundations, participants often reported they are now allowing students more time to explore problems without rushing to the algorithm, taking time to explain the “why” behind algorithms, and using “interviews” to better understand student thinking and adjust instruction. Many indicated using fair sharing and number line activities from the course with their students, and employing greater use of manipulatives and fraction models introduced in the course. Finally, professional development leaders noted using ideas and tools from the course, and that the experience has made them more effective in supporting their teachers.

Impact on Practice

“Have you attempted to make changes in your practice?”

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>3%</td>
<td>97%</td>
</tr>
</tbody>
</table>

Illustrative Quotes

**Learning Goals**

“I found that using the videos and the course readings were most helpful with my personal and professional learning goals. I was able to take a lot of this information back and use it in my classroom... It was very helpful with my growth as a teacher.”

- Disciplinary Literacy

**Knowledge and Skills**

“I have learned to better listen to how students think about fraction problems, and I am more confident in being able to help students to understand fractions.”

- Fraction Foundations

I have become much more mindful of what Internet resources I use with the students with a view to increasing close reading practices

- Disciplinary Literacy

“This course has helped me hone my conceptual skills and helped me focus on what is important for teachers to know in their upcoming professional development.”

- Fraction Foundations

**Impact on Practice**

“I have changed a boring old historical fiction unit into an inquiry-based unit revolving around heroes.”

- Disciplinary Literacy

“I have begun to facilitate learning of fractions versus teaching the students about fractions. I now have students take their time and explore concepts in different ways rather than rushing through to teach an algorithm.”

- Fraction Foundations

“I conducted a training on ‘what is disciplinary literacy’ and we also did ‘make and takes’ for pre-reading strategies, vocabulary strategies and during-reading strategies. I will address other information learned from this course at future offerings and through coaching.”

- Disciplinary Literacy
**Illustrative Quotes**

**Peer Support**

“The most valuable aspect of this MOOC-Ed was learning about the value of online courses and how effective they are to our professional learning communities as well as being able to make authentic connections with educators from around the world.”
- Disciplinary Literacy

“I appreciated reading the postings of other educators. I also found myself asking other educators how they were addressing the needs of their students. I learned I wasn’t the only teacher searching for a way to make the concepts of comparing fractions easier for the Resource and ELL students to understand.”
- Fraction Foundations

“The PLC questions for discussion were great - it really sparked some nice discussion within my cohort.”
- Disciplinary Literacy

**Supporting Practice**

“The most valuable aspect of the course for me was the expert panels videos. Because of where we are in Montana, we just don’t hear people, leading, cutting edge people, or leaders in mathematics education, so to be able to hear the expert panel was really good.”
- Fraction Foundations

“The most valuable aspect of the course was developing my Inquiry-Based Disciplinary Literacy lesson, which I’ll be able to bring back to my PLC and share with my colleagues, who will hopefully tweak it and make it a really great and applicable project!”
- Disciplinary Literacy

**Self-Directed Learning**

“I have a clearer sense of what the expectations are for my personal learning goal while continuing to deepen my understanding of disciplinary literacy.”
- Disciplinary Literacy

**Design Effectiveness**

**Opportunities for peer collaboration and discussion supported their learning.**

MOOC-Eds are designed to foster a collaborative community of learners. Discussion forums are the primary tool for supporting this goal and were used to encourage participants to share ideas, ask questions, and provide constructive feedback. In the forums, 44% (214) of Literacy participants and 47% (304) of Fraction participants contributed a combined 4,355 postings and comments to the forums, both during and beyond the end of the course. On average, participants contributed 8.4 posts or replies, and received responses from 3 different peers. When asked if the discussions promoted constructive peer interaction, 84% indicated positive agreement, including 66% who “agreed” or “strongly agreed” and 18% who “somewhat agreed.” Discussions with peers were often cited during interviews and surveys as one of the most valuable aspects of the course. Specifically, educators appreciated the multiple perspectives shared, “hearing from other teachers” about their experience and practice, and networking with other professionals in similar roles.

**Educators cited videos, resources and projects as valuable for supporting their professional practice.** MOOC-Eds are designed to support the direct application of content to practice. When asked on Unit Feedback Forms if they agreed the course was achieving this end, 91% indicated positive agreement. On End-of-Course Surveys, participants were also asked how effective the course was in preparing them to make changes to their professional practice; 96% of participants responded positively. Educators specifically cited the value of the videos, the core resources, and course projects, and how these course components, as well as the MOOC-Ed experience as a whole, contributed to their professional growth.

**Educators reported MOOC-Eds are helping them self-direct their learning.** MOOC-Eds are designed to allow educators to tailor the experience to their professional needs and interests, as well as help participants gauge progress towards their personal learning goals. At course end, over 90% of survey participants agreed that the MOOC-Ed 1) enabled them to personalize their learning through differentiated resources and activities, 2) provided opportunities to investigate self-identified problems or areas of interests, and 3) provided activities and/or resources (e.g. self-assessments, peer assessment, feedback) that helped them gauge their learning.
Participant Recommendations

*Improve the usability of the discussion forums.* When asked to provide recommendations for improving the unit or course, participants frequently expressed frustration with the design and layout of the discussion forums. Participants reported feeling “overwhelmed” by the sheer volume of postings, and “confused” in navigating the forums. Specifically, participants noted difficulties in getting back to particular conversations and locating replies to posts. They also frequently noted difficulties in locating other educators in similar professional roles and a desire to discuss with others in the same discipline. Participants recommended providing additional support in the beginning such as videos or tutorials to help better navigate the discussion forums, as well as better ways to follow discussions and connect with peers in similar roles.

*Promote deeper engagement between educators.* Specifically, participants recommended that consideration be given to grouping people in different ways and finding ways to increase interaction within groups. In discussing how to make the discussions and groups more interactive, participants suggested alternate grouping methods such as groups based on educational roles or forming smaller “work teams” for those interested and committed to fully participating. Additionally, participants indicated that it would be helpful if expectations for engagement in the discussion forums were made more explicit and additional guidelines and/or encouragement for engagement in the forums were provided. For example, one participant suggested emphasizing the importance of engaging in the discussions in a timely manner so as not to delay or disrupt the momentum of the conversations. Another suggested that participants might need more encouragement for commenting on posts rather than simply viewing them, as many posts in the forums had a high number of views, but no comments in response to their post.

*Include more models and concrete examples of effective practice.* Participants called for more practical examples of how principles or concepts presented in MOOC-Eds might be applied in classrooms or educational settings. Specifically, some participants in Fraction Foundations felt that they were not provided “practical tips” or strategies for addressing student misconceptions. Participants also called for more examples of completed course projects, as well as more realistic examples than the ones provided. One participant noted that the Inquiry-Based Disciplinary Literacy (IDL) project examples felt “overdone” in terms of technology integration and “did not represent the teaching context of most public school educators.” Finally, participants suggested more videos of current classroom teachers demonstrating the strategies or concepts introduced.

*Include resources for more specific contexts, and help filter existing ones.* To a lesser extent, participants desired resources that were more specific to their grade level and subject area, or more geared towards their professional role. In Disciplinary Literacy, for example, one teacher noted that readings and videos were sometimes “too technical,” while coaches and administrators requested projects more specific to their role. In Fractions, some participants indicated that some of the resources were too broad and would have liked some more specific their grade level. However, several participants felt “overwhelmed” with the amount of resources already available and suggested offering fewer options, or better ways to filter them.

Illustrative Quotes

**Forum Design**

“Somehow, the discussions were overwhelming for me. I agree that we need those forums but there is a LOT of information with the amount of people taking the class…”
- Fraction Foundations

“I liked the discussion boards being broken down by state, but found it difficult to find teachers teaching the same grade/similar class settings to have discussions with. It would be nice to focus in on middle school special education.”
- Fraction Foundations

**Promoting Engagement**

“Many discussions have no responses despite several viewings and that is not helpful to the person who authored the discussion… most of the [peer] feedback on projects was very superficial.”
- Fraction Foundations

“I think that maybe we can make groups according to the interests or discipline… as a middle school special ed. and general ed. math teacher I found it difficult to find others to talk with whom teach similar students.”
- Disciplinary Literacy

**Models of Practice**

“I felt less confident in teaching fractions after taking this course than when I started because… I did not feel I was given practical tips of how to teach to solve the problems. I would like more specific breakdown of how to teach each concept.”
- Fraction Foundations

**Differentiation**

“There are a lot of resources …for a coach it was difficult to decide which ones to read. So maybe a set of resources specifically for coaches… and resources for helping administrators coach teachers through the development of IDL in their classrooms.”
- Disciplinary Literacy
**Technical Brief**

**MOOC-Ed Registration**
All participants complete a registration form for each MOOC-Ed course. The registration form consists of self-reported demographic data, including information on professional roles and work settings, year of experience, gender, level of education, and personal learning goals.

**Google Course Builder & Vanilla Forums Analytics**
Course Builder and Vanilla forum analytics include user event log data used to track in detail each participant’s engagement with the units, unit lessons, lesson resources, and discussion views and posts. A combination of applications were used to clean, merge, and format the data into usable tables. These applications access the data repository directly to produce downloadable Excel tables. Tableau, Excel, and NodeXL were used to calculate basic descriptive statistics and visualizations.

**Unit Feedback Forms**
Unit Feedback forms were embedded at the end of each unit in both MOOC-Eds. These short forms consisted of five close-ended items aligned to the evaluation questions and two open-ended items requesting participants describe the most valuable aspect of the unit and recommendations for improving the unit. Overall, 709 embedded surveys were recorded by 305 unique users. Analysis of survey results consisted of item-level descriptive statistics using Excel software and thematic analysis of the open-ended responses using Atlas.ti software.

**End-of-Course Surveys**
At the completion of each MOOC-Ed, participants were asked to complete and end of course survey. Completion was a requisite for participants requesting a certificate. The survey consisted of roughly 30 closed-ended items and 4 open-ended items designed to solicit participants’ perceptions of the impact and effectiveness of the MOOC-Eds. They survey was completed by 48 Literacy participants and 55 Fraction participants. Analysis of survey results consisted of item-level descriptive statistics using Excel software and thematic analysis of the open-ended responses using Atlas.ti software.

**Fractions Pre-Post Assessment**
The Fraction Foundations pre-post assessment was adapted from the Mathematical Knowledge for Teaching (MKT) assessment developed at the University of Michigan. Items included in the pre-post assessments were selected from MKT items that aligned with the three major topics covered in the MOOC-Ed: Fractions in fair-sharing contexts; fraction as measure; and understanding operations with fractions. Basic descriptives were calculated in SPSS and further statistical analyses are planned for the summative report.

**Participant Interviews**
Following a mid-course email solicitation, a representative sample of 11 participants (5 and 6 participants from the Literacy and Fraction MOOC-Eds respectively) were selected based on their educational role and extent of engagement. A semi-structured phone interview (30-60 min) was designed to gather feedback regarding motivations, perceived value, recommendations, and application to practice. Audio recordings were transcribed and open-coded by one Team member using Atlas.ti software who then consolidated quotes by themes.

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**Data Links**

Demographics & Site Analytics:  
go.ncsu.edu/hewlett_analytics

Unit Feedback Surveys:  
go.ncsu.edu/hewlett_unit_all  
go.ncsu.edu/hewlett_unit_fractions  
go.ncsu.edu/hewlett_unit_literacy

End-of-Course Surveys:  
go.ncsu.edu/hewlett_eoc_all  
go.ncsu.edu/hewlett_eoc_fractions  
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