Toward a More Personalized MOOC:
Resources, Activities, and Technologies for MOOC Design and Implementation

Curtis J. Bonk, Najia Sabir, Shuya Xu, Meina Zhu, Minkyoung Kim, and Annisa Sari
Indiana University – Bloomington

Abstract
This study explores the content, activities, tools, and resources that instructors of massive open online courses (MOOCs) use to enhance the personalization of their MOOC. Email interviews with 25 MOOC and open education leaders about the personalization of MOOCs led to the development of an online survey with both closed and open ended items. The survey was completed by 134 MOOC instructors. There were a range of instructional practices, technology tools, and content resources that instructors employed to personalize MOOC learning environments. Among them were supplemental readings, options on course tasks, and multiple media elements. A majority of respondents reported interest in learning new techniques to personalize their MOOCs and expressed initiative in personalizing their next MOOC offering.

Objectives/Purpose
Massive open online courses (MOOCs) are able to make a global impact by helping learners in developing parts of the world obtain access to education (Jagannathan, 2015). Despite this potential, there are scant empirical studies evaluating how online courses address personalization and cultural sensitivity to meet diverse learner needs. Even fewer studies leverage instructor perspectives to better understand such personalization and cultural sensitivity. In response, this study utilizes mixed methods (Greene, 2007) to explore the practices of 134 experienced MOOC instructors. Using an online questionnaire of MOOC instructors from a wide range of disciplines and locales, it was hoped that this research would help reveal instructional design and delivery practices related to greater personalization and cultural sensitivity within MOOCs. Importantly, the survey items were based on the results of email interviews with more than two dozen experts in MOOCs and open education.

In particular, this study focuses on the following three research questions:
1. What are the personalization practices of MOOC instructors in terms of content resources and associated technology tools employed?
2. What are the personalization practices of MOOC instructors in terms of the task structuring and pedagogical activities employed?
3. How would MOOC instructors structure their MOOC differently next time in terms of MOOC personalization?

Theoretical Perspectives
Meeting diverse learner needs has become a key challenge in MOOCs. Personalization was considered as a potential way to address the challenge (Prain et al., 2013). Personalized learning, while a pressing trend in education, is a highly complex construct (Bethke, 2016) with minimal research. Personalized learning, grounded in learner-centered and constructivist learning perspectives, relates to addressing specific learner needs based on their learning interests and preferences, prior knowledge and

experiences, and overall background (Xu, Huang, Wang, & Heales, 2014). For some, personalization is the means used to tailor the particular learning environment resources, tools, activities, and contents to better address individual learner needs, skills, and issues (Kelly, 2016). Learning environment personalization attempts to address students' heterogeneity, including their prior knowledge and experiences, age, culture and language, motivation, sense of autonomy, and familiarity with online learning. Reigeluth et al. (2015) claimed that the personalization of instructional spaces lends itself to a more learner-centered paradigm.

Recently, Hayworth (2016) suggested that there are a wide range of technologies that can help personalize the learning environment including social bookmarking, wikis, blogs, image sharing, and collaborative tools. He also notes that such personalized learning environments (PLEs) have significant implications for distance educators, instructional designers, life-long learners, and administrators. Hayworth cautioned, however, against placing too much emphasis on technology solutions. Rather than technology-centered, adult learners exhibit a preference for learning which is social, participatory, and supported by rich media (McLoughlin & Lee, 2010).

Siemen's (2007) simplified definition of personalized learning includes two elements, the tools and ideals that guide the design. His MOOC colleague, Downes (2016), claimed that personalized learning must empower learners by allowing them to customize and organize their own learning directives. Tapping into those two perspectives, the definition of personalization used in the present study was as follows: "personalization indicates *the process by which MOOCs instructors adapt their course and teaching to meet students' individual learning needs*."

While several researchers have evaluated MOOC elements for personalization, such as course designs, assessments, and means of content delivery (e.g., de Oliveira Fassbinder, 2015; deWaard et al., 2011; Yousef, Chatti, Schroeder, & Wosnitza, 2014; Yuan & Powell, 2013), there is a scarcity of empirical studies which specifically investigate MOOC personalization from instructor perspectives. Instead, much of the focus of the literature on MOOCs examines learner completion trends and student-based data (e.g., Balch, 2013; Heutte et al., 2014; Jordan, 2013). As such, it tends to focus on platform-based learner analytic systems (e.g., Daradoumis, 2013; Guàrdia, Maina, & Sangrà, 2013). Other MOOC research is often in the form of descriptive cases based on a singular MOOC (e.g., Fini, 2009; Rodriguez, 2012).

Method

According to Kop (2011), instructors are one of the five main components of MOOCs; the other four are learners, topic, material, and context. This study seeks to understand how MOOC instructors are personalizing their courses in an effort to best meet individual student learning needs by using qualitative and quantitative data. The study is comprised of two distinct datasets: (1) two sets of email interviews of 25 international experts in MOOCs and open education; one addressing cultural sensitivity within MOOCs and the other addressing personalization of MOOCs; and (2) an online questionnaire completed by 134 MOOC instructors via SurveyMonkey that focused on the personalization of and cultural sensitivity within their MOOCs (as noted, this paper focuses on the former--personalization). It is important to mention that the email interviews provided the thematic and categorical foundations from which the survey instrument was created.

The 30 item questionnaire consisted of 23 close ended items and seven open ended questions, of which five were optional, narrative responses. Over 1,000 MOOCs were mined from Class Central, the MOOC list, Coursera, edX, FutureLearn, and Open2study to create a database to distribute the questionnaire. Class Central and the MOOC List encompassed proprietary and private platforms, such as Open2study, Canvas, NovoEd, Blackboard, iversity, and Kadenze. Additionally, the researchers directly searched individual vendors and organizational sites to ensure the maximum scope within the MOOC

listings database. Next, the researchers cross checked the database for duplicity and errors. The primary selection criteria for MOOC instructor participation in the questionnaire was past or present experience teaching or designing a MOOC.

Results

Some of the findings are recapped below starting with key demographic data related to the instructor experience with MOOCs. For of all, 134 instructors from fields such as science (e.g., computational, biological, and physical), social sciences/humanities (e.g., psychology, theology, and political sciences), engineering, medicine, business, art, and law responded to the online questionnaire (see Figure 1 in appendix). More than half of these instructors had never enrolled in a MOOC as a learner.

In terms of MOOC enrollment, 62 (out of 132) MOOC instructors taught courses with less than 10,000 people, 33 courses had between 10,000-25,000 enrolled, 17 courses had 25,001-50,000, and just eight courses had more than 100,000 enrolled. Such data is in sharp contrast to Jordan (2014) which found an average of 43,000 students for MOOCs.

The instructors were requested to reflect on their practices for their most recent MOOC. Roughly 61% (n=81/132) of the instructors taught instructor led courses; of which 56 instructors utilized additional aids such as teaching assistants, moderators, and/or tutors, while the other 25 instructors had no additional teaching support. Of the remaining 51 courses, 16 were participant driven, 18 were self-paced, eight were hybrid, and nine used other methods.

Given that online course personalization can depend on an instructor's involvement in the course design, participants (n=134) were asked to rank (1-3 Low; 4-7 Medium; and 8-10 High) their involvement in designing the course. Five instructors indicated little involvement in designing the course, while 116 MOOC instructors indicated a high level of involvement, of which 69.8% (81/116) instructors marked "10" out of ten on the scale. Figure 2 (see appendix) represents the self-identified efforts of MOOC instructors during the design and implementation/delivery phases of the MOOC to personalize their courses.

Additionally, MOOC instructors tended to emphasize learner-to-learner interactions with an average of 6.23 on a scale of 1 (low) to 10 (high) (n=121). Table 1 displays the types of ways in which these instructors encouraged their learners to engage in peer-based course interactions; with discussions forums being the most widely technique employed (81.7%).

Another common problem encountered by MOOC instructors is the range of learner prior content mastery and confidence. As identified by Fini (2009), Mackness et al. (2010), McAuley, Stewart, Siemens, and Cormier (2010), and Schulze (2014), MOOC instructors need to account for learner diversity in linguistic, technical, and content competency throughout the course. Table 2 represents the various ways MOOC instructors addressed varying participant competencies and needs. In the open ended questions, instructors indicated that they incorporated "flexible deadlines" (n = 33); allowed learners multiple attempts to compete assignments (n=1); encouraged participants to communicate directly with the instructor (n=4); leveraged social media, multimedia, mobile applications and readings to supplement course materials (n=13); empowered learners to choose their own assignments (n=2) and created student groups (n=2); incorporated guest speakers and/or case-based learning (n=5); and greatly increased the amount of feedback given to students (n=8).

One way to interpret personalization is to consider resources available to MOOC participants. Not surprisingly, MOOC instructors provided discussion forums (91.1%), readings (75%), video lectures and tutorials (74.2%), and practice quizzes (56.5%). They also offered content in the form of expert interviews (50%), interactive assessments (49.2%), PowerPoint and other slides (46%), animations and interactive content (44.4%), instructor lecture notes (42.7%), various forms of visuals like concept maps and flowcharts (43.5%), and video examples like TED talks (41.9%). After that, there is a drop-off to

social media (29%), news stories and popular media (29%), wikis (18.5%), podcasts and audio recordings (17.7%), simulations/games (16.9%), job aids or study guides (16.1%), instructor blogs (16.1%), and mobile applications (13.7%). Clearly, there are a wide range of resources that are relied on in a MOOC.

Student choice is a key part of personalization. In this regard, MOOC instructors (n = 111) primarily relied on optional readings (73%) and learner selected incentives such as certificates, badges, or course credit (64%). They also utilized options in terms of course tasks and assignments (40.5%), learner discussion and negotiation of content (36.9%), multiple media elements to explain a concept (33.3%), learner determined or contributed content (30.6%), and learner selected learning pathways (29.8%). Follow-up interviews are needed to explain these options and preferences.

Personalization also requires the awareness of learner progress or learning accomplishments. In terms of student progress in a MOOC, over 40% of MOOC instructors (n=120) relied on learner self-monitoring and evaluation. Furthermore, about one in three (34.2%) employed modular or unit-based forms of assessment. About one in four (24.2%) used moderator, tutor, or teaching assistant feedback. A similar percentage (25.8%) used weekly or daily reports from learning analytics. While about 15.8% used a hybrid system of tracking learner progress and participation, another 15.0% did nothing as learner progress was not monitored.

Most interesting perhaps was that the majority of MOOC instructors surveyed wanted to do a better job of addressing personalization in their next MOOC. There was a wide range of ideas for accomplishing such goals listed the open-ended questions. Respondent ideas included greater instructor participation in discussion forums, increased opportunities for learner reflection, designing online learning communities, shorter and less formal videos, fostering more peer interaction, subtitling content in different languages, and formative assessments in the form of participant surveys at the end of each week.

Discussion and Significance of this Study

As shown in this study, there is no one way to personalize a MOOC. Instructors employed a wide gamut of feedback techniques, pedagogical activities, resources, interactions, and assessments to address learner needs. Such techniques will only increase in the coming years, thereby adding to the already complex instructional task confronting MOOC instructors. It is important to remember that most instructors surveyed in this study had only taught one MOOC. Such limited experiences with MOOCs also constrains the degree to which instructors feel comfortable addressing learner personal needs.

It is clear that there is a pressing need to better understand how MOOCs can become more personalized. This study of over 130 MOOC instructors offers insights how this can be accomplished in both MOOC design and implementation. The results can inform instructional designers, instructors, and policy makers of what is required for higher quality and more effective MOOC experiences. Our expert email interviews and online survey are just the first steps in the process. Follow-up interviews and course observations will further inform those attempting to create more personalized and culturally sensitive experiences. Of course, there is also a need to research learner or participant points of view in terms of MOOC personalization. Better understanding of instructors and participants should help foster more engaging, personalized, and culturally sensitive MOOC-based learning environments.

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Table 1. **In what ways is peer interaction encouraged in your MOOC?**

[Check all that apply; N = 137]

Answer Options	Response Percent	Response Count
Asynchronous discussion forums	80.3%	110
Assigning pair-based assignments or peer reviews	25.5%	35
Offer or encourage breakout discussion forums or	22.6%	31
Local meet-ups arranged or encouraged	16.1%	22
Assigning peer groups	10.9%	15
Synchronous conferencing and chat tool(s)	8.8%	12
Not applicable	7.3%	10
System formed collaborative teams	4.4%	6
Virtual worlds	1.5%	2
answered question		137
skipped question		25

Table 2: *MOOC Instructors Practices to Address the Variety of Student Competencies (n=142)*

| Answer Options	Response Percent	Response Count
Establish learner-based discussion forums	81.0%	115
Embed supplementary course materials (e.g., readings, animations,	78.2%	111
Post timely course announcements and emails	63.4%	90
Record video tutorials or walkthroughs (e.g., Screencasts, YouTube walkthroughs, etc.)	40.8%	58
Emphasize project-based learning over exams	34.5%	49
Using preexisting online videos (e.g., Lynda.com, TED talks, YouTube, etc.)	32.4%	46
Other (Please describe):	26.1%	37
Hold synchronous lectures, meetings, and events (e.g., Skype, Google Hangouts,	23.9%	34
Establish study groups	19.0%	27
Establish learner reflection journals or blogs	16.2%	23
Schedule virtual office hours and meetings	14.1%	20
Offer face-to-face meet-up opportunities	7.0%	10
answered question		142
skipped question		20
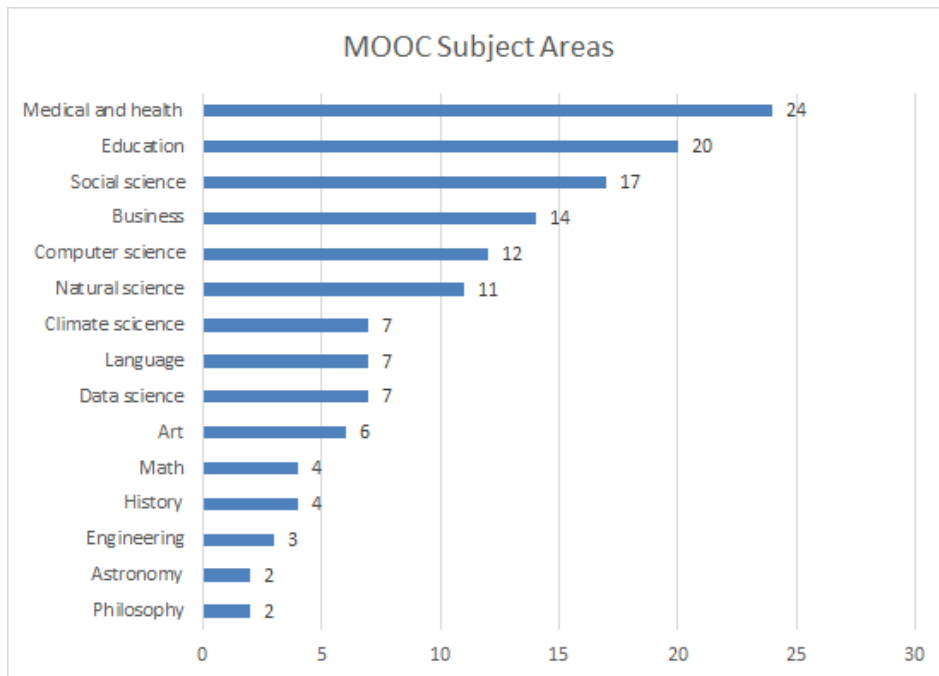
Figure 1: MOOC instructor affiliations as reported on the online survey questionnaire
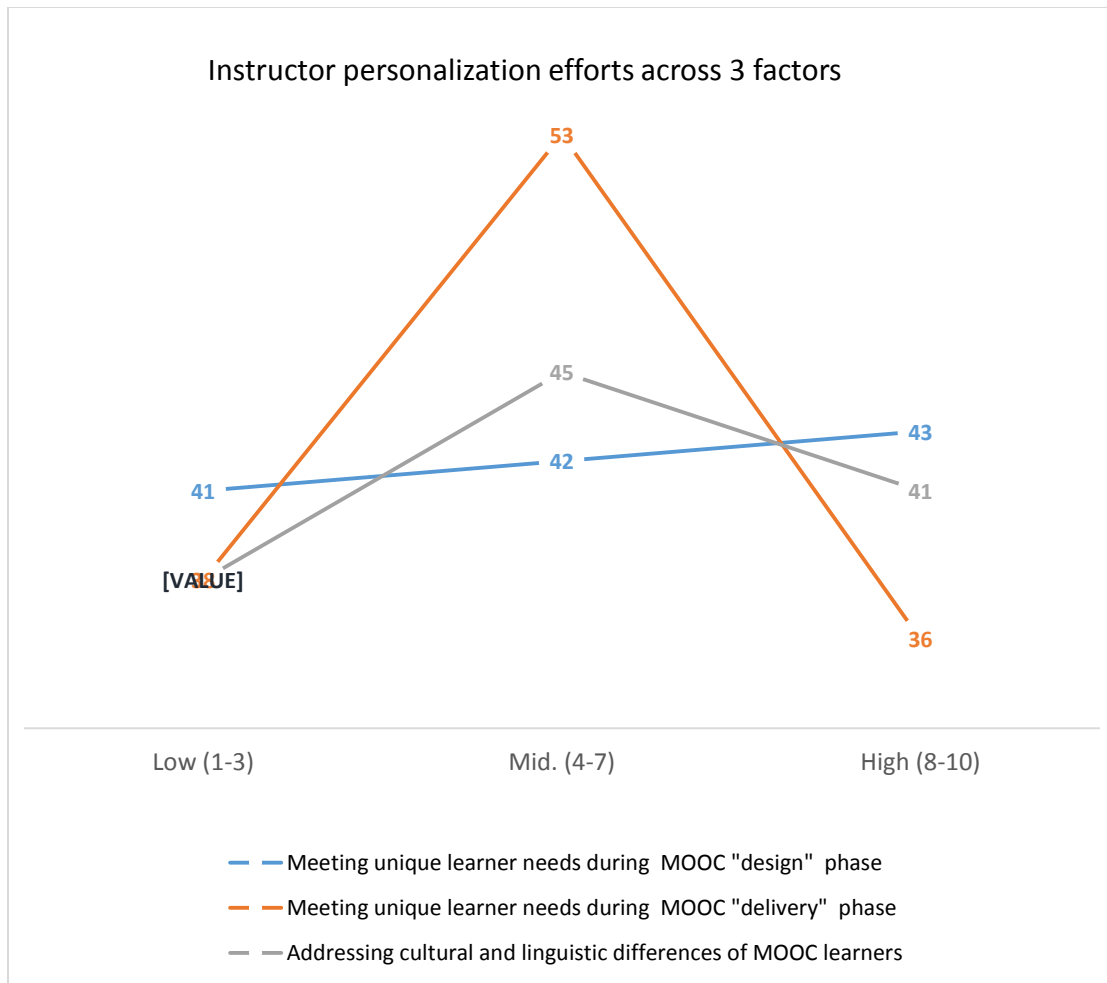140 (out of 145) instructors identified departmental and disciplinary affiliations for which they taught courses

Instructor personalization efforts across 3 factors

Low (1-3)　　　Mid. (4-7)　　　High (8-10)

- Meeting unique learner needs during MOOC "design" phase
- Meeting unique learner needs during MOOC "delivery" phase
- Addressing cultural and linguistic differences of MOOC learners

Figure 2: Efforts noted by MOOC instructors to personalize their course, as related though ranking questions (Note: the number indicates the number of instructors at each level).
Reported on a scale of one to ten, where ten indicated high levels of effort and one indicated low levels of effort.
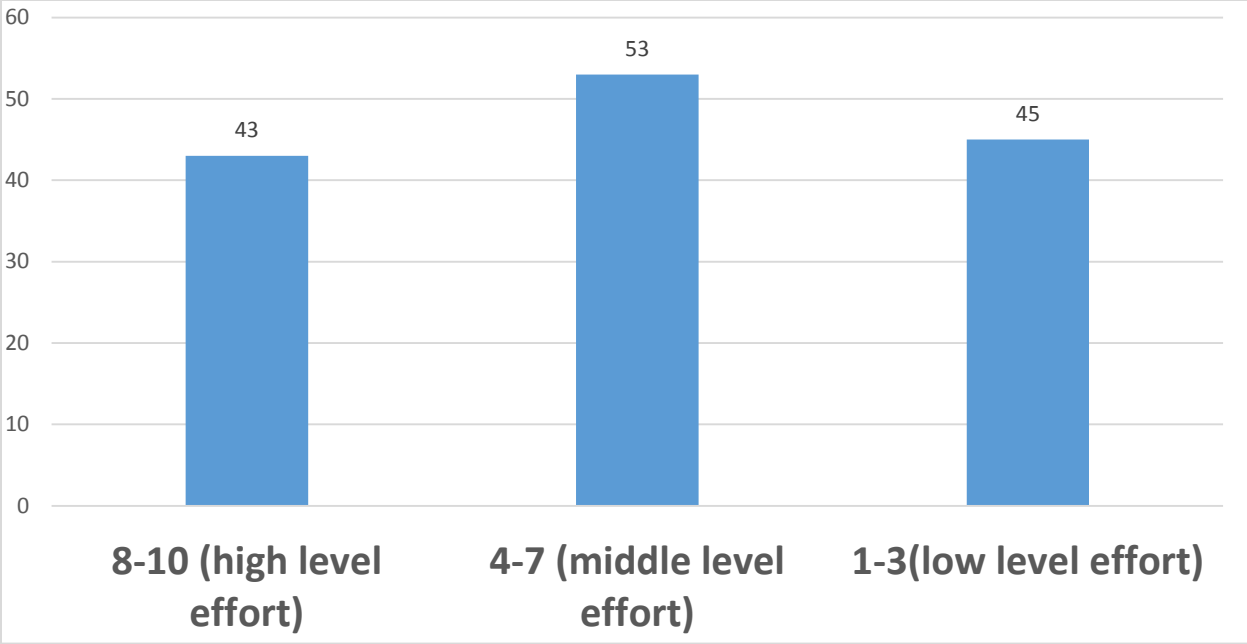
Figure 2. On a scale of 1 (low) to 10 (high), how much effort was placed on addressing the needs of individuals from different cultural backgrounds and languages in your most recent MOOC?
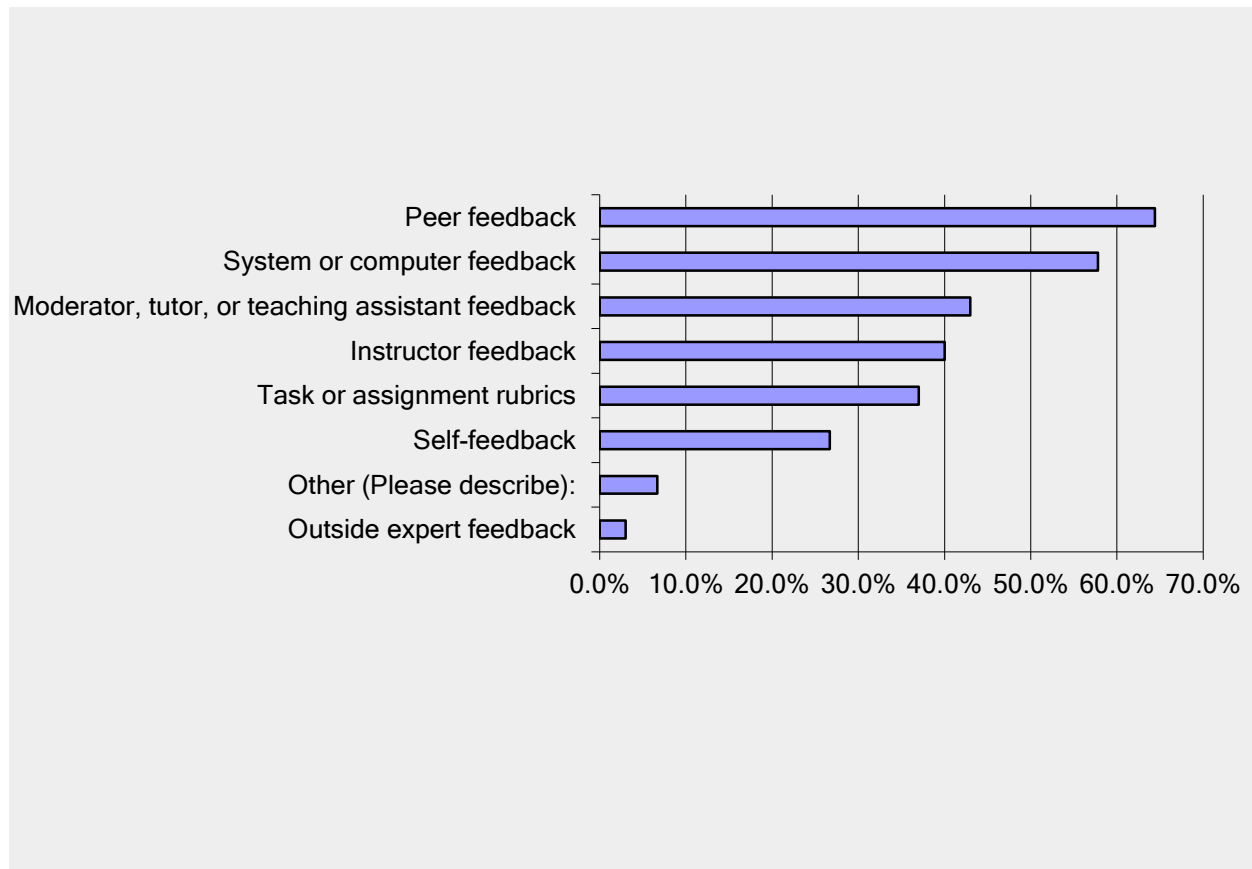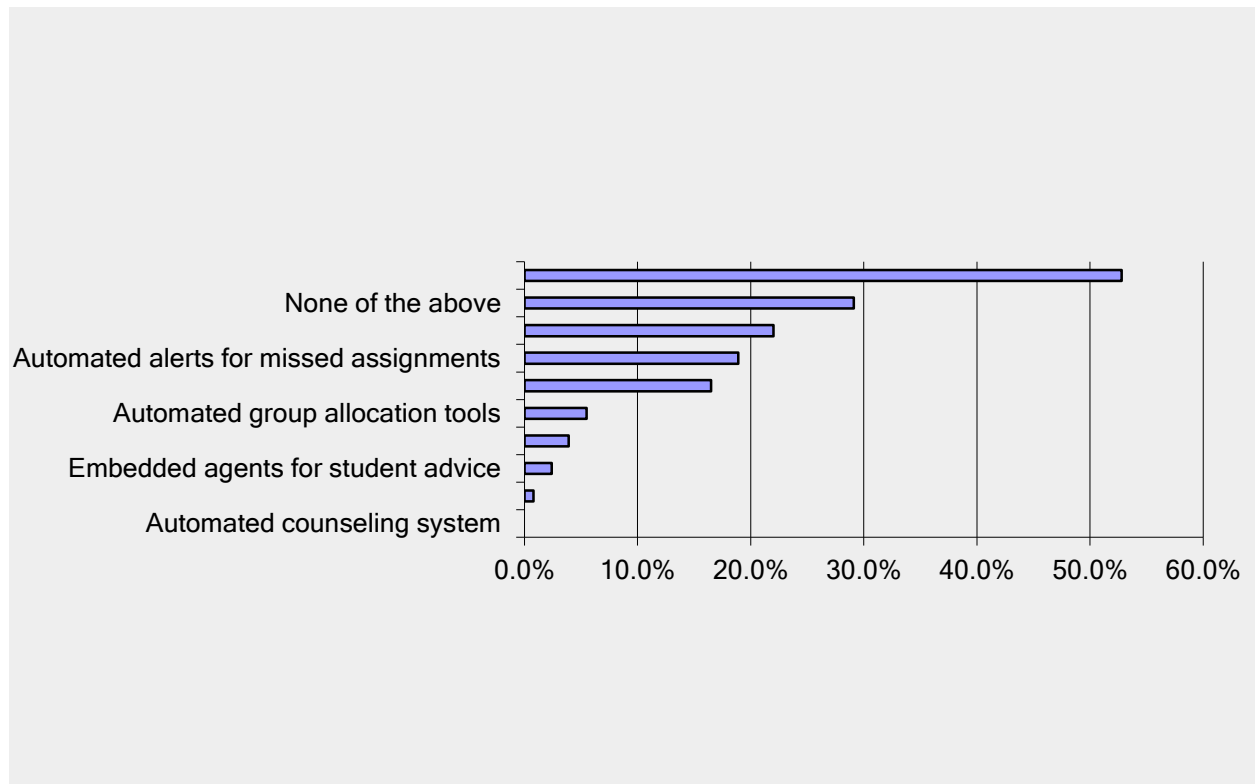

Figure 3. In what ways do students get feedback in the course? [Check all that apply; N = 135] (N = 135)

Figure 4. Does your most recent (or current) MOOC utilize any of the following? [Check all that apply] (N = 127)

Survey Questionnaire Instrument:
The Personalization of MOOCs

Basic Course Demographics

1. How many MOOCs have you taught (including any that you are currently teaching)?
    _____

2. What is the name of your most recent MOOC offering? _____

3. How many MOOCs have you completed as a learner (including any that you are currently engaged with)? _____

4. On a scale of 1 (low) to 10 (high), how much prior experience did you have teaching full online or blended courses prior to teaching the MOOC in question #3?

5. On a scale of 1 (low) to 10 (high), to what degree were you involved in designing the course content for the MOOC in question #3?

6. What is your department or primary discipline affiliation? _____

7. What is the delivery format of your most recent MOOC (select):
    a. Instructor led (with teaching assistants, moderators, and/or tutor support)
    b. Instructor led with no additional teaching support
    c. Primary learner/participant driven (cMOOC)
    d. Self-paced
    e. Hybrid or blended
    f. Other: _____

8. How many people signed up for your most recent MOOC?
    a. Less than 10,000
    b. 10,000-25,000
    c. 25,001-50,000
    d. 50,001-100,000
    e. More than 100,000

9. How many of the participants from your most recent MOOC would you now consider a personal friend?
    a. None

b. 1-5
c. 6-10
d. 11-20
e. More than 20

Personalization Section

Personalization Definition: When referring to personalization we mean: how you adapt your course and teaching to meet students' individual learning needs.

10. On a scale of 1 (low) to 10 (high), how much effort was placed on MOOC personalization in the design of your MOOC on meeting unique participants or learner needs?

11. On a scale of 1 (low) to 10 (high), how much effort was actually placed during the implementation of your MOOC on meeting unique learner needs

12. How do you address students' varying competencies and concerns? [Check all that apply]
    a. Embed supplementary course materials (e.g., additional readings, animations, simulations, maps, job aids, news, videos, etc.)
    b. Emphasize project-based learning over exams
    c. Establish study groups
    d. Establish learner reflection journals or blogs
    e. Establish learner-based discussion forums.
    f. Hold synchronous lectures, meetings, and events (Skype, Google Hangout, Adobe Connect, Blackboard Collaborate, Zoom, etc.)
    g. Offer face-to-face meet-up opportunities
    h. Provide study centers
    i. Record video tutorials (e.g., Screencasts, YouTube walkthroughs, Lynda, etc.)
    j. Schedule virtual office hours and meetings
    k. Timely course announcements and emails
    l. Other: Describe: _____

13. What types of content can participants select from in your most recent MOOC? [Check all that apply]
    a. Animations and other types of animated or interactive contents
    b. Discussion forums or threads
    c. Expert interviews
    d. Jobs aids and study guides
    e. Instructor blogs
    f. Instructor lecture notes
    g. Interactive assessments
    h. Learner blogs
    i. Mobile applications
    j. Podcasts

k. Popular media (e.g., news stories and videos)
l. PowerPoint and other presentation slides
m. Practice quizzes and exams
n. Readings (including textbooks, literature, and scientific and technical reports)
o. Simulations and games
p. Social media (e.g., Facebook, Instagram, Snapchat, Twitter, Pinterest, etc.)
q. Video examples (e.g., TED talks, YouTube, etc.)
r. Video lectures and tutorials
s. Virtual conferences and summits
t. Visuals (e.g., concept maps, diagrams, flowcharts, timelines, etc.)
u. Wiki-style documents
v. Other _____ (fill in the blank – optional)

14. In your most recent, on a scale of 1 (low) to 10 (high), to what degree did you attempt to foster learner to learner connections?
Yes/No

15. How do you design your course to be suitable for students from different cultures and/or linguistic backgrounds? [Check all that apply]
    a. Add subtitles to video content
    b. Be careful with language use and hand gestures
    c. Encourage participants to translate and localize the content for others
    d. Limit text by relying more on pictures
    e. Offer transcripts of video or audio content
    f. Simplify the language used
    g. Slowing the pace of speech
    h. Simplify the course content and navigation
    i. Translate the content to different languages
    j. Other: _____

16. Does the structure of your most recent MOOC provide any of the following? [Check all that apply]
    a. Choice in team or collaborative partners (i.e., self-formed teams)
    b. Learner selected incentives (e.g., certificates, badges, course credit, etc., options)
    c. Learner selected learning pathways (i.e., different routes to learn the same content)
    d. Learner determined or contributed content
    e. Learner discussion and negotiation of content
    f. Learner portfolios of course accomplishments
    g. Options with course tasks and assignments
    h. Optional readings, videos, or other materials
    i. Two or more media elements to learn the same content
    j. Other (Please describe): _____

17. How is student progress/participation monitored or tracked?
    a. Not applicable (learner progress is not monitored or tracked in this MOOC)

b. Moderator, tutor, or teaching assistants feedback
c. Modular or unit based progress
d. Peer or group member reports
e. Personal tracking from instructor
f. Personal tracking from tutors, moderators, and teaching assistants
g. Self-monitoring and self-evaluation
h. Weekly or daily reports offered by learning analytics
i. Hybrid system of two or more of the above
j. Other: (Please describe): _____

18. In what ways do students get feedback in the course? (Rate the order in what ways do students receive feedback)
    a. Instructor feedback
    b. Moderator, tutor, or teaching assistant feedback
    c. Outside expert feedback
    d. Peer feedback
    e. Task or assignment rubrics
    f. Self-feedback
    g. System or computer feedback
    h. Other (Please describe): _____

19. Does your most recent (or current) MOOC utilize any of the following? (check all that apply)
    a. Automated alerts for missed assignments
    b. Automated alerts to students who do not log on regularly
    c. Automated counseling system
    d. Automated or system generated feedback system
    e. Automated grading system
    f. Automated group allocation tools
    g. Automated plagiarism checking/detection (e.g., Turnitin.com)
    h. Embedded agents for student advice
    i. System adaption to user performance
    j. None of the above

20. How do participants in your MOOC contact you if they have questions, concerns, or suggestions? [Check all that apply]
    a. Not applicable (they cannot contact the instructor)
    b. Email to the course or system
    c. Email to the instructor
    d. Email to teaching assistants
    e. Face-to-face meet ups (e.g., cafés, study center, university, etc.)
    f. Mobile phone (including text messaging)
    g. Personal visits
    h. Social media
    i. Synchronous chat tool

j. Synchronous conferencing (e.g., Skype, Google Hangouts, Zoom, Adobe Connect, etc.)
k. Virtual world or environment
l. Other (Please describe): _____

21. In your most recent MOOC, in what ways could your student work be showcased (check all)?
    a. Blog
    b. e-Portfolio
    c. Learning management system
    d. Online gallery of best work
    e. Presentations during final class
    f. Presentations at online conferences, symposia, or other events
    g. Sharing exchange or portal
    h. Social media
    i. Not applicable

22. In what ways is peer interaction encouraged in your MOOC? [Check all that apply]
    a. Assigning peer groups
    b. Asynchronous discussion forums
    c. Assigning pair-based assignments or peer reviews (e.g., critical friends, email pals, and Web buddy activities)
    d. Local meet-ups arranged or encouraged
    a. Offer or encourage breakout discussion forums or groups
    b. System formed collaborative teams
    c. Synchronous chat tool(s)
    d. Virtual worlds
    e. Not applicable

23. Do you want to continue with open-ended questions on the next page to provide more details? Yes/No

End of survey – Part I

Prompt: Thank you for volunteering your time, we really appreciate your help! The questions below are optional. Please feel free to answer as many as you like. The details you can provide will give the researchers a better understanding of how you personalize your MOOC. Feel free to use lists/bullet points as needed.

Optional Open Ended Questions:
27. How did you design your MOOC to make it easier to access for students with different backgrounds and technology access?
28. Can you provide one or more ways that you attempt to personalize the MOOC experience for those enrolled in the course?

29. What kinds of learning content do you provide in your MOOC(s) to satisfy students with different learning styles? (e.g., diagrams, videos, animations, simulations, games, text, tables, timelines, concept maps, etc.)?
30. How do you design your MOOC tasks or assignments considering the differences among MOOC learners?
31. How do you use learning technology such as computer conferencing (e.g., Skype, Zoom, Google Hangouts, etc.) to personalize your MOOC? Can you provide one or more ways that you personalize asynchronous or synchronous conferencing activities in your most recent MOOC?
32. How do you use social media (e.g., Facebook, Twitter, Pinterest, mobile conversations, etc.) to personalize your MOOC?
33. How have you designed or delivered your most recent MOOC to address the cultural and linguistic differences of the participants?
34. In what ways, do you or your teaching assistants and moderators provide just in time support, feedback, and individualized learner attention?
35. Does your MOOC include the use of teams/groups to interact about learning goals? If yes, can you describe briefly.
36. If you were to redesign the course for enhanced personalization within your most recent MOOC offering, what would you do?

End of survey – Part II
Prompt: Thank you for volunteering your time, we really appreciate your help!

37. If you would like a copy of our final report, please provide your email. _____

38. Would you be willing to participate in a follow-up interview? If you reply yes and you are selected, you will receive an email with further instructions. These 30 to 45 minute interviews are conducted online and scheduled based on your convenience. [Yes/No]