Effects of Accountability Interventions on Environmental Educators' Engagement in MOOCs

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Abstract
Many participants in online courses struggle to remain engaged and complete the course, often due to a lack of perceived accountability. This study experimentally tested the effects of accountability interventions designed to encourage learners to discuss their progress with someone either inside or outside the course who could help hold them accountable. In a Massive Open Online Course (MOOC) on *Environmental Education Outcomes*, developed for a global audience of environmental educators, 1,259 participants were randomly assigned to one of three conditions: accountability-inside, accountability-outside, or a business-as-usual control. Overall, the interventions did not significantly affect the average number of discussion posts or project completion rates. However, participants in the accountability-inside condition made significantly fewer comments across all countries. Notably, among U.S. participants, those in the accountability-outside made more posts and comments and had higher project completion rates than those in the accountability-inside condition. These findings offer insights into culturally contingent responses to accountability structures and point to a scalable approach for enhancing engagement in online learning environments. They also raise important theoretical questions about the psychological mechanisms through which accountability influences learner behavior.

Introduction

Massive Open Online Courses (MOOCs) continue to play a significant role in expanding access to education and fostering global learning communities around complex challenges such as sustainability (Adefila et al., 2021; Jekabsone & Gudele, 2023). Yet, persistent disparities in learner engagement and completion rates remain a major concern (2U, 2024), particularly across national contexts (Ruipérez-Valiente et al., 2020). These disparities underscore the need for more targeted and culturally responsive interventions (Hansen & Reich, 2015; Kizilcec et al., 2017). Prior research has identified a range of barriers to MOOC participation, including challenges related to digital literacy, course design, and learner motivation (Henderikx et al., 2018). Among these factors, accountability has stood out as particularly salient, as perceived obligations to oneself or others may influence persistence in self-paced, low-structure learning environments such as MOOCs. In contrast to traditional classrooms, MOOCs typically lack built-in mechanisms that encourage commitment and follow-through, which contribute to high dropout rates.

Accountability is defined as the "perceived expectation that one's decisions or actions will be evaluated by a salient audience and that rewards or sanctions are believed to be contingent on this expected evaluation" (Hall & Ferris, 2011, p. 134). In the context of online learning, it reflects the extent to which learners assume responsibility for their goals, monitor their own progress, and feel a sense of obligation toward others (Winrotte, 2022). Understanding how accountability can be purposefully activated, particularly across diverse cultural contexts, is therefore critical. Comparative research has suggested that online learners from collectivist cultures, such as China, may be more responsive to socially oriented accountability mechanisms, whereas learners from individualist cultures, such as the United States, may be more influenced by self-directed regulatory strategies (Kizilcec & Cohen, 2017; Rizvi et al., 2022a, 2022b). While prior studies have indicated that accountability interventions hold promise for enhancing learner engagement (Kizilcec et al., 2020), empirical research on how such interventions function across cultural settings in MOOCs remains limited.

To address this gap, we implemented an accountability intervention in an *Environmental Education Outcomes* MOOC designed for environmental educators worldwide. Participants were randomly assigned to one of three groups: a control group, a group prompted to seek accountability from someone within the course ("accountability-inside"), and a group prompted to seek accountability from someone outside the course ("accountability-outside"). In the two treatment groups, participants were encouraged to engage in conversations with individuals who could help hold them accountable for making progress in the course. This study investigated two primary research questions:

1. How does accountability during MOOCs influence environmental educators' learning engagement and practice?
2. How do the effects of accountability interventions differ across various cultural contexts, particularly between China and the United States?

The study was preregistered to ensure transparency and minimize post-hoc bias in analysis. The results contribute to the existing literature on online learning by highlighting how culturally responsive accountability structures can enhance learner engagement in MOOCs, offering insights to inform the design of more inclusive and effective global online education experiences.

Literature Review

Psychological Interventions in Online Learning

Prior research has investigated a variety of interventions aimed at enhancing learner engagement and completion in online learning environments. One such intervention focuses on self-regulated learning (Arnesen et al., 2025; Guntur & Purnomo, 2024; Xu & Richardson, 2024), which includes strategies such as goal setting (Bipp et al., 2021; Handoko et al., 2019; Wong et al., 2021), strategic planning (Hoch et al., 2020; Sitzmann & Johnson, 2012), self-evaluation (Sitzmann & Ely, 2010; Lerís et al., 2017), and task strategy (Kizilcec et al., 2017; Sonnenberg & Bannert, 2019). Another category of intervention emphasizes social comparison, employing tools such as using learning analytics dashboards (Davis et al., 2017; Cogliano et al., 2022), badge systems (Anderson et al., 2014), and reputation scores (Coetzee et al., 2014) to display peer progress, as well as using social norm messages to highlight course-specific and broader community norms (Cho et al., 2021). Additionally, Borrella et al. (2022) found that making course contents more approachable was more effective to reduce dropout rates than communication-based strategies.

Recently, an increasing number of studies on MOOC learner outcomes have explored the intention fulfillment from learners' perspectives rather than focusing solely on course completion (Henderikx et al., 2017; Semenova, 2022). Rabin et al. (2019) argued that learner-centered outcomes, which emphasize learners' intentions rather than course developers' objectives, are essential for evaluating nonformal lifelong learning opportunities such as MOOCs. A study investigating MOOC participants' motivational dispositions and found that those with intrinsic motivation performed better than those with extrinsic motivation (Moore & Wang, 2021). Extending from these and other studies on learner intentions and motivations, Moore et al. (2025) proposed a Learner-Intention Continuum to examine how different personas, including knowledge seeker, undecided explorer, and goal-oriented learner, influence learner engagement and outcomes in MOOCs. Focusing on learner's intention fulfillment could provide an alternative way to examine success and offer insights for MOOC providers to design experiences that align with learners' intentions.

Culture is an important consideration in the design of educational interventions. Hofstede (2001) proposed that national cultures are characterized by distinct configurations of value dimensions, including power distance, uncertainty avoidance, individualism versus collectivism, masculinity versus femininity, and long-term versus short-term orientation. Similarly, Schwartz's theory of basic values identified ten universal values, including self-direction, stimulation, hedonism, achievement, power, security, conformity, tradition, benevolence, and universalism, which are shared across cultures but vary in relative importance (Schwartz, 2012). These cultural differences can shape how learners engage with and respond to educational interventions, resulting in varied learning behaviors and outcomes. For example, a self-regulation intervention incorporating goal setting and goal striving significantly improved completion rates among learners from individualist cultures but had no such effect among those from collectivist cultures (Kizilcec & Cohen, 2017). In another study, a social norm intervention using injunctive norm messaging increased course completion among U.S. learners but not among learners from China (Cho et al., 2021). Further cultural contrasts have been observed in learner engagement. Grothaus (2023) reported distinct participation patterns between Thai and German learners. Learners from Thailand, a feminine, collectivist, and harmony-oriented culture, often refrained from speaking in video conferences to avoid disrupting group harmony or causing discomfort. In

contrast, German learners, whose culture emphasizes separation between private and academic life, were reluctant to contact peers outside of class, citing concerns about privacy. In line with these cultural differences, the U.S. students perceived greater privacy risks and less personal control over their data in learning analytics compared to students from other cultural contexts (Viberg et al., 2024). Moreover, the design and variation of course activities like discussion forums can yield different effects depending on cultural background. For example, discussion activities facilitated learner progress in Anglo-Saxon contexts but were associated with inhibited progress among learners from South Asia (Rizvi, 2022a).

Additionally, social interaction plays a critical role in engaging and supporting learners in online environments (Loh et al., 2024). Interaction with instructors and peers has been shown to increase students' sense of engagement (Limbu, 2025; Redmond et al., 2023) and positively influence their persistence in online learning (Tang et al., 2025). Learners' social capital, particularly having more, and more diverse peers, can further enhance learning outcomes (Canals et al., 2025). Moreover, instructor interaction has been linked to improved learners' retention (Hone & El Said, 2016) and satisfaction (Kucuk & Richardson, 2019). However, given the scale of MOOCs, frequent instructor-learner interaction is often difficult to achieve (Hew & Cheung, 2014), making peer interaction especially important for providing support and improving retention (Castellanos-Reyes, 2021; Rahimi, 2024). MOOC discussion boards are commonly used to facilitate peer interaction and support learning (Kellogg et al., 2014; Zhang et al., 2016; Liu et al., 2022). Some studies found that social media platforms offer more accessible avenues for interaction than traditional course forums (Huang et al., 2023; Li et al., 2025; Zheng, et al., 2016). Others have explored the use of video-based commenting tools that allow learners to interact with each other during video watching, which can enhance learning engagement (Yang & He, 2022) and promote knowledge convergence (Xiang et al., 2025). Group work has also been used to support learning (Sanz-Martínez et al., 2017) and increase course completion rates (Jitpaisarnwattana et al., 2021). When integrated into MOOCs, group work has shown to encourage greater participation among women and foster peer recruitment (Bayeck, 2016). Finally, social interactions can also extend beyond the MOOC itself as learners often share their experiences with family members or friends.

Social interaction plays a crucial role in the professional development of educators (Bell & Gilbert, 1996). A number of studies have examined the role of interaction in online professional development courses for environmental educators. For example, Li et al. (2016) analyzed the course discussion board of a U.S.-based online course and found that participant-participant interactions were positively associated with increased motivation to learn and the development of professional networks. In addition, instructor-participant interactions can contribute to fostering professional networks among participants. In a global context, DuBois et al. (2019) applied Garrison et al.'s (2010) Community of Inquiry framework to analyze three types of presences, including cognitive, teaching, and social, in both the course discussion board and the course-associated Facebook group. The study found that cognitive presence was more prominent on the discussion board, while social presence was more prevalent in the Facebook group. In China, Xiang et al. (2025) found that knowledge convergence occurred through participants' use of social annotation in course video lectures. Additionally, Krasny et al. (2018) proposed the concept of a "social learning MOOC" to emphasize the importance of peer interactions in supporting learning and collaboration. Their findings indicated that study groups could enhance participants' learning by addressing challenges related to language, content, culture, and internet access, and by facilitating collaborative group projects.

Accountability

Accountability has been defined and conceptualized in various ways (Hall et al., 2017). At the micro-level, *felt accountability* refers to an individual's perception of being accountable for their own actions (Frink & Klimoski, 1998). Key elements of accountability typically include an expected evaluation, potential consequences for non-compliance identified during the evaluation, and the presence of a salient audience to whom the behavior is visible (Hall et al., 2017). Perceived accountability for others involves being held answerable for the beliefs or actions of others, extending beyond formal roles, with outcomes often dependent on the adequacy of justification provided (Zellars et al., 2011). Expanding on Bovens' (2005) research on public accountability, Levitt et al. (2008) defined accountability as "proper behavior" relating to "the responsibilities of individuals and organizations for their actions towards other people and agencies" (p. vii). In this framing, responsibility is considered as a core component of accountability and can also serve to promote greater accountability (Cummings & Anton, 1990; Schlenker et al., 1991).

Various models have been developed to conceptualize different facets of accountability. For example, Schlenker et al.'s (1994) pyramid model emphasizes social psychological aspects, illustrating how others influence an individual's thinking and behavior. Tetlock's (1992) social contingency model focuses on internal psychological processes and coping strategies. Building on the role theory, which emphasizes role-making and role-taking (Frink and Klimoski, 1998), Ammeter et al. (2004) developed a framework integrating role theory, trust, and accountability, suggesting that increased trust may reduce the need to enforce accountability. Frink et al. (2008) proposed a meso-level theory of accountability in organizations, including individual, dyad, group, and organizational levels. Features of the work environment, such as source, focus, salience, and intensity of accountability (Hall et al., 2007), as well as personability and perceived organizational support (Dewi & Riantoputra, 2019), can shape individuals' experiences of accountability.

Accountability in education is conceptualized as performance reporting, a technical process, a political process, or an institutional process (Levin, 1974). It can apply to various stakeholders, including teachers, students, parents, administrators, schools, and external entities. Teachers are expected to be accountable to their students, parents, school, profession, and the broader society (Rahmatollahi & Mohamadi Zenouzagh, 2021), with teacher accountability often assessed through teacher evaluations and student achievement (Darling-Hammond, 2004; Huber & Skedsmo, 2016). Student accountability, the focus of this study, refers to students taking ownership of their educational performance (Levin, 1974). Parental accountability involves the roles and responsibilities of parents in supporting their child's education (Đurišić & Bunijevac, 2017). A recent study found that parents played a critical role in supporting young learners by co-creating and co-constructing visuals through a digital-screen-mediated design (Guo et al., 2025). Administrative accountability concerns school leaders and administrators being held responsible for overall school performance (Normore, 2004), while organizational accountability refers to an institution-wide obligation to ensure performance, transparency, and alignment with stated goals (Choi & Chun, 2021). External accountability involves schools being held responsible by outside entities, such as governments and the public, which can in turn impact student outcomes (Carnoy & Loeb, 2002).

Student accountability can take the form of either self-accountability or peer accountability. Self-accountability is considered a key element of self-regulated learning, enabling students to manage their learning processes effectively (Zimmerman, 2002). Peer

accountability, often examined in collaborative or team-based contexts, involves students taking responsibility for their contribution to group tasks, which is essential for team success (Stein et al., 2016). Student accountability is shaped by multiple influences, including teachers, peers, parents, and schools. In the MOOC context, traditional accountability structures are often absent; however, the scale and openness of MOOCs provide unique opportunities for participants to interact with others from diverse backgrounds (Sparke, 2017). While teacher accountability remains important for instructional quality, peer interaction also plays a key role in fostering learner engagement (Rahimi, 2024). Moreover, research showed that both self-regulated and social learning approaches can support high-quality learning experiences in MOOCs (Askeroth & Richardson, 2019). External support systems, such as encouragement from family and friends, have also been shown to positively impact learners' self-efficacy, engagement, and academic outcomes (Chu, 2010; Gao et al., 2021; Singh & Ishrat, 2025). Therefore, interventions that promote peer interaction and family support may be crucial for enhancing learner engagement in MOOCs. Nevertheless, the extent to which peers, families, and friends can help learners maintain commitment to their learning goals in open online environments remains an open question.

Research on online learning has examined learners' tendencies to seek accountability. Kizilcec & Cohen (2017) found that Indian learners, compared to U.S. learners, were more inclined to engage others in monitoring their learning progress as a form of external accountability. However, an accountability intervention that encouraged learners to develop a plan for regular check-ins about their course progress did not lead to improved completion rates among learners from non-individualistic cultural contexts (Kizilcec et al., 2020). It remains unclear whether identifying a specific group for accountability, such as peers within the course or individuals outside the course, might differentially affect learners' engagement and course completion.

In sum, theoretical and empirical evidence suggests that cultural differences shape learners' responses to intervention cues. China, characterized as a collectivist, high power distance, and more restrained culture, contrasts with the United States, which is highly individualist, low in power distance, and more indulgent (Hofstede, 2001). Similarly, while both countries value mastery, China places greater emphasis on embeddedness and hierarchy, whereas the United States prioritizes autonomy (Schwartz, 2012). These cultural contrasts may lead to differing responses to interventions such as self-regulation prompts and progress-sharing with peers (Cho et al., 2021; Kizilcec & Cohen, 2017; Kizilcec et al., 2020). A comparative study between China and the United States would offer valuable insights into the design of culturally responsive interventions.

Methods

Research Context

We conducted the experiments in the *Environmental Education Outcomes* MOOC, which was offered twice in 2020 and 2021 by Cornell University in the United States. The course was co-taught by the first and fourth authors and was designed to help participants define their environmental education goals and apply research-based approaches to achieve them. Each offering lasted six weeks, consisting of five weekly modules followed by a final project week, during which participants applied what they had learned to their environmental education practice. The course featured short, pre-recorded lectures, podcasts, readings, and weekly live webinars. While most participants accessed the course through the EdX Edge

platform, a separate Chinese course site was maintained to store course materials for participants in China. To support non-English-speaking participants, captions were provided in English, Spanish, and Chinese. To facilitate global interaction, we supported various social media platforms, including Facebook, WhatsApp, Telegram, and WeChat, depending on their regional popularity. To complete the course, participants were required to create at least five discussion posts, submit one webinar reflection, reply to a minimum of two other participants per week (for a total of 10 comments), and complete a final project. To increase global accessibility, we offered an optional payment model. Participants could pay a standard fee of $60, a sponsorship fee of $120, contribute any amount they could afford, or enroll for free due to financial or technical barriers. The study was approved by the Cornell University Institutional Review Board (Protocol ID: 1603006192).

Participants

A total of 1,259 participants enrolled in the courses. Among them, 65% were female and 87% held a bachelor's degree or higher. The average age was 34 years, with a range from 16 to 86 (SD = 11, Median = 32). Regarding work experience in environmental education, 27% had more than five years of experience, 50% had between one and five years, and 23% had no prior experience. Nearly half of the participants (49%) were actively conducting environmental education programs during the course. Participants came from a wide range of countries, with 29% from China, 27% from the United States, 13% from Nigeria, and 31% from 80 other countries. They represented diverse professional backgrounds, including non-formal educators (25%), university students (24%), self-employed (9%), K–12 teachers (8%), business employees (7%), university professors (7%), and others (21%). Most participants (44%) paid the standard course fee of $60, 10% paid more than $60, ranging from $75 to $120, 6% paid a reduced fee between $2 and $50, and 41% participated for free.

To compare the influence of accountability interventions between participants in China and the United States, we analyzed a subset of 705 participants, 51% of whom were from China. In both countries, the majority of participants were female, with 80% in China and 79% in the United States. A higher percentage of U.S. participants (91%) held a bachelor's degree or higher, compared to 79% of Chinese participants. On average, U.S. participants were older, with a mean age of 40 (ranging from 16 to 86), while Chinese participants had a mean age of 30 (ranging from 17 to 69). U.S. participants also reported more experience in environmental education. Specifically, 87% had prior experience, compared to 53% for Chinese participants, and 62% were conducting ongoing environmental education programs at the time of the course, compared to 37% for Chinese participants. Professional backgrounds also varied between the two groups. Among Chinese participants, the largest group was university students (29%), followed by non-formal educators (24%), business employees (10%), self-employed individuals (8%), university professors (7%), and K–12 teachers (4%). Among U.S. participants, non-formal educators made up the largest group (47%), followed by K–12 teachers (12%), self-employed individuals (8%), university students (6%), business employees (5%), and university professors (5%). Both groups exhibited similar payment patterns. Only 10% of the participants in each group took the course for free. Among Chinese participants who paid, most selected either $60 (60%) or $75 (30%) due to the fixed payment system. In contrast, U.S. participants showed greater variability in payment amounts, which ranged from $5 to $120, with 73% paying $60 and 3% paying more than $60.

Procedure

      Prior to collecting data in 2021, we preregistered our research design on AsPredicted.org (https://aspredicted.org/9fmh-5z8r.pdf). The pre-registration specified the independent and dependent variables, sample size, and data analysis plan. Only one deviation from the preregistered plan was made: we did not exclude participants who did not complete the intervention activities to avoid selection bias. Further details are provided in the data analysis section below.

      We randomly assigned participants to one of three conditions: control, accountability-inside, and accountability-outside (Table 1), based on course registration data to ensure balance across the bivariate distribution (Baiocchi & Kizilcec, 2018). At the beginning of the second week of the course, all participants were asked to fill out a survey embedded in the course platform and sent via email. Participants in the control condition were asked only two questions: whether they had any friends or colleagues taking the course, and how likely they were to complete it. In the two treatment conditions, we embedded the accountability intervention activities into the survey. Participants in the accountability-inside condition were asked to contact somebody within the course who could hold them accountable. Participants in the accountability-outside condition were asked to contact somebody outside the course who could hold them accountable (Table 2). In both treatment conditions, participants were asked to provide the names of their accountability contacts, describe their plans for what they would share about their goals and progress, and specify how and when they would contact their selected individuals. Participants were given multiple opportunities to engage in the intervention activities by promoting the survey in the second, third, and fourth week of the course.

Table 1

Counts of Participants, Certificate Earners, and Survey Respondents by Experimental Conditions (China and the United States)

	Control	Accountability-inside	Accountability-outside
2020		Total (China, USA)	
Participants	259 (73, 74)	259 (69, 74)	259 (70, 73)
Certificates	117 (50, 34)	109 (46, 32)	120 (47, 45)
Survey respondents	167 (62, 47)	165 (61, 45)	165 (56, 57)
2021		Total (China, USA)	
Participants	160 (47, 44)	162 (53, 39)	160 (47, 42)

Certificates	66 (20, 23)	60 (20, 16)	68 (22, 20)
Survey respondents	101 (28, 35)	91 (23, 24)	98 (27, 33)

Measure

We used the MOOC participants' learning engagement and practice to determine the impact of accountability interventions. Learning engagement was measured by the number of discussion posts and comments participants made throughout the course. Practice was assessed by whether participants completed the course project, which required them to apply course concepts to develop a theory of change for their environmental education practice. Participants who completed at least six posts, including five weekly discussion posts and one webinar reflection, at least 10 comments on peers' posts, and the course project were eligible to receive a course certificate. In addition, a post-course survey asked participants whether they had discussed their learning with individuals inside or outside the course, and how these interactions influenced their learning experience. De-identified data are available upon request.

Table 2

Accountability Intervention Activity Instructions

Accountability-inside Intervention Instructions	Accountability-outside Intervention Instructions
Now is the best time to think about finding peers to hold each other accountable.	Now is the best time to think about who can hold you accountable.
If you already know someone else in the course: 1. Write down the names of one or more course participants who could hold you accountable. If you don't know anyone in the course yet: 1. Write down how you will find someone through the course social media or the discussion board. 2. Now make a plan for what you will tell them about your goal and progress. *Tip: Ask them to check in often about your progress in the course.* 3. Finally, write down how and when you	1. Write down the names of one or more friends, co-workers, family members, or acquaintances who could hold you accountable. *Tip: Pick people who you don't see too often but whose opinion matters to you.* 2. Now plan for what you are going to tell them about the course and your goal. *Tip: Ask them to regularly check in with you about your progress in the course.* 3. Finally, write down how and when you will tell them about the course and your goal. For example, will you talk in person or on the phone, or send them an email or text message? Be sure to choose a time and place that works.

will tell them about your goal and progress. For example, will you talk in person, on the phone, or send them an email or text message? Be sure to choose a time and place that works. You can make a note of your plans above to help you remember them.	You can make a note of your plans above to help you remember them.

Data Analysis

We conducted regression analysis to examine the effects of accountability conditions on participants' learning engagement and practice. The dependent variables included the number of posts (numeric), number of comments (numeric), and project completion (binary: 0 = no, 1 = yes). The accountability condition was coded into categories: control, inside, and outside. Control variables included the year of MOOC participation (binary: 2020 or 2021), as well as participants' demographic data: age (numeric), gender (categorical: female, male, other), education level (categorical: high school/associate, bachelor's, master's/doctoral), and work experience in environmental education (categorical: 0 years, 1–5 years, >5 years). Following our pre-registered analysis approach, adapted from prior intervention research in MOOCs (Cho et al., 2021), we used a linear multiple regression model with robust standard error estimation, applying the 'lm_robust' function from the *estimatr R* package (Blair et al., 2025). In terms of R formula syntax, we specify our regression model as follows:

Outcome ~ Condition + Year + Age + Gender + Education + WorkExp

For the binary project completion outcome, this specification estimates a linear probability model (von Hippel, 2017). We also conducted a subgroup analysis by restricting the sample to compare the effects between U.S. and Chinese participants. To examine whether the effect of condition on outcome differ by country, we tested a Condition-by-Country interaction term in the model and conducted a model comparison using an *F*-test, specified as:

Outcome ~ Condition*Country + Year + Age + Gender + Education + WorkExp

Initially, the control group was used as the reference category for comparisons. However, when analyzing the differences between the accountability-inside and accountability-outside conditions, we shifted the reference group to the accountability-inside condition.

All data from randomized participants were analyzed, regardless of whether they engaged in the intervention activities, using an intent-to-treat approach, to avoid selection bias. Additionally, we analyzed the open-ended responses in the intervention activities to understand the plans of inside and outside condition participants for reaching out to their contacts.

Results

The accountability interventions did not impact the average number of discussion posts or rates of project completion. However, we found that participants in the accountability-inside condition made significantly fewer comments (M = 6.18, SD = 7.07) compared to participants in the control condition (M = 7.25, SD = 9.05, b = -1.15, SE = 0.55, p = 0.036) and participants in the accountability-outside condition (M = 7.32, SD = 7.75, b = -1.18, SE = 0.49, p = 0.018); the accountability-outside intervention did not significantly increase commenting compared to the control condition (b = 0.02, SE = 0.57, p = 0.097) (Figure 1). The overall model explained approximately 4.9% of the variance in the number of comments, R^2 = 0.049, *Cohen's f^2* = 0.052, indicating a small effect size.

Figure 1

Mean Number of Comments by Participants by Experimental Condition
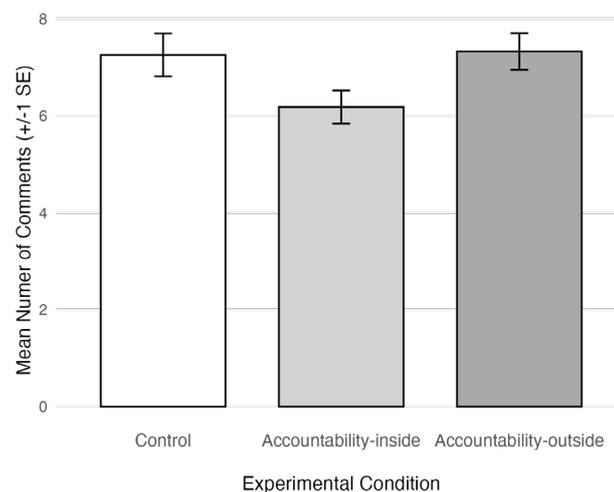
Note. Error bars indicate one standard error around the mean.

Among the 256 participants in the accountability-inside condition who completed the intervention activity, 205 wrote specific plans, and 128 identified specific individuals for contacts. Participants mentioned that they found other peers with similar interests or who lived in the same area on the course discussion board or social media, and then used email, Facebook, WhatsApp, or WeChat to make contact. For example, a participant indicated that she had contacted several participants from the course group. She mentioned that: "I can ask them if we can study together. I often share my learning progress in the course with them and learn about their work" and her plan was to "choose three participants and send them a WeChat message once a week" (female, 27 years old, China). Some participants chose their colleagues who took the course together. For example, a participant wrote as her plan: "We will update each other twice a week about our progress. Besides, we will discuss ideas with each other about our assignments", and her approach for contacting: "we work together so we will talk about it at work. Normally on Wednesday and Friday afternoon" (female, 28 years old, Vietnam). Some participants felt no need to seek additional accountability support: "I do not need to find someone to monitor my learning at the moment. I feel that the WeChat group communication is rich and lively, which is enough" (female, 45 years old, China). Others

encountered challenges in connecting with peers: "I have been sending friend requests to my peers on Facebook but they are not approving them" (male, 41 years old, Zambia).

Among the 263 participants in the accountability-outside condition who completed the intervention activity, 233 wrote specific plans, and 229 identified specific individuals for contact. These individuals included family members, friends, colleagues, friends, and classmates. For example, a participant chose to contact his parents, stating: "Tell them in person when they come by for the usual visit during our discussion about my studies and work (male, 21 years old, Cameroon). Another participant planned to tell her supervisor, coworkers, and partner, noting she would share: "How I am learning more about assessment and theory of change models today at work and over dinner" (female, 24 years old, U.S.).

Among the 268 participants in the control condition who completed the survey questions asking about whether they had any friends or colleagues taking the course, and how likely they were to complete it, 92 indicated that they did have friends or colleagues enrolled. An ad hoc analysis comparing control group participants who had friends or colleagues in the course with those who did not show significant differences.

F-tests indicated that adding the interaction between condition and country (China vs. U.S.) did not significantly improve model fit compared to the main effects model for any of the outcome: number of posts ($F(2, 691) = 0.84$, $p = 0.434$), number of comments ($F(2, 691) = 0.94$, $p = 0.391$), and project completion ($F(2, 691) = 0.85$, $p = 0.427$). These results suggest that the effect of condition on learning outcomes did not differ significantly between the two countries. Therefore, we proceed to analyze the data for participants from China and the United States separately.

When analyzed separately, participants from China and the United States demonstrated significant differences in learning engagement, including the number of discussion posts and comments, and project completion. Among U.S. participants, those in the accountability-outside condition created more posts (M = 4.50, SD = 3.20) than those in the accountability-inside condition (M = 3.56, SD = 3.64, $b = 0.90$, SE = 0.46, $p = 0.049$, $R^2 = 0.030$, *Cohen's f^2* = 0.031) (Figure 2). They also made more comments on other students' posts (M = 9.02, SD = 6.87) compared to those in the accountability-inside condition (M = 6.62, SD = 7.27, $b = 2.46$, SE = 0.95, $p = 0.009$, $R^2 = 0.047$, *Cohen's f^2* = 0.049) (Figure 3). In terms of practice, a higher percentage of U.S. participants in the accountability-outside condition completed the course projects compared to those in the accountability-inside course condition (57% vs. 42%, $b = 0.15$, SE = 0.07, $p = 0.029$, $R^2 = 0.032$, *Cohen's f^2* = 0.033). Additionally, a higher percentage of Chinese participants completed the course projects compared to U.S. participants (60% vs. 51%, $b = 0.09$, SE = 0.04, $p = 0.013$, $R^2 = 0.009$, *Cohen's f^2* = .009) (Figure 4). However, no significant differences in the number of posts and comments, or project completion were found between conditions for Chinese participants.
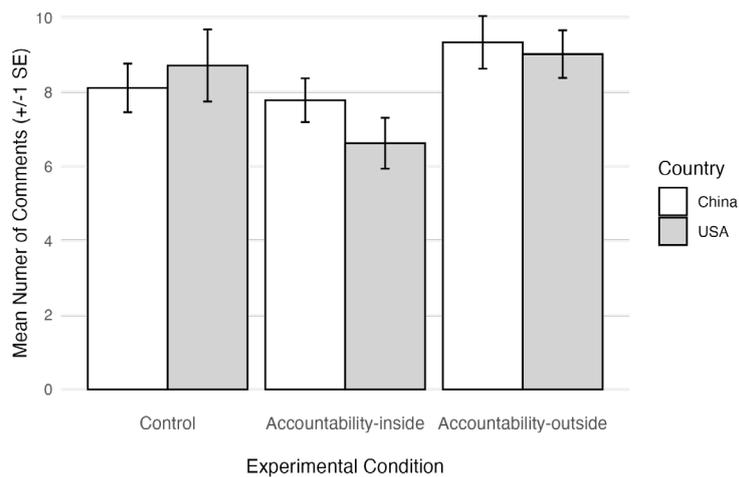
Figure 2

Mean Number of Posts by Participants in China and the United States by Experimental
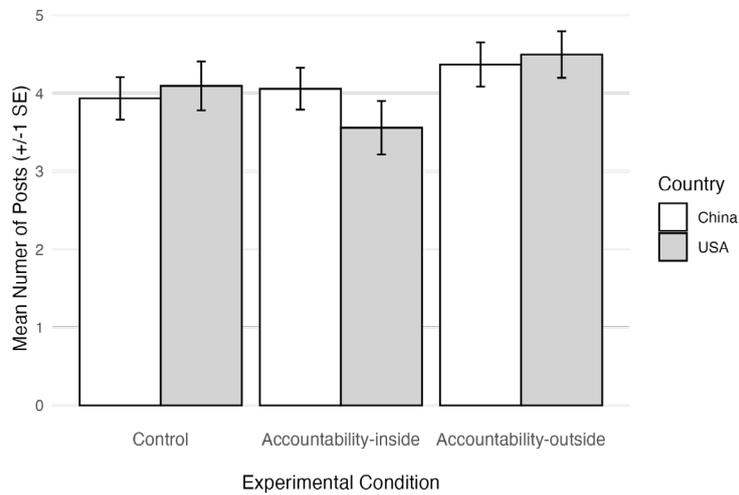
Condition

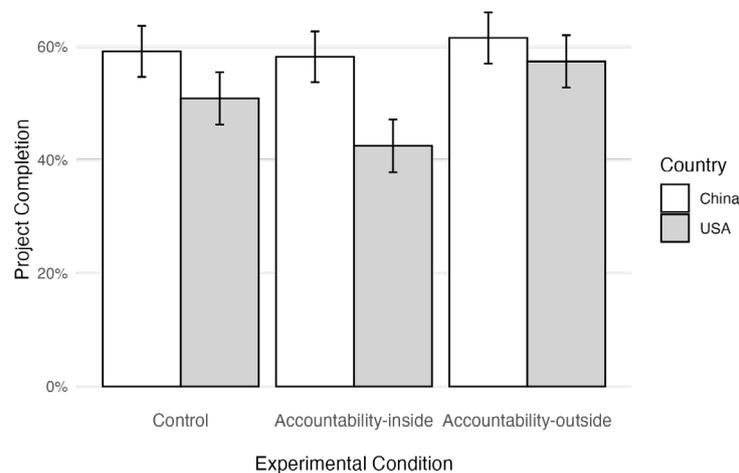*Note.* Error bars indicate one standard error around the mean.

Figure 3

Mean Number of Comments by Participants in China and the United States by Experimental

Condition

Note. Error Bars Indicate One Standard Error Around the Mean.

Figure 4

Project Completion Rates by Participants in China and the United States by Experimental

Condition

Note. Error bars indicate one standard error around the mean.

In the course post-survey, participants were asked whether they had spoken with someone inside or outside the course and how these interactions had supported their learning. Among the 1,259 participants, 13% reported contacting both individuals inside and outside the course, 6% reported contacting only people inside the course, and 22% reported contacting only people outside the course. For example, a participant assigned to the accountability-inside condition indicated that she talked with people both inside and outside the course and mentioned: "Talking with others helped me to understand my final project and what I have learned, read, and seen in the course" (female, 43 years old, Argentina). In some cases, however, participants contacted individuals different from those specified in their assigned condition. For example, one participant in the accountability-outside condition mentioned that she had instead contacted a colleague enrolled in the course: "Having a colleague at work doing this course too, much easier to brainstorm" (female, 34 years old, Australia). Another participant assigned to the accountability-inside condition noted in the intervention survey that she found someone on the discussion board who was also in the same state and planned to reach out via email and potentially meet at statewide conferences. However, in the post-survey, she reported only contacting coworkers outside the course: "Talking with my coworkers gave me the input needed for the final project and made the final project a practical and useful item" (female, 59 years old, U.S.).

Discussion

In sum, the study found that the accountability-inside intervention, which involved contacting people within the course, significantly decreased participants' comments across all countries. In contrast, the accountability-outside intervention, which involved contacting people outside the course, was more effective for U.S. participants in terms of the number of posts and comments, and project completion when compared to the accountability-inside intervention. These results serve as a caution for designing such interventions to engage learners in online environments and point to important areas for future research and practice.

The potential explanation for fewer comments in the accountability-inside condition could be that participants had alternative communication channels through course-related social media groups, such as Facebook, WhatsApp, and WeChat, which were mentioned in the survey as being easier to use and more interactive compared to the course platform. When encouraged to communicate with peers, participants might have shifted their focus to social media instead of the course discussion board. Previous research has also shown that MOOC participants were more engaged in social media groups than on the course discussion forums (Zheng et al., 2016; Li et al., 2025). Furthermore, Jitpaisarnwattana et al. (2021) found that working in groups and creating a learning plan were important factors associated with course completion, whereas merely interacting with other learners online was not. Another possible explanation is that participants might prefer to interact with people they already knew (Cisel, 2018), such as classmates or friends who were also taking the course together, which was reflected in some responses in the post-course survey. Asking them to reach out to unfamiliar participants might have made them uncomfortable, which discouraged their engagement in the course. On the contrary, participants in the accountability-outside condition were asked to contact people outside of the course. Although they used similar methods for contacting through email and social media, they kept their coursework separate from their social contacts.

Participants in the accountability-inside condition made significantly fewer comments than those in the control condition. Additionally, participants in the accountability-outside condition did not outperform those in the control condition. Participants in the control condition were also exposed to the survey embedded in the course, even though it did not include any accountability activity instructions. Asking them about their friends and colleagues taking the course might have reminded them to check in with people they already knew. In addition, asking them the likelihood of completing the course might have helped them set goals (Handoko et al., 2019; Wong et al., 2021), which could have motivated them to complete the course. These simple questions, while not designed as interventions, may have acted as a self-directed nudge that helped participants reflect on their social connections and goals, potentially offering a low-effort alternative to more prescriptive strategies. Future research could explore the effectiveness of such minimal interventions, particularly in large-scale, low-instructor-contact settings like MOOCs.

The effects of accountability interventions differed between participants in China and the United States. Only the U.S. participants in the accountability-outside condition completed significantly more posts, comments, and projects than those in the accountability-inside condition. This divergence aligns with Hofstede's (2001) cultural dimension of individualism versus collectivism. U.S. culture, characterized by high individualism, tends to emphasize personal autonomy and self-directed achievement, making externally visible forms of accountability more motivating. In contrast, Chinese culture, which leans toward collectivism, places greater emphasis on group harmony and relational obligations, which may reduce the impact of external accountability cues on individual task completion. Consistent with findings from previous studies that self-regulation or social norm interventions were effective for participants in individualist cultures, but not for those in collectivist cultures (Kizilcec & Cohen, 2017; Cho et al., 2021), these results suggest that the effectiveness of interventions can vary significantly depending on cultural value orientations. This cultural sensitivity is also evident in other contexts; for instance, German learners, from a culture that emphasizes boundaries between private and academic life, were hesitant to contact peers outside of class (Grothaus, 2023), further highlighting how cultural norms mediate learners' engagement behaviors. Additionally, more Chinese participants completed

the course compared to the U.S. participants. This may be because Chinese participants were more motivated to complete the course due to a lack of environmental education professional development opportunities, as discussed in a previous study (Cho et al., 2021). This might also explain why Chinese participants were less sensitive to the interventions, indicating they would complete the course regardless of the intervention. Furthermore, Chinese participants received more support through WeChat course group discussions with teaching assistants who helped them overcome barriers (Li et al., 2024). This additional support might have influenced their learning engagement.

The study offers several recommendations for the design and facilitation of MOOCs. First, while peer interaction within online courses can foster participant engagement, instructors should provide structured opportunities and clear guidance to support these interactions (Wei et al., 2023). For example, assigning learners to small groups, rather than expecting them to find independently, can promote more meaningful engagement. When encouraging the use of social media groups, instructors should also remind participants to complete the required assignments on the primary course platform. Instructors can also consider assigning several students with rotating roles to improve discussion quality (Chen & Yeh, 2021) or recruit teaching assistants to serve as facilitators (Li et al., 2024). Second, instructors and designers should be mindful of participants' cultural backgrounds and ensure that the course offers diverse and inclusive learning opportunities (Rizvi et al., 2024). This includes both the content and the modes of engagement, recognizing that learners from different contexts may have varying preferences and constraints (Rizvi et al., 2022a; Parrish & Linder-VanBerschot, 2010). Third, MOOC platforms should consider making course discussion boards more user-friendly and interactive or integrating social media tools directly into the course (Huang et al., 2023; Li et al., 2025). Allowing participants to complete certain assignments via social media platforms could improve accessibility, particularly in regions with limited technological infrastructure. Finally, instructors should recognize that meaningful learning outcomes may extend beyond course completion and assignments. Learner-centered outcomes such as intention fulfillment (Moore et al., 2025; Rabin et al., 2019) offer valuable insights into participants' experience and the broader impact of MOOCs.

Limitations and Conclusion

This study has several limitations. First, approximately one-third of participants assigned to the treatment groups did not complete the intervention activity, suggesting that many did not receive the intended interventions as designed. Additionally, some participants reported in the post-survey that they contacted individuals different from those specified in their assigned condition, indicating a degree of intervention non-compliance. Furthermore, participants in the control condition were also asked to complete a survey. Although they did not receive any accountability instructions, responding to questions about whether they had friends or colleagues in the course and their likelihood of completing it may have influenced their learning behavior. Future control group designs should be more carefully crafted to avoid introducing potential nudges that could unintentionally affect outcomes. Finally, although the course project reflects a level of practical application, we do not know whether participants implemented the projects beyond the course itself.

This study examined the effectiveness of accountability interventions in an online learning context and offers two key contributions to the literature on engaging diverse participants in MOOCs. First, the study design is innovative in incorporating two different accountability interventions within a MOOC setting, yielding practical insights for course

design and instructional strategies. Second, the study explored how the effects of these interventions differed between Chinese and U.S. participants, advancing our understanding of how accountability strategies may function across cultural contexts. These findings offer implications for tailoring learner support based on cultural background. Future research should further investigate effective forms of accountability interventions and explore additional strategies to promote learner accountability and engagement in online learning environments.

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References

2U. (2024). 2023 Transparency & outcomes report. https://press.edx.org/2023-transparency-outcomes-report

Adefila, A., Arrobbio, O., Brown, G., Robinson, Z., Spolander, G., Soliev, I., Willers, B., Morini, L., Padovan, D., & Wimpenny, K. (2021). Ecologized collaborative online international learning: Tackling wicked sustainability problems through education for sustainable development. *Journal of Teacher Education for Sustainability*, *23*(1), 41–57. https://doi.org/10.2478/jtes-2021-0004

Ammeter, A. P., Douglas, C., Ferris, G. R., & Goka, H. (2004). A social relationship conceptualization of trust and accountability in organizations. *Human Resource Management Review*, *14*(1), 47–65. https://doi.org/10.1016/j.hrmr.2004.02.003

Anderson, A., Huttenlocher, D., Kleinberg, J., & Leskovec, J. (2014). Engaging with massive online courses. *Proceedings of the 23rd International Conference on World Wide Web*, 687–698. https://doi.org/10.1145/2566486.2568042

Arnesen, K. T., Leary, H., Graham, C. R., & McMurry, A. I. (2025). Encouraging self-regulation in an online university course for preservice teachers: An intervention study. *Online Learning*, *29*(1), 266–292. https://doi.org/10.24059/olj.v29i1.4318

Askeroth, J. H., & Richardson, J. C. (2019). Instructor perceptions of quality learning in MOOCs they teach. *Online Learning*, *23*(4), 135–159. https://doi.org/10.24059/olj.v23i4.2043

Baiocchi, M., & Kizilcec, R. F. (2018). Criteria-based randomization: Explicit and exact control in multi-arm trials. *SSRN.* https://doi.org/10.2139/ssrn.3339748

Bayeck, R. Y. (2016). Exploratory study of MOOC learners' demographics and motivation: The case of students involved in groups. *Open Praxis*, *8*(3), 223–233. https://doi.org/10.5944/openpraxis.8.3.282

Bell, B., & Gilbert, J. (1996). *Teacher development: A model from science education*. Falmer Press, Taylor and Francis, Inc.

Bipp, T., Kleingeld, A., & Schelp, L. (2021). Achievement goals and goal progress as drivers of work engagement. *Psychological Reports*, *124*(5), 2180–2202.

Blair, G., Cooper, J., Coppock, A., Humphreys, M., & Sonnet, L. (2025). *Estimatr: Fast estimators for design-based inference. R package* (Version 1.0.4) [Computer software]. https://github.com/declaredesign/estimatr

Borrella, I., Caballero-Caballero, S., & Ponce-Cueto, E. (2022). Taking action to reduce dropout in MOOCs: Tested interventions. *Computers & Education*, 179, 104412. https://doi.org/10.1016/j.compedu.2021.104412

Bovens, M. (2005). Public accountability. In E. Ferlie, L. E. Lynn, & C. Pollitt (Eds.), *The Oxford handbook of public management*. Oxford University Press.

Canals, A., Cobarsí-Morales, J., & Ortoll, E. (2025). Social capital in online environments: Effects of social structure on academic performance in an online university. *Online Learning*, *29*(1), 238–265. https://doi.org/10.24059/olj.v29i1.4388

Carnoy, M., & Loeb, S. (2002). Does external accountability affect student outcomes? A cross-state analysis. *Educational Evaluation and Policy Analysis*, *24*(4), 305–331. https://doi.org/10.3102/01623737024004305

Castellanos-Reyes, D. (2021). The dynamics of a MOOC's learner-learner interaction over time: A longitudinal network analysis. *Computers in Human Behavior*, 123, 106880. https://doi.org/10.1016/j.chb.2021.106880

Chen, K.-Z., & Yeh, H.-H. (2021). Acting in secret: Interaction, knowledge construction and sequential discussion patterns of partial role-assignment in a MOOC. *Australasian Journal of Educational Technology*, *37*(6), 41–60. https://doi.org/10.14742/ajet.6979

Cho, J. Y., Li, Y., Krasny, M. E., Russ, A., & Kizilcec, R. F. (2021). Online learning and social norms: Evidence from a cross-cultural field experiment in a course for a cause. *Computer-based Learning in Context*, *3*(1), 18–36. https://doi.org/10.5281/ZENODO.4781808

Cho, J., Li, Y., Krasny, M. E., & Kizilcec, R. F. (2022). Measuring cultural dimensions of learning in online courses. *Proceedings of the ACM Conference on Learning at Scale (L@S)* (pp. 395–399). Association for Computing Machinery. https://doi.org/10.1145/3491140.3528333

Choi, S., & Chun, Y. H. (2021). Accountability and organizational performance in the public sector: Analysis of higher education institutions in Korea. *Public Administration*, *99*(2), 353–370. https://doi.org/10.1111/padm.12683

Chu, R. J. (2010). How family support and Internet self-efficacy influence the effects of e-learning among higher aged adults—Analyses of gender and age differences. *Computers & Education*, *55*(1), 255–264. https://doi.org/10.1016/j.compedu.2010.01.011

Cisel, M. T. (2018). Interactions in MOOCs: The hidden part of the iceberg. *International Review of Research in Open and Distributed Learning*, *19*(5), 80–94. https://doi.org/10.19173/irrodl.v19i5.3459

Coetzee, D., Fox, A., Hearst, M. A., & Hartmann, B. (2014). Should your MOOC forum use a reputation system? *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 1176–1187. https://doi.org/10.1145/2531602.2531657

Cogliano, M., Bernacki, M. L., Hilpert, J. C., & Strong, C. L. (2022). A self-regulated learning analytics prediction-and-intervention design: Detecting and supporting struggling biology students. *Journal of Educational Psychology*, *114*(8), 1801–1816. https://doi.org/10.1037/edu0000745

Cummings, L. L., & Anton, R. J. (1990). The logical and appreciative dimensions of accountability. In S. Srivastva & D. L. Cooperrider (Eds.), *Appreciative management and leadership: The power of positive thought and action in organizations* (pp. 257–286). Jossey-Bass/Wiley.

Darling-Hammond, L. (2004). Standards, accountability, and school reform. *Teachers College Record*, *106*(6), 1047–1085. https://doi.org/10.1111/j.1467-9620.2004.00372.x

Davis, D., Jivet, I., Kizilcec, R. F., Chen, G., Hauff, C., & Houben, G.-J. (2017). Follow the successful crowd: Raising MOOC completion rates through social comparison at scale. *Proceedings of the Seventh International Learning Analytics & Knowledge Conference*, 454–463. https://doi.org/10.1145/3027385.3027411

Dewi, R. C., & Riantoputra, C. D. (2019). Felt accountability: The role of personality and organizational factors. *Journal of Management Development*, *38*(4), 312–322. https://doi.org/10.1108/JMD-12-2018-0375

DuBois, B., Krasny, M. E., & Russ, A. (2019). Online professional development for environmental educators: Strategies to foster critical thinking and social interactions. *Environmental Education Research*, *25*(10), 1479–1494. https://doi.org/10.1080/13504622.2018.1564247

Đurišić, M., & Bunijevac, M. (2017). Parental involvement as a important factor for successful education. *Center for Educational Policy Studies Journal*, *7*(3), Article 3. https://doi.org/10.26529/cepsj.291

Frink, D. D., Hall, A. T., Perryman, A. A., Ranft, A. L., Hochwarter, W. A., Ferris, G. R., & Royle, M. T. (2008). Meso-level theory of accountability in organizations. In J. J. Martocchio (Ed.), *Research in personnel and human resources management* (vol. 27, pp. 177–245). Emerald Group Publishing Limited. https://doi.org/10.1016/S0742-7301(08)27005-2

Frink, D. D., & Klimoski, R. J. (1998). Toward a theory of accountability in organizations and human resource management. In G. R. Ferris (Ed.), *Research in personnel and human resources management* (vol. 16, pp. 1–51). Elsevier Science/JAI Press.

Gao, H., Ou, Y., Zhang, Z., Ni, M., Zhou, X., & Liao, L. (2021). The relationship between family support and e-learning engagement in college students: The mediating role of e-learning normative consciousness and behaviors and self-efficacy. *Frontiers in Psychology*, *12*, 573779. https://doi.org/10.3389/fpsyg.2021.573779

Garrison, D. R., Anderson, T., & Archer, W. (2010). The first decade of the community of inquiry framework: A retrospective. *The Internet and Higher Education*, *13*(1), 5–9. https://doi.org/10.1016/j.iheduc.2009.10.003

Grothaus, C. M. (2023). Engagement in online learning among Thai and German students: The role of classmates, instructors, and technology across country contexts. *Online Learning*, *27*(3), 188–208. https://doi.org/10.24059/olj.v27i3.3413

Guntur, M., & Purnomo, Y. W. (2024). A meta-analysis of self-regulated learning interventions: Studies on learning outcomes in online and blended environments. *Online Learning*, *28*(3), 563–584. https://doi.org/10.24059/olj.v28i3.4025

Guo, D., Ramos, R., Zhao, Y., & Sun, Q. (2025). Design of interactive spaces for promoting parental involvement: Strategies used by EFL teachers. *Online Learning*, *29*(2), 140–167. https://doi.org/10.24059/olj.v29i2.4683

Hall, A. T., Bowen, M. G., Ferris, G. R., Royle, M. T., & Fitzgibbons, D. E. (2007). The accountability lens: A new way to view management issues. *Business Horizons*, *50*(5), 405–413. https://doi.org/10.1016/j.bushor.2007.04.005

Hall, A. T., & Ferris, G. R. (2011). Accountability and extra-role behavior. *Employee Responsibilities and Rights Journal*, *23*(2), 131–144. https://doi.org/10.1007/s10672-010-9148-9

Hall, A. T., Frink, D. D., & Buckley, M. R. (2017). An accountability account: A review and synthesis of the theoretical and empirical research on felt accountability. *Journal of Organizational Behavior*, *38*(2), 204–224. https://doi.org/10.1002/job.2052

Handoko, E., Gronseth, S. L., McNeil, S. G., Bonk, C. J., & Robin, B. R. (2019). Goal setting and MOOC completion: A study on the role of self-regulated learning in student performance in Massive Open Online Courses. *The International Review of Research in Open and Distributed Learning*, *20*(3), 40–58. https://doi.org/10.19173/irrodl.v20i4.4270

Hansen, J. D., & Reich, J. (2015). Democratizing education? Examining access and usage patterns in massive open online courses. *Science*, *350*(6265), 1245–1248. https://doi.org/10.1126/science.aab3782

Henderikx, M. A., Kreijns, K., & Kalz, M. (2017). Refining success and dropout in massive open online courses based on the intention–behavior gap. *Distance Education*, *38*(3), 353–368. https://doi.org/10.1080/01587919.2017.1369006

Henderikx, M. A., Kreijns, K., & Kalz, M. (2018). A classification of barriers that influence intention achievement in MOOCs. In V. Pammer-Schindler, M. Pérez-Sanagustín, H. Drachsler, R. Elferink, & M. Scheffel (Eds.), *Lifelong Technology-Enhanced Learning* (pp. 3–15). Springer International Publishing. https://doi.org/10.1007/978-3-319-98572-5_1

Hew, K. F., & Cheung, W. S. (2014). Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges. *Educational Research Review*, *12*, 45–58. https://doi.org/10.1016/j.edurev.2014.05.001

Hoch, E., Scheiter, K., & Schüler, A. (2020). Implementation intentions related to self-regulatory processes do not enhance learning in a multimedia environment. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.00046

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*. SAGE Publications Inc. https://us.sagepub.com/en-us/nam/cultures-consequences/book9710

Hone, K. S., & El Said, G. R. (2016). Exploring the factors affecting MOOC retention: A survey study. *Computers & Education*, *98*, 157–168. https://doi.org/10.1016/j.compedu.2016.03.016

Huang, L., Wang, K., Li, S., & Guo, J. (2023). Using WeChat as an educational tool in MOOC-based flipped classroom: What can we learn from students' learning experience? *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.1098585

Huber, S. G., & Skedsmo, G. (2016). Teacher evaluation—Accountability and improving teaching practices. *Educational Assessment, Evaluation and Accountability*, *28*(2), 105–109. https://doi.org/10.1007/s11092-016-9241-1

Jekabsone, I., & Gudele, I. (2023). Online adult education for sustainable development: The analysis of the consequences of the COVID-19 pandemic in Latvia. *Journal of Teacher Education for Sustainability*, *25*(1), 155–167. https://doi.org/10.2478/jtes-2023-0010

Jitpaisarnwattana, N., Reinders, H., & Darasawang, P. (2021). Understanding the roles of personalization and social learning in a language MOOC through learning analytics. *Online Learning*, *25*(4), 324–343. https://doi.org/10.24059/olj.v25i4.2509

Kellogg, S., Booth, S., & Oliver, K. (2014). A social network perspective on peer supported learning in MOOCs for educators. *The International Review of Research in Open and Distributed Learning*, *15*(5). https://doi.org/10.19173/irrodl.v15i5.1852

Kizilcec, R. F., & Cohen, G. L. (2017). Eight-minute self-regulation intervention raises educational attainment at scale in individualist but not collectivist cultures. *Proceedings of the National Academy of Sciences*, *114*(17), 4348–4353. https://doi.org/10.1073/pnas.1611898114

Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in Massive Open Online Courses. *Computers & Education*, *104*, 18–33. https://doi.org/10.1016/j.compedu.2016.10.001

Kizilcec, R. F., Reich, J., Yeomans, M., Dann, C., Brunskill, E., Lopez, G., Turkay, S., Williams, J. J., & Tingley, D. (2020). Scaling up behavioral science interventions in online education. *Proceedings of the National Academy of Sciences*, *117*(26), 14900–14905. https://doi.org/10.1073/pnas.1921417117

Krasny, M., DuBois, B., Adameit, M., Atiogbe, R., Baih, L., Bold-erdene, T., Golshani, Z., González-González, R., Kimirei, I., Leung, Y., Shian-yun, L., & Yao, Y. (2018). Small groups in a social learning MOOC (slMOOC): Strategies for fostering learning and knowledge creation. *Online Learning*, *22*(2), 119–140. https://doi.org/10.24059/olj.v22i2.1339

Kucuk, S., & Richardson, J. C. (2019). A structural equation model of predictors of online learners' engagement and satisfaction. *Online Learning*, *23*(2), 196–216. https://doi.org/10.24059/olj.v23i2.1455

Lerís, D., Sein-Echaluce, M. L., Hernández, M., & Bueno, C. (2017). Validation of indicators for implementing an adaptive platform for MOOCs. *Computers in Human Behavior*, *72*, 783–795. https://doi.org/10.1016/j.chb.2016.07.054

Levin, H. M. (1974). A conceptual framework for accountability in education. *The School Review*, *82*(3), 363–391.

Levitt, R., Janta, B., & Wegrich, K. (2008). *Accountability of teachers: Literature review*. RAND Corporation. https://www.rand.org/pubs/technical_reports/TR606.html

Li, S., Du, J., & Yu, X. (2025). Dynamics of cMOOC learner interactions in different social media: A longitudinal network analysis. *Interactive Learning Environments*, *33*(3), 2460–2478. https://doi.org/10.1080/10494820.2024.2412058

Li, Y., Armstrong, A. K. & Krasny, M. E. (2024). MOOC teaching assistants' global engaged-learning in the United States and China. *Online Learning*, *28*(4), 147–171. https://doi.org/10.24059/olj.v28i4.4567

Li, Y., Krasny, M. E., & Russ, A. (2016). Interactive learning in an urban environmental education online course. *Environmental Education Research*, *22*(1), 111–128. https://doi.org/10.1080/13504622.2014.989961

Limbu, Y. (2025). Factors associated with student engagement in online learning during COVID-19 pandemic: A systematic review. *Online Learning*, *29*(1), 293–325. https://doi.org/10.24059/olj.v29i1.4221

Liu, Z., Zhang, N., Peng, X., Liu, S., Yang, Z., Peng, J., Su, Z., & Chen, J. (2022). Exploring the relationship between social interaction, cognitive processing and learning achievements in a MOOC discussion forum. *Journal of Educational Computing Research*, *60*(1), 132–169. https://doi.org/10.1177/07356331211027300

Loh, H. S., Martins van Jaarsveld, G., Mesutoglu, C., & Baars, M. (2024). Supporting social interactions to improve MOOC participants' learning outcomes: A literature review. *Frontiers in Education*, *9*. https://doi.org/10.3389/feduc.2024.1345205

Moore, R. L., & Wang, C. (2021). Influence of learner motivational dispositions on MOOC completion. *Journal of Computing in Higher Education*, *33*(1), 121–134. https://doi.org/10.1007/s12528-020-09258-8

Moore, R. L., Wang, C., Liu, L., & Lee, S. S. (2025). The knowledge quest: Navigating the Learner-Intention Continuum from curiosity to achievement. *Education and Information Technologies*, *30*(9), 12991–13009. https://doi.org/10.1007/s10639-025-13327-9

Normore, A. H. (2004). The edge of chaos: School administrators and accountability. *Journal of Educational Administration*, *42*(1), 55–77. https://doi.org/10.1108/09578230410517477

Parrish, P., & Linder-VanBerschot, J. A. (2010). Cultural dimensions of learning: Addressing the challenges of multicultural instruction. *International Review of Research in Open and Distance Learning*, *11*(2), 1–19. https://doi.org/10.19173/irrodl.v11i2.809

Rabin, E., Kalman, Y. M., & Kalz, M. (2019). An empirical investigation of the antecedents of learner-centered outcome measures in MOOCs. *International Journal of Educational Technology in Higher Education*, *16*(1), 14. https://doi.org/10.1186/s41239-019-0144-3

Rahimi, A. R. (2024). A tri-phenomenon perspective to mitigate MOOCs' high dropout rates: The role of technical, pedagogical, and contextual factors on language learners' L2 motivational selves, and learning approaches to MOOC. *Smart Learning Environments*, *11*(1), 11. https://doi.org/10.1186/s40561-024-00297-7

Rahmatollahi, M., & Mohamadi Zenouzagh, Z. (2021). Designing and validating an evaluation inventory for assessing teachers' professional accountability. *Language Testing in Asia*, *11*(1), 11. https://doi.org/10.1186/s40468-021-00128-3

Redmond, P., Alexsen, M., Maloney, S., Turner, J., Brown, A., Basson, M., Galligan, L., Lawrence, J., & Henderson, R. (2023). Student perceptions of online engagement. *Online Learning*, *27*(1), 383–403. https://doi.org/10.24059/olj.v27i1.3320

Rizvi, S., Rienties, B., Jekaterina Rogaten, & Kizilcec, R. F. (2024). Are MOOC learning designs culturally inclusive (enough)? *Journal of Computer Assisted Learning*, *40*(6), 2496–2512.

Rizvi, S., Rienties, B., Rogaten, J., & Kizilcec, R. F. (2022a). Culturally adaptive learning design: A mixed-methods study of cross-cultural learning design preferences in MOOCs. In Rienties, B., Hampel, R., Scanlon, E., & Whitelock, D. (Eds.), *Open World Learning* (pp. 103–115). Routledge.

Rizvi, S., Rienties, B., Rogaten, J., & Kizilcec, R. F. (2022b). Beyond one-size-fits-all in MOOCs: Variation in learning design and persistence of learners in different cultural and socioeconomic contexts. *Computers in Human Behavior*, *126*, 106973. https://doi.org/10.1016/j.chb.2021.106973

Ruipérez-Valiente, J. A., Jenner, M., Staubitz, T., Li, X., Rohloff, T., Halawa, S., Turro, C., Cheng, Y., Zhang, J., Despujol, I., & Reich, J. (2020). Macro MOOC learning analytics: Exploring trends across global and regional providers. *Proceedings of the Tenth International Conference on Learning Analytics & Knowledge*, 518–523. https://doi.org/10.1145/3375462.3375482

Sanz-Martínez, L., Martínez-Monés, A., Bote-Lorenzo, M. L., Muñoz-Cristóbal, J. A., & Dimitriadis, Y. (2017). Automatic group formation in a MOOC based on students' activity criteria. In É. Lavoué, H. Drachsler, K. Verbert, J. Broisin, & M. Pérez-

Sanagustín (Eds.), *Data driven approaches in digital education* (pp. 179–193). Springer International Publishing. https://doi.org/10.1007/978-3-319-66610-5_14

Schlenker, B. R., Britt, T. W., Pennington, J., Murphy, R., & Doherty, K. (1994). The triangle model of responsibility. *Psychological Review*, *101*(4), 632–652. https://doi.org/10.1037/0033-295X.101.4.632

Schlenker, B. R., Weigold, M. F., & Doherty, K. (1991). Coping with accountability: Self-identification and evaluative reckonings. In C. R. Snyder & D. R. Forsyth (Eds.), *Handbook of social and clinical psychology: The health perspective* (pp. 96–115). Pergamon Press.

Schwartz, S. (2012). An overview of the Schwartz theory of basic values. *Online Readings in Psychology and Culture*, *2*(1). https://doi.org/10.9707/2307-0919.1116

Semenova, T. (2022). Not only the intention to complete: The role of action-oriented intentions in MOOC completion. *Technology, Knowledge and Learning*, *27*(3), 707–719. https://doi.org/10.1007/s10758-021-09534-1

Singh, A., & Ishrat, A. (2025). The role of social support in enhancing self-efficacy and learning satisfaction in online education among secondary school students. *On the Horizon: The International Journal of Learning Futures*, *3*(33), 320–337. https://doi.org/10.1108/OTH-03-2025-0033

Sitzmann, T., & Ely, K. (2010). Sometimes you need a reminder: The effects of prompting self-regulation on regulatory processes, learning, and attrition. *Journal of Applied Psychology*, *95*(1), 132–144. https://doi.org/10.1037/a0018080

Sitzmann, T., & Johnson, S. K. (2012). The best laid plans: Examining the conditions under which a planning intervention improves learning and reduces attrition. *Journal of Applied Psychology*, *97*(5), 967–981. https://doi.org/10.1037/a0027977

Sonnenberg, C., & Bannert, M. (2019). Using Process Mining to examine the sustainability of instructional support: How stable are the effects of metacognitive prompting on self-regulatory behavior? *Computers in Human Behavior*, *96*, 259–272. https://doi.org/10.1016/j.chb.2018.06.003

Sparke, M. (2017). Situated cyborg knowledge in not so borderless online global education: Mapping the geosocial landscape of a MOOC. *Geopolitics*, *22*(1), 51–72. https://doi.org/10.1080/14650045.2016.1204601

Stein, R. E., Colyer, C. J., & Manning, J. (2016). Student accountability in team-based learning classes. *Teaching Sociology*, *44*(1), 28–38. https://doi.org/10.1177/0092055X15603429

Tang, Y., Tseng, H., Kuo, Y.-C., Yeh, H.-T., & Liu, J. (2025). Setting the stage for success: Readiness and connectedness as antecedents of learning continuance intention in online learning. *Online Learning*, *29*(1), 214–237. https://doi.org/10.24059/olj.v29i1.4402

Tetlock, P. E. (1992). The impact of accountability on judgment and choice: Toward a social contingency model. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (vol. 25, pp. 331–376). Academic Press. https://doi.org/10.1016/S0065-2601(08)60287-7

Viberg, O., Kizilcec, R. F., Jivet, I., Martínez Monés, A., Oh, A., Mutimukwe, C., Hrastinski, S., & Scheffel, M. (2024). Cultural differences in students' privacy concerns in learning analytics across Germany, South Korea, Spain, Sweden, and the United States. *Computers in Human Behavior Reports*, *14*, 100416. https://doi.org/10.1016/j.chbr.2024.100416

von Hippel, P. (2017). When can you fit a linear probability model? More often than you think. *Statistical Horizons*. https://statisticalhorizons.com/when-can-you-fit/

Wei, W., Liu, J., Xu, X., Kolletar-Zhu, K., & Zhang, Y. (2023). Effective interactive engagement strategies for MOOC forum discussion: A self-efficacy perspective. *PLOS ONE*, *18*(11), e0293668. https://doi.org/10.1371/journal.pone.0293668

Winrotte, S. (Director). (2022). Student accountability in online environments [Video recording]. https://onlineteachinghub.education.purdue.edu/student-accountability-in-online-environments/

Wong, J., Baars, M., He, M., de Koning, B. B., & Paas, F. (2021). Facilitating goal setting and planning to enhance online self-regulation of learning. *Computers in Human Behavior*, *124*, 106913. https://doi.org/10.1016/j.chb.2021.106913

Xiang, M., Zhang, J., & Li, Y. (2025). Examining the dynamics of knowledge convergence in online learning context: A network perspective. *Computers & Education*, *227*, 105222. https://doi.org/10.1016/j.compedu.2024.105222

Xu, Q., & Richardson, J. (2024). The impact of social media and gamification of a mobile vocabulary learning app: Self-regulation and learning persistence. *Online Learning*, *28*(4), 4–32. https://doi.org/10.24059/olj.v28i4.4592

Yang, B., & He, H. (2022). Learning alone yet together: Enhancing between-learner social connectivity at scale. *Proceedings of the Ninth ACM Conference on Learning @ Scale*, 374–378. https://doi.org/10.1145/3491140.3528294

Zellars, K. L., Hochwarter, W. A., Lanivich, S. E., Perrewé, P. L., & Ferris, G. R. (2011). Accountability for others, perceived resources, and well being: Convergent restricted non-linear results in two samples. *Journal of Occupational and Organizational Psychology*, *84*(1), 95–115. https://doi.org/10.1348/2044-8325.002004

Zhang, J., Skryabin, M., & and Song, X. (2016). Understanding the dynamics of MOOC discussion forums with simulation investigation for empirical network analysis (SIENA). *Distance Education*, *37*(3), 270–286. https://doi.org/10.1080/01587919.2016.1226230

Zheng, S., Han, K., Rosson, M. B., & Carroll, J. M. (2016). The role of social media in MOOCs: How to use social media to enhance student retention. *Proceedings of the*

Third (2016) ACM Conference on Learning @ Scale, 419–428. https://doi.org/10.1145/2876034.2876047

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, *41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2