

Exploring Science Teachers' Experiences with Massive Open Online Courses for Professional Development

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Date Submitted:

March 25, 2026

Date Accepted:

June 19, 2026

Date Published:

August 08, 2026

DOI:

10.5281/zenodo.21846157

ABSTRACT

Continuous professional development is essential for teachers to remain responsive to rapid changes in educational practices and technological innovations. Massive Open Online Courses (MOOCs) have emerged as an accessible and flexible approach to lifelong learning by providing educators with opportunities to develop professional competencies beyond conventional training programs. Despite the increasing global adoption of MOOCs, empirical evidence describing teachers' experiences within basic education institutions in developing countries remains limited. This study explored the perceptions and experiences of science teachers who participated in Massive Open Online Courses as part of their professional development in an international basic education institution in the

Philippines. A qualitative descriptive research design was employed involving science teachers selected through purposive sampling. Participants completed pre-course and post-course online questionnaires consisting of closed-ended and open-ended questions. They were given the flexibility to enroll in MOOCs of their choice and complete them within one academic year. Quantitative responses were analyzed using descriptive statistics, while qualitative responses underwent thematic analysis to identify recurring patterns and experiences. Participants demonstrated positive attitudes toward lifelong learning and expressed strong intrinsic motivation to participate in MOOCs. Teachers perceived MOOCs as valuable because of their flexibility, accessibility, high-quality instructional content, and opportunities for self-paced learning. Although most participants successfully completed at least one MOOC, workload and competing professional responsibilities emerged as the primary barriers to course completion. Overall, participants considered MOOCs an effective strategy for continuous professional development and recommended their integration into institutional learning initiatives. MOOCs represent a practical and sustainable professional development strategy for science teachers. Institutional support mechanisms, including recognition of MOOC achievements and dedicated learning time, may further improve teacher participation and completion rates.

Keywords: Massive Open Online Courses; Teacher Professional Development; Lifelong Learning; Science Education; Qualitative Research

INTRODUCTION

Continuous professional development has become an indispensable component of teaching in the twenty-first century. Rapid advances in educational technology, evolving curriculum standards, and changing learner needs require teachers to continually update their pedagogical knowledge, disciplinary expertise, and digital competencies. Consequently, lifelong learning has shifted from being a desirable professional characteristic to an essential expectation for educators worldwide.

The emergence of digital learning environments has transformed how teachers access professional development opportunities. Unlike traditional seminars and workshops that are often constrained by time, location, and institutional resources, online learning platforms provide flexible alternatives that support continuous learning regardless of geographical or financial limitations. Among these innovations, Massive Open Online Courses (MOOCs) have gained significant attention because they offer high-quality learning experiences delivered by leading universities, professional organizations, and educational institutions across the world.

MOOCs are characterized by open enrollment, flexible pacing, multimedia instructional resources, interactive assessments, and opportunities for collaborative learning among geographically diverse participants. Since their emergence, MOOCs have expanded rapidly across disciplines, serving millions of learners seeking personal enrichment, academic advancement, and professional development. For educators, MOOCs provide opportunities to strengthen subject matter expertise, explore innovative pedagogical approaches, enhance digital literacy, and engage with global communities of practice.

Teacher participation in MOOCs has become increasingly relevant as educational institutions seek cost-effective and scalable approaches to professional learning. Previous studies have reported that MOOCs promote self-directed learning, professional reflection, collaboration, and the acquisition of new instructional strategies. Teachers also value the flexibility of completing courses at their own pace while balancing professional and personal responsibilities. However, despite these benefits, challenges such as limited time, workload, motivation, course completion, and institutional recognition continue to influence teachers' engagement with online professional learning.

Within the Philippine educational context, research examining teachers' experiences with MOOCs remains relatively limited, particularly within the basic education sector. Most existing studies have focused on higher education students or technological adoption rather than the lived experiences of practicing teachers participating in online professional development. Consequently, there remains a need to understand how teachers perceive MOOCs, the opportunities and barriers they encounter, and the implications of these experiences for institutional professional development initiatives.

This study addressed this gap by exploring the experiences of science teachers from an international basic education institution in the Philippines who participated in MOOCs as part of their professional learning. Rather than evaluating a specific MOOC platform, the study examined teachers' motivations, perceptions, experiences, and reflections following participation in MOOCs selected according to their professional interests. The findings contribute to the growing body of literature on technology-enabled teacher professional development and provide evidence that may inform institutional policies promoting lifelong learning among educators.

Specifically, this study sought to answer the following research questions:

1. What were science teachers' perceptions of MOOCs prior to participation?
2. What opportunities and challenges did teachers experience while completing MOOCs?
3. How did teachers evaluate the usefulness of MOOCs for their professional development?
4. What implications do teachers' experiences have for institutional professional development initiatives?

METHODS

Research Design

This study employed a qualitative descriptive research design to examine science teachers' perceptions and experiences regarding participation in Massive Open Online Courses (MOOCs) for professional development. A qualitative descriptive approach was considered appropriate because it enables researchers to obtain straightforward accounts of participants' experiences while preserving the meanings they assign to their own professional learning. The study also incorporated descriptive quantitative data derived from structured survey items to provide contextual information regarding participants' demographic characteristics, course completion,

and overall perceptions. The integration of qualitative and descriptive quantitative findings provided a comprehensive understanding of teachers' engagement with MOOCs.

Research Setting

The study was conducted during the 2018–2019 academic year in an international basic education institution in the Philippines. The institution actively encouraged faculty members to pursue continuous professional development through technology-enhanced learning initiatives. As part of this institutional initiative, science teachers were invited to participate in MOOCs offered by reputable universities and educational organizations worldwide. To preserve institutional anonymity, the name of the school is withheld throughout this manuscript.

Participants

A total of 18 science teachers participated in the study through purposive homogeneous sampling. Participants were selected because they shared similar professional characteristics and were directly involved in the institutional initiative promoting participation in MOOCs. The participants represented various grade levels within the basic education program, ranging from elementary to senior high school. Both tenured and non-tenured faculty members were included to capture diverse perspectives regarding professional learning and online course participation.

MOOC Participation

Rather than assigning participants to a single online course, teachers were given the autonomy to select MOOCs that aligned with their professional interests, subject specialization, or personal development goals. This approach reflected authentic professional learning practices in which educators independently identify learning opportunities relevant to their instructional needs.

Participants enrolled in courses offered through internationally recognized MOOC providers and universities. They were allowed to complete the courses at their own pace within the duration of one academic year. Successful completion of a course was verified through certificates of completion submitted electronically to the research team.

Research Instrument

Data were collected using researcher-developed pre-course and post-course online questionnaires administered through Google Forms. The questionnaires consisted of two components.

The first component contained structured questions that gathered demographic information, participants' previous professional development experiences, perceptions of lifelong learning, willingness to participate in MOOCs, expectations regarding course difficulty, and evaluations of various aspects of the learning experience.

The second component comprised open-ended questions that elicited participants' reflections on their motivations for enrolling, positive and negative learning experiences, perceived benefits, challenges encountered during course completion, and recommendations regarding the institutional implementation of MOOCs. The inclusion of both structured and open-ended questions enabled the researchers to obtain quantitative summaries while capturing rich narrative descriptions of participants' experiences.

Data Collection Procedure

Following institutional approval, eligible science teachers were invited to participate voluntarily in the study. Participants first completed the pre-course questionnaire, which established baseline information regarding their perceptions of lifelong learning, prior professional development experiences, and expectations concerning MOOCs.

After completing the baseline survey, participants independently enrolled in MOOCs of their choice. They completed the selected courses according to their own schedules within the academic year while balancing their regular teaching responsibilities. Upon completion, participants submitted their certificates as evidence of

successful course completion and subsequently completed the post-course questionnaire reflecting on their learning experiences.

The research process followed five sequential phases:

1. Administration of the pre-course questionnaire;
2. Enrollment in a self-selected MOOC;
3. Independent completion of the online course;
4. Submission of course completion certificates; and
5. Administration of the post-course questionnaire.

This procedure enabled the researchers to examine changes in teachers' perceptions before and after participation while documenting authentic learning experiences in real educational settings.

Data Analysis

Quantitative responses were analyzed using descriptive statistics, including frequencies, percentages, and weighted means. These analyses summarized participants' demographic characteristics, completion rates, perceptions of course difficulty, and evaluations of various MOOC features.

Qualitative responses were analyzed using thematic analysis. Responses from the open-ended questions were read repeatedly to achieve familiarity with the data. Initial codes were generated from meaningful statements, which were subsequently grouped into broader categories based on recurring similarities. These categories were refined into overarching themes representing participants' shared experiences and perceptions of MOOCs. Representative quotations were selected to support each identified theme while preserving participants' anonymity.

The integration of descriptive statistical findings with thematic analysis provided methodological triangulation, strengthening the credibility and comprehensiveness of the study's findings.

Ethical Consideration

To enhance the trustworthiness of the findings, all participants completed identical questionnaires before and after MOOC participation. The use of standardized online instruments promoted consistency in data collection. Additionally, participants' qualitative responses were interpreted within the context of their quantitative responses, allowing for triangulation between numerical summaries and narrative accounts. Direct participant quotations were retained to preserve authenticity and accurately represent teachers' perspectives.

RESULTS AND DISCUSSION

Participant Profile

Eighteen science teachers participated in the study. Participants represented various grade levels within the basic education program, including elementary, junior high school, and senior high school. The majority of the participants were teaching at the junior high school level (61%), followed by elementary school teachers (22%) and senior high school teachers (17%). Both tenured and non-tenured teachers participated, providing diverse perspectives on online professional development.

Before enrolling in a MOOC, participants reported varying levels of previous engagement in professional development activities. While some had recently attended local and international seminars, workshops, and certification programs, others indicated limited participation outside institution-sponsored training. Despite these differences, all participants identified themselves as lifelong learners and expressed willingness to participate in online professional learning opportunities.

Theme 1. Teachers Demonstrated Strong Commitment to Lifelong Learning

Prior to MOOC participation, all participants expressed positive attitudes toward lifelong learning. Their responses consistently described learning as a continuous process extending beyond formal education and emphasized personal and professional growth as essential characteristics of effective educators.

Participants viewed lifelong learning as:

- continuously improving professional competence;
- remaining open to new knowledge and experiences;
- adapting to changing educational practices; and
- pursuing learning beyond traditional classroom settings.

Representative responses included:

"Being a lifelong learner means that you continue to learn and build on the knowledge and abilities that you acquired in the past."

"Learning knows no boundaries. We should be open to any means of learning."

"It is a continuous exploration of knowledge for personal and professional growth."

These responses indicate that participants possessed an intrinsic orientation toward continuous professional development even before enrolling in MOOCs.

Theme 2. Professional Growth Was the Primary Motivation for MOOC Participation

Participants demonstrated overwhelmingly positive attitudes toward participating in MOOCs. Before course enrollment, all respondents indicated their willingness to participate, with most describing MOOCs as opportunities to strengthen teaching practice, acquire new knowledge, and remain current with educational innovations.

The most frequently reported motivations included:

- improving teaching competence;
- acquiring updated scientific knowledge;
- learning innovative instructional strategies;
- supporting student learning; and
- fulfilling personal goals for professional growth.

Illustrative responses included:

"I take ownership of my professional growth which in turn will benefit my students."

"I want to improve as a STEM teacher."

"To seek new ideas and strategies that I could use in class."

"Personal and professional growth."

Although institutional encouragement influenced participation, participants' responses suggest that intrinsic motivation was a stronger driver than compliance with institutional expectations.

Theme 3. MOOCs Were Perceived as Flexible, Accessible, and Instructionally Valuable

Following course completion, participants generally reported positive learning experiences. They appreciated the flexibility offered by MOOCs, particularly the opportunity to learn independently while accommodating teaching responsibilities.

Participants consistently identified several strengths of MOOCs:

- self-paced learning;
- high-quality instructional videos;
- comprehensive learning materials;
- interactive assessments;
- discussion forums;
- opportunities to interact with learners from diverse backgrounds.

Representative comments included:

"You can study at your own pacing."

"The platform is user-friendly, simple, and not time-consuming."

"I liked the pre-recorded videos and the interactive community."

"The assessment helped me evaluate my understanding of the lessons."

Teachers also valued the availability of transcripts, downloadable resources, and discussion forums, which enhanced comprehension and encouraged reflective learning.

Theme 4. Workload Was the Greatest Barrier to MOOC Completion

Although participants viewed MOOCs positively, completing the courses while fulfilling teaching responsibilities proved challenging for several respondents.

Among the 18 participants, 72% successfully completed at least one MOOC, whereas 28% did not complete their selected course within the study period. Most successful participants finished their courses in less than one month.

Participants attributed non-completion primarily to:

- heavy teaching loads;
- administrative responsibilities;
- limited available time;
- competing institutional deadlines.

Several respondents explained:

"The pressure from knowing that you need to finish a MOOC within a certain period on top of everything else."

"It is difficult to focus on your MOOC if you have other deadlines to meet."

Interestingly, non-tenured teachers generally demonstrated higher completion rates than tenured teachers occupying administrative roles. Participants suggested that senior faculty members experienced greater workload demands, limiting their capacity to complete self-paced online learning.

Theme 5. Teachers Evaluated MOOCs as Effective Professional Development

Participants generally reported that their chosen MOOCs met or exceeded their expectations. The majority indicated that course content, instructional delivery, learning resources, and assessments effectively supported their learning objectives.

Teachers particularly appreciated:

- organized course structure;
- comprehensive content;
- practical applications;
- opportunities for reflection;
- immediate feedback through assessments.

Representative responses included:

"The course provided what it intended to give."

"Everything needed to understand the lessons was available in the platform."

"The MOOC summarized and explained the topics very well."

Using the institutional five-point scale, participants rated the overall difficulty of completing a MOOC at a weighted mean of **2.67**, corresponding to a **moderate degree of difficulty**. This finding suggests that participants generally considered MOOCs manageable despite workload-related challenges.

Furthermore, participants ranked the characteristics of an effective MOOC in the following order of importance:

1. Course content
2. Platform quality and provider reputation
3. Assessment strategies
4. Instructional design
5. Participant interaction
6. Certification of completion

These rankings highlight that teachers prioritized educational quality over external incentives such as certificates.

Theme 6. Teachers Supported Institutional Adoption of MOOCs

Participants expressed strong support for integrating MOOCs into institutional professional development initiatives. Many believed that MOOCs could enhance teachers' professional competence while also serving as supplementary learning opportunities for senior high school students.

Participants recommended that institutions:

- recognize MOOC completion as part of professional development;
- encourage participation through institutional support;
- integrate MOOCs into faculty development programs;
- provide guidance for selecting high-quality courses.

Most respondents also indicated willingness to participate in future initiatives involving the adaptation of open educational resources and MOOC development, although few expressed interests in producing instructional videos themselves.

Overall, participants regarded MOOCs as valuable learning opportunities capable of strengthening teacher competence, supporting lifelong learning, and expanding access to quality educational resources. They emphasized that institutional encouragement, recognition, and protected time for professional learning would likely improve participation and course completion rates.

This study explored the experiences of science teachers participating in Massive Open Online Courses (MOOCs) as a strategy for continuous professional development. The findings demonstrate that teachers generally perceived MOOCs as valuable learning opportunities that promoted lifelong learning, enhanced pedagogical knowledge, and expanded access to high-quality educational resources. At the same time, participants identified workload and competing professional responsibilities as major barriers to successful course completion. These findings contribute to the growing body of literature on technology-enabled teacher professional development by providing empirical evidence from an international basic education institution in the Philippines.

Teachers Demonstrated a Strong Orientation Toward Lifelong Learning

One of the most significant findings of this study was that all participants identified themselves as lifelong learners prior to participating in MOOCs. Teachers viewed learning as a continuous process extending beyond formal education and considered professional growth an integral component of effective teaching. Rather than participating solely because of institutional encouragement, many respondents expressed intrinsic motivation to improve their knowledge and instructional practice.

This finding supports theories of adult learning, which emphasize that professionals engage more actively in learning when educational experiences address authentic workplace needs and personal aspirations. Teachers' descriptions of lifelong learning reflected characteristics of self-directed learners, including curiosity, professional responsibility, and continuous reflection.

The findings also align with previous studies indicating that educators increasingly recognize continuous professional development as essential for maintaining instructional effectiveness amid rapidly evolving educational technologies and curriculum reforms. Rather than perceiving professional development as an occasional institutional requirement, participants viewed learning as an ongoing professional responsibility.

MOOCs Offered Flexible and Accessible Professional Learning

Participants consistently described flexibility as one of the greatest strengths of MOOCs. The ability to learn independently, determine individual learning schedules, and access educational materials at any time enabled teachers to participate despite demanding professional responsibilities.

Several participants specifically appreciated:

- self-paced learning;
- multimedia instructional resources;
- downloadable learning materials;
- discussion forums;
- immediate formative assessments.

These features promoted learner autonomy while allowing teachers to balance professional obligations with continuing education.

The positive perceptions reported in this study reinforce previous research suggesting that MOOCs provide scalable and cost-effective alternatives to traditional face-to-face professional development. Unlike conventional seminars that require travel, scheduling adjustments, and institutional funding, MOOCs reduce logistical barriers and expand access to internationally recognized educational content.

For educators working within resource-constrained educational systems, these characteristics may substantially improve opportunities for continuing professional learning.

Professional Growth Was a Stronger Motivation Than Institutional Compliance

Although participation in MOOCs formed part of an institutional initiative promoting lifelong learning, participants primarily described personal and professional improvement as their motivation for enrolling.

Teachers frequently reported that MOOCs enabled them to:

- strengthen subject knowledge;
- discover innovative instructional strategies;
- improve classroom practice;
- remain updated with current developments;
- better support student learning.

This finding suggests that teachers perceived MOOCs not merely as institutional requirements but as meaningful opportunities to enhance professional competence.

The prominence of intrinsic motivation is particularly important because educational research consistently demonstrates that self-determined professional learning leads to greater engagement, persistence, and knowledge transfer into classroom practice. Teachers who voluntarily pursue professional learning opportunities are generally more likely to apply newly acquired knowledge in authentic teaching contexts.

Workload Remains the Greatest Challenge to MOOC Completion

Despite overwhelmingly positive perceptions of MOOCs, participants identified heavy workload as the principal obstacle to successful course completion. Administrative responsibilities, classroom preparation, assessment tasks, and competing institutional deadlines limited the amount of time teachers could dedicate to independent online learning.

Interestingly, the findings showed that teachers occupying administrative positions or holding longer tenure were less likely to complete MOOCs than newer faculty members. This observation suggests that professional responsibilities, rather than technological competence or motivation, may be the primary determinant of MOOC completion among practicing educators.

This finding is consistent with previous studies reporting that time constraints remain one of the strongest predictors of MOOC attrition. While MOOCs offer flexibility, successful completion still requires sustained self-regulation, effective time management, and institutional support.

The findings therefore suggest that increasing teacher participation in online professional development cannot rely solely on providing access to MOOCs. Educational institutions must also create enabling conditions that allow teachers sufficient time and organizational support to engage meaningfully in professional learning.

Institutional Support Is Essential for Sustainable MOOC Implementation

Participants strongly supported integrating MOOCs into institutional professional development initiatives. They viewed MOOCs as valuable supplements to traditional faculty training and suggested that online learning opportunities could also benefit senior high school students preparing for higher education.

However, participants emphasized that institutional support would significantly influence long-term participation. Several forms of support emerged from the findings, including formal recognition of MOOC completion, guidance in selecting appropriate courses, opportunities to share acquired knowledge with colleagues, and dedicated time for professional learning.

These findings suggest that institutional policies should move beyond encouraging participation toward creating structured professional learning ecosystems in which MOOCs complement existing faculty development programs. Recognition systems, mentoring arrangements, and collaborative reflection sessions may enhance both participation and knowledge transfer.

Implications for Teacher Professional Development

The findings have several practical implications for educational institutions seeking to strengthen teacher professional development through digital learning.

First, MOOCs may serve as cost-effective and scalable alternatives to conventional training programs, particularly for institutions seeking access to internationally recognized expertise without substantial financial investment.

Second, institutional encouragement alone may not be sufficient to ensure successful participation. Professional learning initiatives should incorporate structured support mechanisms that acknowledge teachers' workload and provide protected time for online learning.

Third, administrators may consider recognizing completed MOOCs within faculty development frameworks, promotion systems, or continuing professional development portfolios. Such recognition may further motivate teachers to pursue lifelong learning while strengthening institutional cultures that value continuous improvement.

Finally, the positive experiences reported by participants suggest that MOOCs may complement rather than replace traditional professional development. Blended models combining online learning, peer collaboration, and institutional mentoring may provide more sustainable approaches to teacher learning.

Strengths of the Study

This study contributes to the literature by documenting authentic experiences of practicing science teachers participating in self-selected MOOCs within an institutional professional development initiative. Unlike many studies focusing solely on learner satisfaction or completion rates, this research examined teachers' motivations, perceptions, challenges, and reflections before and after participation. The combination of descriptive statistics and thematic analysis provided a richer understanding of teachers' experiences and allowed quantitative findings to be interpreted alongside participants' narratives.

Limitations

Several limitations should be acknowledged when interpreting the findings. The study involved a relatively small sample drawn from a single international basic education institution, which may limit the transferability of the results to other educational contexts. Additionally, the findings relied primarily on self-

reported perceptions rather than direct observations of changes in classroom practice or student learning outcomes. The study also examined experiences over a single academic year and therefore could not assess the long-term impact of MOOC participation on teachers' professional growth.

Future research should consider larger multi-institutional studies, mixed-methods approaches, and longitudinal designs to examine how participation in MOOCs influences instructional practice, teacher effectiveness, and student achievement over time.

CONCLUSION

The present study demonstrates that Massive Open Online Courses represent a viable and meaningful approach to teacher professional development. Science teachers viewed MOOCs as flexible, accessible, and academically valuable opportunities that supported lifelong learning, strengthened professional competence, and broadened access to global educational resources. While workload and competing, professional responsibilities remained significant barriers to course completion, participants generally expressed positive experiences and strong support for integrating MOOCs into institutional professional development initiatives.

The findings suggest that the successful adoption of MOOCs requires more than providing access to online courses. Educational institutions should establish supportive policies that recognize teachers' learning achievements, allocate time for professional development, and encourage collaborative reflection on newly acquired knowledge. Such strategies may foster a culture of lifelong learning that benefits both educators and the students they serve.

As digital learning continues to reshape professional education, MOOCs offer a sustainable and scalable mechanism for expanding teacher development opportunities. When implemented alongside institutional support systems, they have the potential to strengthen teacher capacity, promote instructional innovation, and contribute to continuous improvement within basic education.

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